

**98A Priory Road
London NW6 3NT**

**Basement Impact Assessment
Audit**

For
London Borough of Camden

Project Number: 12066-35
Rev: F1

November 2015

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	September 2015	Comment	RMjw12066-35-040915	R Morley	R Morley	A Marlow
D2	October 2015	Following receipt of revised BIA (Rev 1)	RMjw12066-35-040915-D2	R Morley	R Morley	E M Brown
F1	November 2015	Following receipt of revised BIA (Rev 2)	RMjw12066-35-111115-98A Priory Road-F1.doc	R Morley	R Morley	E M Brown

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Document Details

Last saved	11/11/2015 12:28
Path	RMjw12066-35-111115-98A Priory Road-F1.doc
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Project Number	12066-35
Project Name	98A Priory Road, London, NW6 3NT
Planning Reference	2015/1302/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 submitted as part of the Planning Submission documentation for 98A Priory Road, London NW6 3NT (planning reference 2015/1302/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 review it against an agreed audit check list.
- 1.4. Following the initial D1 issue of this report a revised BIA was received (revision 1) and was assessed on 1st October 2015. This audit report has been updated to incorporate the content of the updated BIA.
- 1.5. Following the D2 issue of this report further information was again received. This included a revised basement scheme drawing, revised damage assessment calculation, a structural monitoring statement, and a revised ground water conclusion from the BIA.
- 1.6. It has been confirmed that the development site does not involve a listed building, nor is it in the neighbourhood of listed buildings.
- 1.7. The BIA has confirmed that the proposed basement will be located within the London Clay and that the surrounding slopes are stable.
- 1.8. Despite the basement being founded in the London Clay it is noted that the construction of the basement could alter the groundwater flow and that there is a risk in the Ground Water BIA of ground water coming to the surface. The revised BIA concludes that the existing ground conditions, comprising of a top 900mm of permeable made ground, provide a suitable drainage stratum to prevent ground water coming to the surface. A scheme ground drainage system has been detailed. While there are concerns over the scheme drainage systems effectiveness as currently shown should it be developed in the detailed design stage it could pose a viable solution.
- 1.9. The proposed basement will be excavated and constructed utilising a tunnelling technique, this in combination with the potential requirement of dewatering of the excavation leads to concerns as to the stability of the surrounding ground during the construction phase. The revised BIA noted that full dewatering would not be required as the sequential underpins would provide

temporary water tightness as the basement progresses. It is recommended that this is confirmed or otherwise by further groundwater monitoring.

- 1.10. In conjunction with the tunnelling technique used to construct the basement the existing ground floor slab is proposed to be retained and supported on new steelwork and concrete lintels spanning between the new underpinning. The existing construction of the floor slab is not confirmed, and there are concerns regarding its suitability and capacity to withstand the extensive temporary propping that would be required until its permanent support can be provided. However this is not anticipated to have an impact on stability.
- 1.11. It is accepted that the risk of surface water flooding the buildings is low, despite nearby streets having been flooded in 2002. Numerous mitigation measures have been suggested including the use of SUDS.
- 1.12. The ground movement assessment provided indicates that damage to the adjacent properties will be Burland category 2 or less.
- 1.13. It is recommended that water level monitoring continue in order to clarify the maximum and minimum values.
- 1.14. Following the receipt of revised information all the previous queries have now been closed. Details of the closed queries are given in Appendix 2.

2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 8th July 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 98A Priory Road, NW6 3NT Reference 2015/1302/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 proposal as the "Excavation of basement level, in association with erection of single storey rear and two storey side extension and side dormer extension."

The Audit Instruction also confirmed that the basement proposals did not involve a listed building nor the site neighboured listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 21th August 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment
- Ground water report
- Land stability report
- Ground investigations report
- Drawings;

S1006PL01-1 Existing Plans and Elevations

S1006PL01-2 Proposed Basement, Ground Floor and First Floor Plans

S1006PL01-3 Proposed Loft Plan and Section

S1006PL01-4 Proposed Elevations

2.7. A revised BIA (revision 1) was received and reviewed on 1st October 2015. It is noted from LBC's website that the Ground Investigation Report, BIA - Ground Water and BIA - Land Stability were uploaded for a second time with the revised BIA.

2.8. Following the issue of revision D2 of the audit report the following information was received by email on 2nd November 2015: revised damage assessment calculation, revised basement scheme drawing, revised BIA groundwater conclusion, and structural monitoring statement.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	The authors of the BIA, the Ground water report, and the Land Stability report have suitable credentials.
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	BIA Executive Summary
Are suitable plan/maps included?	Yes	BIA and drawings.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	BIA, land stability report, and ground water report.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Land stability report section 3.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Ground water report section 3.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA section 1.
Is a conceptual model presented?	Yes	Ground water report section 4.1, BIA section 2, and ground stability report section 6.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	No formal scoping is carried out. Comments in screening section provide some scoping but are not developed further
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Ground water report section 4.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 2.
Is factual ground investigation data provided?	Yes	Ground investigation report
Is monitoring data presented?	Yes	Groundwater monitoring in the Ground investigation report.
Is the ground investigation informed by a desk study?	Yes	BIA section 3.
Has a site walkover been undertaken?	Yes	BIA section 3 and site investigation report section 3.1.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA section 3 notes that the neighbouring properties have been externally observed for basements.
Is a geotechnical interpretation presented?	Yes	Ground investigation report Section 6.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Ground investigation report Section 6.
Are reports on other investigations required by screening and scoping presented?	No	No further reports were required by scoping.
Are baseline conditions described, based on the GSD?	Yes	BIA, land stability report, and ground water report.

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	BIA.
Is an Impact Assessment provided?	Yes	Ground Movement Assessment within BIA.
Are estimates of ground movement and structural impact presented?	Yes	Ground Movement Assessment within BIA. However the building damage assessment is deemed as incorrect.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	The points raised by the screening and scoping have been addressed in the BIA, land stability report, and the ground water report.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	SUDS, upstand to lightwells, dual sump pumps are discussed. However confirmation of which measures are to be provided and further details of these measures have not been provided.
Has the need for monitoring during construction been considered?	Yes	BIA
Have the residual (after mitigation) impacts been clearly identified?	Yes	Residual risks regarding surface water flooding have been discussed in the BIA.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure been maintained?	Yes	Building damage assessment.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	A scheme ground drainage system has been provided. Further development is necessary.
Has the scheme avoided cumulative impacts upon structural stability	Yes	The ground water report concludes that there is a risk of ground

Item	Yes/No/NA	Comment
or the water environment in the local area?		water backup and that a ground water drainage system should be incorporated. A scheme ground drainage system has been provided. Further development is necessary.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Estimated to be Burland Category 2 or less.
Are non-technical summaries provided?	Yes	Executive summary in BIA.

4.0 DISCUSSION

- 4.1. The BIA has been carried out by an established firm of structural engineers, Croft Structural Engineers, who have employed the services of Ground and Project Consultants Ltd and H Fraser Consulting to supplement the work needed to form the BIA. The authors and reviewers from all of these organisations have suitable qualifications.
- 4.2. The proposed basement will be excavated using a tunnelling method from the front of the property towards the rear. Reinforced concrete underpins/retaining walls are to be cast to support the existing loads from above and the retained soil. Sections are to be cast in a hit and miss sequence with the general direction of construction from the front towards the rear of the property. The existing ground floor ground bearing slab is to be retained and supported on steel beams and concrete lintels bearing onto the underpinning. A tunnelling technique as described is not the generally preferred method of construction and is considered of higher risk than traditional basement construction where individual underpins are constructed singly prior to the ground level being reduced.
- 4.3. The retaining walls/underpins have been designed to act as unpropped cantilevers both during the construction and permanent stages, with the rear earth face temporarily propped against a retained central 'dumpling' during the construction stage utilising sacrificial trench sheeting should it be required until the underpinning has been cast.
- 4.4. The sequence of the underpinning is shown in a hit and miss sequence, with the general direction of construction being from the front towards the rear of the property. Due to a tunnelling method being proposed this will mean that in order to maintain the hit and miss sequence they will be excavating beyond sections of foundation that are yet to be underpinned, in order to maintain stability the clay below these sections of foundation would require propping.
- 4.5. The BIA mentions existing basements/cellars to the neighbouring properties, however their extent is not discussed.
- 4.6. The geological report indicates that the site consists of made ground, underlain by clay head, underlain by London Clay. The depth of the basement will mean that it founds well into the London Clay; this is considered an acceptable bearing stratum.
- 4.7. The ground investigation report provides a serviceable bearing capacity for the London Clay at the depth required of 120kPa.
- 4.8. A retaining wall design has been produced to BS 8002. This design has assumed the worst case for pore water pressure, neighbouring foundation surcharge, and axial loading. The bearing pressures are within the 120kPa serviceability limit as given in the ground investigation report.

- 4.9. The ground water BIA indicates that initially the ground water level has been identified at 4.2m below ground level, below the underside of the basement. However it is reported that a subsequent water level was observed at 1.02m below ground level following monitoring. It has been determined that there is a risk of daylighting of this ground water which could cause damage to nearby basements. Further groundwater monitoring has been recommended to identify high and low levels. A ground water drainage system is recommended by the ground water report.
- 4.10. The revised BIA proposes a ground drainage system incorporating vertical perforated pipes to allow ground water to drain from the made ground to Type 1 material placed below the basement slab. This is partially accepted as a viable solution to prevent ground water backup, however a type 1 material is generally considered to have low permeability and would not be a suitable material for the pipes to discharge into. The scheme is sufficient to address the ground water backup concerns but should be developed further in the detailed design stage.
- 4.11. Due to uncertainty as to the natural ground water level the current estimate based on the monitored standpipe indicates that the ground water level is at 1.02m below ground level, well above the formation level of the basement which is at approximately 3.6m below ground level. This could potentially require the dewatering of nearly 2.6m of soil. It is accepted that local dewatering by pumping will not be detrimental to the surrounding ground bearing capacity. The revised BIA notes that large scale dewatering is not going to be required as each underpin that is constructed will provide temporary water tightness to the areas already excavated. This should be confirmed by further groundwater monitoring.
- 4.12. The BIA has shown that the surrounding slopes to the development are stable.
- 4.13. The BIA does not indicate whether the foundations to the basement will be lower than the foundations to the basement/cellar of the adjoining properties.
- 4.14. The BIA includes an assessment of whether the development is likely to be affected by surface water flooding, and even though nearby streets were flooded in 2002, the risk is accepted as being low. A number of mitigation options such as dual pumps, upstands to the lightwells, SUDS, and alarm systems are discussed and should be incorporated as necessary.
- 4.15. The BIA confirms that the area of hardstanding will increase by 7%. The BIA recommends the use of SUDS incorporating attenuation tanks in order to attenuate surface water flow.
- 4.16. The Ground Movement Assessment concludes that any damage to the neighbouring properties will be Burland Category 2 or less. This is agreed with. The movement assessment has been produced based on the guidance from CIRIA Report C580 that determines the horizontal and vertical movements based on propped embedded walls. The method of construction proposed

by Croft is for unpropped L shaped cantilever walls in the permanent case, however a construction methodology has been provided that conclude that high level propping will be provided to the retained soil at all times until the concrete has cured. It is stated that sacrificial propping will be used and cut off only once the concrete has cured.

- 4.17. An acceptable movement monitoring regime on the adjacent properties during construction is proposed, this includes the use of optical equipment to measure lateral and vertical movement.

5.0 CONCLUSIONS

- 5.1. The BIA has been carried out by established organisations. The authors and reviewers from all of these organisations have suitable qualifications.
- 5.2. The ground water level is uncertain, with evidence of the standing water level at 1.02m below ground level. The ground water report concluded that the basement could be below the water table and could cause ground water backup and daylighting, and potential damage to adjacent properties. Further water level monitoring is required in order to confirm the water level and to identify seasonal high and low levels. A scheme ground water drainage system has been proposed that requires further consideration and detail design.
- 5.3. There are concerns over the tunnelling excavation method proposed, particularly in combination with the potential large reduction in ground water level required in order to carry out construction. The BIA concludes that as the basement construction progresses temporary water proofing will be provided by each underpin, therefore the entire dewatering of the basement will not be required and will only be required locally as each pin is constructed. The ground water level should be confirmed via water level monitoring in order to allow this concern to be better evaluated.
- 5.4. In conjunction with the tunnelling technique used to construct the basement the existing ground floor slab is proposed to be retained and supported on new steelwork and concrete lintels spanning between the new underpinning. The existing construction of the floor slab is not confirmed, and there are concerns regarding its suitability and capacity to withstand the extensive temporary propping that would be required until its permanent support can be provided. However the stability affect on the neighbouring properties/ground stability by this ground slab is thought to be minimal as its capacity to provide lateral restraint would be negligible.
- 5.5. The Ground Movement Assessment concludes that any damage to the neighbouring properties will be less than Burland Category 2. While the ground movement assessment technique utilised does not fully correspond to the proposed construction method, it is accepted that the damage potential is relatively low due to the presence of neighbouring basements reducing the differential between foundation depths. The proposals made for propping underpins and excavation faces should be adopted.
- 5.6. A movement monitoring regime on the adjacent properties during construction is proposed and this should be provided.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Rosen, Gadow, Almedia, Swithenbank, Curtis	Flats B-F, 98 Priory Road	22/06/2015	Adjacent property stability which is constructed on shallow foundation.	The BIA contains structural calculations for the permanent and temporary structure that is to support the adjacent land and foundations. The existing foundations are to be supported by concrete underpinning in a hit and miss sequence which is accepted as industry standard to help to prevent land/foundation instability. A method statement has been produced detailing industry standard practises for the excavation and formation of the basement. The fact that the property has been constructed on a shallow foundation has been accounted for due to worst case assumptions in the retaining wall design.
Rosen, Gadow, Almedia, Swithenbank, Curtis	Flats B-F, 98 Priory Road	22/06/2015	Damage to Robinia tree to front of property.	The BIA confirms that the proposed basement falls outside of the trees root protection zone.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Subterranean groundwater	<p>Due to conflicting conclusions regarding the ground water level and the proposed basements potential to cause ground water daylighting and damage to adjacent basements, clarification is required regarding the ground water level. Ideally this would be supported by water level monitoring data.</p> <p>Note added for D2 audit report: The BIA (Rev 1) and BIA - Ground Water conflicts with respect to the impact on subterranean groundwater. This conflict should be resolved.</p>	Closed	09/11/15
2	Movement assessment	Movement assessment to be resubmitted assuming a low stiffness scenario.	Closed-accepted as appropriate	01/10/15
3	Ground water drainage	<p>Details of recommended ground water drainage system to be provided along with calculations. This may not be required should the ground water level be confirmed to be lower than the basement level consistently.</p> <p>Note added for D2 audit report: Refer to Query No 1.</p>	Closed	09/11/15
4	Building Damage Assessment	Not carried out in accordance with CIRIA C580 as noted in BIA.	Closed	09/11/15

Appendix 3: Supplementary Supporting Documents

None