

## APPENDIX - C CGL BASEMENT IMPACT ASSESSMENT

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Mr James Busta

# 17 Eaton Mews North, London

*Basement Impact Assessment*

May, 2021

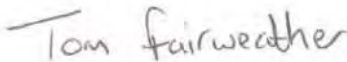




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## Contents

|           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b>INTRODUCTION</b>                             | <b>4</b>  |
| <b>2.</b> | <b>SITE CONTEXT</b>                             | <b>5</b>  |
| 2.1       | Site Location                                   | 5         |
| 2.2       | Site Description                                | 5         |
| 2.3       | Proposed Development                            | 6         |
| 2.4       | Site History                                    | 7         |
| 2.5       | Published Geology                               | 7         |
| 2.6       | Unpublished Geology                             | 8         |
| 2.7       | Groundwater                                     | 9         |
| 2.8       | Hydrogeology and Hydrology                      | 9         |
| 2.9       | Previous Ground Investigations                  | 10        |
| <b>3.</b> | <b>STAGE 1 - SCREENING</b>                      | <b>11</b> |
| 3.1       | Introduction                                    | 11        |
| 3.2       | Subterranean (Groundwater) Screening Assessment | 11        |
| 3.3       | Slope/ Land Stability Screening Assessment      | 12        |
| 3.4       | Surface Flow and Flooding Screening Assessment  | 13        |
| <b>4.</b> | <b>STAGE 2 – SCOPING</b>                        | <b>16</b> |
| <b>5.</b> | <b>STAGE 3 – GROUND INVESTIGATION</b>           | <b>17</b> |
| 5.1       | Summary   | 17        |
| 5.2       | Ground and Groundwater Conditions               | 17        |
| 5.3       | Geotechnical Laboratory Testing                 | 17        |
| 5.4       | Geotechnical Design Parameters                  | 18        |
| 5.5       | Groundwater                                     | 19        |
| <b>6.</b> | <b>STAGE 4 – BASEMENT IMPACT ASSESSMENT</b>     | <b>20</b> |
| 6.1       | Subterranean (Groundwater) Flow                 | 20        |
| 6.2       | Slope Stability                                 | 20        |
| 6.3       | Surface Flow and Flooding                       | 20        |
| <b>7.</b> | <b>GROUND MOVEMENT ASSESSMENT</b>               | <b>21</b> |
| 7.1       | Introduction                                    | 21        |
| 7.2       | Construction Sequence                           | 21        |
| 7.1       | Sources of ground movement                      | 21        |
| 7.2       | Ground Movement Assessment Methodology          | 22        |
| 7.3       | Conceptual Site Model and Critical Sections     | 22        |
| <b>8.</b> | <b>DAMAGE IMPACT ASSESSMENT</b>                 | <b>26</b> |
| 8.1       | Introduction                                    | 26        |
| 8.2       | 18 Eaton Mews North                             | 26        |

|            |  |           |
|------------|--|-----------|
| 8.3        | 16 Eaton Mews North  | 28        |
| 8.4        | 52 Eaton Place   | 28        |
| 8.5        | Eaton Mews North Road                                      | 28        |
| 8.6        | 17 Eaton Mews North – site movements                       | 28        |
| <b>9.</b>  | <b>CONTROL OF CONSTRUCTION WORKS (MONITORING STRATEGY)</b> | <b>29</b> |
| <b>10.</b> | <b>CONCLUSIONS</b>   | <b>30</b> |
| 10.1       | Subterranean (Groundwater) Flow – Conclusion               | 30        |
| 10.2       | Slope Stability – Conclusion                               | 30        |
| 10.3       | Surface Flow and Flooding – Conclusion                     | 30        |

## FIGURES

|          |  |
|----------|--|
| Figure 1 | Site Location Plan   |
| Figure 2 | Site Layout Plan, Conceptual Model & Critical Section A-A' |
| Figure 3 | Critical Section B-B'                                      |






## APPENDICES

|            |   |
|------------|---|
| Appendix A | Proposed Development Plan               |
| Appendix B | BGS Borehole Records                    |
| Appendix C | Structural Design Drawings and Loadings |
| Appendix D | PDISP Outputs                           |

1. INTRODUCTION

Card Geotechnics Limited (CGL) has been commissioned by Mason Navarro Pledge - MNP (the Structural Engineers for the project) on behalf of Mr James Busta (the Client) to provide a Basement Impact Assessment for 17 Eaton Mews North, located within the City of Westminster, SW1X 8AR, to assess the impact on surrounding properties, infrastructure, and hydrological features. The proposed development comprises redevelopment of the property to include a new lower ground floor basement level and new mansard level, along with internal improvements on the ground and 1<sup>st</sup> floor.

This Basement Impact Assessment (BIA) report will be undertaken in accordance with the City of Westminster Supplementary Planning Document<sup>1</sup> (SPD) and their revised City Plan<sup>2</sup>. However, as there is currently no specific City of Westminster guidance/ template document for the detailed assessment of basement construction this BIA will follow the template suggested by the London Borough of Camden’s guidance document for basements<sup>3</sup>. The London Borough of Camden’s guidance document requires a BIA to be undertaken for new basements in the Borough and sets out 5 stages for a BIA to “enable the Borough to assess whether any predicted damage to neighbouring properties and the water environment is acceptable or can be satisfactorily ameliorated by the developer”. The five stages are set out below:

-  Screening
-  Scoping
-  Site investigation
-  Impact assessment
-  Review and decision making

This report is intended to address all stages of the BIA. It identifies key issues relating to land stability, hydrogeology and hydrology as part of the screening process (Stage 1). The report will review publicly available investigation to establish a ground model for the site and will carry out an engineering assessment on the anticipated ground movements related to the proposed development at 17 Eaton Mews North.

<sup>1</sup> Westminster City Council (2014) Basement Development in Westminster SPD  
<sup>2</sup> Westminster City Council (2021) City Plan 2019 - 2040  
<sup>3</sup> Camden Planning Guidance. CPG4, Basements. March 2018

2. SITE CONTEXT

2.1 Site Location

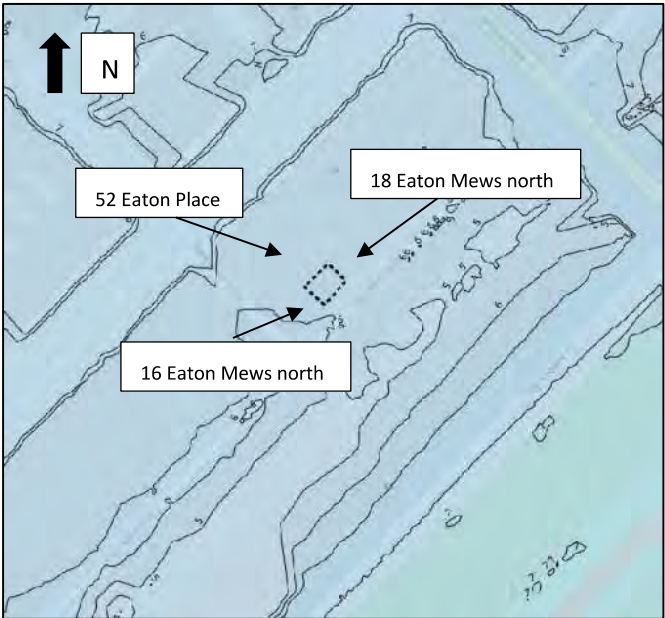
The site is located at 17 Eaton Mews North, City of Westminster, SW1X 8AR. The National Grid reference for the approximate centre of the site is 528333E, 179138N.

A site location plan is included as Figure 1.

2.2 Site Description

The site is bounded to the south by Eaton Mews North road and to the north by buildings located along Eaton Place road. The site shares party walls with 16 Eaton Mews north (south west) and 18 Eaton Mews North (north east). It is understood that they neighbouring properties both have lower ground floor levels/ basement levels. It is assumed that they have been constructed at approximately 3m below ground level (bgl), as this is the maximum level permitted by Westminster. The current property covers an area of approximately 45m<sup>2</sup>. The proposed basement will be constructed within the footprint of the existing property and is rectangular in shape. The ground level of the site is approximately 6mOD, as seen in Plate 1, below. Although it is understood that the rear courtyard is slightly lower. The rear courtyard is bounded in the north west by 52 Eaton Place.

Plate 1. Elevations local to the site (approximate location shown as dashed black line)



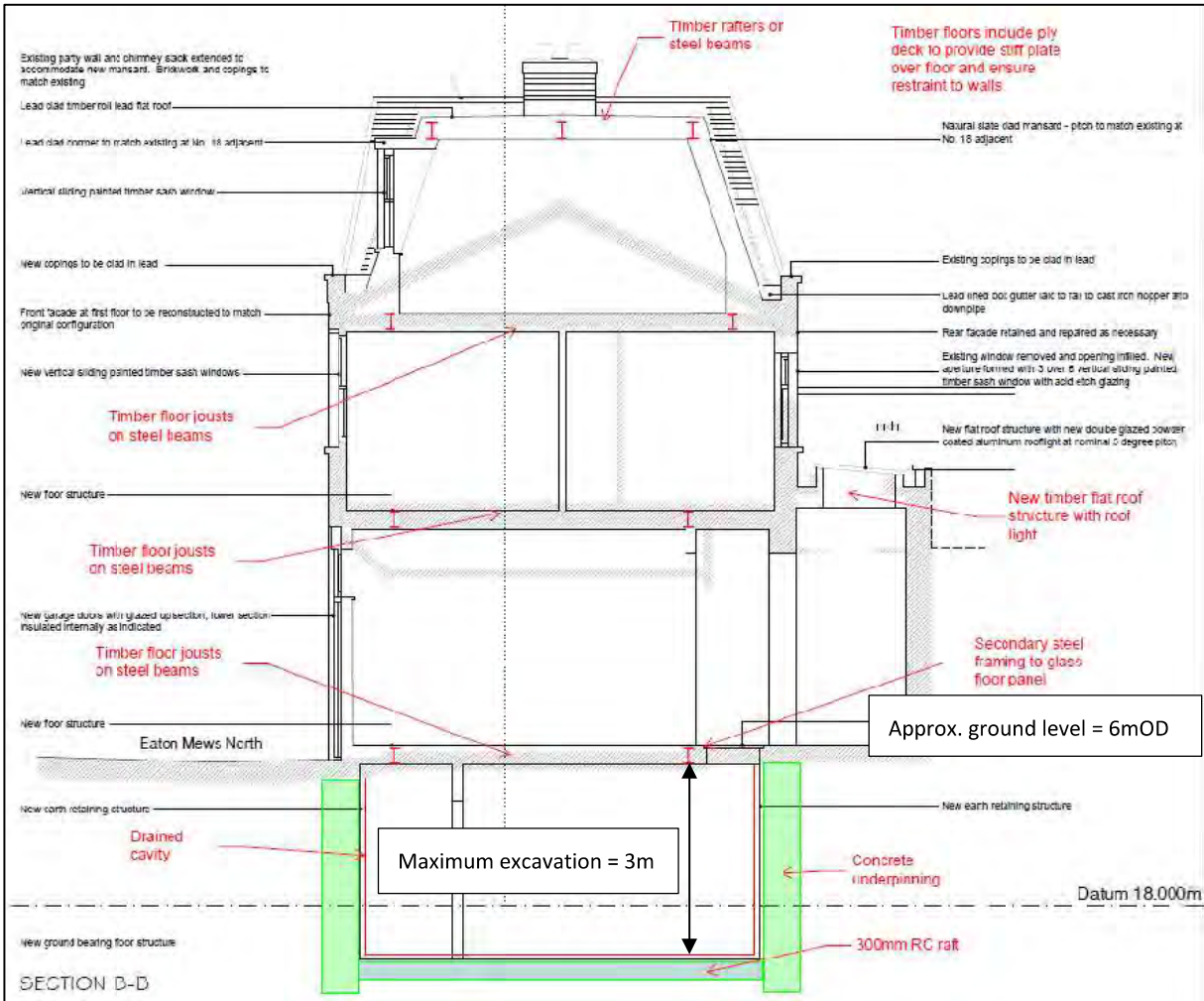


2.3 Proposed Development

It is understood that the proposed development comprises the construction of a new lower ground floor basement level beneath the existing property, construction of a mansard level and general refurbishment of the ground floor and 1<sup>st</sup> storey.

The proposed basement will not exceed 3m in depth but will incorporate an additional 0.3m thick raft slab taking the total excavation depth to 3.3m. The anticipated formation level of the raft slab will be at approximately 2.7mOD. The front and rear of the property will be underpinned, whilst the party walls (16 and 18 Eaton Mews North) existing underpins will be faced with concrete to regularise them. The underpins to the rear of the property change in total height to accommodate the lower levels of the rear courtyard (see drawing no. 220413\_s 200 in Appendix A). The proposed basement construction is presented in Plate 2, below and Appendix A.

Plate 2. Section B-B taken along party wall with 16 Eaton Mews North.



2.4 Site History

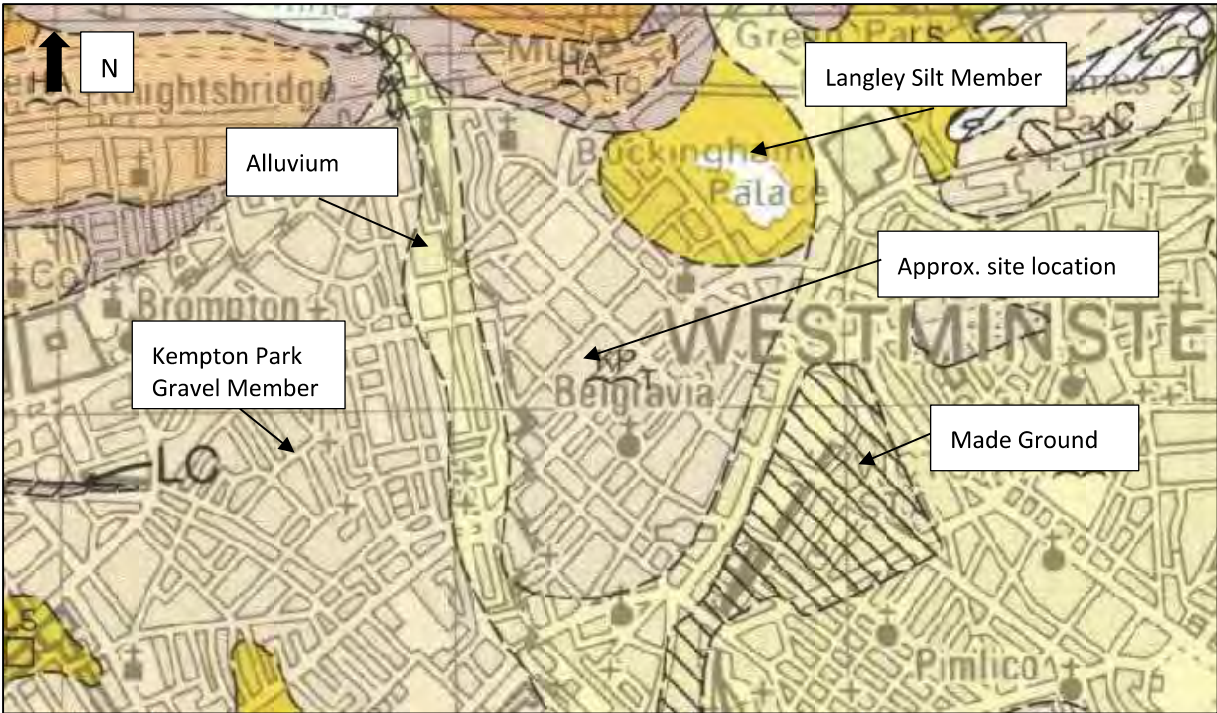
Publicly available historical mapping dating back to 1850<sup>4</sup> indicates that no significant changes have occurred on site or in the local vicinity. No significant potentially contaminative land uses were recorded within the vicinity of the site. The primary land use of the local area has historically been residential and commercial.

With reference to the London County Council Bomb Damage maps<sup>5</sup>, the properties to the north eastern end of Eaton Mews North and the south west end of Eaton Mews North were damaged. The site itself was not, however, recorded to have been damaged during The Second World War.

2.5 Published Geology

With reference to the British Geological Survey (BGS) geological sheet<sup>6</sup> and digital maps<sup>7</sup> for the area, the site is underlain by superficial deposits of the Kempton Park Gravel Member over the London Clay Formation. A large area of Made Ground is mapped approximately 500m south east of the site associated with London Victoria station and its associated railway sidings/ tracks.

Plate 3. Extract from BGS geological sheet 270 (South London)



<sup>4</sup> Oldmaps (May 2021) <https://www.old-maps.co.uk/#/Map/528305/179113/10/100910>  
<sup>5</sup> Layers of London (May 2021) <https://www.layersoflondon.org/map>  
<sup>6</sup> BGS. (1998). South London. England and Wales Sheet 270. 1:50,000.  
<sup>7</sup> <http://mapapps2.bgs.ac.uk/geoindex/home.html> (accessed June 2019)

The Kempton Park Gravel Member is a River Terrace Deposit and typically comprises of medium dense to dense gravel with sand, silt and occasional bands or lenses of clay.

The London Clay Formation is an overconsolidated, firm to stiff, becoming stiff to very stiff with depth, fissured, dark grey silt clay with occasional siltstone/claystone inclusions and selenite crystals. Based on the contours on the BGS geological sheet<sup>6</sup>, the London Clay is anticipated to be approximately 35m to 40m thick in the area. The London Clay is underlain by Lambeth Group, Thanet Formation and Upper Chalk at depth.

2.6 Unpublished Geology

A summary of selected historical BGS borehole records in the area of the site is presented in Table 1, below and in Appendix B.

Table 1. Summary of BGS borehole records

| BH record reference | Easting | Northing | Base of BH (m bgl) | Ground water level (m bgl) | Depth to top of stratum (m bgl) |                     |                            |                       |               |                  |
|---------------------|---------|----------|--------------------|----------------------------|---------------------------------|---------------------|----------------------------|-----------------------|---------------|------------------|
|                     |         |          |                    |                            | Made Ground                     | Langley Silt Member | Kempton Park Gravel Member | London Clay Formation | Lambeth Group | Thanet Formation |
| TQ27NE2031          | 528190  | 179120   | 138                | 48.6                       | -                               | -                   | 0                          | 8                     | 67            | 75               |
| TQ27NE2214          | 528501  | 179192   | 150                | -                          | 0                               | -                   | 1.3                        | 8.8                   | 53            | 65               |
| TQ27NE2215          | 528532  | 179236   | 151                | -                          | 0                               | -                   | 2.5                        | 7.9                   | 53            | 67.3             |
| TQ27NE2335          | 528585  | 179335   | 48                 | -                          | 0                               | -                   | 0.9                        | 9.2                   | 49.9          | -                |

The locations of the adjacent boreholes are illustrated on Plate 5, below. A number of boreholes have not been included as they are either unavailable or don't include legible writing.

Plate 4. BGS borehole records (approximate site location shown as dashed black line)






2.7 Groundwater




Limited information is available relating groundwater as the majority of holes reviewed targeted the deeper groundwater within the Upper Chalk and did not record groundwater strikes in the overlying material. However, based on CGL's experience it is therefore anticipated that shallow groundwater will be present within the Kempton Park Gravel Member. Typically, water would be some 1m to 2m above the surface of the London Clay Formation. A second deeper body is potentially present within the granular basal portions of the Lambeth and the Thanet Formation.

2.8 Hydrogeology and Hydrology

The Environment Agency (EA) has produced an aquifer designation system consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geology and are based on the importance of aquifers for portable water supply, and their role in supporting surface water bodies and wetland ecosystems.

-  The Kempton Park Gravel Member is classified as a Secondary A Aquifer and the London Clay Formation is classified as Unproductive Strata.
-  The site is not located in a groundwater Source Protection Zone (SPZ).
-  Shallow groundwater in the Kempton Park Gravel Member (Secondary A Aquifer) is likely to flow in a general south/ south-easterly direction towards the River Thames.



-  The nearest surface water feature is Rosamund’s Pond in Buckingham Palace Gardens, located approximately 510m north east of the site.
-  With reference to the Environment Agency records and Halcrow’s Preliminary Flood Risk Assessment (PFRA) for the City of Westminster<sup>8</sup>, the site is not located within an area at risk of flooding from rivers. The nearest river flood risk is located approximately 460m south east of the site, associated with the River Thames. The immediate vicinity south and west of the site is associated with a low to moderate surface water flood risk with an area of high risk located south west of the site.
-  The River Westbourne, one of London’s ‘Lost Rivers’, is located approximately 250m west of the site, associated with the band of alluvium presented in Plate 3, that runs north to south.

2.9 Previous Ground Investigations

No previous ground investigations have been undertaken on site however, an investigation was carried out at 18 Eaton Mews North in June 2014 by Ian Farmer Associates. The investigation information is publicly available from the Planning Portal under Planning Application number 14/05870/FULL. The investigation comprised the drilling of a single borehole to 6mbgl and the excavation of four trial pits to expose the party wall’s foundations.

A second local investigation as carried out at 17 Eaton Mews South, approximately 230m south east of the site. The investigation was carried out by Fastrack in February 2017. The investigation information is publicly available from the Planning Portal under Planning Application number 17/07424/FULL. The investigation comprised the drilling of a single borehole to 10mbgl. The information from both of these investigations will be further reviewed in Section 5, in relation to the anticipated ground conditions beneath the site.

<sup>8</sup> Halcrow (2011) Preliminary Flood Risk Assessment. Maps 4.1, 5.2, 5.3 and 5.4

3. STAGE 1 - SCREENING

3.1 Introduction

A screening assessment has been undertaken and is summarised below.

3.2 Subterranean (Groundwater) Screening Assessment

Table 2. Responses to Figure 1, CPG4

| Question   | Response   | Action required                             |
|--|--|---|
| 1a. Is the site located directly above an aquifer?   | Yes<br>The site is situated above the Kempton Park Gravel Member (Secondary A aquifer).  | None – basement is above local water levels |
| 1b. Will the proposed basement extend beneath the water table surface?   | No – based on current data<br>Based on the available local ground investigation data groundwater was not encountered within the upper 6m of the ground at 18 Eaton Mews North. |   |
| 2. Is the site within 100m of a watercourse, well or potential spring line?  | No.<br>No watercourses, wells or potential spring lines are within 100m of the site.   | None  |
| 3. Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?                     | No.<br>Site is already covered in hardstanding. Proposed development is to be within footprint of the existing building.   | None  |
| 4. As part of site drainage, will more surface water than at present be discharged to ground (e.g. via soakaways and/or SUDS)?   | No<br>Proposed development is to be within the footprint of the existing building. No SUDS and/or soakaways are proposed.  | None  |
| 5. Is the lowest point of the proposed excavation close to or lower than, the mean water level in any local pond or spring-line? | No.<br>No local ponds or spring lines are present.   | None  |

The proposed development is expected to be underlain by the Kempton Park Gravel Member, designated a ‘Secondary A Aquifer’ by the Environment Agency. A review of available data has been conducted to determine groundwater conditions on site and suggests that regional groundwater in the area is at least 2m below the base of the proposed basement level on site. On this basis the proposed development does not alter or affect groundwater flow paths.



3.3 Slope/ Land Stability Screening Assessment

This section has been undertaken in general accordance with Figure 2 in CPG4 but has been altered to specific to the local area and not Camden:

Table 3. Responses to Figure 2, CPG4

| Question   | Response  | Action required |
|--|---|-----------------|
| 1. Does the site include slopes, natural or man-made, greater than about 1 in 8?   | No.<br>The site does not include slopes, natural or man-made, greater than about 1 in 8.  | None            |
| 2. Will the proposed re-profiling of the landscaping at site change slopes at the property boundary to greater than about 1 in 8?                              | No.<br>The proposed changes on site will not include reprofiling slopes.                  | None            |
| 3. Does the development neighbour land include railway cuttings and the like with a slope greater than about 1 in 8?   | No.<br>The development does not neighbour land with a slope greater than about 1 in 8.    | None            |
| 4. Is the site within a wider hillside setting in which the general slope is greater than about 1 in 8?  | No.<br>The site is not set within a wider setting with a slope greater than about 1 in 8. | None            |
| 5. Is the London Clay the shallowest stratum on site?  | No.<br>The Kempton Park Gravel Member is the shallowest stratum on site.                  | None            |
| 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.   | None            |
| 7. Is there a history of shrink/swell subsidence in the local area and/or evidence of such at the site?  | No.<br>There is no history of shrink/swell subsidence in the local area or on site.       | None            |
| 8. Is the site within 100m of a watercourse or a potential spring line?  | No.<br>The site is not within 100m of a watercourse or potential spring line.             | None            |
| 9. Is the site within an area of previously worked ground?   | No.<br>The site is not within an area of previously worked ground.                        | None            |
| 10. Is the site within an aquifer?   | Yes.<br>Within a Secondary A Aquifer.   | None            |



| Question   | Response  | Action required |
|--|---|-----------------|
| 11. Is the site within 5m of a highway or pedestrian right of way?   | Yes.<br>Eaton Mews road is immediately south of the site. However, construction works are unlikely to impact the highway assuming good workmanship and well-constructed scheme are carried out. | None            |
| 12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties? | No.<br>The proposed basement does not significantly increase the differential depth to foundations relative to neighbouring properties as both currently have basements.                        | None            |
| 13. Is the site over (or within the exclusion zone of) any tunnels?  | No.   | None            |

A review of the local topography suggests that local and wider hillslopes do not exceed a gradient of 1 in 8 and that the area is not located in an area of potential landslide.

No trees are to be felled as part of the proposed works and the basement structure is located outside any tree root protection zones.

The structures immediately adjacent to the site are known to have an existing basement floor level. Therefore, the proposed basement will not significantly increase the differential depth of foundations to neighbouring properties and will pose a low risk to the neighbouring structures.

3.4 Surface Flow and Flooding Screening Assessment

This section has been undertaken in general accordance with Figure 3 in CPG4 but has been altered to specific to the local area and not Camden:

| Question  | Response | Action required |
|---|----------|-----------------|
| 1. 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.      | None            |
| 2. Will the proposed development result in a change in the proportion of hard surfaced/paved external areas?  | No.      | None            |



|  |  |  |
|--|--|--|
| 3. Will the proposed basement result in a change to the profile of the inflows of surface water being received by adjacent properties or downstream watercourses?                                    | No.  | None   |
| 4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?  | No.  | None   |
| 5. Is the site in an area known to be at risk from surface flooding, or is it at risk from flooding because the proposed basement is below the static water level of a nearby surface water feature? | Yes.<br>There is a risk from surface water flooding in the immediate vicinity of the site. However, the site is not located within a surface water flood risk hotspot, as listed in the Westminster SPD <sup>1</sup> | Managed through appropriate drainage design. |

The proposed development will be constructed within the footprint of the existing building and the ratio of hardstanding and soft landscaping will remain the same (i.e. 100% hardstanding across the site). Water will be drained either to local sewers and/or attenuated on site to restrict run-off rates to current planning requirements. Whilst the site is not within a surface water flood risk hotspot, the local area is predominately associated with a low to medium surface water flood risk (see Plate 5). It is considered that this risk can be managed through appropriate drainage design. Assuming this design measure is implemented the impact of the proposed development is considered negligible.

Plate 5. Surface water flooding



4. STAGE 2 – SCOPING

Whilst no specific investigation has been undertaken on site there are a number of local publicly available investigations that were undertaken by others and whose scope broadly allows for questions ranged in the screening stage to be answered within the context of the project. The details and findings of the pertinent local ground investigations are summarised in the following section of this report.

5. STAGE 3 – GROUND INVESTIGATION

5.1 Summary

The two local investigations carried out at 18 Eaton Mews North (14/05870/FULL) and 17 Eaton Mews South (17/07424/FULL) have been summarised in the section below to establish a ground model for the site.

5.2 Ground and Groundwater Conditions

The ground conditions encountered during the ground investigation works are generally consistent with those detailed by published geological maps. The ground conditions have been interpreted from the borehole records to comprise a relatively thin layer of Made Ground overlying the Kempton Park Gravel Member which is in turn underlain by the cohesive London Clay Formation. The ground conditions, as described and provided on the Council Planning Portal, are summarised below in Table 4.

Table 4. Summary of Ground Conditions

| Stratum*  | Depth to Top of Stratum (m bgl) | Typical thickness (m)  |
|---|---------------------------------|--|
| Dark brown, gravelly, fine to coarse sand. Gravel is fine to coarse, angular to subangular flint, brick and ash.<br>[MADE GROUND]                         | Ground level                    | 0.7 to 1.4   |
| Medium dense, brown, fine to coarse SAND and fine to coarse, angular to subangular, flint GRAVEL with occasional cobbles.<br>[Kempton Park Gravel Member] | 0.7 to 1.4                      | >5.3 to 8  |
| Sandy gravelly CLAY*<br>[LONDON CLAY FORMATION]   | 9.4                             | >0.6 (encountered at 17 Eaton Mews South only and base not proven) |

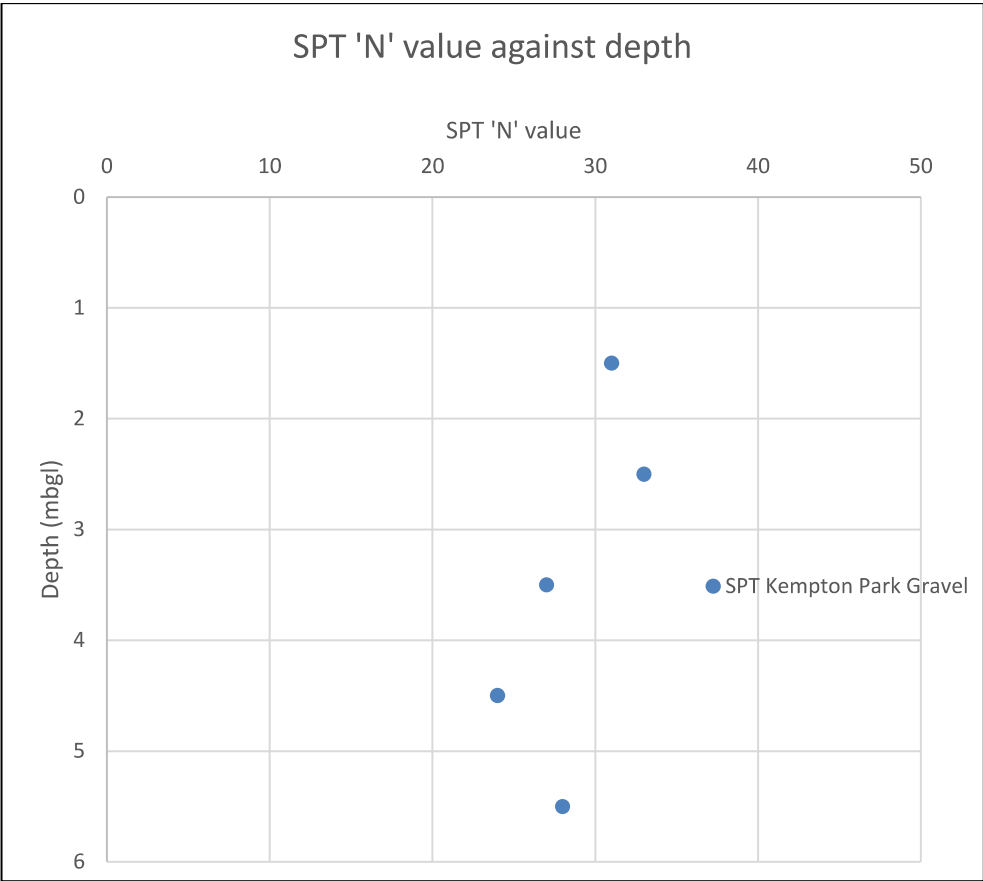
\*presence of sand and gravels believed to be related to boundary conditions with overlying Kempton Park Gravel Member.

5.3 Geotechnical Laboratory Testing

Limited geotechnical testing was carried out at 17 Eaton Mews South with no testing undertaken at 18 Eaton Mews North. The testing that was undertaken predominately comprised moisture content testing and Particle Size Distribution testing. The testing was completed within the Kempton Park Gravel Member and confirmed a moisture content range of between 5.8% and 7.2%. The Particle Size Distribution (PSD) results demonstrated that the material typically corresponded to a sandy gravel or gravelly sand.

Insitu Standard Penetration Tests (SPTs) were undertaken at 17 Eaton Mews North. The results of which have been plotted as Plate 6, below.

Plate 6. Plot of SPT test results against depth



5.4 Geotechnical Design Parameters

Geotechnical design parameters for the site are summarised in Table 5 below, these are based on local soil descriptions and typical published data for the well-studied London Basin geology.

Table 5. Geotechnical Design Parameters

| Stratum                    | Design Level<br>m bgl | Bulk Unit Weight<br>$\gamma_b$<br>(kN/m <sup>3</sup> ) | Undrained Cohesion<br>$c_u$<br>(kPa) | Effective Cohesion<br>$c'$<br>(kPa) | Effective Friction Angle<br>$\phi$<br>(°) | Young's Modulus<br>$E_u$<br>[E']<br>(MPa)           |
|----------------------------|-----------------------|--|--------------------------------------|-------------------------------------|---|---|
| Made Ground                | 0                     | 18   | -                                    | -                                   | 28  | [15] <sup>a</sup>                                   |
| Kempton Park Gravel Member | 1                     | 20   | -                                    | -                                   | 34 <sup>f</sup>                           | [60] <sup>a</sup>                                   |
| London Clay Formation      | 9                     | 20   | 40 + 8z <sup>b,c</sup>               | 5                                   | 24  | 24 + 4.8z <sup>d</sup><br>[18 + 3.6z <sup>e</sup> ] |

- Notes:
- a) Conservative value adopted for Made Ground and Kempton Park Gravel Member
  - b) z = depth below lower surface of the London Clay Formation
  - c) A conservative value based on CGL's experience within the material
  - d) Based on 600c<sub>u</sub> - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200. Increased to 1000c<sub>u</sub> for embedded retaining wall analysis as per the recommendations of C760.
  - e) Based on 0.75E<sub>u</sub> - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.
  - f) Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2<sup>nd</sup> Edition, John Wiley, New York, 1967, p.310.

The parameters in Table 5 are characteristic, unfactored (Serviceability Limit State) and considered to be ‘moderately conservative’ design values.

5.5 Groundwater

No groundwater was encountered within during the nearby investigations; typically groundwater is present between 1m to 2m above the surface of the London Clay, CGL has therefore assumed a conservative groundwater level of 6mbgl to account for seasonal variation.