CampbellReith
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18 Ornan Road, NW3 4PX

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-83
Revision: D2

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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 18 Ornan Road, NW3 4PX (planning reference 2016/1089/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 authors are in compliance with the requirements of CPG4.

1.5. Screening and scoping as outlined in CPG4 has not been carried out for Hydrology, this should be rectified.

1.6. The BIA has confirmed that the proposed basement will be founded within London Clay. Roots were noted at a depth of 1.5m – 2.8m bgl. The proposed basement depth is 3.3m bgl, below the root penetrated strata. This will limit the impact of seasonal desiccation of the underlying soils. Discrepancies between the geotechnical evaluation and recommendations remain which should be resolved.

1.7. It is unlikely that the ground water table will be encountered during basement foundation excavation. Measures for temporary dewatering during construction are described.

1.8. The proposal is to construct the basement using traditional 'hit and miss' underpinning techniques. The perimeter walls and underpins are to be laterally propped, allowing for the basement excavation to be carried out and reinforced concrete basement slab and walls to be constructed. The construction sequence is clearly outlined on drawings 1206-667-CM1 and 1206-667-CM2.

1.9. The BIA highlights the importance of quality and experienced workmanship to construct a robust structure without significant adverse impacts on adjoining properties and to limit ground movements, both during and after construction.

1.10. It is noted that the preliminary retaining wall designs provided takes the groundwater level at ground level, this is good practice. However, the ground model assumed in the structural calculations does not reflect that described in the ground investigation report.

1.11. To accommodate variations in the ground water level the basement slab should be designed to resist hydrostatic uplift pressures as well as heave forces arising from the excavation. Confirmation of this is required.

1.12. Proposals have been put in place to minimise the impacts on neighbouring properties due to differential foundation depths and seasonal clay heave.

1.13. The public highways to the front and rear of the property are more than 5m from the proposed development.

1.14. It is understood that due to the depth of London underground tunnels within 5m of the site in plan, the proposed works are unlikely to impact the tunnel.

1.15. The BIA provides an assessment of vertical and horizontal ground movements and indicates the potential damage to neighbouring properties as no higher than category 2 on the Burland scale, risk of aesthetic damage only. An assessment potential damage to the upper level flats should also be provided. However, queries remain with respect to the assessment.

1.16. A movement monitoring strategy during excavation and construction has been provided.

1.17. The BIA has shown that although the development is close to a tributary of a “lost” river, it will not impact on the wider hydrogeology of the area.

1.18. It is accepted that the surrounding slopes to the development site are stable and will be reviewed on site prior to construction.

1.19. 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.

1.20. Queries and requests for clarification are described in Section 4 and summarised in Appendix 2.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 18 Ornan Road, NW3 4PX (Camden Planning reference 2016/1089/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;

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 *"Excavation of basement with front and rear lightwells; alteration of the residential mix to comprise 4x1-bed and 3x2-bed units and associated works."*

The Audit Instruction also confirmed 18 Ornan Road does not involve, and it is not a neighbour to, listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 25 July 2016 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment – Structural Construction Method Statement – STS dated February 2016
- Basement Impact Assessment – Land Stability Report– Ground and Project Consultants dated January 2016
- Basement Impact Assessment – Hydrology – Part 1 (Groundwater) - H Fraser Consulting dated February 2016
- Basement Impact Assessment – Hydrology – Part 2 (Flooding) – Groundsure
- Ground Investigation Report – Ground & Water – dated August 2015
- Planning Application Drawings consisting of

  Location Plan

  Existing Plans

  Sequence Drawings

  Proposed Plans
- Design & Access Statement
- Planning Comments and Response

2.7. Supplementary information was provided by email from the planning officer in the 19th of September 2016, which included:

- Proposed Movement Monitoring Scheme – 1206-667-MMT
- Revised Underpinning Calculations – (Previously included as Appendix 5 of the Construction Method Statement)
- Basement Impact Assessment – Land Stability Report– Ground and Project Consultants – revised September 2016
- Basement Impact Assessment – Hydrology – Part 1(Groundwater) - H Fraser Consulting – revised September 2016
- Ground Investigation Report – Ground & Water – revised September 2016
- Email from F. Williams (Ground and Water Limited) dated 14.09.2016

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?	No	Works Programme not included.
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?	No	Relevant Arup GSD map extracts have not been included however reference to these maps is provided.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	No	Location plans provided show sufficient details; GSD map extracts have not been included.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Justification for 'No' answers has been provided with revised report.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	The Hydrology – Part 2 (Flooding) section to the BIA carried out by Groundsure does not provide answers to the screening question outlined in the Arup GSD. This should be rectified and further information provided for items identified for scoping.
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	This should be rectified.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
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?	Yes	
Is a geotechnical interpretation presented?	Yes	However, queries are raised as discussed in Section 4.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	Ground investigation report. Scoping stage to be completed for hydrology.
Are the 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	
Are estimates of ground movement and structural impact presented?	Yes	However, queries are raised as discussed in Section 4.

Item	Yes/No/NA	Comment
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	
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	Queries are raised with respect to geotechnical interpretation.
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?	No	Screening, scoping process to be completed for hydrology. Queries on geotechnical interpretation to be addressed.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	However, queries are raised with regard to the assessment.
Are non-technical summaries provided?	No	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by a number of engineering consultants. The qualifications of the authors are in compliance with the requirements of CPG4.

4.2. The Structural Construction Method Statement (CMS) has similarly been carried out by Structural Engineering Ltd and has been signed off by a chartered structural engineer. The Land Stability Report, which includes a Ground Movement Assessment (GMA), has been undertaken by Ground and Project Consultants, the author is a chartered geologist. Similarly the author of the Groundwater Report, provided by H Fraser Consulting, is a chartered geologist. The qualification and the author of the Flooding Report are unknown.

4.3. The BIA includes Land Stability and Hydrogeology screening and scoping, relevant site investigations and impact assessments as defined and required in the LBC Planning Guidance document 'Basement and Lightwells (CPG4)'. Relevant screening and scoping as outlined in CPG4 has not been carried out for Hydrology, this should be rectified. However it is noted from the report provided that the site is a low flood risk.

4.4. The current building is a 4 storey semi-detached house of typical Victorian construction, which has previously been converted into three flats. To the rear of the property are a single story extension and a conservatory. The planning application relates to the ground floor flat only.

4.5. The LBC Instruction to proceed with the audit identified that the basement proposal did not involve or neighbour a listed building. The Design & Access Statement identified that 18 Ornan Road is located in the Fitzjohns Netherhall Conservation Area.

4.6. The proposal consists of excavating a single storey basement, to a depth of 3.3m, beneath the existing ground floor footprint. It is proposed to construct lightwells at the front and rear of the property to allow light into the proposed basement. The proposal is to construct the basement using traditional 'hit and miss' underpinning techniques.

4.7. A ground investigation (GI) has been undertaken at the site by Ground and Water Ltd on 18 June 2015. These investigations comprised of foundation trial pits, window samples to a depth of 5.0m and a dynamic probe to a depth of 10.0m.

4.8. The GI identifies the ground conditions as Made Ground from 1.25m-1.75m, below which lies the London Clay Formation. This is generally in line with local geology maps. Roots were noted at a depth of 1.5m – 2.8m bgl and again at 4.8m bgl. The ground investigation report suggests a strength profile in the London Clay based on the dynamic probe results. Whilst this is highly unreliable, G & PC note that the nature of the foundation soils should be further assessed. Discrepancies remain in the quoted undrained shear strength profiles in the revised (Rev 2) BIA

Slope and Land Stability. A clear statement of the soil properties to be assumed in design and should be provided with appropriate justification. The data are still described as "tentative due to the lack of data". Whilst the quoted bearing capacity supported by the data and geotechnical interpretation, the structural calculations reveal a significantly lower bearing pressure than the bearing capacity quoted. The adequacy of the soil as a bearing stratum and resultant settlement should be confirmed. Demonstrating an adequate bearing stratum and its likely behaviour are fundamental to assessing the impact of the basement proposals on stability.

4.9. The basement will be founded in London Clay/Head Deposits which soils have a high shrink/swell potential. The BIA states that there are a number of mature and substantial trees in the proximity of the property. The GI notes that the roots at 4.80m are unlikely to cause risk to the proposed construction, however the proposed construction should be extended 300mm into the non-root penetrated strata to a minimum foundation depth of 3.10m to limit the impact of seasonal desiccation of the underlying soils. The proposed foundation depth of 3.3m bgl is satisfactory. It is not proposed to fell any trees as a result of the works.

4.10. No groundwater was encountered within the trial hole, a standing water level was noted on a return visit in August at 3.44m bgl, which is below the proposed basement formation depth. Due to the low permeability of London Clay, it is accepted that the excavation level is unlikely to be below the groundwater level or to impact groundwater flows. However levels measured were during the summer months and flows may increase if head deposits are encountered, or after periods of heavy rainfall and temporary dewatering may be required during the construction period. This is described in the construction sequence.

4.11. The proposed construction sequence is to underpin the perimeter walls, extending the foundations into the clay to a depth of approximately 3.3 metre deep. The perimeter walls and underpins are to be laterally propped, allowing basement excavation and reinforced concrete basement slab and walls to be constructed. The trial pits carried out as part of the GI indicates that the perimeter walls are typically shallow, brick spread foundations supported on concrete strip foundations. The underside of the concrete footing to the rear of the property was 0.3m below the underside of the brick footing. The underside of the concrete footing to the front of the property was not determined but is in excess of 0.5m. It is thought that the concrete footing may be underpinning previously carried out to deal with past subsidence issues, were severe cracking was noted to the front of the property. If it is necessary to break back the existing foundations a CMS should be put in place to minimise damage to adjacent properties.

4.12. The basement construction sequence has been described in detail with the BIA. The proposal explains clearly the construction sequence, temporary propping requirements and the importance of quality and experienced contractors to construct a robust structure without

significant adverse impacts on adjoining properties and to limit ground movements, both during and after construction.

4.13. It is noted that the preliminary retaining wall designs provided takes the groundwater level at ground level, this is good practice and in line with the recommendations outlined in the Land Stability report. Whilst the assumptions made for the London Clay are in line with the ground investigation report, the original calculations ignored the presence of up to 1.75m of Made Ground with significantly different characteristics. This has been rectified. Indicative details of waterproofing measures have been included in the BIA.

4.14. The basement slab should be designed to resist hydrostatic uplift pressures and heave forces arising from the excavation. Drawing 1206-667-CM2, gives details of the anti-heave measures required beneath the slab. Hydrostatic uplift pressures should be considered when carrying out the detailed slab design.

4.15. The property is bounded by Flat A and B within 18 Ornan Road, shares a party wall with 20 Ornan Road, and is location 3.0m from the boundary wall of 16 Ornan Road.

4.16. The BIA identifies that the adjoining property No. 20, does not have a basement. The proposal is to underpin this wall and provide transition pins to the returns walls at No.20, if approved by the party wall agreement, to limit the risk of differential settlement and seasonal clay heave behaviour between the two foundation depths. No. 16 has a basement which is believed to be at a similar depth to the proposal at No. 18.

4.17. The CMS identifies that the public highways to the front and rear of the property are more than 5m from the proposed development.

4.18. There are underground tunnels within 5m of the site in plan; however they are at a depth of 25m. It is understood that the asset owner has confirmed that the proposed works are unlikely to impact the tunnel.

4.19. The BIA provides an assessment of vertical and horizontal ground movements and indicates the potential damage to neighbouring properties as no higher than category 2 on the Burland scale, risk of aesthetic damage only.

4.20. Despite the receipt of a revised GMA, it appears that the assessment still does not consider settlement (the ground investigation report states that settlements are likely to be moderate, and elsewhere that they might be around 20mm). It is also not clear what has been assumed for the depths of the foundations and the heights of the affected properties. The GMA/building damage assessment requires clarification and revision and it should be demonstrated that only Nos 16 and 20 Ornan Road are affected. Additionally, CPG4 requires mitigation measures to be proposed where damage equating to Burland Category 1 or greater is predicted, with the

damage category then re-evaluated. The BIA recommends that a movement monitoring strategy is put in place during excavation and construction; proposals for the neighbouring properties have been included in the revised BIA. It was recommended that an assessment of vertical and horizontal ground movements and a movement monitoring strategy were provided for the upper level flats at 18 Ornan Road. This this has not been provided.

4.21. It is accepted that there is a negligible increase in the hardstanding area that will not significantly increase surface water runoff or impact on the wider hydrogeology of the area.

4.22. The BIA has shown that although the development is close to a tributary of a “lost” river, it will not impact on the wider hydrogeology of the area.

4.23. It is accepted that there are no slope stability concerns regarding the proposed development, the BIA confirms that slopes in the area are generally 6 degrees and advises that this is assessed on site to confirm prior to construction.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) has been carried out by a number of engineering consultants. The qualifications of the authors are in compliance with the requirements of CPG4.

5.2. Relevant screening and scoping as outlined in CPG4 has not been carried out for Hydrology, this should be rectified. However it is noted from the report provided that the site is a low flood risk.

5.3. The BIA has confirmed that the proposed basement will be founded within London Clay. Roots were noted at a depth of 1.5m – 2.8m bgl. The proposed basement depth is 3.3m bgl, below the root penetrated strata.

5.4. A ground investigation has been presented, however, the data has severe limitations as acknowledged in the BIA and described in Section 4. The land stability assessment does not reflect the information provided within the GI report and the stability assessment is itself contradictory. A reliable undrained shear strength should be provided at formation level and the bearing capacity confirmed as adequate.

5.5. It is unlikely that the ground water table will be encountered during basement foundation excavation. Measures for temporary dewatering are described in the construction sequence.

5.6. The proposal is to construct the basement using traditional 'hit and miss' underpinning techniques. The perimeter walls and underpins are to be laterally propped, allowing for the basement excavation to be carried out and reinforced concrete basement slab and walls to be constructed.

5.7. The BIA highlights the importance of quality and experienced workmanship to construct a robust structure without significant adverse impacts on adjoining properties and to limit ground movements, both during and after construction.

5.8. It is noted that the preliminary retaining wall designs provided takes the groundwater level at ground level, this is good practice.

5.9. The basement slab should be designed to resist hydrostatic uplift pressures and heave forces arising from the excavation. Anti-heave measures required beneath the slab are noted on the drawings. Hydrostatic uplift pressures should be considered when carrying out the detailed slab design.

5.10. Proposals have been put in place to minimise the impacts on neighbouring properties due to differential foundation depths and seasonal clay heave.

5.11. The CMS confirms that the public highways to the front and rear of the property are more than 5m from the proposed development.

5.12. It is understood that due to the depth of the underground tunnels within 5m of the site in plan, the proposed works are unlikely to impact the tunnel.

5.13. The BIA provides an assessment of vertical and horizontal ground movements and indicates the potential damage to neighbouring properties as no higher than category 2 on the Burland scale, risk of aesthetic damage only. However, queries are raised with respect to the assessment.

5.14. Movement monitoring proposals for the neighbouring properties has been included in the revised BIA.

5.15. The BIA has shown that although the development is close to a tributary of a “lost” river, it will not impact on the wider hydrogeology of the area.

5.16. It is accepted that the surrounding slopes to the development site are stable and will be reviewed on site prior to construction.

5.17. 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: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
The Heath & Hamspstead Society	The Heath & Hamspstead Society	12.06.16	Ground Movement and potential damage	Refer to audit report section 4.19.
Tan	20 Ornan Road, NW3 4PX	28.06.16	Subsidence	Refer to section 4.9 – Proposed works should decrease the risk of damage to the property by extending the foundations into the clay and below the strata penetrated with roots.

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	BIA notes that nature of foundation soils to be further assessed and that recommendations are tentative due to lack of test data.	Open – Discrepancies remain in interpretation of data.	
2	Stability	Discrepancies exist between GI report and structural assessment.	Closed	08/10/16
3	Stability	Ground movement assessment to be clarified/revised and damage category to upper floor flats provided.	Open – Revised GMA does not consider settlement and flats above subject property.	
4	Stability	Monitoring proposals for neighbouring properties should be provided.	Closed	08/10/16
5	Stability	Outline calculations to validate floor slab required.	Closed	08/10/16
6	Hydrology	Part 2 (Flooding) section to the BIA carried out by Groundsure does not provide answers to the screening question outlined in the Arup GSD. This should be rectified and further information provided for items identified for scoping.	Open – Not addressed	

Appendix 3: Supplementary Supporting Documents

None

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