CampbellReith
consulting engineers

15-17 Tavistock Place
WC1H 9SH

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12066-61
Revision: D2

October 2015

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Project Number	12066-61
Project Name	15-17 Tavistock Place, London WC1H 9SH
Planning Reference	2015/3406/P

Contents

Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith has been instructed by the 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 15-17 Tavistock Place, London WC1H 9SH - Planning Reference 2015/3406/P.

1.2. The Audit has been carried out in accordance with the Terms of Reference set by the LBC. The Audit has reviewed the BIA for potential impacts on land stability and on local ground and surface water conditions arising from the proposed basement development.

1.3. CampbellReith has accessed LBC's Planning Portal and reviewed the latest revisions of submitted documentation against an agreed audit check list.

1.4. The BIA includes screening, scoping, site investigation and impact assessment stages as defined and required in the LBC Planning Guidance document 'Basements and Lightwells' (CPG4), dated July 2015.

1.5. The BIA has been based on LBC Planning Guidance document CPG4, dated September 2013. Any BIA updates issued following this audit should be written to accord with the revised document dated July 2015.

1.6. There is no reference in the BIA authorship to any specific ground engineering/geotechnical specialism and no reference to flood risk management and surface water drainage expertise as required by the LBC Planning Guidance Document 'Basements and Lightwells (CPG4)'. These points should be clarified.

1.7. Information on the current condition of 15-17 Tavistock Place and on the nature and depth of the existing footings and basement should be confirmed together with information on building condition and the nature and depth of the footings and/or basements to all properties within the likely sphere of influence of the basement works. This information should be provided within a Basement Construction Plan (BCP). The above will permit a greater understanding to be gained of nearby building sensitivity to ground movements so that construction sequencing and propping arrangements may be optimised and ground movement induced damage minimised.

1.8. It is understood from the BIA that the foundations to 15-17 Tavistock Place and the boundary walls to properties surrounding much of the site are to be underpinned. However, no details have been provided as to the locations and extent of such underpinning. Likewise, no calculations have been provided for wall/underpinning design. The above should be provided in the BCP.

1.9. The soil descriptions given in the GMA report differ in places from those presented in the previously issued BIA.

1.10. No exploratory hole location plan, borehole logs, piezometer locations or stratigraphical cross-sections have been included in the BIA. It is not possible based on the information provided to ascertain the lateral sequence of strata and the implications on groundwater flows. This information is required to be able to complete the audit of the BIA.

1.11. Groundwater information is very limited and long-term groundwater monitoring should be undertaken at the site to establish a design groundwater level and allow the potential impact on subterranean flows to be confirmed. This may be reported in the BCP.

1.12. It is not clear whether intermediate level temporary props to the basement walls will be provided. No calculations have been provided for the design of the basement walls. These issues require addressing.

1.13. Ground movement and damage assessments in accordance with CIRIA C580 have been undertaken using the computer programme X-disp for selected 'sensitive' structures in Cartwright Gardens, Marchmont Street and Woolf Mews. No information is given as to how the assessed buildings were selected. This should be clarified and the X-disp calculations should be re-submitted with all input data included and fully annotated to allow the BIA audit to be completed. It should be confirmed whether or not heave effects caused by basement excavation has been included.

1.14. Generally, predicted damage categories were assessed as negligible (Category 0) to slight (Category 2). However, a moderate (Category 3) assessment was made for 57 Cartwright Gardens and 61 to 62 Cartwright Gardens. Where damage in excess of Category 2 was predicted, it was stated that provision would be made for mitigation measures to be implemented to safeguard the properties, although the details of this were not discussed. Mitigation measures should be clarified where predicted damage exceeds Category 1 to allow the audit to be completed.

1.15. No assessment of damage category has been undertaken for 15-17 Tavistock Place on the basis that it is not a sensitive structure. This argument is not accepted as the existing building is in very close proximity to the proposed basement. A ground movement assessment of 15-17 Tavistock Place and allocation of building damage category is required before the BIA can be approved.

1.16. Proposals for monitoring movement in surrounding structures during excavation and construction should be provided together with proposals for pre- and post-construction condition surveys.

1.17. The LUL Piccadilly line running tunnels are said to pass some 20m to the east of the site. Evidence of consultation with LUL should be provided.

1.18. Queries and requests for clarification/further information are summarised in Appendix 2.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by the London Borough of Camden (LBC) on 05 August 2015 to carry out a Category 'C' Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 15-17, Tavistock Place, London WC1H 9SH - Planning Reference 2015/3406/P.

2.2. The above Audit has been carried out in accordance with the Terms of Reference set by the LBC. The Audit has reviewed the above BIA for potential impacts on land stability and on local ground and surface water conditions arising from the proposed basement development.

2.3. A BIA is required for all planning applications with basements in the LBC in general accordance with policies and technical procedures contained within the following documents:

a) Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.

b) Camden Planning Guidance (CPG) 4: Basements and Lightwells.

c) Camden Development Policy (DP) 27: Basements and Lightwells.

d) 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.

The BIA should evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described within the GSD and should make recommendations for detailed design.

2.5. The LBC Audit Instruction described the planning proposal as '*Demolition of existing shed buildings (Class D1) and erection of a part single, part two-storey, part three-storey medical research laboratory and higher education facility (Class D1) with associated plant on roof and basement accommodation (2 floors)'.*

The Audit Instruction noted the following:

a) The basement proposals do not involve a listed building but the site does neighbour listed buildings.

b) The site is not in an area subject to slope stability constraints or in an area subject to surface water flow and flooding constraints but may be subject to subterranean (groundwater) flow constraints.

c) The application requires determination by the Development Control Committee (DCC).

d) The scope of the submitted BIA extends beyond the screening stage.

2.6. CampbellReith accessed the LBC Planning Portal on 26 October 2015 and has examined the following reports and drawings relevant to the audit:

a) A 'Townscape, Heritage and Visual Impact Study' prepared by Montague Evans, dated July 2015.

b) The following London School of Hygiene & Tropical Medicine planning application drawings:

Block Plan as Proposed.

Demolitions Ground Floor (Level 0).

As Existing Basement Floor (Level 1) Layout.

As Existing Ground Floor (Level 0) Layout.

As Existing Site Section 1.

As Existing Site Section 2.

As Existing Site Section 3.

Section A-A As Proposed.

Section B-B As Proposed.

Section C-C As Proposed.

Section D-D and E-E As Proposed.

Basement Floor (Level-1) Layout As Proposed.

Basement Floor (Level-2) Layout As Proposed.

South Elevation As proposed.

c) Comments received from the public on the planning application.

2.7. The following documents were issued by the LBC directly to CambellReith:

a) A Basement Impact Assessment prepared by Wilde Carter Clack Ltd, consulting engineers, dated June 2015.

b) A Ground Movement Assessment Report (including a summary of ground conditions), prepared by Geotechnical Environmental Associates (GEA), dated 16 October 2015.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are the BIA author(s) credentials satisfactory?	No	There is no reference in the BIA to the authors having experience/expertise in the fields of ground/geotechnical engineering or flood risk management and surface water drainage. These points should be clarified.
Is data required by Cl.233 of the GSD presented?	No	No works programme has been provided. Contingency measures have been mentioned in the GMA report but no details have been given as to what these might constitute. No evidence has been provided of contact with LUL to discuss potential impacts arising from the basement works on the nearby Piccadilly Line running tunnels.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	However, only very limited monitoring of groundwater levels has been undertaken at the site to date to establish a level for design. No borehole location plan is included in the BIA.
Are suitable plans/maps included?	Yes	Except that Figure (c) in the BIA is entitled 'Aquifer Designation Map'. This should read 'Camden Surface Water features'.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Slope and Ground Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	Justification is not always given for 'no' answers.
Hydrology Screening: Have appropriate data sources been consulted?	No	Justification is not always given for 'no' answers.

Item	Yes/No/NA	Comment
Is justification provided for 'No' answers?		
Hydrogeology (Groundwater Flow) Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	Justification is not always given for 'no' answers.
Is a conceptual ground model presented?	Yes	
Slope and Ground Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	NA	
Hydrogeology (Groundwater Flow) Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	However, the information provided is in summary form only. No GI factual report has been provided to audit.
Is monitoring data presented?	Yes	However, only very limited monitoring of groundwater levels has been undertaken at the site to date to establish a level for design. No borehole location plan is included in the BIA.
Is the ground investigation informed by a desk study?	Yes	However, the desk study is not available on the LBC portal for viewing and has not been audited.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	However, it is not mentioned whether buildings to the south of the site have basements.

Item	Yes/No/NA	Comment
Is a geotechnical interpretation presented?	No	Descriptions only of the main soil units are provided. No soil parameters have been included in the BIA or GMA report.
Does the geotechnical interpretation include information on retaining wall design?	No	
Are reports on other investigations required by screening and scoping presented?	No	No such reports were identified as being required.
Are baseline conditions described, based on the 'Guidance for Subterranean Development (GSD)'?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Surrounding basements are considered in the context of GMA but have not been considered in any detail in the context of likely effects of the proposed basement on groundwater flow around existing sub-surface structures. It is not mentioned whether buildings to the south of the site have basements.
Is an Impact Assessment provided?	Yes	However, potential impacts on the nearby Piccadilly Line running tunnels have not been evaluated.
Are estimates of ground movement and structural impact presented?	Yes	However, no ground movement predictions have been made with respect to the effects of basement construction on the nearby Piccadilly Line running tunnels. Additionally, no assessment has been made of the heave (vertical) movements of the ground surrounding the proposed basements resulting from excavation of the basement.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	Generally, except that potential impacts on the nearby Piccadilly Line running tunnels have not been evaluated.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	Mitigation measures have not been addressed other than to say that contingency measures (yet to be defined) will be implemented if movements of adjacent structures exceed defined trigger levels.
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	No assessment has been made of the heave (vertical) movements of the ground surrounding the proposed basements resulting from excavation of the basement.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	The new development will be provided with a green and blue roof rainwater harvesting system which will delay run-off rates and reduced the impact of discharge on surface water and foul drainage systems.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	No assessment has been made of the heave (vertical) movements of the ground surrounding the proposed basements resulting from excavation of the basement. The current groundwater regime has not been established via long-term monitoring.
Does the BIA report state that damage to surrounding buildings will be no worse than Burland Category 2?	No	Potential building damage to 57 Cartwright Gardens and 61 to 62 Cartwright Gardens has been assessed as Category 3 (Moderate).
Are non-technical summaries provided?	Yes	In the form of an executive summary.

4.0 DISCUSSION

4.1. A desk study and BIA were first issued in May 2013 (Ref: J13113) by Geotechnics & Environmental Associates (GEA). Following the undertaking of a Ground Investigation (GI) by GEA, the above document was updated in August 2013 (Ref: J13113A). The current BIA by Wilde Carter Clack Ltd (WCC) (Ref: 4159) was issued in June 2015. WCC commissioned GEA to produce a Ground Movement Assessment (GMA) for the project and their report (Ref: J13113B) was issued on 16 October 2015.

4.2. The BIA has been based on LBC Planning Guidance document CPG4, dated September 2013. Any BIA updates issued following this audit should be written to accord with the revised document dated July 2015.

4.3. The authors of the BIA are a chartered civil/structural engineer and a chartered structural engineer. However, there is no reference in the submitted document to any specific ground engineering/geotechnical specialism and no reference to flood risk management and surface water drainage expertise as required by the LBC Planning Guidance Document 'Basements and Lightwells (CPG4)'. These points should be clarified.

4.4. The qualifications of the author and checker of the GMA are in accordance with the requirements of the LBC Planning Guidance Document 'Basements and Lightwells (CPG4)'.

4.5. 15-17 Tavistock Place is occupied by the London School of Hygiene and Tropical Medicine and is located within the Bloomsbury Conservation Area of London. The proposed development comprises the construction of a state of the art medical research facility on land made available directly behind 15-17 Tavistock Place following demolition of the existing structures and buildings in this area. The new building will incorporate two levels of basement covering almost the entire building footprint and extending to 10m or so below ground level (bgl). The existing building at 15-17 Tavistock Place is said to be scheduled for minor alterations only to facilitate access to the new building behind.

4.6. Properties closest to the development site are those of Cartwright Gardens to the north, Marchmont Street to the east, the buildings on the opposite side of Tavistock Place to the south and N^{o} 13 Tavistock Place to the west. Other buildings in proximity to the development are those of Burton Street (to the north-west) and Woolf Mews (to the west).

4.7. Although not itself a listed building, 15-17 Tavistock Place lies in proximity to a number of listed properties of various designations, including the Grade II listed buildings of Cartwright Gardens.

4.8. The London Underground Ltd (LUL) Piccadilly line north-south running tunnels between Russell Square and Kings Cross/St. Pancras stations are said to run some 20m to the east of the site.

There is no evidence of consultation with LUL to confirm tunnel locations and identify any constraints.

4.9. 15-17 Tavistock Place comprises a substantial four storey brick building with part basement. The building was constructed over a number of years from 1904 onwards. No information is provided on the current condition of the building or on the foundation details. This matter should be addressed.

4.10. It is stated in the GMA report that buildings in Cartwright Gardens, Marchmont Street and Burton Street have at least one level of basement extending to 2.5m bgl or so. N^{o} 13 Tavistock Place is also noted to have a single basement, although the depth is not stated. The more recently constructed Woolf Mews is assumed to have relatively shallow foundations at 1.5m bgl or so. It is not mentioned in the BIA whether or not buildings to the south of the site along Tavistock Place have basements. Information on founding details and basement depths (where applicable) within all nearby properties should be confirmed.

4.11. A ground investigation was undertaken at the site by GEA. Ground conditions were indicated to comprise Made Ground (silty/clayey gravelly sand) to depths of between 1.60 and 4.30m bgl overlying Lynch Hill Gravel to a depth of 4.60m bgl overlying London Clay and the Lambeth Group. The Lynch Hill Gravel was noted to be designated as a Secondary Type 'A' aquifer by the Environment Agency (EA) and thus capable of supporting base-flow to watercourses. Soil descriptions given in the GMA report differ in places from those presented in the previously issued BIA.

4.12. Three groundwater monitoring standpipes were installed during the GI to depths of between 4.50m and 6.30m bgl. Groundwater levels were indicated during a single monitoring visit to lie at depths of 3.11m and 5.59m bgl, although a shallower depth range of 0.8m to 2.1m bgl was recorded during the investigation. Minor inflows of water were recorded during boring within the London Clay. The above groundwater information is very limited and long-term groundwater monitoring should be undertaken at the site to establish a design groundwater level.

4.13. The GEA factual report was not included/appended to either the BIA or the GMA report. It has thus not been possible to ascertain the distribution of the more permeable Made Ground and Lynch Hill Gravel aquifer across the site nor to know where the groundwater level measurements were made. The matter requires rectification.

4.14. It is accepted that the development site does not slope at more than 7^{o} (1:8) and does not lie within a wider hillside setting in which the general slope is greater than 7^{o}.

4.15. The basement development area behind the existing building is in excess of 5m from a highway or pedestrian right of way.

4.16. The BIA confirms that the site is not within an area of previously worked ground (based on published data).

4.17. The depth of the proposed basement is such that it will extend below the water table within the Made Ground and Lynch Hill Gravel aquifer. However, dewatering during construction will not be necessary due to the intended adoption of secant piling to the basement walls.

4.18. The BIA says that the site is not located in the vicinity of railway cuttings and the like but it has not been confirmed that the site is not within the exclusion zone of any tunnels. This matter should be confirmed with LUL with respect to the Piccadilly line running tunnels to the east.

4.19. It is accepted that there is no evidence or history of shrink-swell subsidence in the local area due to the depth of the London Clay.

4.20. The BIA confirms that the proposed basement will result in a significant differential in foundation depths relative to neighbouring properties, but states that the intended form of construction and propping arrangements will ensure the stability of the basement excavation itself and of the adjacent buildings at all times. However, full condition, construction and founding details should be obtained for the properties likely to be affected by the works to permit a greater understanding to be gained of their sensitivity to ground movements so that construction sequencing and propping arrangements may be optimised to achieve the required outcome.

4.21. The BIA records that no trees will be felled as a result of constructing the basement, nor are the works within any tree protection zones.

4.22. The BIA notes that the property does not lie within the catchment area of the ponds on Hampstead Heath, nor is it within 50m of the ponds. Additionally, the proposed basement does not lie below the static water level of any nearby surface water features. The site is also not in an area deemed at risk based on past street flooding records held by the LBC. It is therefore accepted that the development is not likely to be at risk from surface water flooding.

4.23. The BIA confirms that as part of the site drainage, surface water flows due to rainfall will be reduced because rainwater harvesting systems are to be utilised to capture roof water and meet SUDS requirements. The proportion of hard surface/paved areas is stated to remain as at present.

4.24. It is confirmed that the site is not within 100m of a watercourse or potential spring line and that although it lies 100m or so to the south of a tributary of the former River Fleet, this former river will have been culverted many years ago to form part of the local sewer network.

4.25. The BIA argues that although the site is located directly above an aquifer (Lynch Hill Gravels) and the proposed basement will extend below the water table, the basement will present only a partial barrier to groundwater flow (the direction of flow is believed to be generally from north to south towards the River Thames) as there will be sufficient space between the basement and neighbouring properties for groundwater to flow around it. Given the lack of current information on groundwater levels (see previous comments on limited groundwater monitoring), flow directions and flow rates, it is considered premature to make a judgement on this.

4.26. The proposed basement perimeter walling is to comprise reinforced concrete (RC) secant piles (to limit water ingress into the basement) with internal RC walls to provide further waterproofing and act in a structural capacity compositely with the secant piled walls. Vertical building loads will be supported on the perimeter piled wall and on bearing piles within the basement area. The secant piled walls are currently assumed to be 900mm in diameter and 21m long, although this is subject to change at detailed design stage.

4.27. A bottom-up construction sequence is currently envisaged, with temporary propping being provided at top of secant piled wall level until such time as the basement roof slab has been cast. It is not clear whether or not intermediate level temporary props to the walls will be provided. This matter should be clarified. No preliminary calculations have been provided for the design of the basement walls. This should be remedied.

4.28. Heave pressures arising from the excavation will be accommodated by the use of compressible void former beneath the basement floor and/or by the bearing piles acting in tension. Hydrostatic (uplift) forces acting on the basement floor slab will be resisted by a combination of the structure self-weight and the tension capacity of the internal bearing piles and the basement wall secant piles.

4.29. It is understood from the BIA that the foundations to 15-17 Tavistock Place and the boundary walls to properties surrounding much of the site are to be underpinned. However, no details have been provided as to the locations and extent of such underpinning and no calculations have been provided for wall/underpinning design.

4.30. An assessment of the combined vertical and combined horizontal ground movements outside the basement has been undertaken using the OASYS computer programme X-disp. Lateral propping has been assumed to be of a high support stiffness category as defined in CIRIA C580. Predicted ground movement contours indicate maximum settlements adjacent to the basement walls of between 10 and 20mm and maximum horizontal movements of between 15 and 35mm.

It is noted that there are imported displacements within the X-disp analyses and the nature/source of these imported displacements should be confirmed. The X-disp calculations should be re-submitted with all input data included and fully annotated to permit full auditing.

4.31. Damage assessments in accordance with CIRIA C580 have been undertaken for selected 'sensitive' structures in Cartwright Gardens, Marchmont Street and Woolf Mews. No information is given as to how the assessed buildings were selected. This should be clarified. Generally, predicted damage categories were assessed as negligible (Category 0) to slight (Category 2). However, a moderate (Category 3) assessment was made for 57 Cartwright Gardens and 61 to 62 Cartwright Gardens.

4.32. For those properties where damage in excess of Category 2 was predicted, it was stated that provision would be made for mitigation measures to be implemented to safeguard the properties, although the details of this were not discussed. It should be noted that the current version of CPG4 requires mitigation where predicted damage exceeds Burland Category 1. It is possible that a more refined analysis of the wall behaviour and construction sequence may reduce predicted movements and the predicted damage category.

4.33. No assessment of damage category has been undertaken for 15-17 Tavistock Place on the basis that it has been argued not to be a sensitive structure due to it being connected to the proposed new structure at ground floor level and above. This argument is not accepted as the building is in very close proximity to the proposed basement. A ground movement assessment for 15-17 Tavistock Place and allocation of building damage category is required before the BIA can be approved.

4.34. No analysis has apparently been undertaken of the vertical movements of the ground outside the basement plan area arising from basement excavation. Such analyses should be undertaken and the results combined with those from the X-disp analyses to generate contours of total movement for the prediction of damage category for all nearby buildings, including 15-17 Tavistock Place. This information is required before the BIA can be approved.

4.35. No assessment has been made of the expected ground movements in the vicinity of the Piccadilly Line running tunnels to the east of the site. It may be considered that the tunnels are too remote from the basement to be affected but this matter should be confirmed with LUL.

4.36. No works programme has been provided for basement construction in the BIA, although an outline method statement has been included.

4.37. It is stated that a detailed construction sequence with propping design will be produced prior to the commencement of construction and that condition surveys of nearby structures will be carried out prior to and following completion of basement construction. It is further stated that

inclinometers will be installed within the basement wall secant piles and that precise movement monitoring of adjacent buildings will be undertaken and contingency measures implemented should movements exceed pre-defined trigger levels. It is noted that the details of the above would need to be defined and agreed with adjacent property owners and set out within a movement monitoring specification. This should be provided under cover of a Basement Construction Plan to be approved prior to the commencement of construction.

4.38. Information on groundwater levels at the site is currently very limited. Long-term groundwater monitoring should be undertaken at the site to establish a design groundwater level and groundwater flow directions and allow the impact of the basement on subterranean flow to be better assessed.

5.0 CONCLUSIONS

5.1. The BIA includes screening, scoping, site investigation and impact assessment stages as defined and required in the LBC Planning Guidance document 'Basements and Lightwells' (CPG4), dated July 2015.

5.2. The BIA has been based on LBC Planning Guidance document CPG4, dated September 2013. Any BIA updates issued following this audit should be written to accord with the revised document dated July 2015.

5.3. There is no reference in the BIA authorship to any specific ground engineering/geotechnical specialism and no reference to flood risk management and surface water drainage expertise as required by the LBC Planning Guidance Document 'Basements and Lightwells (CPG4)'. These points should be clarified.

5.4. Information on the current condition of 15-17 Tavistock Place and on the nature and depth of the existing footings and basement should be confirmed together with information on building condition and the nature and depth of the footings and/or basements to all properties within the likely sphere of influence of the basement works. This information should be provided within a Basement Construction Plan (BCP). The above will permit a greater understanding to be gained of nearby building sensitivity to ground movements so that construction sequencing and propping arrangements may be optimised and ground movement induced damage minimised.

5.5. It is understood from the BIA that the foundations to 15-17 Tavistock Place and the boundary walls to properties surrounding much of the site are to be underpinned. However, no details have been provided as to the locations and extent of such underpinning. Likewise, no calculations have been provided for wall/underpinning design. The above should be provided in the BCP.

5.6. The soil descriptions given in the GMA report differ in places from those presented in the previously issued BIA.

5.7. No exploratory hole location plan, borehole logs, piezometer locations or stratigraphical cross-sections have been included in the BIA. It is not possible based on the information provided to ascertain the lateral sequence of strata and the implications on groundwater flows. This information is required to be able to complete the audit of the BIA.

5.8. Groundwater information is very limited and long-term groundwater monitoring should be undertaken at the site to establish a design groundwater level and allow the potential impact on subterranean flows to be confirmed. This may be reported in the BCP.

5.9. It is not clear whether intermediate level temporary props to the basement walls will be provided. No calculations have been provided for the design of the basement walls. These issues require addressing.

5.10. Ground movement and damage assessments in accordance with CIRIA C580 have been undertaken using the computer programme X-disp for selected 'sensitive' structures in Cartwright Gardens, Marchmont Street and Woolf Mews. No information is given as to how the assessed buildings were selected. This should be clarified and the X-disp calculations should be re-submitted with all input data included and fully annotated to allow the BIA audit to be completed. It should be confirmed whether or not heave effects caused by basement excavation has been included.

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5.12. No assessment of damage category has been undertaken for 15-17 Tavistock Place on the basis that it is not a sensitive structure. This argument is not accepted as the existing building is in very close proximity to the proposed basement. A ground movement assessment of 15-17 Tavistock Place and allocation of building damage category is required before the BIA can be approved.

5.13. Proposals for monitoring movement in surrounding structures during excavation and construction should be provided together with proposals for pre- and post-construction condition surveys.

5.14. The LUL Piccadilly line running tunnels are said to pass some 20m to the east of the site. Evidence of consultation with LUL should be provided.

Appendix 1: Resident's Consultation Comments

Surname	Address	Date	Issue raised	Response
Backlund (Gary)	Flat 2, 87-89 Marchmont Street, London WC1N 1AL	08/08/15	Concern as to structural damage potentially being caused to surrounding properties. Concern that there is no procedure in place to monitor movement /damage/ cracks.	See 5.4 - 5.5 and 5.9 - 5.13. See 4.37.
Cockle (Paul)	Flat 3, 13 Tavistock Place, London WC1H 9SH	20/08/15	Concern expressed that the proposed basement construction could threaten the foundations and party wall to 13 Tavistock Place.	See 5.4 - 5.5 and 5.9 - 5.13.
Donovan (Christopher)	Flat 1, 87-89 Marchmont Street, London WC1N 1AL	20/08/15	The application does not appear to include a flood risk assessment or assessment of local groundwater, drainage and structural conditions. Appropriate measures are required to maintain the structural stability of adjoining properties and to protect existing drainage facilities and groundwater. Appropriately stringent mitigation measures are required.	See 4.22 - 4.25 and 5.4 - 5.5 plus 5.9 - 5.13.

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	Ground engineering/geotechnical and flood risk management and surface water drainage expertise of authors to be confirmed.	Open.	
2	BIA	Discrepancies between the soil descriptions given in the BIA and GMA report should be noted.	To be noted.	N/A
3	BIA	Factual GI report not provided.	Open.	
4	Stability, hydrology & hydrogeology.	Long-term groundwater level monitoring to be undertaken to establish a design groundwater level and permit the impact on subterranean flow to be determined.	To be provided in a BCP.	N/A
5	Stability	Information on current building condition and on the nature and depth of existing footings and basements plus underpinning proposals for 15-17 Tavistock Place and all other properties within the likely sphere of influence of the works should be confirmed.	To be provided in a BCP.	N/A
6	Stability	Propping status of basement walls to be confirmed. Detailed calculations for the design of the basement walls and underpinning to be completed.	To be provided in BCP.	N/A

7	Stability	Ground movement assessment to be re-submitted with all X-disp and P-disp input included and fully annotated to permit full auditing. Selection of sensitive buildings to be justified. 15-17 Tavistock Square to be included.	Open.	
8	Stability	Evidence of consultation with LUL to determine their requirements with regard to the Piccadilly Line running tunnels to be provided.	Open.	
9	Stability	Indicative proposals for monitoring and condition surveys to be provided. Information to be provided in BCP with finalised construction sequence.	Open	
10	Stability	Possible building damage mitigation measures to be clarified where predicted damage exceeds Category 1.	Open.	

Appendix 3: Supplementary Supporting Documents

None

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