Davies Maguire + Whitby

West Central Street

12-49

Basement Impact Assessment
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Produced for City & General New Oxford Street LLP

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Contents

1.0 INTRODUCTION 3
1.1 Proposed Development 3
1.2 Site History and Existing Buildings 4
1.3 Basement Impact Assessment 4
1.4 Qualifications 4
2.0 SCREENING 4
2.1 Slope Stability Screening Assessment 4
2.2 Subterranean (Groundwater) Flow Screening Assessment 6
2.3 Surface Flow and Flooding Screening Assessment 6
3.0 SCOPING 7
3.1 Slope Stability Scoping 7
3.2 Subterranean (Groundwater) Flow Scoping 8
4.0 SITE INVESTIGATION AND STUDY 8
5.0 IMPACT ASSESSMENT 8
5.1 Slope Stability Impact Assessment 8
5.2 Subterranean (Groundwater) Assessment 10
6.0 REVIEW AND DECISION MAKING 10

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1.0 INTRODUCTION

Davies Maguire and Whitby, on behalf of City & General New Oxford Street LLP, have carried out a desk study for a development at West Central Street, London.

This report forms the slope stability and subterranean (groundwater) flow parts of a Basement Impact Assessment (BIA), which has been carried out in accordance with guidelines from the London Borough of Camden (LBC). A Surface Water Screening Assessment has also been completed, but a full flood risk assessment did not form part of the brief for this project.

1.1 Proposed Development

The proposed development incorporates a single storey basement below the southwest corner of the site, and hence a Basement Impact Assessment is required. The site already has a basement, with the same footprint as the proposed basement, but since the proposal is to lower the basement, there is a potential impact on the slope stability and the groundwater flow.

The new basement is proposed as a reinforced concrete ground bearing raft, with new reinforced concrete retaining walls on the perimeter, which are propped at the top by a reinforced concrete ground floor slab. Since the proposed basement is deeper than the existing, and there are foundations of adjacent buildings nearby, it is anticipated that underpinning will be required to the adjacent buildings.

The site is situated in Camden, Central London, bounded on the south and west sides by West Central Street, on the north by New Oxford Street and on the east by Museum Street.
The Site location is shown in Figure 1.1.

Figure 1.1 Site Location Plan

1.2 Site History and Existing Buildings

The buildings currently located on the site are typically residential masonry structures, although the ground floors have mainly been converted to retail units. On the West Central Street elevation, the lower floors of the building have most recently been used as a club. It is thought that the majority of the buildings currently on site date from the 1840s, although the area was first developed in the early 1700s.

The buildings are typically between 2 and 5 stories, and generally sit above a single storey basement.

Post Office owned Mail Rail tunnels run below the western extremity of the site, and although these are disused, they will impact upon the foundation options available for the site.

Since the majority of the development entails demolition and replacement of the existing buildings, and the refurbishment to the retained structures does not entail significant structural works, the nature of the existing buildings should have only a minor impact on the proposals for redevelopment.

1.3 Basement Impact Assessment

The Basement Impact Assessment (BIA) comprises a subterranean (groundwater) flow assessment and a land stability assessment (also referred to as slope stability assessment) and a surface water and flooding risk assessment, which has not been carried out in full although the results of the initial screening have been prepared. These assessments form part of the Basement Impact Assessment (BIA) procedure specified in the London Borough of Camden Planning Guidance CPG4 and their Guidance for Subterranean Development prepared by Arup.

The aim of the assessment is to provide information on land stability and in particular to assess whether the development will affect the stability of neighbouring properties. In addition, the assessment will identify potential groundwater impacts that the development may have and how any identified impacts can be appropriately mitigated by the design of the development.

1.4 Qualifications

This Basement Impact Assessment has been carried out by Malcolm Archer, a Chartered Engineer with the Institution of Civil Engineers with 10 years' experience of working in London, and reviewed by Seamus Maguire, a Chartered Engineer with the Institution of Structural Engineers with 20 years' experience of working in London.

2.0 SCREENING

The LBC guidance suggests that any development proposal that includes a subterranean basement should be screened to determine whether or not a full BIA is required. A number of screening tools are included in the Arup document and for the purposes of this report reference has been made to Appendix E.

2.1 Slope Stability Screening Assessment

Reference has been made to Appendix E of the Arup document, which includes 14 questions within a slope stability screening flowchart. Responses to the questions are tabulated below.

Question	Response for West Central Street
1. Does the existing site include slopes, natural or manmade, greater than 7°?	No.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No.
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No
5. Is the London Clay the shallowest strata at the site?	No.
6. Will any trees be felled as part of the proposed development and / or are any works proposed within any tree protection zones where trees are to be retained?	No.
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	Yes. The area is prone to these effects as a result of the presence of London Clay with high volume change potential.
8. Is the site within 100 m of a watercourse or potential spring line?	No.
9. Is the site within an area of previously worked ground?	Yes.
10. Is the site within an aquifer?	Yes. The site is underlain by gravels overlaying London Clay which are designated as Intermediate Strata by the Environment Agency resulting in a Minor Aquifer (variably permeable) status.
11. Is the site within 50 m of Hampstead Heath ponds?	No.
12. Is the site within 5m of a highway or pedestrian right of way?	Yes.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes. The new basement is lower than the existing, and so suitable underpinning measures will be required to the surrounding buildings.
14. Is the site over (or within the exclusion zone of) any tunnels, eg railway lines?	Yes. (Disused Post Office Tunnel) Separate report included.

The above assessment has identified the following potential issues that need to be assessed:

Q7. The site is underlain by London Clay, which is prone to shrink-swell subsidence.

Q9. The site is within an area of previously worked ground.

Q10. The site is with an aquifer.

Q12. The site is within 5m of a highway or pedestrian right of way.

Q13. The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.

Q14. The site is over tunnels.

The potential issues that need to be assessed are discussed further in section 3.0 of this report.

2.2 Subterranean (Groundwater) Flow Screening Assessment

Reference has been made to Appendix E of the Arup document, which includes 6 questions within a subterranean (groundwater) flow screening flowchart. Responses to the questions are tabulated below.

Question	Response for West Central Street
Ia. Is the site located directly above an aquifer?	Yes. The site is underlain by gravels overlaying London Clay which are designated as Intermediate Strata by the Environment Agency resulting in a Minor Aquifer (variably permeable) status.
Ib. Will the proposed basement extend beneath the water table surface?	Unknown, but most likely not. Ground investigation required to assess the presence of groundwater.
2. Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No.
4. Will the proposed development result in a change in the proportion of hard surfaced / paved area?	No.
5. As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to ground (e.g. via soakaways and/or SUDS)?	No.
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No. There are no ponds or spring lines in the vicinity of the site.

The above assessment has identified the following potential issues that need to be assessed:

Qla. The site lies within a zone classified as a minor aquifer.

Qlb. It is unlikely that the proposed basement structure will extend below the water table, but a ground investigation is required to confirm the groundwater conditions.

The potential issues that need to be assessed are discussed further in section 3.0 of this report.

2.3 Surface Flow and Flooding Screening Assessment

This element of the BIA is provided for guidance only and should be confirmed by a suitably qualified engineer experienced in carrying out surface water assessments.

Reference has been made to Appendix E of the Arup document, which includes six questions within a surface flow and flooding screening flowchart. Responses to the questions are tabulated below and are partly based on information provided by the consulting engineers.

Question	Response for West Central Street
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No.

Question	Response for West Central Street
4. Will the proposed basement development result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No.
6. Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk of flooding because the proposed basement is below the static water level of a nearby surface water feature?	No.

The above assessment has not identified any potential issues that need to be assessed and this aspect of the BIA is not considered to warrant additional consideration.

3.0 SCOPING

This section aims to determine the potential impacts of the various issues identified at the screening stage, and identify any further information required to quantify the risk, and make an informed decision about and action required as a result of it.

3.1 Slope Stability Scoping

Question	Response for West Central Street
7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?	London Clay may shrink and swell depending on conditions, resulting in damage to buildings above. Site investigation should determine the depth of the London Clay stratum in relation to the proposed building foundations, and those of adjacent buildings.
9. Is the site within an area of previously worked ground?	Previously worked ground is more likely to be unstable, and would also not be likely to be suitable for bearing foundations. Investigation should determine the extent and nature of the made ground.
10. Is the site within an aquifer?	The presence of an aquifer could increase the potential instability of any slopes within or around the site, particularly if the proposed development were to change the flow of the aquifer. Site investigation should determine the level of the water table in relation to the proposed basement.
12. Is the site within 5m of a highway or pedestrian right of way?	Any highways bounding the site will require suitable support, to the loadings stipulated by the Highways department and the relevant design codes. A desk study investigation must determine these loadings.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Deeper foundations for the proposed building could potentially undermine the foundations of adjacent buildings, unless suitable underpinning/retention works are specified. The site investigation should determine the depth and nature of adjacent foundations so that suitable works can be specified.
14. Is the site over (or within the exclusion zone of) any tunnels, eg railway lines?	The presence of Mail Rail tunnels immediately below the site has a potential impact on both the proposed building and the tunnels themselves. A desk study investigation must determine the position of the tunnels, and any proposed works must be agreed with the tunnel's asset protection team.

3.2 Subterranean (Groundwater) Flow Scoping

Question	Response for West Central Street
Ia. Is the site located directly above an aquifer?	Any projection of the basement into an active aquifer will have an impact on the flow of the aquifer. This could impact the level of the top of the aquifer, resulting in water ingress to basements, or slope instability. The site investigation should determine the depth of the water table and also, as far as is possible, the direction of the flow.
Ib. Will the proposed basement extend beneath the water table surface?	Site investigation should determine the depth of the water table in relation to the underside of the proposed foundations.

4.0 SITE INVESTIGATION AND STUDY

An extensive desk study including searches through available Envirocheck records has been carried out for this site. The results of this study allow the site to be classified, and the potential risks associated with it to be assessed. The information received from the Envirocheck search is appended to this report.

An intrusive investigation has not yet been carried out for this site for various reasons:

i) Headroom within the existing basement is extremely poor, meaning that for a thorough site investigation to be carried out; opening up works would be required to the ground floor slabs.
ii) The site is within a conservation area, meaning that consent would be required for the opening up works above to be carried out.
iii) The site is within a highly developed area, meaning that large amounts of site investigation data from boreholes on neighbouring sites is available. This gives a good idea of the expected conditions at West Central Street.
iv) Where further information is required, conservative assumptions can be made at this stage, and allowances put in place to ensure that any issues arising can be suitable mitigated.

A full intrusive site investigation fulfilling the scope outlined within section 3.0 of this report will be undertaken at the next stage of the works.

5.0 IMPACT ASSESSMENT

5.1 Slope Stability Impact Assessment

7. Is there a history of seasonal shrink-swell subsidence in the local area and / or evidence of such effects at the site?

The site is underlain by London Clay, which has the potential to shrink and swell depending on season and overburden. The design of the proposed building should take this potential into account, and mitigate any potential issues arising. In this instance, data taken from boreholes in the vicinity of the site suggest that the founding stratum for the proposed development will be the gravels which overlay the site, which reduces the potential impact of the action of the clay. In addition to this, there are no trees in the vicinity of the site, and the area is almost entirely hard-landscaped, meaning that seasonal variations associated with the clay are likely to be very low.

Heave of the clay as a result of loading and unloading has potential issues, and the heave associated with the loading profile of the site will require assessment. This issue may require mitigation, for example via additional reinforcement within the basement slab.

9. Is the site within an area of previously worked ground?

The site is within an area of previously worked ground, but data from boreholes suggests that the made ground does not extend down to the level of the underside of the proposed foundations, meaning that this is not a concern.

The retaining walls of the proposed basement will be designed to support the lateral forces associated with the at-rest earth pressures on the outside face of the wall, meaning that slope instability around the perimeter of the building is also not a concern.

10. Is the site within an aquifer?

The site is designated as within a minor aquifer (variably permeable), but data from boreholes suggests that the proposed foundations will not extend down to the surface of the water table, meaning that there is no impact on the flow of the aquifer, and no associated impact on soil stability. There is potential that the lift pit bases will extend into the water table, but as these are small in elevation, it is not thought that their impact would be significant.

Further investigation is required to determine with certainty the depth of the water table in relation to the proposed basement development.

12. Is the site within 5m of a highway or pedestrian right of way?

The proposed basement is bounded on two sides by highways, so the works to be carried out on site risk undermining these highways. The design of the proposed retaining walls and basement structure must allow for the loadings associated with these highways under clause 5.8.2.1 of BD 37/01 for HA and HB loading. This is 10kN/m² for HA loading and 12kN/m² for 30 units of HB loading associated with the classification of “other public roads” (i.e. not a motorway or a principal road).

An Approval In Principle (AIP) must be agreed with the local authority prior to commencement of works which may have an impact on the Highway.

13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?

The proposed basement is significantly below the level of the existing basement, and hence has a potential impact upon the foundations of the neighbouring buildings. The design must take in to account potential impact on these buildings and specify suitable works to mitigate this impact (for example underpinning of foundations). Party Wall Agreements must be reached with each of the adjoining owners under the terms of the Party Wall Act (1996).

Further investigation is required to determine the nature of the adjacent buildings’ foundations, although at this stage it is thought that underpinning will be the most suitable option and that, suitably specified and implemented, this will result in the impact on adjacent buildings being very low. It is not anticipated that the proposed works will result in damage to adjacent buildings beyond Burland category 2 (slight).

14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?

Disused Post Office Mail Rail Tunnels run immediately below the site. Proposed foundations for the building must not be within the exclusion zone surrounding the tunnels and any development of the site must be agreed with the tunnel's asset protection engineers (CH2M Hill Halcrow). At this stage, initial liaison has been carried out with Halcrow, and preliminary approval in principle has been agreed for the proposed scheme. A report summarising the liaison to date with Halcrow, and their letter of preliminary acceptance are appended to this report. As the project progresses, a more detailed liaison and approval process must be undertaken.

5.2 Subterranean (Groundwater) Assessment

Ia. Is the site located directly above an aquifer?

The site is located directly above an aquifer. However, this is designated as a minor aquifer, and since it is anticipated that the majority of the basement footprint will not project into the aquifer, it is not anticipated that the proposed development will have a significant impact upon the aquifer. It is more likely that the lift pits will extend locally into the aquifer, but since these are small in elevation, it is not thought that they will have a significant impact.

The level of the water table in relation to the development requires confirmation via site investigation.

Ib. Will the proposed basement extend beneath the water table surface?

Through study of borehole data form nearby sites, it is thought unlikely that the basement will extend beneath the water table surface, with the possible exception of the lift pits. This assumption must be confirmed via site investigation.

6.0 REVIEW AND DECISION MAKING

We have found nothing within this Basement Impact Assessment that suggests to us a major issue with the implementation of the proposed basement scheme, as outlined above. There is still some outstanding information required from further site investigation and study, which will allow the assumptions made at this stage to be confirmed. In the instance that the further study finds unexpected results, further mitigating actions may be required.

As the design develops in the upcoming stages of the design, the detail of the basement solution will be further developed also. This will allow further and more detailed liaison with the relevant bodies, such as the local authorities, the adjoining owners and the Mail Rail asset protection engineers.

APPENDICIES

Appendix A – Envirocheck Report Findings

Appendix B – Mail Rail Tunnel Interface Report