CampbellReith
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Great Ormond Street Hospital for Children, London WC1N 3JH

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13693-67

Revision: D1

July 2022

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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 the Great Ormond Street Hospital, Frontage Building, London WC1N 3JH (planning reference 2022/2255/P). The basement is considered to fall within Category C as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment (BIA) 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 A-squared Studio Engineers Ltd with supporting documents provided by A2 Site Investigation Limited, RSK Ltd and BDP Architects. To be in accordance with LBC guidance, assessment by a Chartered Hydrogeologist is required.

1.5. The site is approximately 0.2 hectares with an existing building on site comprising part of the Great Ormond Street Hospital frontage building and the main hospital entrance. The proposed development comprises the demolition of the existing buildings on site and the construction of an eight-storey hospital building together with 2 basement floors.

1.6. The BIA includes the majority of the information required from a desk study in line with LBC guidance.

1.7. The Screening assessment does not include all the questions from the latest LBC guidance (CPG Basements 2021) and should be updated, as required.

1.8. A site investigation indicates that the ground conditions comprise Made Ground overlying the Lynch Hill Gravel Member, London Clay Formation, Lambeth Group and Thanet Sand. Groundwater was encountered within the Made Ground and Lynch Hill Gravel Member.

4.9 A number of supporting documents reference the close proximity of the historic River Fleet, which should be considered within the BIA. The Lynch Hill Gravel is a Secondary A Aquifer. It is noted that the construction records from the adjacent building indicate a number of groundwater related issues. The hydrogeological assessment should be reviewed and confirmed by a Chartered Hydrogeologist.

1.9. Interpretative geotechnical information has been provided in accordance with the LBC guidance, which also includes preliminary information in regard to the proposed piled foundations.

1.10. Outline temporary and permanent works structural information for the proposed basements should be provided, sufficient to demonstrate feasibility and consistency with the assessment criteria for considerations of ground movements / structural damage impacts. The temporary works plan should include detail on the required dewatering.

1.11. A ground movement assessment (GMA) indicates that adjacent buildings will sustain no more than Category 1 damage (Very Slight) in accordance with the Burland Scale. The supporting structural information is required to confirm the assumptions of the GMA, which should also include the full inputs and outputs of the assessment models.

1.12. The BIA confirms that structural monitoring will be undertaken during the works with trigger values adopted to control construction and mitigate impacts to adjacent structures and infrastructure. Asset protection criteria should be agreed with the relevant asset owners.

1.13. There will be no change to the impermeable site area as a result of the proposed development. The BIA and supporting documents indicate that the site will benefit from the proposed drainage scheme, although details have not been provided. The site is within a Critical Drainage Area and proposals for attenuated drainage in accordance with best practice should be agreed with LBC and Thames Water.

1.14. The Flood Risk Assessment indicates the site is at generally low risk of flooding. Flood mitigation measures are presented.

1.15. Queries and matters requiring further clarification are discussed in Section 4 and summarised in Appendix 2. Until the additional information requested is provided, the BIA does not meet the requirements of CPG: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 13th June 2022 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Great Ormond Street Hospital, Frontage Building, London WC1N 3JH, Camden Reference 2022/2255/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): Basements. January 2021
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- The Local Plan (2017): Policy A5 (Basements).

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 planning portal describes the proposal as: *"Redevelopment of the Great Ormond Street Hospital (GOSH) Frontage Building (for the purposes of consultation: Phase 4 Children's Cancer Centre) comprising demolition of the existing building, and erection of a replacement (for the purposes of consultation: 8 storey (plus overruns and rooftop paraphernalia)) hospital building*

(Class C2, for the purposes of consultation: includes ancillary cafe and school) with a basement (for the purposes of consultation: 2 storey), landscaped amenity spaces at roof top and balcony and ground floor levels, plant equipment, cycle storage, refuse storage and other ancillary and associated works pursuant to the development."

2.6. The planning portal confirmed the site lies within the Bloomsbury Conservation Area and is positioned opposite a number of grade II listed Georgian Terrace properties (No.'s 19-27 and 41-61) and to the east of a number of buildings of architectural merit including the immediately adjacent Paul O'Gorman Building designed by Charles Barry Jr. (1893) and located on the site of the original 'Hospital for Sick Children'.

2.7. CampbellReith accessed LBC's Planning Portal on 1st July 2022 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (ref 1226) dated 20 May 2022 by A-squared Studio Engineers Ltd including:
  - Geotechnical and Geo-environmental Desk Study Report (ref 1226) dated 17 May 2022 by A-squared Studio Engineers Ltd.
- Geotechnical and Geo-environmental Factual Report (ref 12921) dated 17 May 2022 by A2 Site Investigation Limited.
- Site Location Plan and existing and proposed plans and sections by BDP.
- Building Ground Movement Assessment (ref 1226) dated 20 May 2022 by A-squared Studio Engineers Ltd.
- Thames Water Utilities Ground Movement Assessment (ref 1226) dated 17 May 2022 by A-squared Studio Engineers Ltd.
- Flood Risk Assessment (ref 680181-R1(03)-FRA) dated May 2022 by RSK Ltd.
- Structural Assessment Report (ref 1292) dated 17 May 2022 by A2 Site Investigation Limited.
- Utilities Survey Report dated 20 December 2021 by Midland Survey Ltd.
- Arboricultural Planning Statement dated 20 May 2022 by RSK ADAS Ltd.
- Design & Access Statement (ref P2007598) dated 20 May 2022 by BDP.
- Demolition and Construction Management Plan (ref PO 05) dated 20 May 2022 by SISK Building Contractors.
- Planning consultation comments.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	No	A Chartered Geologist is required to undertake the groundwater flow assessment.
Is data required by Cl.233 of the GSD presented?	No	Outline structural information including temporary works (propping and sequencing, dewatering etc) and a construction programme should be presented.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	To be confirmed by provision of outline structural information, as above.
Are suitable plans/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	Section 4.2 of the BIA. Does not include all the questions from CPG Basements 2021. With reference to supporting documents, the historic River Fleet to be considered.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	Section 4.1 of the BIA. With reference to supporting documents, the historic River Fleet to be considered.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 4.3 of the BIA.

Item	Yes/No/NA	Comment
Is a conceptual model presented?	Yes	However, this may need to be updated with regard to groundwater / River Fleet proximity.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	Section 5.2 and 5.3 of the BIA. Does not include all the Screening questions from CPG Basements 2021. With reference to supporting documents, the historic River Fleet to be considered.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	No	Section 5.1 of the BIA. With reference to supporting documents, the historic River Fleet to be considered.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	However, with reference to the supporting documents, the existing site is 100% impermeable due to building cover / hardstanding in the areas of the proposed basement, and it is accepted this does not result in an impact due to basement construction.
Is factual ground investigation data provided?	Yes	Geotechnical and Geo-environmental Factual Report (ref 12921) dated 17 May 2022 by A2 Site Investigation Limited.
Is monitoring data presented?	Yes	Appendix E of the A2 Site Investigation Report.
Is the ground investigation informed by a desk study?	Yes	Geotechnical and Geo-environmental Desk Study Report (ref 1226) dated 17 May 2022 by A-squared Studio Engineers Ltd.
Has a site walkover been undertaken?	Yes	As part of Geotechnical and Geo-environmental Factual Report by A2 Site Investigation Limited.
Is the presence/absence of adjacent or nearby basements confirmed?	No	The BIA states that 'it is understood that there are no existing basements immediately adjoining the new basement on the north, south and western sides (at the same level of the new proposed basement). The Octav Botnar building to the east of the site footprint is understood to have an existing single storey basement level'.

Item	Yes/No/NA	Comment
Is a geotechnical interpretation presented?	Yes	Sections 5 and 6 of Geotechnical and Geo-environmental Desk Study Report by A-squared Studio Engineers Ltd.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Geotechnical Design Report
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural Impact Assessment Report, Ground Movement Assessment
Are baseline conditions described, based on the GSD?	No	Hydrogeological conditions require further assessment.
Do the baseline conditions consider adjacent or nearby basements?	Yes	Assumptions have been made on the absence of adjacent basements. Depending on hydrogeological assessment review, this may require further clarification.
Is an Impact Assessment provided?	Yes	Section 9 of the BIA. However, not all potential impacts considered.
Are estimates of ground movement and structural impact presented?	Yes	To be clarified by presentation of outline temporary works information and inputs / outputs of GMA modelling software.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	No	Hydrogeological assessment to be reviewed.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	To be confirmed following review of hydrogeological assessments and temporary structural works / GMA information.
Has the need for monitoring during construction been considered?	Yes	Section 8.2 of the BIA.
Have the residual (after mitigation) impacts been clearly identified?	No	To be confirmed following review of hydrogeological assessments and temporary structural works / GMA information.

Item	Yes/No/NA	Comment
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	To be clarified by presentation of outline temporary works information and inputs / outputs of GMA modelling software.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	To be confirmed following review of hydrogeological assessments.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	To be confirmed following review of hydrogeological assessments, which may require confirmation of local basement locations.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	To be clarified by presentation of outline temporary works information and inputs / outputs of GMA modelling software.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been prepared by A-squared Studio Engineers Ltd with supporting documents provided by A2 Site Investigation Limited, RSK Ltd and BDP Architects. The qualifications of the authors of the BIA for the Surface Water and Flooding and Land stability are in accordance with LBC guidance. However, to be in accordance with LBC guidance, assessment by a Chartered Hydrogeologist is required for the hydrogeological assessments.

4.2. The site is approximately 0.2 hectares with an existing building on site comprising part of the Great Ormond Street Hospital frontage building and the main hospital entrance. It is understood that the building has an existing lower ground floor / basement which covers the entire footprint. The proposed development comprises the demolition of the existing buildings on site and the construction of an eight-storey hospital building together with 2 basement floors. It is understood that the basement formation will extend to approximately 6.90m below the existing lower ground level at the rear of the building.

4.3. The BIA includes the majority of the information required from a desk study in line with the GSD Appendix G1. The presence of underground infrastructure across the site is confirmed within the Utilities Survey Report by Midland Surveys Ltd.

4.4. The Screening assessment does not include all the questions from the latest LBC guidance (CPG Basements 2021) and should be updated, as required.

4.5. The desk study and FRA state that the historic River Fleet is in very close proximity to the site, although this is not acknowledged in the relevant Screening assessments or further assessed.

4.6. It is noted that the construction records from the adjacent building indicate a number of groundwater related issues which required mitigation actions to be undertaken during the works. The Structural Report refers to the "General Construction Information" of the building from a Contractors Account from Architects Journal – Building Study dated 6th April 1994: *"The building sits on 280 piled foundations bored to depths of 25m below the existing basement level. The tops of the piles are incorporated into pile caps constructed beneath a 300mm-thick basement slab. Running sand and a very high-water table meant drainage was required 24 hours a day during the foundation construction. Encased electric pumps to suppress noise were used to avoid disturbance. Many of the pile caps had to be coffer-dammed*".

4.7. Considering 4.5 and 4.6, the underlying Secondary A Aquifer of the Lynch Hill Gravel, and the assumptions made about the location of nearby basements (that may also penetrate and obstruct groundwater flow within the aquifer), the hydrogeological assessments should be reviewed and confirmed by a Chartered Hydrogeologist, including comment on potential cumulative impacts.

4.8. An intrusive site investigation was undertaken in August and September 2021 with subsequent monitoring of boreholes between 15th September and 27th October 2021. The investigation comprised 10 no. hand excavated structural trial pits, 1 no. cable percussion borehole to a maximum depth of 40.00m below ground level (bgl), and 2 no. cable percussion boreholes to a maximum depth of 21.00m bgl. A standpipe was installed in each of the boreholes for monitoring of ground gas and groundwater levels. The ground conditions comprise Made Ground (up to 2.10m thickness) overlying the Lynch Hill Gravel Member (varying in thickness from 0.30m to 3.10m) overlying the London Clay Formation overlying the Lambeth Group and Thanet Sand.

4.9. Groundwater level monitoring was carried out on six occasions between 15th September 2021 and 27th October 2021. Groundwater was encountered between 0.75m and 1.09m bgl perched above the London Clay. The proposed basement formation will extend to approximately 6.90m bgl therefore be below standing groundwater level.

4.10. Interpretative geotechnical information has been provided in accordance with the GSD Appendix G3, which also includes preliminary information in regard to the proposed piled foundations.

4.11. A secant pile wall extending into the London Clay (to achieve a full groundwater cut-off) is proposed, which will limit the ability of groundwater to flow into the basement. The BIA states that the groundwater monitoring data indicates a consistent water table elevation across the site and that no prevailing groundwater flow direction has been identified. The BIA concludes that the creation of a new groundwater cut-off wall will have limited impact on the hydrogeological regime and/or adjacent properties and that groundwater will be permitted to flow around the new basement box preventing any major damming effects. However, as 4.5, 4.6 and 4.7, the hydrogeological assessments should be reviewed and confirmed by a Chartered Hydrogeologist, including comment on potential cumulative impacts and whether longer term monitoring may be required to consider seasonal effects.

4.12. It is understood that a piled raft foundation system is currently proposed and detailed design analyses are being undertaken. The proposed earth retention system for the basement deepening comprises a secant pile wall with internal liner wall and drained cavity. The BIA states that temporary propping measures will be put in place to support the retaining wall and limit ground movements as much as possible, although no information has been presented to support this. Outline temporary and permanent works structural information for the proposed basements should be provided, sufficient to demonstrate feasibility and consistency with the assessment criteria for considerations of ground movements / structural damage impacts. The temporary works plan should include detail on sequencing and propping, and the required dewatering.

4.13. A ground movement assessment (GMA) has been provided for review. In total, 95 façades of the neighbouring buildings were considered: Paul O'Gorman Building, Variety Club Building, Premier Inn Clinical Building, Octav Botnar Wing, 47 Great Ormond Street and 29 Orde Hall Street. The

results indicates that adjacent buildings will sustain no more than Category 1 damage (Very Slight) in accordance with the Burland Scale. The supporting structural information is required to confirm the assumptions of the GMA, which should also include the full inputs and outputs of the assessment models.

4.14. Assessment of impacts to nearby utility infrastructure is also presented.

4.15. The BIA confirms that structural monitoring will be undertaken during the works with trigger values adopted to control construction and mitigate impacts to adjacent structures and infrastructure. Asset protection criteria should be agreed with the relevant asset owners.

4.16. With reference to the supporting documents, the existing site is 100% impermeable due to building cover / hardstanding in the areas of the proposed basement, which will not change. Whilst Screening notes some minor changes in the wider site area (due to removal of trees, for instance) it is accepted this does not result in an impact due to basement construction.

4.17. The BIA and supporting documents indicate that the site will benefit from the proposed drainage scheme, although details have not been provided. The site is within a Critical Drainage Area and proposals for attenuated drainage in accordance with best practice should be agreed with LBC and Thames Water.

4.18. The Flood Risk Assessment indicates the site is at generally low risk of flooding. Flood mitigation measures are presented.

5.0 CONCLUSIONS

5.1. To be in accordance with LBC guidance, assessment by a Chartered Hydrogeologist is required.

5.2. The Screening assessment does include all the questions from the latest LBC guidance (CPG Basements 2021) and should be updated, as required.

5.3. The hydrogeological assessments should be reviewed and confirmed by a Chartered Hydrogeologist, including comment on potential cumulative impacts and whether longer term monitoring may be required to consider seasonal effects.

5.4. Geotechnical data and interpretative information are presented, as required by LBC guidance.

5.5. Outline temporary and permanent works structural information for the proposed basements should be provided, sufficient to demonstrate feasibility and consistency with the assessment criteria for considerations of ground movements / structural damage impacts.

5.6. The GMA should be confirmed by the supporting temporary works information and full inputs and outputs of the assessment models are requested.

5.7. Asset protection criteria should be agreed with the relevant asset owners.

5.8. There will be no change to the impermeable site area as a result of the proposed development.

5.9. The Flood Risk Assessment indicates the site is at generally low risk of flooding. Flood mitigation measures are presented.

5.10. Queries and matters requiring further clarification are summarised in Appendix 2. Until the additional information requested is provided, the BIA does not meet the requirements of CPG: Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

There are many objections to this development from local residents and interested parties. The following comments highlight those pertinent to the BIA:

Surname	Address	Date	Issue raised	Response
Conacher	Not provided	6 June 2022	"Damage to our lower ground business address (under street level on Great Ormond Street) - our building is an old one, and our business address is in the lower ground level - I have huge concerns that repeated access by multiple, heavy construction vehicles on Great Ormond Street will cause damage to our building, and our lower ground space. No structural/impact assessment has been undertaken for the lower ground spaces on our side of Great Ormond Street."	Section 4
Not provided	36a Lambs Conduit Street, London, WC1N 3LD	10 June 2022	Building Ground Movement: We are not just talking about one or two buildings here but 95 buildings, most of them heritage buildings – how can this be acceptable? Can an independent report on this be commissioned?	Section 4
Thames Water		10 June 2022	Waste Comments Thames Water requests that the Applicant should incorporate within their proposal, protection to the property to prevent sewage flooding, by installing a positive pumped device (or equivalent reflecting technological advances), on the assumption that the sewerage network may surcharge to ground level during storm conditions. Conditions relating to foul water infrastructure to be added to any planning permission provided. Conditions relating to surface water drainage to be added to any planning permission provided. Conditions relating to water main which is located within 5m of the proposed development to be added to any planning permission provided.	Section 4
Unwin	Not provided	20 June 2022	Impacts of trafficking on local structures	Not within Audit Scope

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA Format	BIA authors' qualifications.	Open – to be demonstrated as 4.1	
2	BIA Format	Screening assessment to be updated as CPG Basements 2021	Open – to be provided as 4.4	
3	Groundwater	Assessments to be updated and reviewed, based on references within the supporting documents, and confirmed by CGeol FGS including comments on cumulative impacts and seasonal groundwater changes.	Open – to be provided as 4.5-4.7, 4.9, 4.11, 4.12	
4	Land Stability	Outline structural information to be provided	Open – to be provided as 4.12	
5	Land Stability	Ground Movement Assessment input model data and full output data to be provided	Open – to be provided as 4.13	
6	Surface Water	Drainage proposals to be agreed with LBC and Thames Water, as 4.17, and as requested by statutory consultee.	Note Only	Note Only

Appendix 3: Supplementary Supporting Documents

None

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