CampbellReith
consulting engineers

Winter House 81 Swain's Lane
London N6 6PJ

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12985-35
Revision: F1

July 2019

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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 81 Swain's Lane (planning reference 2018/5730/P, 5731/L). The basement is considered to fall within Category C 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 Alan Baxter Associates in conjunction with Ground Engineering using individuals who possess suitable qualifications, as required by CPG Basements.

1.5. The redevelopment proposals comprise the construction of a tunnel using contiguous piles, linking the new 1-storey extension building with the existing cutting. The cutting is proposed to be excavated and two storey of underground space created. As part of the 1-storey extension building, a retaining wall is proposed to be constructed into the hillside.

1.6. A site specific soil investigation has been conducted. Factual data and geotechnical interpretation is presented in the BIA.

1.7. It has been confirmed that the below ground structures will be founded within London Clay. Perched water may be encountered during excavation and measures to control these need to be allowed for.

1.8. Estimates of ground movement and associated structural damage have been presented. The revised submissions demonstrate that neighbouring buildings should not sustain damage worse than Burland Category 1.

1.9. An outline movement monitoring strategy relating to all affected structures will need to be implemented during construction. Movements and associated damage will need to be limited to Category 1 for all structures.

1.10. In the revised submissions, it has been demonstrated that there will be no impact to the wider hydrological environment.

1.11. In the revised submissions, assessment of removal of trees has been undertaken, indicating that impact will be negligible to surrounding structures.

1.12. Consultation with Thames Water is ongoing in relation to the implementation of an asset protection agreement, as required.

1.13. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

1.14. Queries and requests for further information are summaries in Appendix 2. Considering the revised submissions, the proposal meets the requirements of CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18th January 2019 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Winter House, 81 Swain's Lane 2018/5730/P, 5731/L.

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 Basements. March 2018.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- Local Plan Policy A5 Basements.

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;

d) 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 "basement excavation for new tunnel, excavation of infill rubble inside historic cutting". The Audit Instruction also confirmed Winter House was a Grade II* listed building.

2.6. CampbellReith accessed LBC's Planning Portal on 29th January 2019 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) by Alan Baxter dated August 2018.
- Planning Application Drawings consisting of:

  Existing Plans (SHH Architects, dated 12.06.2018).

  Proposed Plans (SHH Architects, dated 12.06.18 and 29.01.2019; Alan Baxter drwgs. 201-202, 211 dated 29.03.18 and 30.01.2019)

  Elevations and Sections (SHH Architects, dated 12.06.2018; Alan Baxter drwgs. 212, 215 dated 29.03.18).

- Design & Access Statement (by SHH dated September 2018).
- Construction Management Plan dated June 2018.
- Flood Risk Assessment by RPS dated February 2018.
- Planning Comments and Response.

2.7. CampbellReith received the following relevant documents for audit purposes between February and June 2019:

- SHH Architects drwgs. (828)002_PL03, (828)021_PL02.
- Alan Baxter (AB) drwgs. 1173-12-201_A, 202, 211, SK1000.
- Revised BIA Report dated March 2019.
- Embedded Wall calculations by AB.
- Response to queries raised by CampbellReith

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA 1
Is data required by Cl.233 of the GSD presented?	Yes	BIA – Multiple sections.
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 – Appendices A to I & chapters 3&4.
Are suitable plan/maps included?	Yes	Whilst the site location is not clearly marked on several maps, these have been consulted and referred to in the BIA.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	BIA Appendices
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA 3.2 and Appendix C
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Appendix C
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Appendix C
Is a conceptual model presented?	Yes	BIA 5.1 and Appendix J
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA 3.2. Insufficient consideration of slope stability issues.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	NA	Not required
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA 3.1. Insufficient assessment provided.
Is factual ground investigation data provided?	Yes	BIA 5.1. and Appendix J.
Is monitoring data presented?	Yes	BIA 5.1.
Is the ground investigation informed by a desk study?	Yes	BIA Appendix J.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	No neighbouring basements identified.
Is a geotechnical interpretation presented?	Yes	BIA Appendix J.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	N/A	
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Neighbouring basements not identified. Foundation depths to adjacent 79 Swain's Lane provided.
Is an Impact Assessment provided?	Yes	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Movement due to wall installation and tunnel excavation considered; it has been confirmed that movement due to heave pressure is anticipated to be negligible in case of the tunnel.
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	Clarified in revised submissions
Has the need for monitoring during construction been considered?	Yes	Clarified in revised submissions
Have the residual (after mitigation) impacts been clearly identified?	Yes	Clarified in revised submissions
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Clarified in revised submissions
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	Clarified in revised submissions
Are non-technical summaries provided?	Yes	Provided in Revised Submissions

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Alan Baxter Associates in conjunction with Ground Engineering. The individuals involved in its preparation are chartered engineers and geologists, as required by CPG Basements.

4.2. It is noted that the BIA refers to historic LBC guidance (CPG4). Current guidance (CPG Basements and the Local Plan (Policy A5 Basements) should be referenced.

4.3. The LBC Instruction to proceed with the audit identified that the basement proposal involves a Grade II* listed building as well as the Grade II listed Mortuary Chapel.

4.4. The proposed below ground works involve constructing a new tunnel, to an approximate depth of 4m, linking the new single storey extension building with a historically infilled subway cutting. This is to be excavated and two levels of habitable space constructed. The extension to the house is to continue at exiting ground level, which cuts into an existing slope.

4.5. The construction of the single storey extension to the Winter House is proposed to be at existing ground level, with a contiguous piled wall proposed at the rear, where the extension is proposed to cut into the existing hillside. The structural sketches show the piles installed in front of an existing garden wall, which is suggested to be demolished and rebuilt subject to agreement with the boundary wall owners.

4.6. The construction of the tunnel will also comprise a contiguous piled wall with a reinforced concrete liner wall, and top and bottom slab. This is proposed to link the planned extension building with the two levels of below ground space created within the subway cutting.

4.7. The BIA confirmed that the tunnel walls will require high stiffness propping system during construction and has assumed stiff propping for the assessment of ground movement and likely structural damage to neighbouring buildings.

4.8. The BIA included limited information on how the two levels of habitable space will be constructed within the subway cutting. The structural proposals do not seem to refer to this area of the site. The assumption that there are existing permanent props at the top of the cutting needs to be confirmed. Otherwise, the sequence and propping arrangements to ensure movements (and any resultant damage impacts) from excavation of the backfilled cutting should be presented.

4.9. The proposed contiguous piled wall for the rear of the house extension into the hillside is stated to be cantilevered. The revised submissions indicate that stability will be maintained.

4.10. The site investigation included 9 hand excavated trial pits and 2 percussive boreholes to a depth of 25m. In-situ testing included Standard Penetration Testing (SPT) and hand shear vane tests to estimate the shear strength of the soil encountered.

4.11. The interpretive geotechnical report identified that the ground conditions encountered comprised Made Ground to varying depths, typically between 0.49m and 5.40m, underlain by the London Clay formation. The same report noted that the 5.4m Made Ground was associated with the infilled historic subway cutting.

4.12. Groundwater monitoring has been undertaken as part of the soil investigation and water was recorded at various levels between 1.34m and 5.2m below ground level (bgl). The BIA comments on the water seepage and confirmed that this appears to be due to water perched within the Made Ground over impermeable London Clay. It is confirmed in the BIA that dewatering is likely to be required during tunnel construction and this should be allowed for.

4.13. The BIA makes reference to an existing Thames Water (TW) sewer running through the site. Consultation with Thames Water is ongoing in relation to the implementation of an asset protection agreement, as required.

4.14. The BIA states that two trees will be removed to facilitate redevelopment. In the revised submissions, it has been confirmed that the removal of the trees will not adversely impact nearby foundations. In addition, mitigation methods have been proposed to further minimise impacts.

4.15. An assessment of likely ground movement and associated structural damage has been undertaken using the methodology documented in CIRIA C760. The structures assessed included the main building, no. 79 Swain's Lane, Highgate Cemetery and the cemetery Toilet Block. The original BIA confirmed that any structural damage due to redevelopment plans will typically be limited to Burland Category 1 (Very Slight) damage.

4.16. The original damage assessment of the Toilet Block indicates potential theoretical damage corresponding to Burland Category 2 (Slight), which is beyond that permissible with reference to LBC guidance. The assessment was carried out in accordance with the methodology described in CIRIA C760. In the revised submissions, appropriate mitigation has been demonstrated to limit movements such that damage will be limited to Category 1 for all structures.

4.17. The BIA discusses the hydrogeological setting and confirmed that the direction of the groundwater flow follows the site slope and occurs within the Made Ground overlying the impermeable London Clay. The BIA also confirmed that the top of tunnel would be located within London Clay and that the overall site hydrogeology will be unaffected by its construction.

Given the existing retaining structures across the site and adjacent to the highway, it is accepted that there will be no significant impact to the wider hydrogeological environment.

4.18. The original BIA indicates that the proposed development will result in an increase in impermeable site area. It is proposed to implement a green roof to provide some form of attenuation SUDS. In the revised submissions, it is confirmed that there will be no increase in the impermeable site area and therefore no impact to the wider hydrological environment.

4.19. A flood risk assessment (FRA) is presented which states that the proposed development is at low risk from all sources. However, the FRA recommends standard flood risk mitigation measures, such as raised thresholds and adoption of 'flood resilience techniques' in regards to groundwater, should be implemented.

5.0 CONCLUSIONS

5.1. The BIA has been prepared by firms of engineering consultants using individuals who possess suitable qualifications.

5.2. The development plans comprise the construction of a single storey extension with a retaining wall at the rear and new tunnel linking this to the existing subway cutting. Two levels of below ground space are proposed within the cutting.

5.3. The BIA has confirmed that the proposed below ground construction, including the new tunnel, will be founded within London Clay.

5.4. The engineering proposals indicate contiguous piled wall construction for both the tunnel and new retaining structure at the back of the extension building.

5.5. A site investigation has been conducted which documented the soil conditions and recommended foundation solutions and design soil parameters. Groundwater, that is perched within Made Ground, may be encountered during excavation works and allowances for dewatering should be made.

5.6. Estimates of ground movement and associated structural damage have been presented. The revised submissions demonstrate that neighbouring buildings should not sustain damage worse than Burland Category 1.

5.7. The revised submissions confirm that stability can feasibly be maintained utilising the proposed structural scheme and mitigation actions, where required.

5.8. In the revised submissions, assessment of removal of trees has been undertaken, indicating that impact will be negligible to surrounding structures.

5.9. Consultation with Thames Water is ongoing in relation to the implementation of an asset protection agreement, as required.

5.10. Confirmation will be required that the construction of the cantilevered retaining wall, as part of the single storey building extension, will not impact on the slope stability.

5.11. It is accepted that the development will not impact on the wider hydrogeology or hydrology of the area and is at low risk of flooding. The recommended measures outlined in the FRA should be implemented.

5.12. Considering the revised submissions, the BIA meets the criteria of CPG Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Parker	-	-	The residents raised concerns with regards to the construction of the 2-storey basement in the immediate proximity of their property and the possible damage due to this.	The BIA author clarified that a 2-storey basement will not be constructed and instead a single storey extension building will be erected.
Woods	-	-	The resident raised concerns about any effects of the basement.	Estimates of ground movement and associated damage, due to construction of the tunnel, have been included in the BIA.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA Format	Reference CPG Basements / Policy A5	Closed	May 2019
2	BIA Format	Provide non-technical summaries.	Closed	May 2019
3	Land Stability	Demonstrate slope stability not impacted by proposed cantilever piled wall for house extension into hillside.	Closed	June 2019
4	Land stability	The sequence and propping arrangements to ensure movements (and any resultant damage impacts) from excavation of the backfilled cutting should be confirmed.	Closed	June 2019
5	Land stability	Confirm asset protection consultation with TWUL regarding sewer crossing the site is being undertaken.	Closed	June 2019
6	Land Stability	Confirm shrink / swell impacts to existing foundations and mitigation, if required, re removal of trees.	Closed	June 2019
7	Lan Stability	With regard to the Toilet Block, to demonstrate that no more than Category 1 damage will occur, it should be confirmed to what extent movements will be limited and how this will be ensured, including proposed structural monitoring and contingency actions.	Closed	June 2019
8	Hydrology	Confirm change in impermeable site area. Provide sufficient outline assessment and drainage proposals to demonstrate LBC policy criteria will be met.	Closed	June 2019

Appendix 3: Supplementary Supporting Documents

Alan Baxter Query Tracker Responses

Alan Baxter Letter June 2019

RESPONSES TO BASEMENT IMPACT ASSESSMENT AUDIT **Date: 04/06/2019**

PROPERTY: JOHN WINTER HOUSE, SWAIN'S LANE, N6

Query No	Subject	Query (04/03/19)	Status	ABA Response (22/03/19)	Campbell Reith Comments (09/05/19)	ABA Response (09/05/19)	Campbell Reith Comments (21/05/19)	ABA Response (31/05/19)	Date closed out
1	BIA Format	Reference CPG Basements / Policy A5	Note	Noted and amended					9 May 2019
2	BIA Format	Provide non-technical summaries.	Closed	A non-technical summary has been provided at the beginning of the BIA report.					9 May 2019
3	Land Stability	Demonstrate slope stability not impacted by proposed cantilever piled wall for house extension into hillside.	Closed	The slope will be supported by a series of contiguous piles up to 2.27m. These piles will be propped at the top by a capping beam. We have produced calculations showing that a reinforced 350mm diameter piled wall will be adequate to support the loads of a wall this high in order to maintain the stability of the slope. These calculations have been included at the end of Appendix I. In addition, the cemetery wall is being taken down and rebuilt after the construction of the wall so it will not be affected by the proposals. The dividing garden wall between no.81 and no.79 Swain's Lane will be retained and is located 1.2m south of the proposed cantilevered wall which varies with the sloping topography from 0m to 2.27m. Trial pits have confirmed that the base of this garden wall is founded at 1.12m below the proposed level of excavation into the cutting. As a result, the wall will not be undermined during the works. However, the garden wall will be monitored for movements during the works.					9 May 2019
4	Land stability	The sequence and propping arrangements to ensure movements (and any resultant	Closed	On the basis that this is a structure that already exists we do not anticipate any significant movements when it is dug out again. The retaining walls of the cutting would have already experienced movements					9 May 2019

		damage impacts) from excavation of the backfilled cutting should be confirmed.		during the original installation. The subsequent backfilling of the cutting is unlikely to have caused any significant reversal of these earlier movements meaning that the subsequent removal of the backfill is also unlikely to lead to any significant movements at all. However, as a precaution, temporary props will be installed in order to confirm the original cast iron props are in place as the excavation proceeds. p					
5	Land stability	Confirm asset protection consultation with TWUL regarding sewer crossing the site is being undertaken.	Closed	The Thames water sewer will pass below the new tunnel and be cast into the basement slab of it with appropriate detailing to allow for differential movements. An opening will be left in the contiguous piled wall to allow the sewer to pass through it. Permission for this is to be sought from Thames Water Developer Services at the next stage.					9 May 2019
6	Land Stability	Confirm shrink / swell impacts to existing foundations and mitigation, if required, re removal of trees.	Closed	Two small trees are being removed as part of the proposals. One of these is a dead apple tree. This collapsed recently and has been removed so would not affect the foundations in the existing or proposed cases. The other tree is a small common walnut tree. With this taken into consideration, the effect of its removal will be minimal. However, it is recommended that it is felled in the winter to mitigate sudden swelling of the clay during the drier months of the year.					9 May 2019
7	Lan Stability	With regard to the Toilet Block, to demonstrate that no more than Category 1 damage will occur, it should be	Open	Ball and Langdon's 2014 paper concluded that piled wall installation movements obtained from Ciria C580 were conservative. Within Circia C580, it states that "the magnitude of ground movements depends upon the quality of	We have reviewed the responses provided by the applicant to the queries raised in our initial audit report. We are generally satisfied with these, but would request that the applicant provides further details of the movement monitoring strategy.	Ball and Langdon's 2014 paper concluded that piled wall installation movements obtained from Ciria C580 were conservative. Within Circia C580, it states that "the magnitude of ground movements depends upon the quality of	Val's audit report and the recent responses from the the applicant's engineers. In regard to the outstanding query, potential damage of Category 2 to the toilet block, the applicant's engineers need to	Ball and Langdon's 2014 paper concluded that piled wall installation movements obtained from Ciria C580 were conservative. Within Circia C580, it states that "the magnitude of ground movements depends upon the quality of workmanship…". The paper concluded that, a well-constructed piled wall utilising stiff regular propping with controls in place with regular monitoring	3 June 2019

		confirmed to what extent movements will be limited and how this will be ensured, including proposed structural monitoring and contingency actions.		workmanship…". The paper concluded that, a well-constructed piled wall utilising stiff regular propping with controls in place with regular monitoring against agreed movement trigger limits could reduce the predicted initial horizontal movement against wall depth ratio from 0.04% to 0.02%. Our proposal is to use a stiff system of propping and monitoring on the site. Taking this into account, the anticipated movements of the toilet block would result in this building also experiencing damage no greater than Burland Category 1.	Can they please specify the movement trigger limits which will prevent any structural damage exceeding Category 1, particularly in case of the Toilet Block . These should be compatible with the estimated movements that have already been established by the Engineer. In the meantime we shall amend our report and issue it by the end of the week, provided that we can receive the above information by then.	workmanship…". The paper concluded that, a well-constructed piled wall utilising stiff regular propping with controls in place with regular monitoring against agreed movement trigger limits could reduce the predicted initial horizontal movement against wall depth ratio from 0.04% to 0.02%. Our proposal is to use a stiff system of propping and monitoring on the site. Taking this into account, the anticipated movements of the toilet block would result in this building also experiencing damage no greater than Burland Category 1. Monitoring targets will be established on the masonry elements of the toilet block at high and low level in order to allow vertical settlement and horizontal displacement to be recorded. These will be recorded by a specialist monitoring contractor at a frequency to suit the construction activities on site but not less than weekly during the installation of the new tunnel link. Green, amber and red trigger levels will be established in line with normal industry practice. The proposed trigger levels are: Vertical movement: green 5mm, amber 18mm, red 10mm - Horizontal movement: green 5mm, amber 7mm,	provide a clear statement demonstrating that movements can be feasibly limited to Category 1. The response so far cites a well known paper top modify to justify their assessment that movements can be limited and Category 1 can be achieved. The paper cited relates to a large commercial development with multistage propping and comprehensive monitoring, which is not necessarily analogous to what is proposed for this application. For clarity, can the engineer provide the following: 1. A statement of what movements will be limited to in order to maintain a maximum of Category 1 damage. 2. An outline method statement on how they propose to feasibly limit this movement ie what type of propping will be used; how this will be adjusted if required etc. The key phrase here is 'feasibly limit this movement'. Just saying 'stiff propping' is not sufficient, because the reasonably conservative assessment indicates Category 2 damage. 3. Their trigger levels and contingency responses ie at amber the following actions will	against agreed movement trigger limits could reduce the predicted initial horizontal movement against wall depth ratio from 0.04% to 0.02%. Our proposal is to use a stiff system of propping and monitoring on the site. Taking this into account, the anticipated movements of the toilet block would result in this building also experiencing damage no greater than Burland Category 1. In addition to the above, the Ball and Langdon paper reviewed vertical and horizontal movements of large, deep basement structures where the consequences of movement are potentially far greater than those associated with the small, single storey, simple toilet block. Monitoring targets will be established on the masonry elements of the toilet block at high and low level in order to allow vertical settlement and horizontal displacement to be recorded. These will be recorded by a specialist monitoring contractor at a frequency to suit the construction activities on site but not less than weekly during the installation of the new tunnel link. Green, amber and red trigger levels will be established in line with normal industry practice. The proposed trigger levels are: Vertical movement: green 3mm, amber 5mm, red 6mm - Horizontal movement (x and y): green 5mm, amber 7mm, red 9mm. <u>Response to trigger levels</u> Green – Continue working and monitoring. Amber – Contractor to implement their amber level action plan. This is to include: • Repeat monitoring to confirm readings • Review method of working and identify any specific activity related to measure movements • Proposed a revised methodology of control increasing trend in movements • Agreed revised proposals with ABA prior to implementation	

						red 9mm.	be undertaken x, y, z; at red the following reponses will be undertaken x, y, z etc.	• Increase frequency of monitoring Red – Contractor to implement their red level action plan. This is to include: • Stop working. • Repeat monitoring to confirm readings • Submit new proposals/methodology to stop further movements • Agree revised proposals with ABA prior to implementation • Increase frequency of monitoring <u>Details of propping</u> We have provided an assumed sequence of construction (see drawing SK1000 in Appendix H) that demonstrates a stiff method of propping (in accordance with Ciria C760). We agree, that the design and methodology of the propping will need to allow stiff propping to be installed that is carefully sequenced to mitigate movements. The design is currently at RIBA Stage 3 and, as the temporary works are contractor designed, this will be provided by them at site stage based on limits set out by Alan Baxter in the tender documents.	
8	Hydrology	Confirm change in impermeable site area. Provide sufficient outline assessment and drainage proposals to demonstrate LBC policy criteria will be met.	Closed	The landscaping proposals on the Architects drawings generally show no change in the permeable site area. The small area of paving in the rear garden will be permeable.					9 May 2019

SCANNED LETTER BY EMAIL

Our Ref: 1173/12F/RD

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Graham Kite
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4 June 2019

Dear Graham

Winter House

As part of the proposals for Winter House, we have been liaising with HGH planning and Campbell Reith for the last 3 to 4 months in order to complete the approval of the Basement Impact Assessment.

During this period, we have updated our Basement Impact Assessment (BIA), provided further calculations in order to respond to Campbell Reith's comments and responded to other queries seperately via email.

This letter has been produced in order to capture Campbell Reith's queries on the BIA and our formal responses to these.

The main query related to the cemetery's toilet block, a single storey brick built structure on the north west boundary of the site. The BIA concluded that the damage to this building from a new tunnel link would fall into Burland Category 2. A Ball and Langdon 2014 paper concluded that the Ciria C760 guidance is conservative in its approach and that far less movement was observed when utilising stiff propping techniques. The anticipated movements from Ball and Langdon are approximately half that of Ciria C760 meaning it would only experience Burland Category 1. To further mitigate the risk of damage to the toilet block, it will also be monitored during construction with set trigger levels. Alan Baxter will include the monitoring requirements and trigger level limits in the Tender documentation to the Contractor.

We understand that there are no further comments in relation to the toilet block following our email response on 31 May 2019. A more detailed response to the toilet block movements and responses to all other Campbell Reith queries are included on the attached tracker for reference.

We trust this tracker, along with the updated BIA, acts as a formal record of our discussions, allowing the BIA approval process to be concluded. If you have any further queries on this, please do get in touch.

Yours sincerely

Rory Dack
for Alan Baxter Ltd

Enc.

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