

**Mallinson Sports Centre,
London, N6 4PB**

**Basement Impact Assessment
Audit**

For
London Borough of Haringey

Project No.
13979-05

Date
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1.0 NON-TECHNICAL SUMMARY

- 1.1 CampbellReith was instructed by London Borough of Haringey, (LBH) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for Mallinson Sports Centre, London N6 4PB, planning reference HGY/2023/0338.
- 1.2 The Audit reviewed the Basement Impact Assessment (BIA) for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBH's policies and technical procedures.
- 1.3 CampbellReith was able to access LBH'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 proposal includes the construction of two basements to depths of 5.50m and 4.00m below ground level. One basement will form the new Fives Court to the south (Phase 2A) with the other proposed to be beneath the new Sports Hall to the north (Phase 2B). The proposal also includes a sunken amphitheatre in the adjacent playing field.
- 1.5 The qualifications of the individuals involved in the production of the BIA are not in accordance with LBH guidance. Non-technical summaries are not presented in the BIA and are required.
- 1.6 The ground model presented in the BIA contradicts the log records provided and published information; this should be reviewed by suitably qualified persons and the full site investigation information provided.
- 1.7 The screening and scoping responses should be updated to accurately consider the ground and groundwater conditions of the site and surrounding area.
- 1.8 Further details of the construction methodology of the basements should be provided to allow impacts to stability and the water environment to be assessed and any necessary mitigation measures, such as dewatering and monitoring, to be described.
- 1.9 The impact assessment should be updated as described in Section 4 to consider the impacts of the development to the neighbouring properties and the water environment. Impacts from the sunken amphitheatre should be included.
- 1.10 Any impact on underground assets within the zone of influence of the basement is outside the scope of this report.
- 1.11 Queries and requests for information are summarised in Appendix 2. The BIA does not clearly establish baseline conditions and assess impacts from the basement proposals to the stability of neighbouring structures and the water environment. Until the clarifications requested are presented, the BIA does not meet the requirements of LBH guidance on basements.

2.0 INTRODUCTION

2.1 CampbellReith was instructed by London Borough of Haringey (LBH) on 17th November 2023 to carry out an audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Mallinson Sports Centre, London N6 4PB, planning reference HGY/2023/0338.

2.2 The audit reviewed the BIA for potential impact on land stability and local ground and surface water conditions arising from basement development. An audit of land quality/contamination issues has not been undertaken and is outside the scope of this report.

2.3 A BIA is required for all planning applications with basements in Haringey in general accordance with policies and technical procedures contained within:

- Development Management DPD. July 2017.
- Draft Basement Development Guidance Note. June 2012.
- Haringey Council Strategic Flood Risk Assessment.

2.4 The BIA should demonstrate that the scheme:

- a) maintains the structural stability of neighbouring properties;
- b) does not adversely affect drainage and run-off or cause other damage to the water environment;
- c) does not have a cumulative impact 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 and to make recommendations for the detailed design.

2.5 Although the site lies within the London Borough of Haringey, it was agreed that the audit of the screening, scoping and impact assessment would follow the procedure presented in the London Borough of Camden (LBC) Planning Guidance: Basements as it is widely known and is considered to provide a robust approach to the issues of concern.

2.6 The site is within the Highgate Neighbourhood Area.

2.7 LBH's Audit Instruction described the planning proposal as "Redevelopment of Mallinson Sport Centre, to include: 1) Partial demolition of existing structure, squash and fives buildings; 2) Refurbishment and extension of the remaining facilities, comprising new part single basement, new double height sports hall and new entrances, new teaching classrooms, offices, gym and exercise studios, circulation and ancillary accommodation; 3) New basement level outdoor covered fives courts; 4) External sunken oval sports pitch; and 5) Associated landscaping and improved provision for emergency services and servicing".

2.8 CampbellReith accessed LBH's Planning Portal on 28th November 2023 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report by Pringuer-James Consulting Engineers, reference L2384, revision A, dated June 2022.
- Drainage and SuDS Statement by Pringuer-James Consulting Engineers, reference L2384-REP-002, revision 04, dated 1st November 2022.
- Design and Access Statement by Ed Toovey Architects, dated January 2023.
- Flood Risk Assessment by EdenvaleYoung, reference EVY0753, revision F, dated January 2023.
- Surface Water Modelling Report by EdenvaleYoung, reference EVY0753, revision C, dated July 2022.
- Heritage Statement by Bidwells LLP, dated November 2022.
- Arboricultural Impact Assessment by SJ Stephens Associates, reference 380.1, dated 31st May 2022.
- Archaeological Desk-Based Assessment by Compass Archaeology dated October 2022.
- Utilities Assessment by Peter Deer and Associates, dated January 2023.
- Ecology Report by Applied Ecology Ltd, reference AEL0983, revision 2.0 dated 8th November 2023.
- Landscape Strategy Report by Robert Myers Associates, reference 733.01(PR)001, revision D, 21st November 2022.
- Existing and Proposed Architectural Drawings by Ed Toovey Architects including:
 - Location Plan existing
 - GIA and GEA Proposed and Existing Areas
 - Ground Floor Plan Level 2 Demolitions
 - Basement Plan Level 1 proposed
 - Part Ground Floor Plan Level 2 existing Interface of Proposals with MOL
 - Elevation existing and proposed (north/east/west/south)
 - Existing and proposed sections AA, BB, CC, DD, EE & FF
- Consultation responses. Those of note include:
 - Independent Review of BIA, FRA, SUDs by Haycock Environmental Consultants Ltd., revision 2.05, dated 15th June 2023.
 - Objection Letter from Highgate Society dated 9th May 2023.
 - Objection Letter from Highgate Society dated 13th September 2023.
 - Objection Letter from 18 Broadlands Road (Management) Ltd.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	No	The BIA should be reviewed by individuals holding the relevant qualifications.
Is data required by Cl.233 of Arup's Guidance for Subterranean Development presented?	No	See comments in Section 4.0 below.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	No	See comments in Section 4.0 below.
Are suitable plans/maps included?	Yes	
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	See comments in Section 4.0
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	See comments in Section 4.0
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	No	See comments in Section 4.0

Item	Yes/No/NA	Comment
Is a conceptual model presented?	No	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	However, this requires updating following comments made in Section 4.0.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	However, this requires updating following comments made in Section 4.0.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	See comments in Section 4.0
Is factual ground investigation data provided?	Yes	However, the full Ground Investigation Report has not been provided and is requested.
Is monitoring data presented?	No	
Is the ground investigation informed by a desk study?	Unknown	The full Ground Investigation Report has not been provided and is requested.
Has a site walkover been undertaken?	Unknown	
Is the presence/absence of adjacent or nearby basements confirmed?	No	Require further details of the foundations of potentially impacted neighbouring properties.
Is a geotechnical interpretation presented?	No	
Does the geotechnical interpretation include information on retaining wall design?	No	

Item	Yes/No/NA	Comment
Are reports on other investigations required by screening and scoping presented?	Yes	Flood Risk Assessment
Are the baseline conditions described, based on the GSD?	No	A ground model of the existing conditions has not been provided.
Do the baseline conditions consider adjacent or nearby basements?	No	As above.
Is an Impact Assessment provided?	Yes	However, see comments in Section 4.0 below.
Are estimates of ground movement and structural impact presented?	No	
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	No	The impact assessment provided requires updating following review of comments made in Section 4.0.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	See comments in Section 4.0 below.
Has the need for monitoring during construction been considered?	No	
Have the residual (after mitigation) impacts been clearly identified?	No	Residual impacts are reported as being negligible however, the impact assessment requires updating following comments in Section 4.0.

Item	Yes/No/NA	Comment
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	As above.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	See comments in Section 4.0 below.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	See comments in Section 4.0 below.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	No	
Are non-technical summaries provided	No	

4.0 DISCUSSION

- 4.1 The BIA has been carried out by Pringuer-James Consulting Engineers (PJCE). The individuals involved do not hold the qualifications required by LBH policy for the subterranean and land stability assessments; these should be reviewed by qualified professionals.
- 4.2 A Construction Management Plan (CMP) has been produced by Bidwells.
- 4.3 Non-technical summaries are not presented in the BIA and are required. Clarification on whether a site walkover was undertaken is also required.
- 4.4 The proposed redevelopment of the site includes the partial demolition of existing structures and the refurbishment and extension of the remaining facilities along with the construction of two basements. One basement will form the new Fives Court to the south (Phase 2A) directly adjacent to the existing Sports Hall, with a maximum depth of approx. 4.00m. The other basement will be beneath the new Sports Hall to the north (Phase 2B) directly adjacent to the existing Pool Hall Block, with a maximum depth of approx. 5.50m below existing ground level. Both basements will be formed with contiguous piled walls with internal reinforced concrete (RC) walls.
- 4.5 The proposed development also includes construction of a sunken amphitheatre in the adjacent playing fields that is to act as a flood storage attenuation. Reference to the sunken amphitheatre is not included in the BIA. It is recommended that this is included in the assessment and its impacts to the subterranean flow, and surface flow & flooding are considered.
- 4.6 The BIA report outlines that Broadlands Road and Bishopswood Road run along the north and west boundaries of site respectively. Directly south of site is open ground (used as playing fields) with sports grounds belonging to Highgate School to the east. It is acknowledged in the BIA that residential properties are present in proximity to the eastern boundary (27 Broadlands) however, the foundation depths and distances from the proposed basements have not been provided and should be confirmed.
- 4.7 No clear evidence is provided that a detailed desktop study of the site and surrounding area has been undertaken by suitably qualified individuals. The ground model outlined within the screening responses is contradictory to the information provided within the BIA appendices.
- 4.8 The BIA refers to a ground investigation undertaken in 2016 by Soil Consultants Ltd and a subsequent investigation undertaken in 2019. Exploratory hole records, dated January 2016 and December 2018, have been provided in Appendix C of the BIA however, neither of the full ground investigation reports have been provided and are requested. Within the BIA the ground conditions are described as comprising 1m cover of Made Ground over London Clay to a minimum depth of 20m. The BIA screening responses state that there are no indications of high groundwater or outcrops of permeable material in the immediate area. This description contradicts the information provided in the logs in Appendix C. The logs include reference to gravel soils and presence of flint gravel within some clay soils (indicating they are not in situ London Clay Formation). In addition, the BIA has not identified that the published geological

information suggests deposits of the Claygate Member overlie the London Clay Formation in the area.

- 4.9 Many of the logs included in the BIA contain mention of groundwater seepages / inflow at shallow depths. Monitoring wells appear to have been installed in several boreholes however no groundwater monitoring data has been provided and is requested. As aforementioned, the ground model provided in the BIA is contradictory and has not considered multiple references from other sources that indicate shallow groundwater exists within the area.
- 4.10 It should be noted that a previous BIA was audited for a proposed basement along Broadlands Road some 150m from this site. This BIA determined that the area surrounding the southern part of Broadlands Road historically contained meadows with watercourses and springs. Furthermore, the playing fields behind numbers 13-17 were described as waterlogged and unusable for many months of the year. This BIA also identified the presence of soils from the Claygate Member across the site and groundwater to be as shallow as 0.30m bgl.
- 4.11 Based on the above comments the ground model should be revisited and the screening and scoping responses revised accordingly.
- 4.12 The slope stability screening acknowledges that trees will be felled as part of the proposed development but fails to bring this through to the scoping stage. It should be noted that the comment provided in the screening does not address the impact of tree removal to the behaviour of the ground.
- 4.13 The screening identifies that the proposed basements are within 5m of a highway and significantly increase the differential depths of foundations to neighbouring properties. The scoping outlines that the Pool Hall Block (which is to remain largely unchanged) has piled foundations to 'great depths'. The BIA states that "*on this basis, the expected differential depth between the existing foundations and the excavated depth of the proposed lower basement will be in the order of 3.50m*". Clarification on whether the 3.50m relates to the existing foundations being 3.50m above or below the excavation depth is required. In addition, the CMP indicates that underpinning is proposed beneath part of this structure. Clarification is required.
- 4.14 The scoping does not include consideration of the neighbouring properties and, Q12, relating to the highways in proximity to site, has not been brought through to scoping. Again, it should be noted that the comment included within the screening response does not cover issues specifically relating to impacts created from basement construction.
- 4.15 As discussed above, the subterranean flow screening fails to identify that the site is underlain by the Claygate Member which is classified as a Secondary A aquifer. The screening responses also state that the proposed basements will not extend beneath the water table however, this should be updated following a review of the ground model.
- 4.16 The screening responses for the subterranean flow and surface water flow assessments state that the proposed basement developments will not result in an increase in hardstanding. This

contradicts the Drainage and SuDs Statement report which suggest the overall impermeable area of the site will increase. Clarification should be provided within the screening response.

- 4.17 The screening response to Q6 regarding risk to surface water flooding should be amended to reflect the current risk. It is acknowledged that a Flood Risk Assessment (FRA) and SuDS strategy have been presented. The mitigation measures outlined need to be reviewed as the BIA currently appears to contradict the Drainage SuDS Statement report.
- 4.18 The FRA carried out for the planning application describes flood mitigation options for the site which include a sunken amphitheatre that doubles as a flood storage attenuation area. As aforementioned the amphitheatre has not been considered within the BIA assessment. Details of the amphitheatre should be provided to indicate how it will impact the subterranean flow, land stability and surface water flow & flooding.
- 4.19 A response from Thames Water, available on the planning portal, dated 8th March 2023 states that they would not have any objection to the planning application in respect of foul drainage. With regards to surface water drainage, Thames Water advises that discharge to a public sewer requires prior approval from Thames Water Developer Services.
- 4.20 The Thames Water response also includes a note to highlight that there are public sewers crossing or close to the development. Any impact on underground assets within the zone of influence of the basement is outside the scope of this report but will require approval from the asset owner.
- 4.21 Construction drawings (within the BIA appendices) and the CMP include minimal information on how the construction of the proposed basement adjacent to the existing Sports Hall, Phase 2A, will be carried out. Further details on the basement construction methodology are required to justify the impact assessment. It should be confirmed that a contiguous piled wall is sufficient to maintain stability in the identified ground and groundwater conditions.
- 4.22 The CMP outlines that the basement beneath the new Sports Hall, Phase 2B, will be constructed as outlined below:
- Demolish the Fives Court and squash court buildings.
 - Install a contiguous pile perimeter wall followed by load bearing piles.
 - Form the capping beam in sections.
 - Install the piles situated inside the footprint from ground level.
 - Carry out the bulk excavation to the basement level. Propping is assumed to be minimal, limited to the deeper basement area.
 - Install the below slab drainage and carry out the slab preparation.
 - Cast the capping beam to the deeper basement and ground bearing slabs.
- 4.23 The CMP includes mention of some basement excavation along the front of the existing pool building. Underpinning to support the existing foundations is indicated as part of these works.

Further clarification of the proposed basement works in this area is required along with confirmation of the depth and methodology of the proposed underpinning.

- 4.24 An impact assessment is presented in Section 5 of the BIA. The assessment suggests the development will have negligible impacts to the subterranean flow based on an assumption that minimal groundwater is present. As discussed above it is recommended that the ground model is reviewed and, following this, the impact assessment is updated.
- 4.25 The impact assessment indicates that the impacts to neighbouring properties regarding land stability will be limited to acceptable levels by the use of silent rigs (to minimize vibration) and by designing a cantilevered wall with acceptable limiting deflection levels. The structures and infrastructure potentially affected by the development, and the impacts on them, have not been identified. No ground movement assessment has been undertaken and no building damage assessment is presented. In accordance with LBH policy, an impact assessment must use suitably cautious or moderately conservative engineering estimates and the methodologies and assumptions used must be clearly stated.
- 4.26 The BIA suggests that the proposed development will have negligible impact to volume and quality of surface water due to the proposed mitigation measures, including the use of SuDS and attenuation. As discussed above, the assumptions made in the BIA contradict those in other reports. Clarification should be provided to justify the assumptions made.
- 4.27 The BIA does not include any discussion on potential dewatering requirements or proposed monitoring regimes. Discussion of these should be included as necessary following review of the impact assessment.
- 4.28 A number of technical objections have been raised by neighbours to the scheme, many of which correspond with queries raised by this audit. Objection letters issued by The Highgate Society Planning Committee on 9th May and 13th September 2023 and by 18 Broadlands Road (Management) Ltd (undated) also outline concerns that the hydrology assessment within the BIA has not considered suitable sources of information; these include assessments of neighbouring sites undertaken by Alan Baxter and Haycock Environmental Consultants Ltd (HECL). In addition, an independent review of the BIA was carried out by HECL issued in June 2023. The report raises concerns regarding the flood risk mitigation measures involving using the sunken amphitheatre as a flood attention basin and highlights that the management of groundwater has not been considered in the BIA.
- 4.29 It cannot be confirmed that the BIA demonstrates the scheme maintains the stability of the host building, neighbouring properties and adjoining highways and, does not adversely affect the water environment until the queries raised in Section 4 and Appendix 2 are addressed.

5.0 CONCLUSIONS

- 5.1 The individuals involved in the production of the BIA do not hold the qualifications required by LBH policy. Clarification on whether a site walkover was undertaken is required. Non-technical summaries are to be included in the BIA.
- 5.2 The proposed redevelopment includes the partial demolition of existing structures and the refurbishment and extension of the remaining facilities along with the construction of two basements to depths of 5.50m and 4.00m bgl. One basement will form the new Fives Court to the south (Phase 2A). The other basement will be beneath the new Sports Hall to the north (Phase 2B). Both basements will be formed with contiguous piled walls with internal reinforced concrete (RC) walls.
- 5.3 The proposed development also includes construction of a sunken amphitheatre; it is recommended that the construction of the amphitheatre is considered within the BIA.
- 5.4 Independent reviews of the BIA highlight several concerns regarding the assumptions made relating to the ground conditions and groundwater regime, many of which echo queries raised within this audit report.
- 5.5 Ground investigations have been carried out at the site and, while some logs have been included in the appendices, the full ground investigation reports have not been provided and are requested. The ground conditions discussed in the BIA appear to contradict the record information provided as well as published information of the area.
- 5.6 The ground and groundwater model of the site should be reviewed, and the screening and scoping responses revised accordingly. Clarifications are required within the land stability and subterranean water screening and scoping responses. Q6 within the surface water assessment should be updated and brought through to scoping.
- 5.7 A Flood Risk Assessment has been carried out as part of the application. Further clarification of the mitigation measures is required.
- 5.8 The basement foundation proposals are not clearly presented in the BIA. Additional details of the basement construction methodologies are required including details of the underpinning referenced in the CMP. The impact assessment should clearly reference the form of construction in all respects.
- 5.9 An impact assessment has been carried out however, this should be updated following the screening and scoping responses being reviewed. The impact assessment must apply suitably cautious or moderately conservative engineering estimates and consider impacts to the stability of neighbouring structures, including an estimation of the maximum anticipated damage, together with impacts to subterranean and surface water flows. Where necessary, mitigation measures such as dewatering or monitoring should be provided.
- 5.10 Any impact on underground assets within the zone of influence of the basement is outside the scope of this report.

- 5.11 Queries and requests for information are summarised in Appendix 2. Until the clarifications requested are presented, the BIA does not meet the requirements of Haringey Council Planning Guidance.

Appendix 1

Residents' Consultation Comments

Residents Consultation Comments

Surname	Company/ Address	Date	Issued Raised	Response
Pierce		18/04/2023	The proposed mitigation measures for surface water management may negatively impact the surface water flow in the area.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
Koritsas/ Hammerson	Highgate Society	09/05/2023 and 13/09/2023	The surface water flow to the neighbouring properties (specifically the gardens) may be impacted. Land stability (specifically neighbouring foundations) may be impacted. Previous investigations, in proximity to site, have identified shallow groundwater flow which has not been identified in the BIA.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
Menton		12/05/2023	The surface water flow may be negatively impacted in the surrounding area.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
Bitran		16/05/2023		
O'brien & Carey		19/05/2023	The subterranean flow may be impacted in the surrounding area.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
Highgate Neighbourhood Forum		22/05/2023	The subterranean flow may be impacted in the surrounding area.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.

Surname	Company/ Address	Date	Issued Raised	Response
Haycock	Haycock Environmental Consultants Ltd	15/06/2023	The proposed mitigation measures for surface water management may negatively impact the surface water flow and subterranean flow in the area. The ground model is not accurate and contradicts published guidance and previous investigations carried out in proximity to the site. The development may impact the subterranean flow around the surrounding area.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
Highgate Society		13/09/2023	The proposed mitigation measures for surface water management may negatively impact the surface water flow and subterranean flow of the area. The ground model is not accurate and contradicts findings from previous investigations carried out in proximity to the site. The subterranean flow may be impacted by the development.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.
18 Broadlands Road (Management) Ltd		Not dated	Surface water flow may be impacted in the surrounding area. Land Stability (specifically neighbouring foundations) may be impacted. Previous investigations carried out in proximity to site have identified shallow groundwater flow which has not been discussed in the BIA.	The BIA should be updated to cover the queries outlined in Section 4 and Appendix 2.

Appendix 2

Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Qualification	The subterranean and land stability assessments should be reviewed by qualified professionals as per LBH guidance.	Open	
2	BIA	Provide non-technical summaries within the BIA and clarify if a site walkover has been undertaken.	Open	
3	BIA	Include consideration of the impacts of the sunken amphitheatre to the subterranean flow, land stability and surface flow & flooding.	Open	
4	Ground Conditions	Provide the ground investigation reports including groundwater monitoring data.	Open	
5	Ground Model	Undertake a review of available desktop study and site investigation information (to include suitable data sources) and produce a revised ground model that is consistent and accurate.	Open	
6	Land stability	Revise the screening and scoping responses following the ground model being updated.	Open	
7	Subterranean Flow	Revise the screening and scoping responses following the ground model being updated.	Open	
8	Surface water flow	Update screening response of Q6 to reflect current conditions and bring through to scoping. Ensure mitigation methods are consistent with the Flood Risk Assessment and Drainage and SuDS Statement.	Open	
9	Construction	Provide further details of the construction methodology of the basements and justification that the proposed methodology is suitable for the ground conditions present at the site.	Open	

Query No	Subject	Query	Status	Date closed out
10	Impact Assessment	Confirm the distance and foundation depths of the neighbouring properties.	Open	
11	Impact Assessment	Clearly identify any structures and/or infrastructures potentially affected by the development. Undertake a ground movement assessment and provide a building damage assessment using suitably cautious or moderately conservative engineering estimates.	Open	

Appendix 3

Supplementary Supporting Documents

None

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