CampbellReith
consulting engineers

45 Flask Walk, London NW3 1HH

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-99
Revision: F1

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Appendix

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 45 Flask Walk, London, NW 3 1HH (planning reference 2016/3900/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 BIA has been prepared by well-known firms of engineering consultants using individuals who possess suitable qualifications.

1.5. The BIA has confirmed that the proposed basement will be founded within the Claygate Member and will be formed using a series of underpin retaining walls which is accepted as a principle. Some further clarification was requested in relation to the design of the underpins and the basement slab to ensure the solution shown can be justified as part of the final basement design. A number of queries in relation to the underpinning solution in terms of design and buildability and site constraints were also identified. Further information and clarification was requested which has subsequently been provided.

1.6. A site investigation has been carried out in support of the scheme. Whilst generally this is considered adequate to inform the design, it is considered that further longer term monitoring of the groundwater profile below the site, in particular the proposed basement, should be carried out to ensure this is fully understood.

1.7. The BIA has identified that the slope to the front of the property is currently unstable and as part of the redevelopment, slope stabilisation works will be employed. It is understood that this will involve underpinning the existing front façade and installing piles to act as a retaining structure within the front garden. The principles of this are accepted though some further detail of the methods likely to be employed were requested and have subsequently been provided.

1.8. A ground movement and damage assessment analysis has been carried out in accordance with CPG4. The analysis identifies that a number of walls to adjacent properties where the damage according to the Burland Scale is Category 2 – 'Slight'. In accordance with the guidance of CPG 4, mitigation measures are required where damage higher than Category 0 is calculated. The

BIA provides commentary on this which following review, required some further assessment by the applicant.

1.9. The BIA identified that the site is not in an area prone to flooding and that the hydrology of the site and surrounding area will not be altered significantly as a result of the basement scheme, subject to provision of surface water attenuation measures.

1.10. Overall there were a number of matters where further information or clarification was required following a review of the initial information provided. These are discussed within section 4.0 of this report and noted in appendix 2. It is accepted that in general the BIA and supplementary information presented in Appendix 3 adequately identify the potential impacts arising out of the basement proposals and describe sufficient mitigation.

1.11. Further monitoring work will be required to confirm the groundwater regime below the footprint of the basement. This aspect of the proposals will be subject to a Basement Construction Plan (BCP) requiring supplementary monitoring information, along with any impacts or changes to the design, to be submitted and approved prior to construction works commencing.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18/08/16 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 45 Flask Walk, NW3 1HH, planning reference 2016/3900/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 "Demolition of an existing two storey rear extension, erection of a replacement three storey rear extension and single storey basement excavation.

2.6. The Audit Instruction also confirmed 45 Flask Walk was a listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 09/09/16 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) – Issue 1 - Dated 25/05/16
- Construction Method Statement by Terrence Fidler Partnership – Dated April 2016
- Construction Management Plan by Kias Services Ltd – Dated June 2016
- Planning, Heritage, Design & Access Statement by Allde – Dated June 2016
- Planning Application Drawings consisting of:

  Proposed Structural Drawings by Terrence Fidler Partnership – Dated June 2016

  Existing Architectural Plans, Elevations & Sections by Allde – Dated January 2016

  Proposed Architectural Plans, Elevations & Sections by Allde – Dated May 2015
- Site investigation email, sketches and photos by Terrence Fidler Partnership – Dated April 2016
- Planning Comments and Responses

2.8. Further to the issue of the initial audit report, supplementary information was provided by the applicant on 06/12/16 and 12/01/17 comprising of:

- An audit query tracker produced by Terrence Fidler Partnership
- Underpin retaining wall design calculations by Terrence Fidler Partnership
- Rainwater attenuation proposals and drawings by Hewitt Consulting
- Movement monitoring method statement (ref KA 1131) by Knight Associates
- Ground Movement & Damage Assessment calculations and letter report by GEA
- Supplementary Heave Analysis by GEA
- Supplementary Structural Engineers drawings by Terrence Fidler Partnership

2.9. This information is presented in Appendix 3 and has been considered in this updated audit report.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Author & final checkers credentials are satisfactory.
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	
Are suitable plan/maps included?	Yes	Some plans included. Refer to audit report section 4.6.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes (part)	Refer to discussion section 4.6.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report section 3.1.2.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report section 3.1.1.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report section 3.1.3 Refer to audit report section 4.7.
Is a conceptual model presented?	Yes	BIA report section 7.0.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Slope Stability Scoping provided in BIA section 9.5 Refer to audit report section 4.5 & 4.17.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Scoping provided in BIA section 10.0.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Scoping provided in BIA section 10.0.
Is factual ground investigation data provided?	Yes	Ashdown Site Investigation Ltd report LW26363 dated Feb 2016 is appended to the BIA.
Is monitoring data presented?	Yes (part)	Refer to audit report section 4.14 also.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	BIA section 2.1.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Refer to audit report section 4.10.
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	Refer to discussion section 4.8.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural report provided.
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	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Within BIA section 9.0 and appendix (detailed analysis inputs & outputs. Refer to audit report section 4.22, 4.23-4.25.
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	BIA section 9.3.1 & 9.5. Refer to audit report section 4.14.
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes (Part)	Refer to audit report section 4.8-4.13 & 4.22-4.25.
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?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	BIA section 9.3.1. Refer to audit report section 4.22-4.25.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by a well-known firm of engineering consultants, Geotechnical & Environmental Associates (GEA) and the individuals concerned in its production have suitable qualifications.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal involved a listed building. It has been confirmed that 45 Flask Walk is a listed building within a terrace of listed properties.

4.3. The proposed basement consists of a single storey construction formed by lowering an existing basement area below the rear half of the original property by around 0.8m as well as forming a new basement approximately 3.4m deep to the rear of the property. The existing rear wing of the property is to be demolished and rebuilt above the new basement as part of the proposals.

4.4. The BIA has identified that the site is underlain by Made Ground of varying depth, below which is the Claygate Member. The profile of the ground was confirmed to a depth of 5m below ground level where the investigation works terminated.

4.5. Though the ground below the footprint of the property is broadly flat, the property itself is set approximately 4.0m above the level of the Flask Walk highway, which is located approximately 10m from the front façade of the building. The building is understood to have been subject to historic settlement. Investigation works encountered fissures in the ground below the front of the property along with signs of distress within the front garden which suggests that there may be slope stability issues associated with the ground between the front of the house and the highway. This has been identified in the screening aspect of the BIA report and taken forwards to the scoping stage where a slope stability analysis has been carried out.

4.6. Reference is included within the screening assessment to appropriate sources of information for review of whether the basement is located in close proximity to watercourses, springs, the catchment of the pond chains on Hampstead Heath and whether the site is in an area prone to surface water flooding. It is accepted from review of the screening assessment that the basement will not have an impact on the above and that the site is not in an area prone to surface water flooding.

4.7. It is accepted that the site is largely covered by existing buildings and areas of hardstanding such that infiltration of rainwater into the ground is limited to the areas of soft landscaping in the front and rear gardens. It is noted that the area of hardstanding as a result of the development is slightly increased and that attenuation measures will be provided to accommodate the slightly increased flow. The outline proposals of these submitted as part of the supplementary package of information have been reviewed and are considered sufficient.

4.8. The basement construction relies on reinforced concrete retaining wall underpins which it is assumed will act as propped cantilevers in the permanent case. Whilst detailed design of the structure is not required as part of the BIA, it was requested that sufficient calculations be provided to demonstrate that the stability of the property and surrounding buildings will be maintained. It was noted that geotechnical properties should be taken from the site investigation report and that consideration should be given to the fact that the worst case loads for structural retaining wall design may not be the worst case loads in terms of maximum bearing pressure and settlement. Calculations were submitted as part of the supplementary information provided and are considered sufficient to show the design approach is feasible.

4.9. In addition to the above, the supplementary information confirmed that an allowance has been made in the design of the basement for ground water levels to rise beyond the as recorded levels.

4.10. The extent of assumed basements to surrounding properties is identified on the figure within 2.6 of the BIA. Though it is noted that these are assumed basements, the Terence Fidler Partnership drawing 360219-02 Rev P1 states the assumed basement extents have been confirmed by site inspection and liaison with adjacent owners. It was noted that 43 Flask Walk has a cellar below the front half of the property however review of trial pits TP8 & TP9 showed the footing to the party wall here terminating around 800mm below the ground floor level. It was highlighted in the initial audit comments that this did not seem sufficient to be the wall of a cellar structure in the adjacent property. Whilst it was acknowledged that this footing level had been used in the ground movement assessment calculations, section B-B on the structural drawings showing the underpinning details assumed the wall goes much deeper. As this relationship may affect the feasibility of the underpinning details adopted, it was requested that further clarification on this relationship should be provided. It was confirmed that at present it is not possible to fully confirm the relationship due to access restrictions but that details here will be finalised as part of the party wall process in conjunction with the engineer based on their further investigations.

4.11. In relation to point 4.10, it was highlighted that where new underpinning works meet the two party walls adjacent to the cellars with shallower foundations, particular care would need to be taken with the methods adopted to facilitate excavating and forming the underpins, to ensure the integrity of the ground below the shallower party wall footings was not compromised and the stability of the adjacent buildings will be maintained. Preliminary details of how this will be achieved were requested and further clarification was provided on this point, as identified in the tracker contained within Appendix 2 & 3 of this report.

4.12. It was noted that the underpinning proposals are such that the front façade, internal spine wall and rear portion of the house will all be underpinned. As a result, only two sections of the

existing party wall, within the front half of the building, will not be underpinned. It was accepted that these walls are in locations of adjoining basements, such that the differential depth between the underpinned walls and the adjacent walls which are not underpinned should be low. However, as noted in 4.9, the relationship between the party wall foundations and the cellar did not seem to be clearly defined. Clarification was requested as to whether this differential in foundation depth (whatever it may be) has the potential to cause issues with differential settlement between the front façade of 45 Flask Walk and the party walls / front façades of 43 & 47 Flask Walk. Further clarification has been provided on this point including confirmation of engineering input during construction works when the relationship between the foundations will be better understood. Refer to supplementary information in Appendix 3.

4.13. Terence Fidler Partnership drawing 360219-01 Rev P6 shows a layout of the proposed underpin retaining walls to be installed. Underpinning details appear to show the chimney breast on the party wall with 47 Flask walk being underpinned however it was not clear that the main party wall will be underpinned in this area to ensure its stability would be maintained. Further clarification on this matter was provided which confirmed that the 'underpins' in this area will buttress rather than underpin the wall.

4.14. A Construction Management Plan is provided in accordance with clause 4.3 of CPG 4 however this does not contain details of the monitoring proposals. It is acknowledged in 9.3.1, 9.3.2 and 9.5 of the BIA that monitoring will be carried out and that contingency measures will be implemented if movements of adjacent structures exceed pre-defined trigger levels. It was requested that outline proposals of the monitoring should be provided within the BIA or as part of an updated Construction Management Plan. These were provided and reviewed as part of the supplementary information received. No further comments were raised on this point. It is accepted also that the detailed monitoring proposals will be agreed as part of the party wall awards prior to any works commencing.

4.15. TFP drawing 360219-04 Rev P5 notes *'Possible underpinning to front wall is necessary, depth is to be subject to trial holes to be excavated and BIA report'.* The BIA notes in Section 1.1 that '*the proposed refurbishment will also include underpinning to the front elevation of the house'*. It was requested that the drawing above should be updated to reflect the fact that underpinning will be provided and the depth of the underpins added to the drawings (plans and sections). It was also requested that confirmation was provided that the depth of the underpins is sufficient to deal with any existing or future desiccation, as well as complying with the requirements of the slope stability analysis contained with section 9.5 of the BIA.

The applicant has confirmed that the final level of the pins here will be confirmed with the geotechnical specialists prior to works commencing and that the final pin level may be subject to actual inspection of the stratum on site during excavation which is welcomed.

4.16. It was noted that the ground movement assessment calculations refer to the existing front façade as 'Wall A' and appears to assume a footing depth of 0.43m below ground floor level. The ground movement assessment is therefore considered to be conservative in this regard as the actual underpinned wall depth will be deeper.

4.17. TFP drawing 360219-04 Rev P5 notes *'Possible piles to be located as advised by GEA as noted in the BIA report with regards to slope stability requirements'.* As the BIA has noted that the slope to the front of the property will require stabilisation and the stability of the slope could be influenced, either directly or indirectly by the basement dig, it was requested that sufficient detail be provided as to the piling proposed to facilitate slope stabilisation. It was noted that this could include preliminary details of the form and location of the piles proposed and this was provided via updated structural engineers drawings included within the supplementary information within appendix 3.

4.18. The BIA noted that groundwater was not encountered in monitoring which lasted for approximately 2 weeks, with the exception of 4 days where it was recorded at levels of between 4.60m & 4.75m below ground level. As noted in both Section 8.1.1 and Section 10.0 of the BIA, the monitoring undertaken was for a relatively short period of time and at a location not within the footprint of the proposed basement itself. Given the potential for significant quantities of perched water and / or groundwater to have an impact on the wider hydrogeological setting and the surrounding basements, it was suggested that further investigation is required to ensure the groundwater in the area of the basement is fully understood.

4.19. We agreed with the commentary in section 10.0 and 11.0 of the BIA that an extended period of standpipe monitoring within the footprint of the basement through the winter months should be carried out to fully understand the groundwater levels. If possible, trial excavations within the proposed footprint of the basement, extending as close to the proposed basement depth as possible should also be carried out during this period.

4.20. It has been advised that there are difficulties with carrying out supplementary monitoring now however the nature of the ground in the area is such that ground water regime differing from that currently assumed could result in changes being required to the basement proposals and mitigation measures being required to prevent ground water flows being affected. Whilst it is identified in the attached response that further monitoring will be carried out as part of the build programme, by this stage the ability to address any variations in the ground water encountered, (particularly a higher level than assumed) in a satisfactory manner will be limited. As such the monitoring work should be carried out prior to works commencing and at the end of the monitoring period, the applicant should confirm the findings and any amendments required to the information submitted. It is suggested that this aspect of the proposals is

managed through the planning process via a Basement Construction Plan (BCP). The scope of the BCP would need only to relate to groundwater related matters..

4.21. It is noted that to establish the necessary data for the purposes of the ground movement assessment and developing structural details, a good range of trial pits have been carried out to ascertain the form & depth of all existing wall footings.

4.22. Retaining wall design parameters are included on Page 10 of the Site Investigation report and further commentary is provided with 8.1.2 of the BIA. It is noted that the stiffness parameters (E) for the various strata encountered are assumed in Section 9.2.2. These values are considered reasonable and are generally accepted, however the stiffness of 20MPa assumed for the Made Ground was considered high. We would have anticipated a figure of circa of 8-10MPa would be more typical. This query was raised with the applicant who provided supplementary calculations confirming negligible difference to the design if a figure of 10Mpa was adopted. Calculations are included within appendix 3 of this report.

4.23. Section 9.3.1 of the BIA identifies the anticipated category of damage to adjacent properties based on the results of the ground movement analysis. The analysis identifies a number of walls to adjacent properties where the damage according to the Burland Scale is Category 2-Slight. In accordance with the guidance of CPG 4, mitigation measures are required where damage higher than Category 0 is calculated.

4.24. It is noted in 9.3.1 that the walls in question *'may require stabilisation prior to the excavation of the basement. It is recommended that the depth of the neighbouring foundations are confirmed, and the ground movement assessment is updated and monitoring of these structures and No 43 Flask walk will be required before and during basement construction'*. Confirmation was requested as whether it is feasible to ascertain the depth of these foundations. If it was then the depths should be established and ground movement assessment updated. If this demonstrates that a damage category of 0 is achieved, no further action would be required. If however a damage category of 0 was not achieved, details of the mitigation measures, which may include as suggested, stabilisation and monitoring works should be detailed. If access to ascertain foundation depths to the critical walls was not possible, conservative assumptions on foundation depth should be made and the process described above repeated.

4.25. Following issue of the initial comments, the applicant confirmed that access to the adjacent properties was not possible however supplementary hand calculations relating to ground movements and damage assessments would be provided based on the approach contained within CIRIA C580 and using conservative parameters for any unknown foundation depths. The further calculations were provided for review and identified the mitigation measures that would be put in place for areas where the damage category of 0 was still exceeded. Supplementary calculations and & report and included in appendix 3.

4.26. It was not clear when reviewing the BIA whether the existing / proposed building loads and any associated settlement had been considered as part of the GMA. If the superstructure above the new basement has a net settlement effect (i.e. not heave), then the settlement induced by the new building loads should be taken into account in the GMA as these would have an effect on the party walls. This query was raised with the applicant and clarification was provided on this point. Refer to the tracker schedule within Appendix 2 & 3 of this report.

4.27. A review of the X-disp models presented in the BIA was undertaken and the following comments were raised which required clarification:

- With regards to basement level, the Terence Fidler Partnership drawing 360219-04 Rev P5 indicates an excavation depth of 3.6m for the new section of basement and an excavation depth of 3.4m where the existing basement is to be lowered. The xdisp model seems to indicate that the existing basement portion of the site will only be deepened to 2.6m. Clarification is requested on this point.

- The existing basement surface level appears to be modelled at 0.0m where as given it is existing, we believe this should be at -2.0m from the model's datum level of 0. Clarification is requested on this point.

4.28. Clarification was provided in relation to these queries. Refer to the tracker schedule within Appendix 2 & 3 of this report.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by well-known firms of engineering consultants using individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the proposed basement will be comprised of a slight extension in depth of an existing basement, along with a new basement formation at the rear of the property.

5.3. The BIA is generally considered to generally be a well compiled and comprehensive report however there were a number of matters for which further clarification was requested. These are discussed within Section 4.0 of this report and in the appended Audit Query tracker.

5.4. The BIA identified that 45 Flask walk has been subject to historic movement and the investigations and calculations carried out suggest that the slope at the front of the property is unstable. A slope stability analysis was conducted using Geostudio and identified the slope as marginally unstable with mitigation measures required. As part of the basement works the existing building and slope is to be stabilised and the outline methods and calculations provided within the BIA and supplementary information are considered reasonable.

5.5. The proposed basement is to be formed using a series of underpin retaining walls. Whilst the principle of this was accepted, further details were requested to confirm that these works will not affect the stability of 45 Flask walk or the surrounding buildings which it shares party walls with. These queries include preliminary design of the underpins, clarification of the relationship of the proposed underpins to retained walls which are not underpinned and the interaction of the front façade pins to the slope stabilisation works. Clarification and further information in this regard was provided in the supplementary information and tracker documents, included within Appendix 3 of this report.

5.6. The understanding of the groundwater regime beneath the site will be critical to this scheme given the underlying ground conditions and proximity of adjacent basements. Currently the understanding is based on a 2 week period of monitoring which it is acknowledged within the BIA should be supplemented to ensure a fuller understanding of the groundwater. In particular, this should include monitoring within the footprint of the basement.

5.7. It has been advised that further monitoring and investigation works are not possible at this stage. Due to the potential risks associated with the ground water profile varying from that assumed, it is suggested that this monitoring work is carried out prior to works commencing. Once complete, the findings of the monitoring and further investigations should be confirmed and any changes to the design required as a result. It is suggested that the above is managed via a Basement Construction Plan.

5.8. It is accepted that surface water flows and risk of flooding is not an issue subject to provision of the appropriate maps confirming the commentary within the screening and scoping sections of the BIA. Outline proposals for attenuation of the increased surface water run off have been provided for review and are considered reasonable.

5.9. A detailed ground movement assessment was carried out as part of the BIA which highlighted a damage category of 2 on the Burland Scale for some elements of the surrounding properties. In accordance with CPG4, damage categories of 1 or higher require mitigation measures to be considered. It was noted that the damage category assumed was based on a number of assumptions and following queries on these points, supplementary calculations and clarification have been provided on anticipated damage category and the mitigation measures proposed.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Heath & Hampstead Society	PO Box 30214, London, NW3 1XD	07/08/16	Existing structural instability and effect on adjoining houses.	Refer to discussion section 4.8 – 4.28
Kwek	51 Flask Walk, London, NW3	05/08/16	Stability of adjacent properties & risk of settlement.	Refer to discussion section 4.8 – 4.28
Lamb	51 Flask Walk, London, NW3	15/08/16	Effect on underground water courses, risk of flood and subsidence.	Refer to discussion section 4.0, in particular 4.15-4.17 & 4.19 – 4.20
Ashworth & Dewar	New Court, Flask Walk, NW3 1HD	11/08/16	Effect on adjacent properties, risk of settlement and sink holes.	Refer to discussion section 4.0, in particular 4.15-4.17
Hayward	43 Flask Walk, London, NW3	31/07/16	Destabilizing of properties and movement of intervening (party) wall.	Refer to discussion section 4.0, in particular 4.8-4.15 & 4.22-4.25

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Surface water & flooding	Attenuation proposals to be provided, see section 4.7.	Closed. Refer to Hewitt Consulting report included Supplementary Documents in Appendix 3	16/01/17
2	Retaining underpin design	Preliminary retaining wall design and commentary to be provided, see section 4.8.	Closed. Refer to TFP design calculations included in Supplementary Documents in Appendix 3	16/01/17
3	Structural stability	Commentary & calculations in relation to overall basement stability, see section 4.9.	Closed. Refer to TFP design calculations & separate audit query tracker included within Supplementary Documents in Appendix 3	16/01/17
4	Construction sequence and underpinning	Queries on underpin installation, refer to section 4.10-4.13 & 4.15.	Closed. Refer to TFP design calculations & separate audit query tracker included within Supplementary Documents in Appendix 3	16/01/17
5	Movement monitoring	Preliminary proposals to be provided, refer to 4.14.	Closed. Refer to Knight Associates monitoring proposals included within Supplementary Documents in Appendix 3	16/01/17
6	Slope stability	Further commentary and outline proposals for retaining piles, refer to section 4.17.	Closed. Refer to TFP drawings & separate audit query tracker included within Supplementary Documents in Appendix 3	16/01/17
7	Ground conditions	Further investigation and monitoring required to confirm groundwater regime local to the basement, refer to section 4.18-4.19.	Open. Matter to be taken forwards as part of a Basement Construction Plan.	To be addressed via BCP
8	Ground movement assessment	Queries raised on damage category calculated, mitigation measures proposed, and X-Disp analysis. Refer to section 4.22-4.25.	Closed. Refer to letter report and additional calculations produced by GEA included within Supplementary Documents in Appendix 3	16/01/17
9	Geotechnical Properties	Properties of made ground used in design, refer to 4.21.	Closed. Refer to Separate audit query tracker and GEA calculations included within Supplementary Documents in Appendix 3	16/01/17

Appendix 3: Supplementary Supporting Documents

Audit query tracker by Terrence Fidler Partnership

Underpin retaining wall design calculations by Terrence Fidler Partnership

Rainwater attenuation proposals and drawings by Hewitt Consulting

Movement monitoring method statement (ref KA 1131) by Knight Associates

Ground Movement & Damage Assessment calculations and letter report by GEA

Supplementary Heave Analysis by GEA

Supplementary Structural Engineers drawings by Terrence Fidler Partnership

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