Scenario Architecture Limited
10b Branch Place
London
N1 5PH

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MES/2305/SA001 Rev 01

FAO: Luca Dalmasso

Ref: 20 Crediton Hill, NW6 1HP –
Basement Impact Assessment – Addendum to Revision 04

Dear Mr Dalmasso

Further to your recent instruction, please find enclosed the Basement Impact Assessment (BIA) Addendum in regard to the changes proposed to the basement construction works at 20 Crediton Hill, London, NW6 1HP (the site, Figure 1).

Planning History / Previous Assessments

Planning was granted by the London Borough of Camden (LBC) on 2 October 2018 for a basement at the site (Planning Reference 2018/1012/P). A BIA was submitted (Ref MES/1611/PMA002, Rev 04, February 2018) and accepted as compliant with the relevant policies (CPG Basements; Local Plan Policy A5) by LBC's BIA Auditor, CampbellReith (Ref 12727-81, Rev F1, August 2018). The referenced BIA, Audit Report and Planning Decision Notice are provided in Appendix A. These should be read in conjunction with this Addendum.

Scope of the BIA Addendum

The current basement proposals have been compared with the Granted basement proposals. Where differences to the proposals or changes in Policy are relevant, these are detailed in this report, and the assessment has been checked and updated as required.

The purpose of this assessment is to consider the impacts of the proposed basement on the local hydrological, geological and hydrogeological environments, including potential impacts on neighbouring properties and the wider area.

The information contained within this BIA Addendum has been produced specifically to meet the requirements set out by Camden Planning Guidance - Basements (CPG, January 2021) and the Local Plan 2017: Policy A5 Basements in order to assist LBC with their decision-making process.

The BIA has been reviewed and approved by Chartered Civil Engineer Corrado Candian, MEng CEng MICE and Chartered Hydrogeologist Philip Lewis, BSc CGeol FGS, who both have more than 20 years' relevant experience of design and assessment of residential and commercial developments including basements.

The Supervising Engineer for the scheme is SD Structures Ltd, specifically chartered engineers Andrew Simpson (CEng MICE) and Mike Davies (CEng MIStuctE), who have reviewed the relevant geo-structural information and provided confirmation of the suitability and buildability of the scheme, within the guidelines provided by LBC, as presented in their Structural Report for Planning (Appendix B).

Existing and Proposed Development

The Application site is to the rear of 20 Crediton Hill and currently comprises garages, a hard standing forecourt and a single-storey studio building at ground level. The development site is level. On the eastern boundary, there is a change in elevation downward to the adjacent cricket field of ~2.5 metres.

The foundation level of the existing studio building is 2.2m below ground level (bgl). The adjacent garages are owned by the Applicant. The adjacent garage to the proposed development has a basement below with foundations at 3.00m bgl. The remaining garages' foundations are at approximately 0.45m bgl.

Architectural and structural proposals are presented in Appendix B. As previously, the proposal is for a single storey basement. The current proposals allow for demolition of the existing structure and an enlarged basement footprint (Figure 2). Previously, an underpinned construction methodology was to be adopted. Currently, underpinning and piled basement retaining wall options are being considered.

The main building (20 Crediton Hill) and the nearest neighbouring building (22 Crediton Hill) are >13m laterally from the proposed development works. The cricket club pavilion to the

south is founded at or below proposed basement formation level.

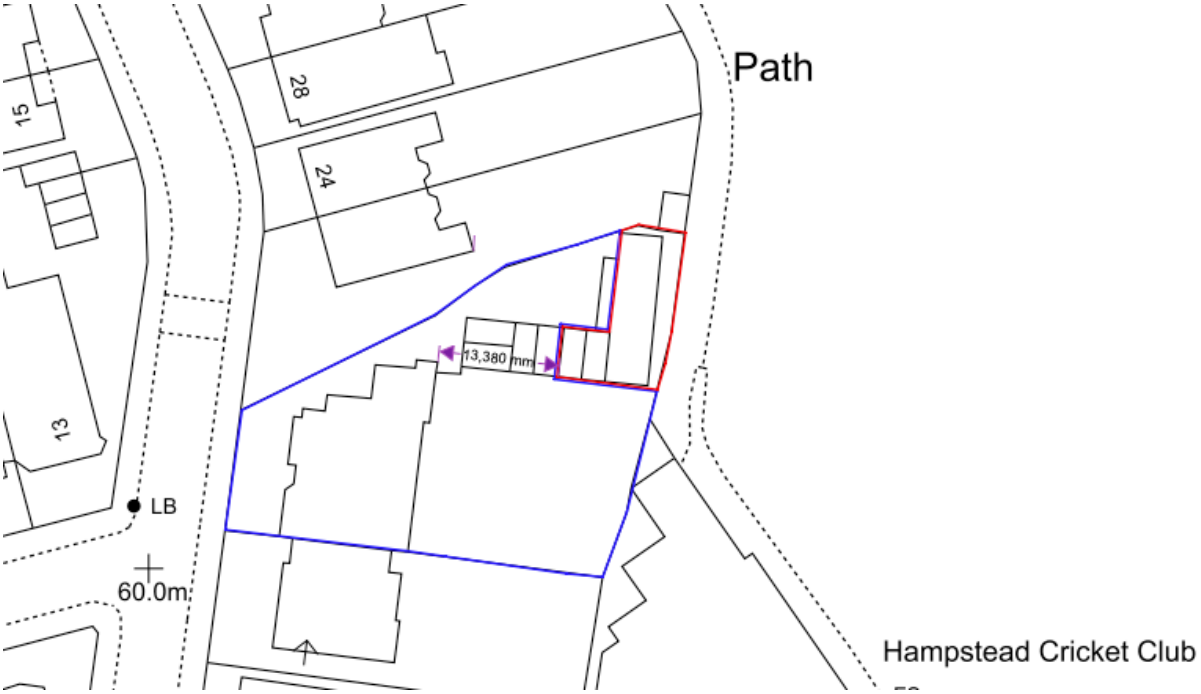
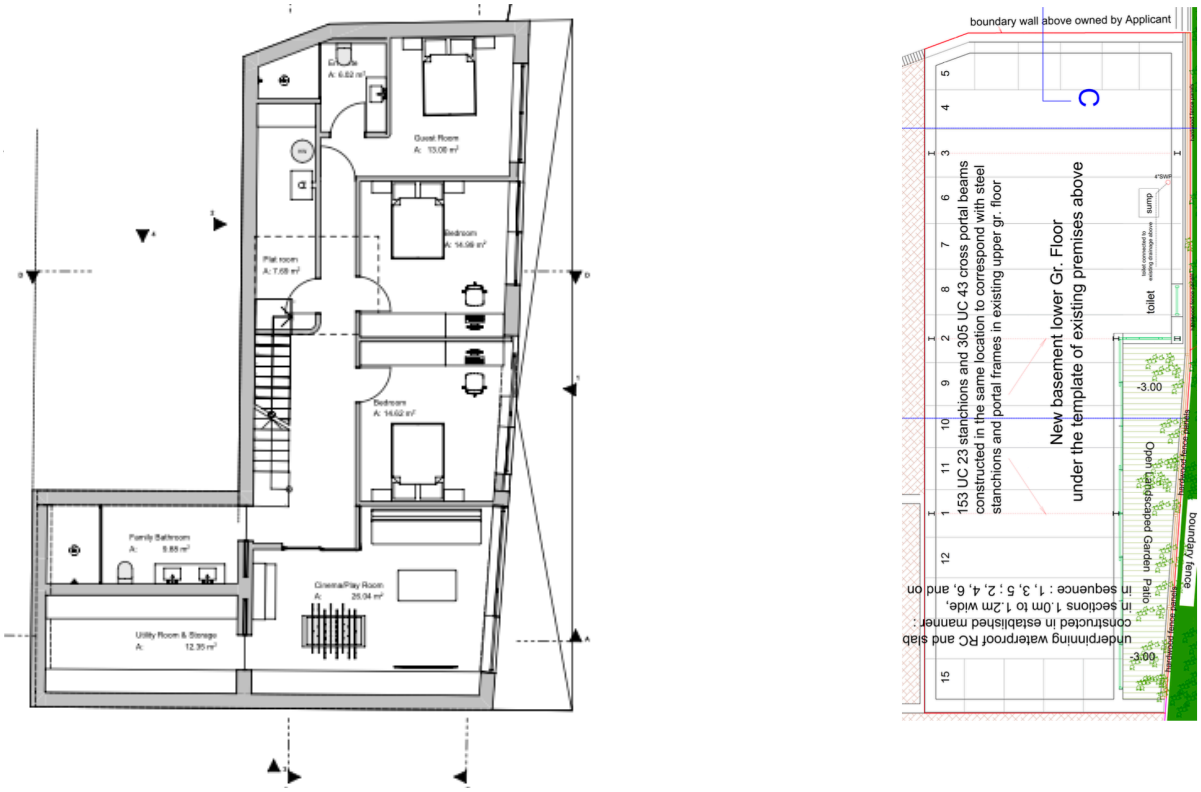


Figure 1: Site Location (Red Line Boundary)



Current Proposals

Previous Proposals

Figure 2: Comparison of Current and Previous Basement Footprint Proposals

Groundwater Flow, Surface Water Flow and Flooding

The BIA Screening and Scoping for groundwater flow and surface water flow previously answered 'No' to all questions with the exception of groundwater flow Q4, indicating the previous development would increase permeable site area by approximately 75m^2, but (as Q5, and Section 5.1) would not result in significant additional attenuation by the underlying soils due to the very low permeability of the London Clay.

The current proposal includes a SuDS Strategy and Flood Risk Assessment (Appendix C) which indicates the use of green roofs (~130m^2). This provides attenuation of surface water flows to better than the relevant greenfield runoff rates with allowance for climate change.

There will be no adverse impacts to groundwater or surface water flows, and the proposed development does not increase the risk of flooding. The conclusions of the BIA remain valid.

Land Stability

The BIA Screening and Scoping for stability previously answered 'No' to all questions with the exception of:

- Q5 – the London Clay is the shallowest natural soil at the site.
- Q6 – there will be removal of a low quality pear tree.

Sections 5.2 and 5.3 of the BIA remain relevant and the conclusions unchanged; no significant impacts will result.

The change in proposed basement area brings the basement closer to the nearest habitable structures (20 Crediton Hill and 22 Crediton Hill). On this basis, Q13 relating to differential depth of foundations with neighbours, is now considered to result in a 'Yes' response. Section 5.4 remains relevant although additional assessment is also required.

There is a basement level partially underlying the main house at 20 Crediton Hill with shallow foundations beneath the rest of the structure. There is no basement at 22 Crediton Hill and all foundations are considered to be shallow. These properties are >13m away from the proposed works. Considering a conservative assessment of potential ground movements, the zone of influence from the works may extend up to 4 x the proposed excavation depth, broadly as described in CIRIA C760. It is therefore considered that these properties are on the

periphery of the zone of influence and could be potentially impacted by the works. A ground movement assessment (GMA) is therefore required and presented in the following section, including a check on the movements generated by the alternative construction methodologies currently being considered by the Structural Engineer.

Garages 1, 2 and 3 are >6m from the proposed development. Although founded at shallow depth the adjoining Garage 4 has a basement founded at 3.00m bgl. The Party Wall between Garage 4 and Garage 3 has been underpinned to the full depth of the basement. Considering the proposed depth of excavation, the proximity of the garages to the works and the protection offered by the basement below Garage 4 (effectively shielding garages 1, 2 and 3) there is considered to be minimal ground movement influencing the garages.

The pavilion to the cricket club is founded at least 3.00m below the site level i.e. at or below proposed basement formation level. Therefore, whilst laterally within 10m of the proposed basement works, it is not considered to be impacted by any movements generated.

Damage to the garages and pavillion structures can conservatively be estimated as falling within Category 0 (Negligible) in accordance with the Burland Scale.

Land Stability – Ground Movement Assessment

A ground movement assessment (GMA) has been undertaken to assess potential impacts from construction of the proposed basement on the neighbouring structures.

The structural proposals (Appendix B) allow for the following methods of construction to be considered as options by the Contractor:

- Contiguous piled wall (propped) to the northern boundary (with garden of 22 Crediton Hill); underpinning to the existing basement wall of garage 4 (only if required); battered excavations to the remaining boundaries.
- Contiguous piled wall (unpropped cantilevers) to the northern boundary (with garden of 22 Crediton Hill); underpinning to the existing basement wall of garage 4 (only if required); battered excavations to the remaining boundaries.
- Keep existing walls / foundations in place with underpinning to the northern boundary (with garden of 22 Crediton Hill); underpinning to the existing basement wall of garage 4 (only if required); battered excavations to the remaining boundaries.

Note that:

- Piles up to 11m in length have been allowed for in the assessment, which is considered conservative. When propped, piles in the order of 1.5 to 1.75 retained height (ie <7m in length) are likely to be adopted.
- The boundary wall between 20 and 22 Crediton Hill will be propped during the works.
- The eastern boundary has a variable retained height of 0.50m to <1.00m between proposed formation level and the cricket field.
- The cricket pavilion to the south is founded at approximate basement formation level such that there is not considered to be a significant differential depth of foundations between the two structures.
- The maximum excavation required will be approximately 3.50m.

In the permanent cases, the retaining walls are propped by RC basement and ground floor slabs.

The site investigation data indicates Made Ground to 1.75m bgl, overlying firm to stiff London Clay. Groundwater was not encountered within the proposed basement depth.

Adjacent and Nearby Structures

The following neighbouring buildings are assessed as being within the zone of influence and potentially impacted by the proposed construction works:

- 20 Crediton Hill.
- 22 Crediton Hill.

Assessment Methodology

The following construction processes are likely to give rise to ground movements, the impacts of which have been considered within this assessment:

1. Installation of the retaining walls.
2. Excavation of the new basement.

Based on the guidance provided in CIRIA C760 for embedded retaining walls, ground movements resulting from installation of the retaining walls and excavation in front of the walls

have been estimated. Whilst its noted that the guidance is intended for use with embedded walls, the methodology provides predicted ranges of movement that are consistent with movements generated during underpinning. Its noted, however, that from a review of the case study data in CIRIA C760, that published movement curves represent an upper bound based on the worst-case conceptual site models, such as:

- in soft Alluvium or saturated River Terrace Deposits;
- where large structural surcharges are present;
- or where poor control of construction was observed.

Based on the site investigation data, the engineering drawings and the proposed sequence of works, these conditions are not considered relevant to this property and as such movement predictions should be in excess of the movements that are actually realised by the proposed works.

The assessment considers that:

- Propped piled / underpinned walls are 'high stiffness';
- Cantilever piled / underpinned walls are 'low stiffness';
- Open excavations are modelled as equivalent 'low stiffness retaining walls', with the excavations being carefully battered with appropriate temporary drainage and protection works to maintain stability in the short term.

The calculations have been repeated over three iterations to reflect all the variables that are being considered by the structural engineer in the design to be adopted for construction. The contour plots of calculated movements are presented in Appendix D.

For movement due to the retaining wall installation, the magnitudes of the movements are dependent on the total retaining wall depth and type. Maximum vertical movements occur at the wall itself. C760 indicates movements will be 0.05% of the wall depth when formed by underpinning or 0.04% when formed by contiguous piling, with negligible vertical movement at twice the wall depth from the wall. On this basis, maximum vertical movements due to wall installation of <6mm are predicted with vertical movements extending to a maximum of <22m from the wall.

Anticipated maximum horizontal movements due to wall installation are 0.05% of the wall depth when formed by underpinning or 0.04% when formed by contiguous piling, with negligible horizontal movement one and a half times the wall depth from the wall. Maximum horizontal movements are therefore predicted to be <6mm with horizontal movements extending to a maximum of <17m from the wall.

For movements due to excavation in front of the retaining wall, the magnitudes of the movements are dependent on the excavation depth. Based on the Contractor adopting a stiffly propped method of excavation, C760 indicates maximum vertical movements of 0.10% of excavation depth, or 0.35% when of low stiffness, with negligible movement three and a half times excavation depth from the wall. Maximum vertical movements due to excavation of <15mm are predicted, extending <13m from the wall.

Anticipated maximum horizontal movement due to excavation are 0.15% of the excavation depth, or 0.40% when of low stiffness, with negligible horizontal movements four times the excavation depth from the wall. Maximum horizontal movements are predicted to be <16mm due to excavation, extending <15m from the wall.

A summary of ground movement predictions are appended, presented as contour plots (Appendix D). The calculations take account of the combined vertical and horizontal movements from both installation and excavation.

Estimates of Ground Movement using Oasys XDisp

The model, as described, is considered representative of the design, sequencing and methodology options to be undertaken and has been adopted as the underlying basis of analysis. The geometries of the site have been imported into Oasys XDisp (an industry standard software) and ground movements modelled.

The displacement profiles and damage assessments derived using XDisp assume greenfield movements and predict movements at ground level.

Damage Assessment

The ground movements calculated have been used to assess the resultant potential damage that may be experienced by neighbouring structures. The methodology proposed by Burland and Wroth, and later supplemented by the work of Boscardin and Cording, has been used, as

described in CIRIA C760 (and preceding CIRIA publications). The 'Burland Scale' damage categories are presented in Table 1.

Based on the ground movements calculated, the following impacts are predicted in accordance with the Burland Scale:

- 20 Crediton Hill – Category 0 (Negligible).
- 22 Crediton Hill – Category 1 (Very Slight).

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain, ε_{lim} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	**Fine cracks that can easily be treated during normal decoration.** Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	**Cracks easily filled. Redecoration probably required.** Several slight fractures showing inside of building. Cracks are visible externally and **some repointing may be required externally** to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	**The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.** Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	**Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.** Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Services pipes disrupted.	15 to 25, but also depends on number of cracks	>0.3
5 Very severe	**This requires a major repair, involving partial or complete rebuilding.** Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

Table 1: The Burland Scale of Damage Classification.

Conclusions

Burland Category 0 to 1 damage (Negligible to Very Slight) is predicted for the immediately neighbouring buildings. This is classified as hairline cracks of <0.1mm to fine cracks of <1mm, which should not require repair or can easily be re-decorated if discernible. This category of damage does not constitute structural damage. With the works being undertaken in a

controlled sequence by an experienced Contractor and supervised by the Engineer, Category 0 to 1 damage to neighbouring structures is considered feasible.

Recommendations

During the works, a structural monitoring strategy should be adopted. The purpose of the monitoring strategy is to control the excavation and construction works adequately to prevent excessive ground movements that will cause unacceptable impacts to neighbouring buildings. Structural monitoring is recommended of the subject property and the neighbouring properties and neighbouring highway in conjunction with visual inspection on a regular basis. Any cracks that do develop should be monitored also.

The Contractor is advised to a develop an appropriate contingency action plan, such as the implementation of additional propping or modification of work sequencing, to implement (with the agreement of the Engineer and relevant parties) should trigger values be breached.

Summary

The assessments undertaken indicate that the conclusions of BIA Rev04 remain valid and that there will be no adverse impacts to groundwater or surface water flow, no increase in flood risk, and no significant impacts to neighbouring structures as a result of the proposed works. Therefore, the works are considered to be compliant with LBC's policies and guidance.

If you have further queries, please do not hesitate to contact the undersigned.

Yours faithfully,

Corrado Candian

Chartered Geotechnical Engineer CEng MICE

- Appendix A
    - BIA Rev 04, February 2018
    - CampbellReith BIA Audit
    - LBC Decision Notice 2018/1012/P
- Appendix B
    - Architectural Plans
    - Structural Proposals
- Appendix C
    - SuDS Strategy and Flood Risk Assessment
- Appendix D
    - Ground Movement Assessment Contour Plots