CIVIL & STRUCTURAL CONSULTING ENGINEERS

LONDON • MIDLANDS • EAST ANGLIA • MANCHESTER • GREECE

Basement Impact Assessment

20-21 King's Mews
London WC1N 2JB

Project Ref L15/284/12 – Rev B

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Preamble

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- Surface flow & flooding analysis has been provided by JMS Engineers (East Anglia) Ltd
  Civil Engineer - R Wigzell MICE
- Damage Assement & Ground Movement provided by JMS Engineers Ltd
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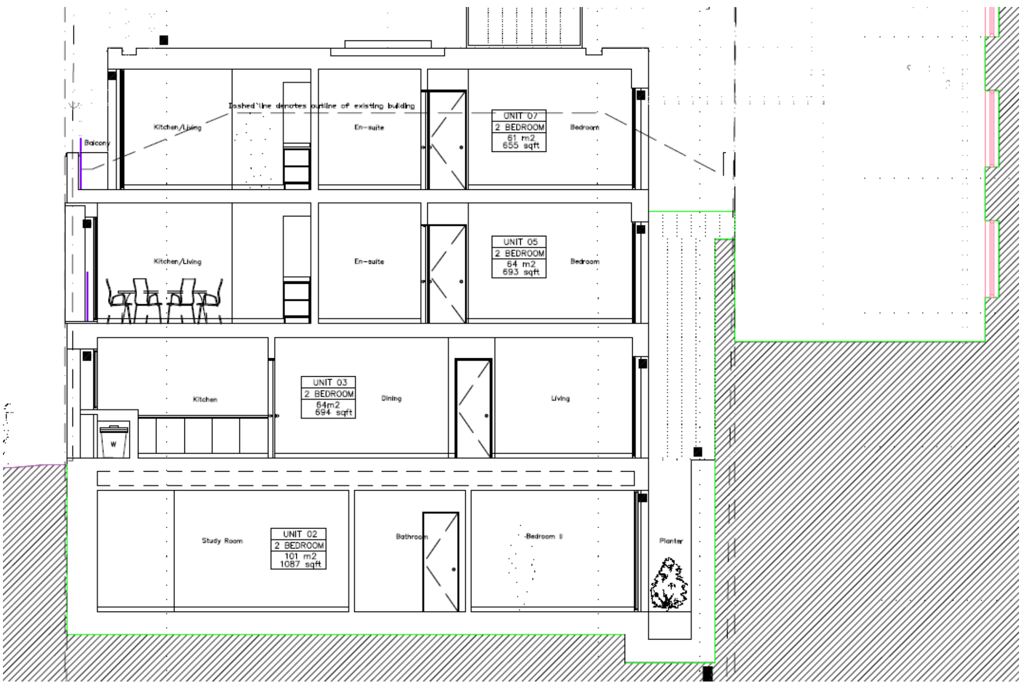

Contents

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1.0 INTRODUCTION

1.1 This report has been prepared to set out the proposed design philosophy and construction method statement for the proposed basement construction at 20 – 21 King's Mews London. WC1N 2JB. It will summarise the basis of the structural and civil engineering design and will be issued to all relevant parties including the Client, Local Planning Authority and Design team members.

1.2 The proposal is for the partial demolition of two storey existing garage structure and the construction of a new building to provide 6 flats over 3 floors plus a basement.

1.3 The report is based on the information produced by Marek Wojciechowski. and is intended to provide the basis for planning and may be subject to further design discussion and development with the successful Contractor.

1.4 This report is for the exclusive use of the Client and should not be used in whole or in part by any third parties without the express permission of JMS Consulting Engineers Ltd. in writing.

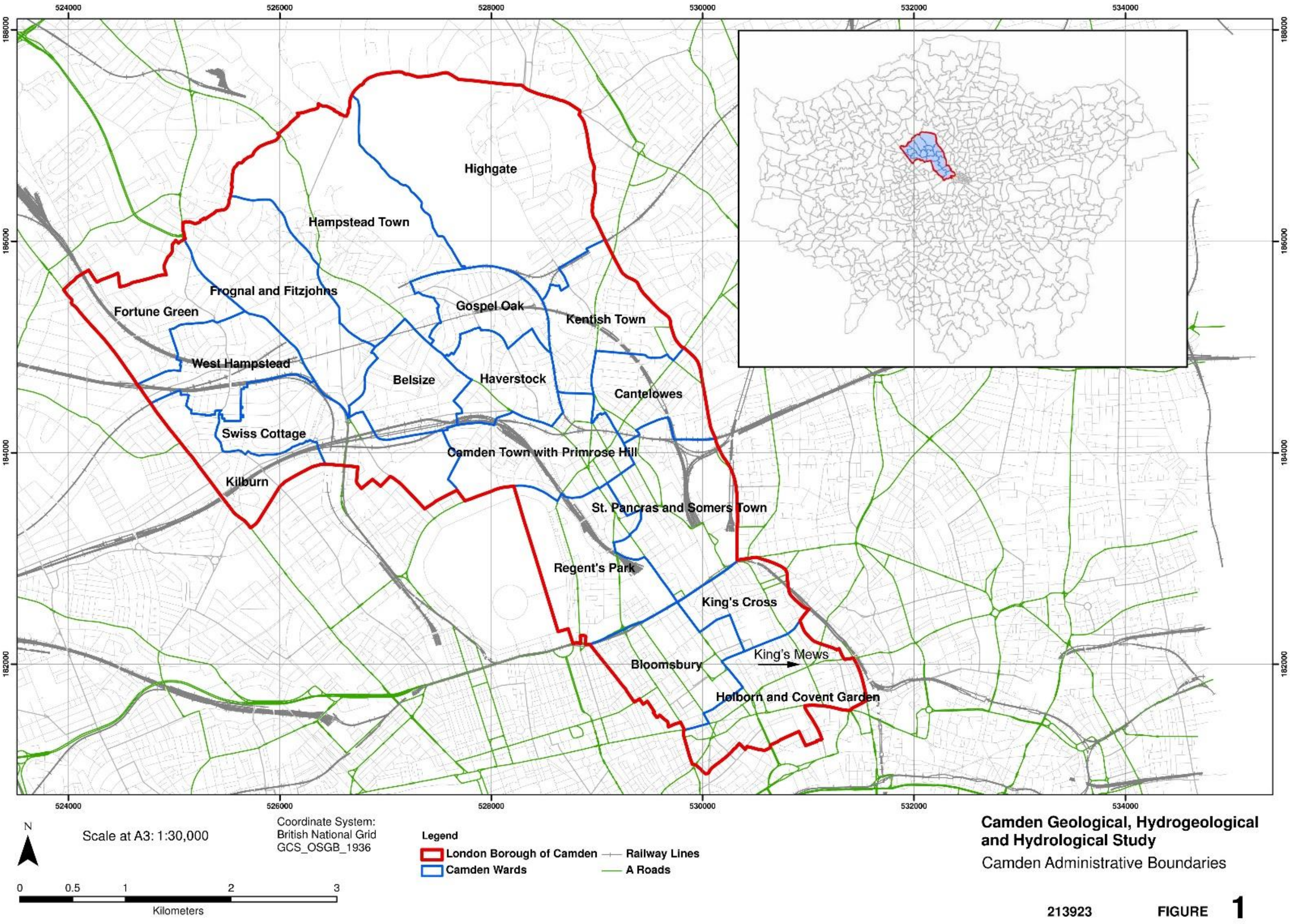
1.5 This report should not be relied upon exclusively by the Client for decision-making purposes and may require reading with other material or reports.

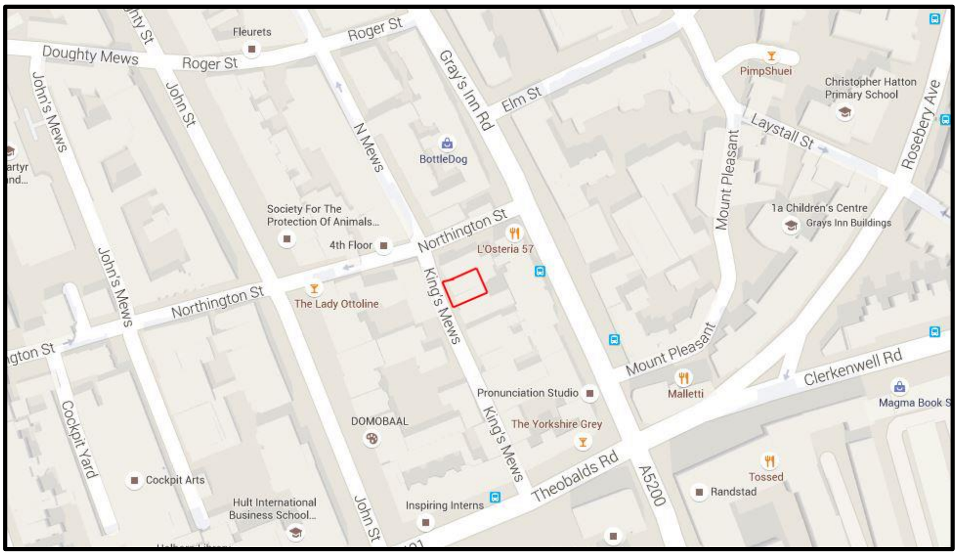
1.6 The work carried out comprises a Basement Impact Assessment, which is in accordance with the procedures specified in the London Borough of Camden Planning Guidance CPG4, and a Construction Method Statement. The aim of the work is to assess if the proposed basement will have a detrimental impact on the surroundings with respect to groundwater and land stability and in particular to assess whether the development will affect the stability of neighbouring properties, local and regional hydrogeology and whether any identified impacts can be appropriately mitigated by the design of the development.

1.7 The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside of the stated scope of the research. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by JMS Engineers Ltd.

2.0 THE SITE & AREA

2.1 King's Mews lies within the Holborn & Covent Garden ward of the London Borough of Camden.





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2.2 Site History

Not to be confused with King's Mews, Charing Cross, where the National Gallery now stands, it is in the south-east of Bloomsbury, running north from King's Road to Little James Street and lays in part of the Doughty Estate. It was developed towards the end of the eighteenth century; it appears on Horwood's map of 1799, but not on Rocque's map of 1746 which shows gardens in this area. It was named as the Mews for King's Road. Horwood's map of 1819 shows the buildings as non-residential and unnumbered. In 2008 many of its old mews buildings were demolished and replaced with luxury apartments. The Doughty estate in the south-east of Bloomsbury was part of extensive lands owned by the Doughty and Tichborne families, mainly outside London (Survey of London, vol. 24, 1952). Its proximity to the Foundling Estate meant that in the late eighteenth century it was involved in exchanges of land to enable the Foundling Estate to connect its new residential developments with the rest of London (Survey of London, vol. 24, 1952). This also prompted the Doughty estate owners to begin developing their land (Survey of London, vol. 24, 1952). The estate is sometimes also known as the Brownlow–Doughty estate, after William Brownlow, who built the streets in the late seventeenth century, and Elizabeth Brownlow, who had married into the Doughty family. In 1867 the estate was embroiled in the celebrated Tichborne case, when a claimant came forward asserting his identity as Sir Roger Charles Doughty-Tichborne, which would have entitled him to the Doughty estate in Bloomsbury along with other property (Oxford Dictionary of National Biography, entry for Tichborne claimant) . Sir Edward Doughty, né Tichborne, came into possession of the Doughty estate in 1826 from his cousin, Mrs Elizabeth Doughty, daughter of George Brownlow-Doughty and granddaughter of the fourth Baronet Tichborne; he changed his name to Doughty as a condition of the settlement (Gentleman's Magazine, vol. 193, May 1853) . Prior to this, it was Henry Doughty who had been negotiating land deals with the Foundling Estate on behalf of the Doughty Estate (Survey of London, vol. 24, 1952). The entire estate was sold off in 1921; Joseph Henry Bernard Doughty Tichborne, The Doughty Estate, Holborn (1921) has details and plans of the property included in the sale

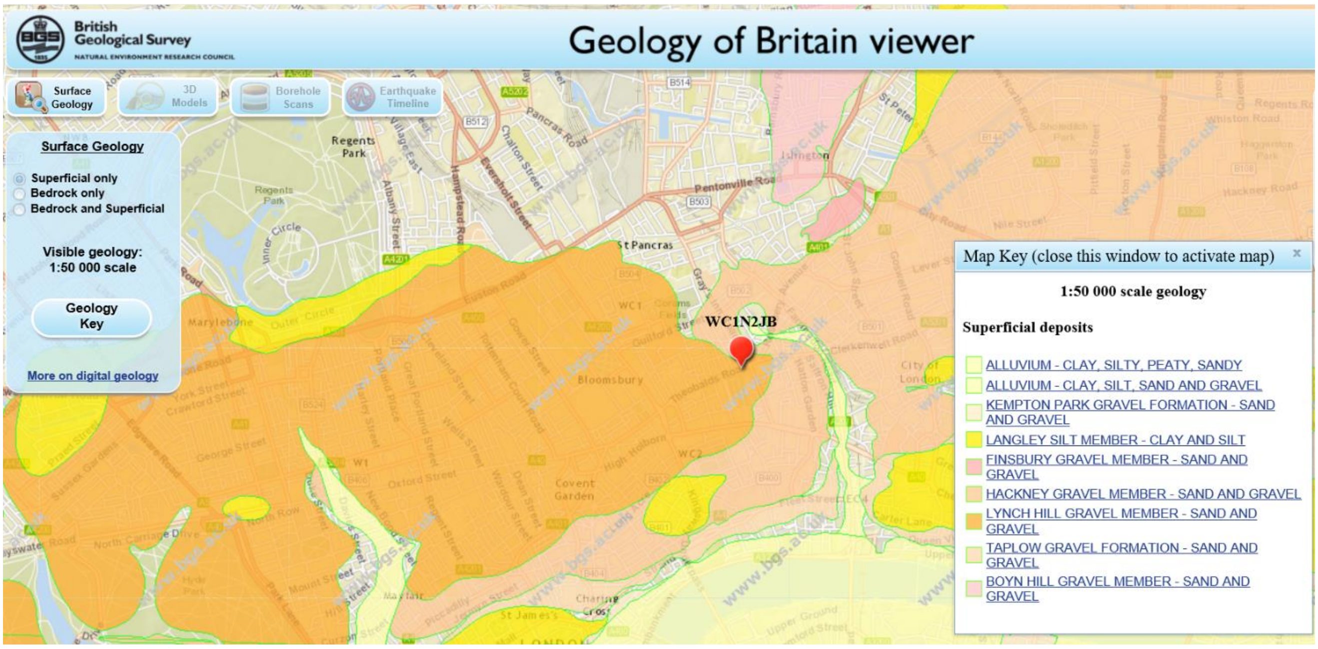
A mapp of St. Andrews Holborn parish as well within the Liberty as without (1720)

A New PLAN of the CITY and LIBERTY of WESTMINSTER, Exhibiting all the New Streets & Roads, with the Residences of the Principal Nobility, Public Offices, &c. Not extant in any other Plan.

Ancient maps of 1720 and 1754 which show the land undeveloped and in use as gardens but maps from the 1790s show the development of the area including King's Mews.

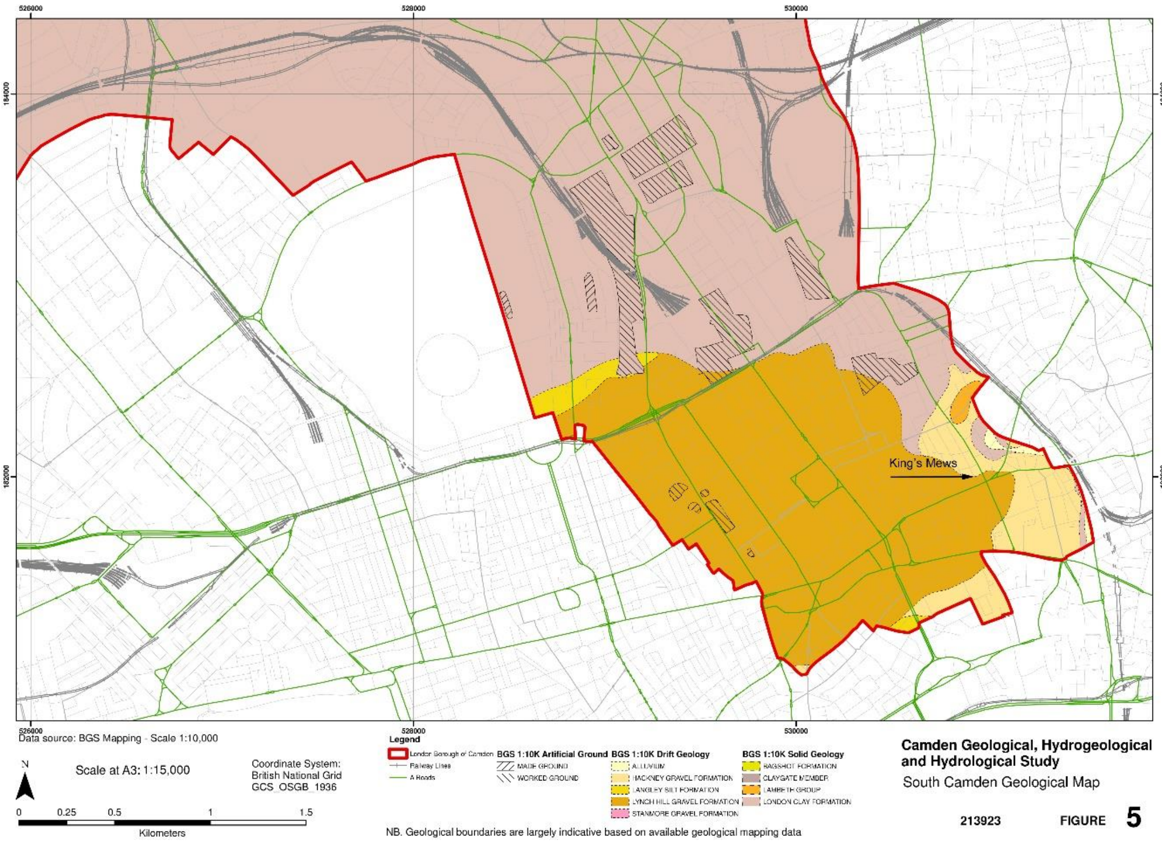
3.0 SITE GEOLOGY

3.1 The 1:50 000 scale geological map for this area, made available by the BGS, shows the site to be bedrock geology to be London Clay Formation comprising Clay, Silt and Sand. The superficial drift deposits are indicated as Lynch Hill Gravels and the ARUP report for LB Camden indicates a depth of circa 1.5 m in this location.

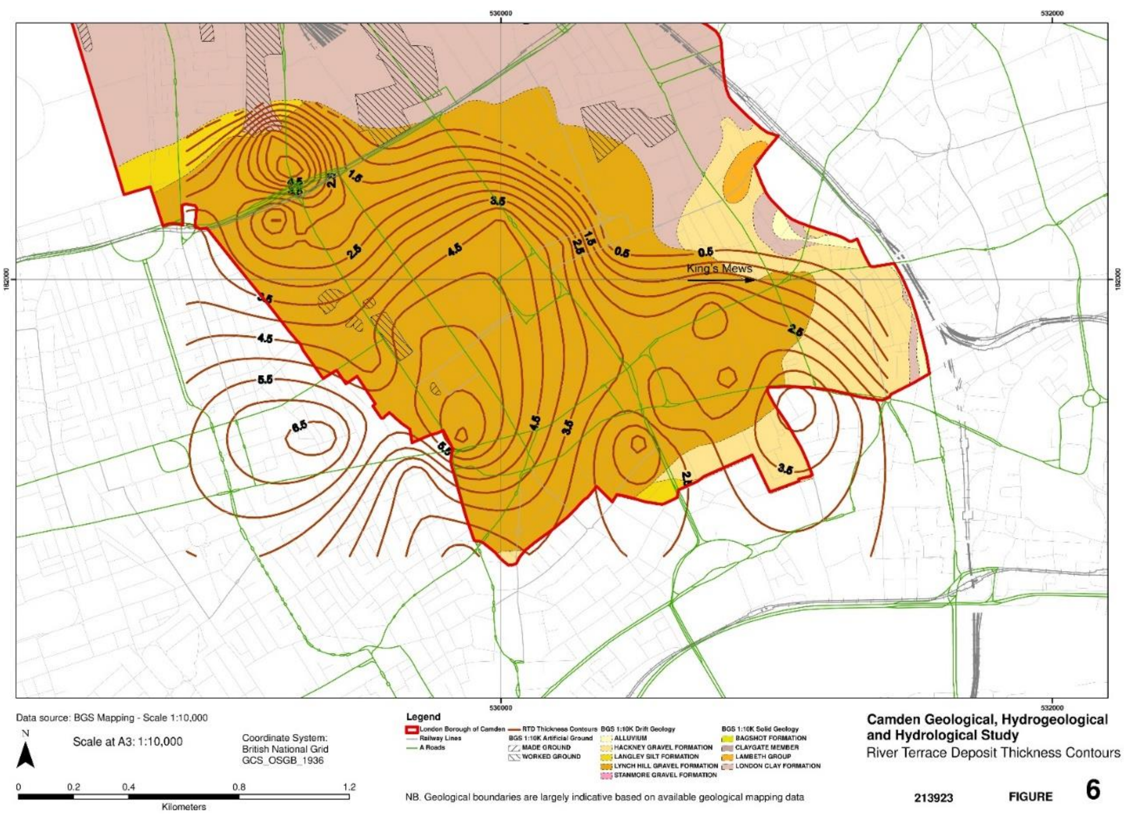


Contains British Geological Survey materials © NERC

3.2 The proposed construction of the basement will result in an unloading of the London Clay at formation level which will potentially result in an elastic heave and long term swelling of the London Clay. These movements will be mitigated to some extent by the applied structural loads but the basement floor slab will need to be designed to accommodate heave movements or suspended accordingly. This is supported by the LB Camden report produced by Arup.

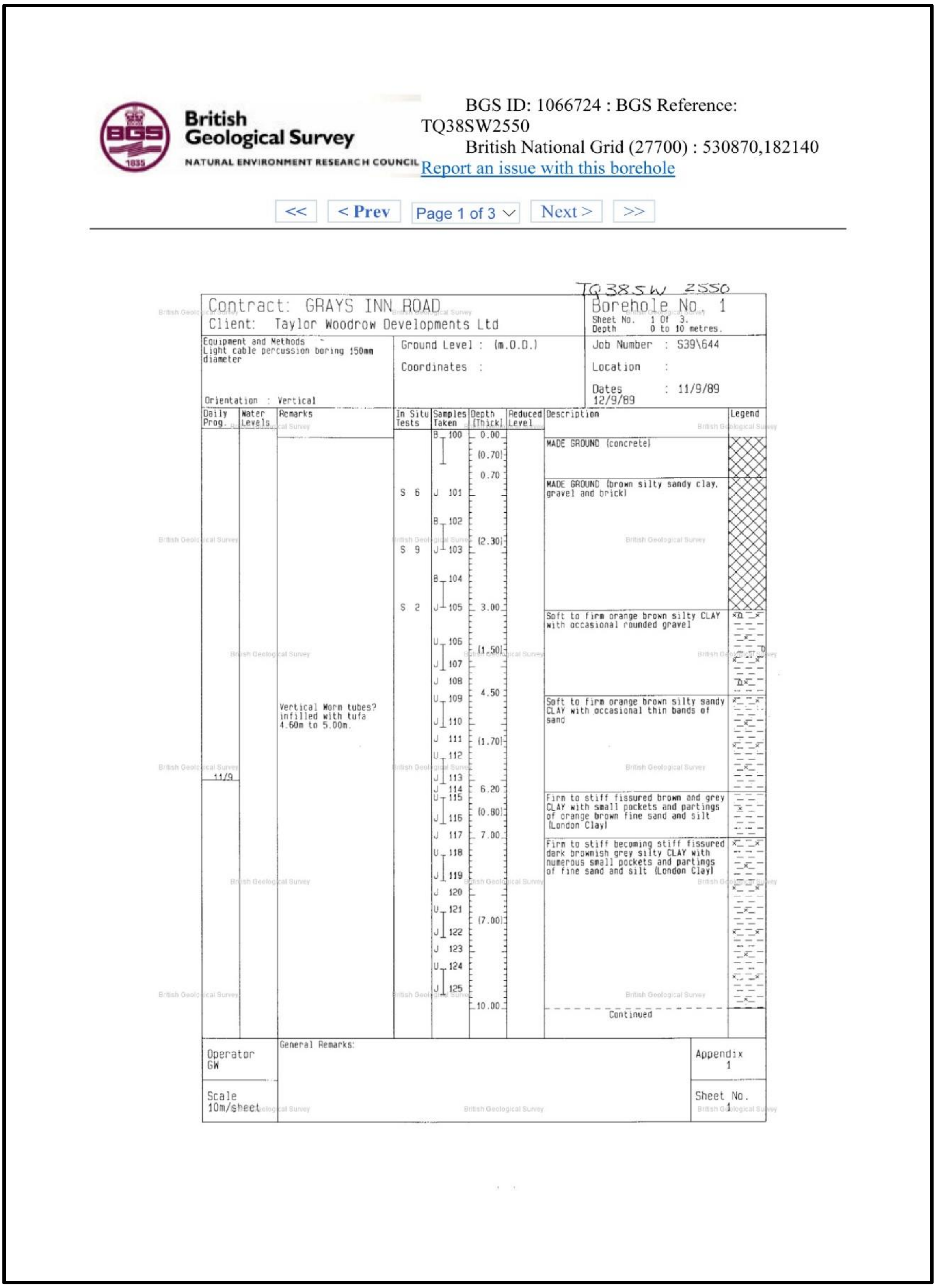


Camden Geological, Hydrogeological and Hydrological Study
South Camden Geological Map
213923 FIGURE **5**



Camden Geological, Hydrogeological and Hydrological Study
River Terrace Deposit Thickness Contours
213923 FIGURE **6**

Historic Borehole records provide further support to the site geology as per the borehole record appended below which relates to a location to the North of this site.



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 1066724 : BGS Reference: TQ38SW2550
British National Grid (27700) : 530870,182140
Report an issue with this borehole

<< | < Prev | Page 1 of 3 | Next > | >>

TQ38SW 2550

Contract: GRAYS INN ROAD
Client: Taylor Woodrow Developments Ltd

Borehole No. 1
Sheet No. 1 Of 3.
Depth 0 to 10 metres.

Equipment and Methods
Light cable percussion boring 150mm diameter
Orientation : Vertical

Ground Level : (m.O.D.)
Coordinates :

Job Number : S39\644
Location :
Dates : 11/9/89
12/9/89

Daily Prog.	Water Levels	Remarks	In Situ Tests	Samples Taken	Depth (Thick)	Reduced Level	Description
				B 100	0.00		
					(0.70)		MADE GROUND (concrete)
					0.70		
			S 6	J 101			MADE GROUND (brown silty sandy clay, gravel and brick)
				B 102			
			S 9	J 103	(2.30)		
				B 104			
			S 2	J 105	3.00		
				U 106	(1.50)		Soft to firm orange brown silty CLAY with occasional rounded gravel
				J 107			
				J 108			
				U 109	4.50		
		Vertical Worm tubes? infilled with tufa 4.60m to 5.00m.		J 110			Soft to firm orange brown silty sandy CLAY with occasional thin bands of sand
				J 111	(1.70)		
				U 112			
11/9				J 113			
				J 114	6.20		
				U 115			Firm to stiff fissured brown and grey CLAY with small pockets and partings of orange brown fine sand and silt (London Clay)
				J 116	(0.80)		
				J 117	7.00		
				U 118			Firm to stiff becoming stiff fissured dark brownish grey silty CLAY with numerous small pockets and partings of fine sand and silt (London Clay)
				J 119			
				J 120			
				U 121	(7.00)		
				J 122			
				J 123			
				U 124			
				J 125			
					10.00		Continued

Operator GW
Scale 10m/sheet
General Remarks:
Appendix 1
Sheet No. 1

Contains British Geological Survey materials © NERC

4.0 HYDROLOGY

4.1 See attached report prepared by ESI Ltd ref Report reference: 64737R1D1, April 2016

esi Environment Specialists

Basement Impact Assessment: 20-21 Kings Mews, London WC1N 2JB

Prepared for

Phil Davies
DDC Ltd
77 Elmers End Road
London
SE20 7UU

Report reference: 64737R1D1, April 2016
Report status: Draft

Confidential
Prepared by
ESI Ltd

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5.0 CPG4 SCREENING FLOW CHARTS

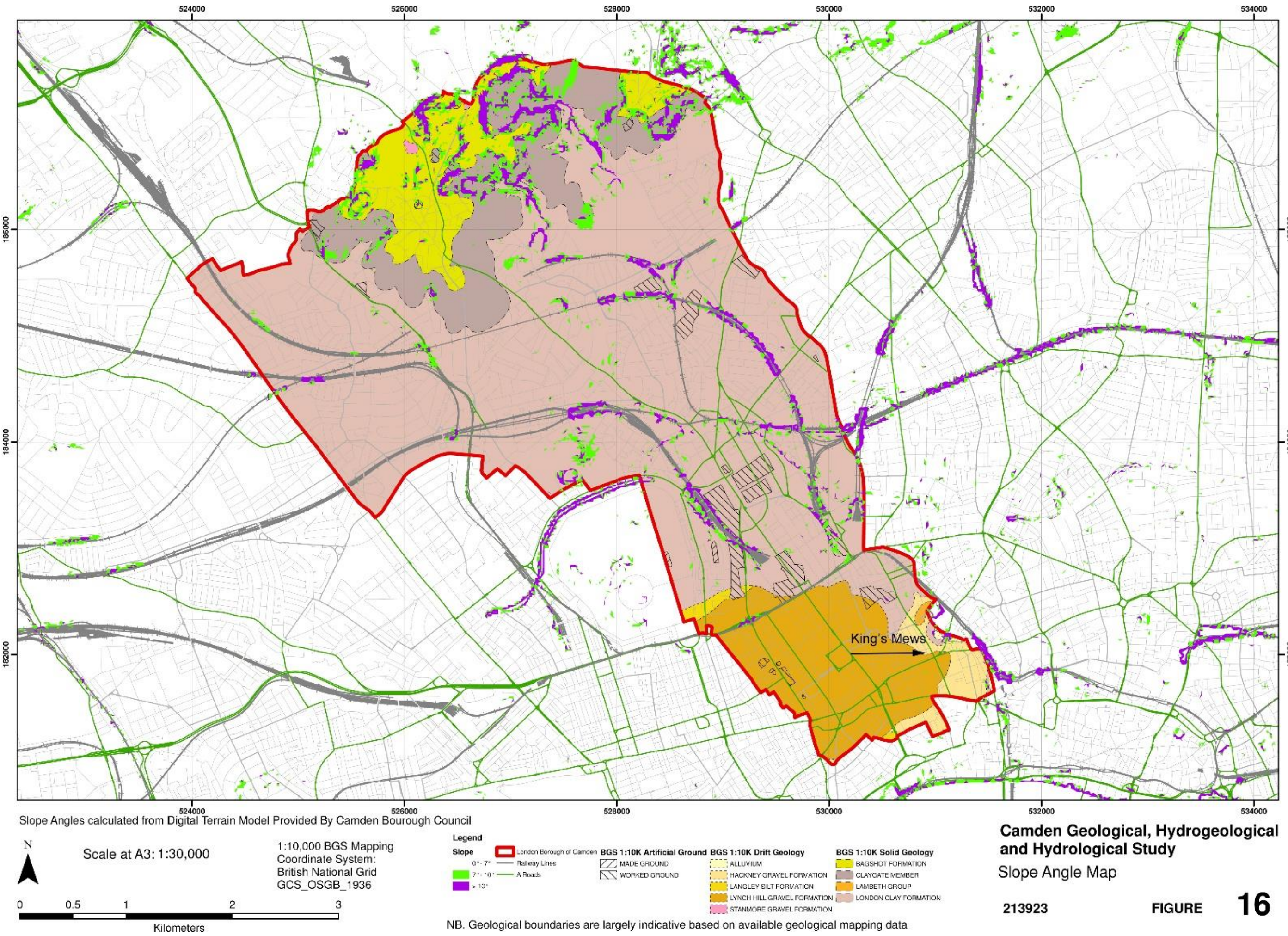
5.1 For the purposes of this report reference has been made to Appendix E of the Arup document screening tools, which includes a series of questions within a screening flowchart for three categories;

- Groundwater flow - *see report prepared by ESI Ltd ref Report reference: 64737R1D1, April 2016*
- Land stability – *See 5.2*
- Surface water flow – *See 5.3*

5.2 Slope Stability (Fig 2)

1: Does the existing site include slopes, natural or man-made, greater than 7 ° (approximately 1 in 8)?

No. The LB Camden map of slope indicates the site is not greater than 1 in 8.



2: Will the proposed re profiling of landscaping at site change slopes at the property boundary to greater than 7 ° (approximately 1 in 8)?

No. The proposal does not include landscaping that affects the boundaries.

3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 °?

No. The neighbouring sites are at a similar gradient.

4: Is the site within a wider hillside setting in which the general slope is greater than 7° (Approximately 1 in 8)?

No. The wider gradient is less than 1:8.

5: Is London Clay the shallowest stratum on the site?

Yes. London Clay is the shallowest stratum – carry forward to scoping stage.

6: Will any trees be felled as part of the proposed development and/or are there any proposed works within any tree protection zones where trees are to be retained?

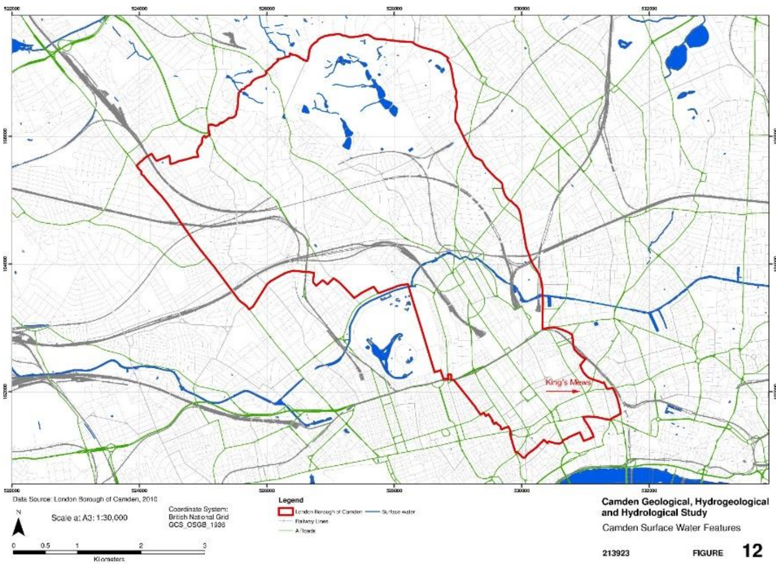
No. No trees are to be felled.

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

No. There is no such evidence to the existing building or neighbouring properties.

8: Is the site within 100m of a watercourse, or spring line?

No. Map 12 of the LB Camden report produced by ARUP indicates no such features within 100 metres.

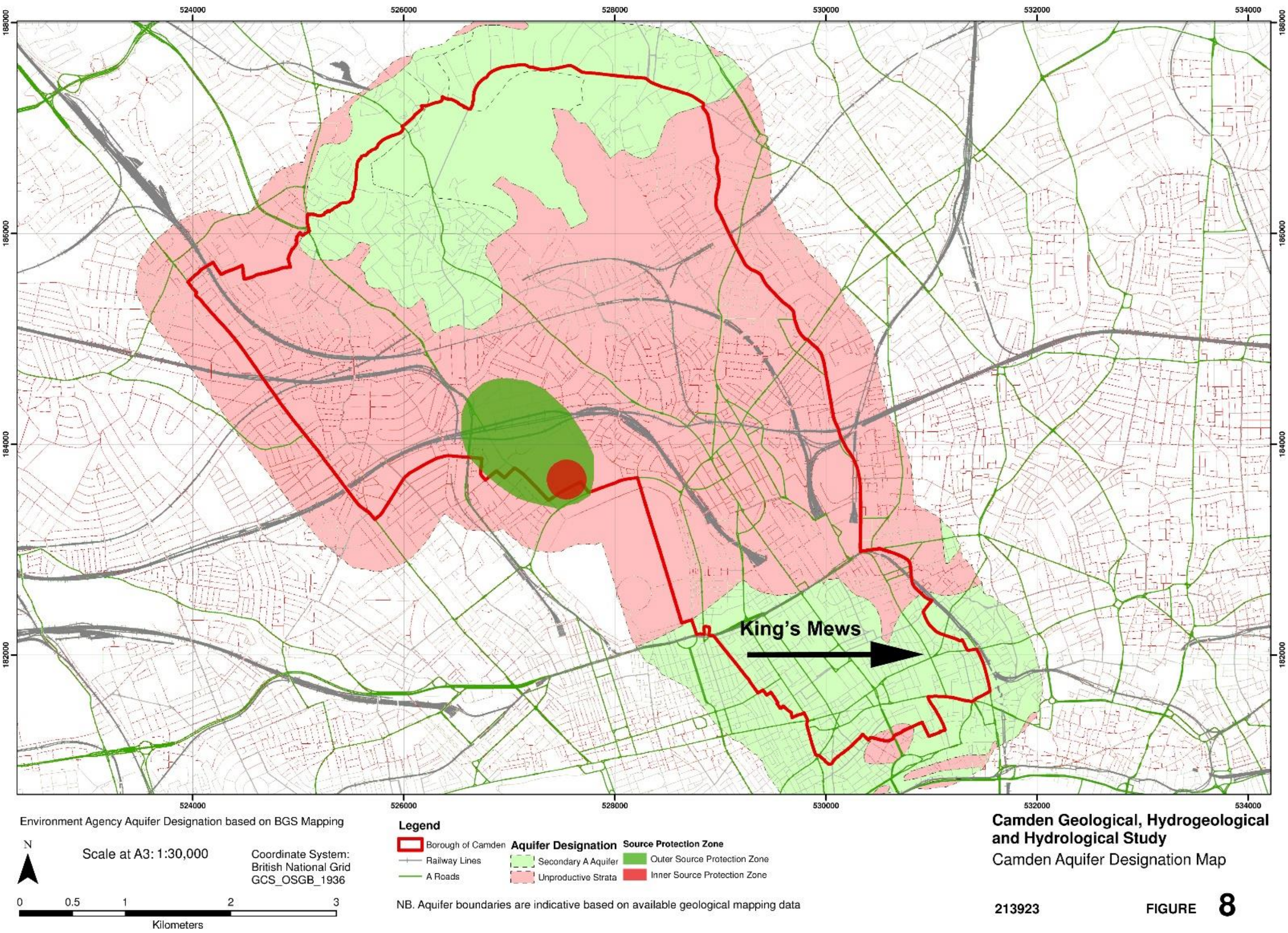


9: Is the site within an area of previously worked ground?

No. Historic records indicate that the site has only been built on in the late 18th Century & was built on land with an agricultural or horticultural use prior to that.

10: Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering will be required during construction?

Yes – the site lays within an area considered to be secondary aquifer.



11: Is the site within 50m of the Hampstead Heath ponds?

No. The site is outside of a 50m zone of the ponds.

12: is the site within 5m of a public highway or pedestrian right of way?

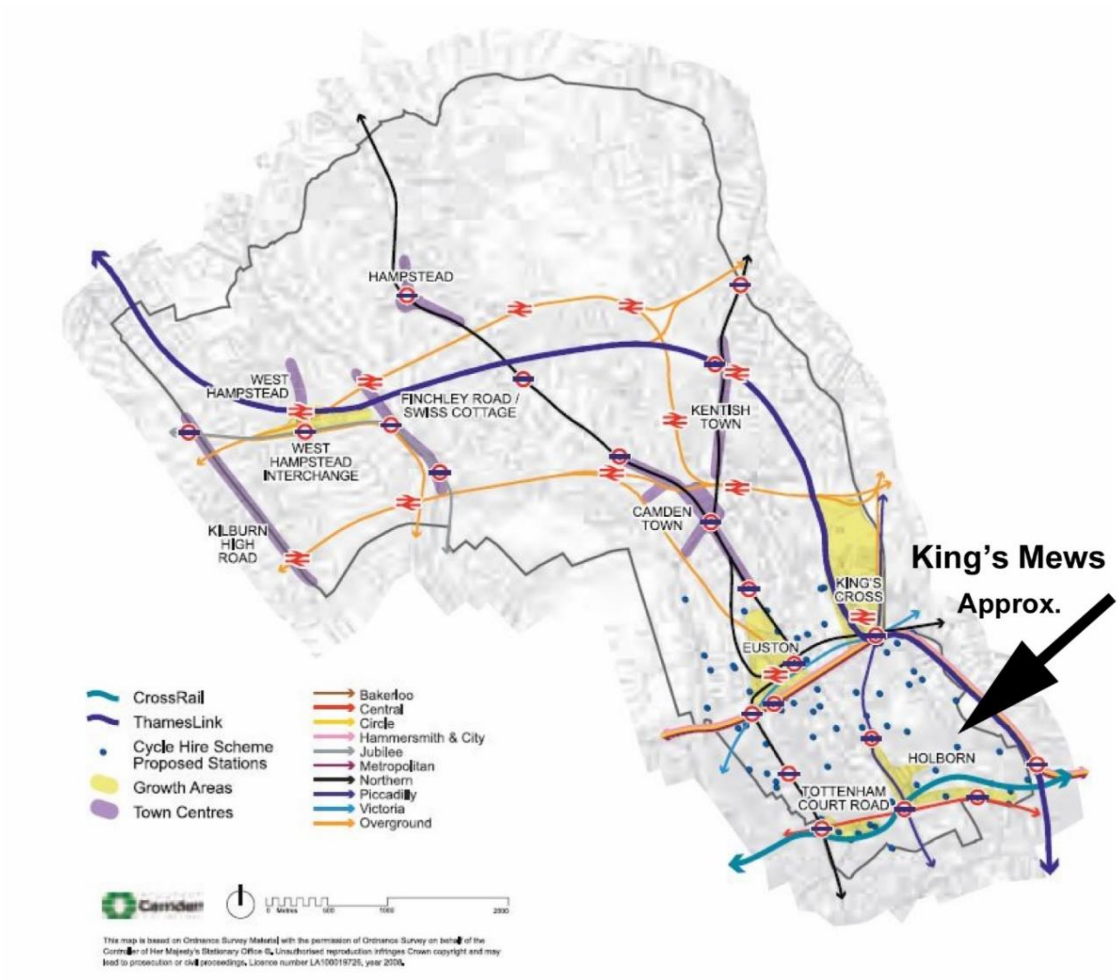
Yes it abuts the public highway. Carry forward to scoping stage

13: Will the proposed basement significantly extend the differential depth of basements relative to neighbouring properties?

Yes. The proposed basement does not abut existing cellars. – carry forward to scoping stage.

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

No – see LB Camden Critical Infrastructure Map below:



Source - London Borough of Camden, January 2010. *Camden Core Strategy Proposed Submission.*

Camden Geological, Hydrogeological and Hydrological Study
Transport Infrastructure

213923 **FIGURE 18**

5.3 Surface Flow and Flooding Fig 3

1*: Is the site within the catchment of the pond chains on Hampstead Heath?*

No. The site is outside the catchment area.

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. It will be largely unaffected.

3: Will the proposed basement development result in a change in the proportion of hard surfaces/paved external areas?

No. The amount and proportion of hard standing areas will remain unchanged

4: Will the proposed basement 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. There will be no change in the surface water flow off-site as a result of this proposal. Surface water will be discharged via existing connection.

5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

No. There will be no change in the surface water flow off-site as a result of this proposal.

6: Is the site in an area known to be at risk from surface water flooding, such as Hampstead Heath, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

No the ARUP report identifying the areas affected by the two major flood events modelled indicate this location to have been unaffected. See fig below:

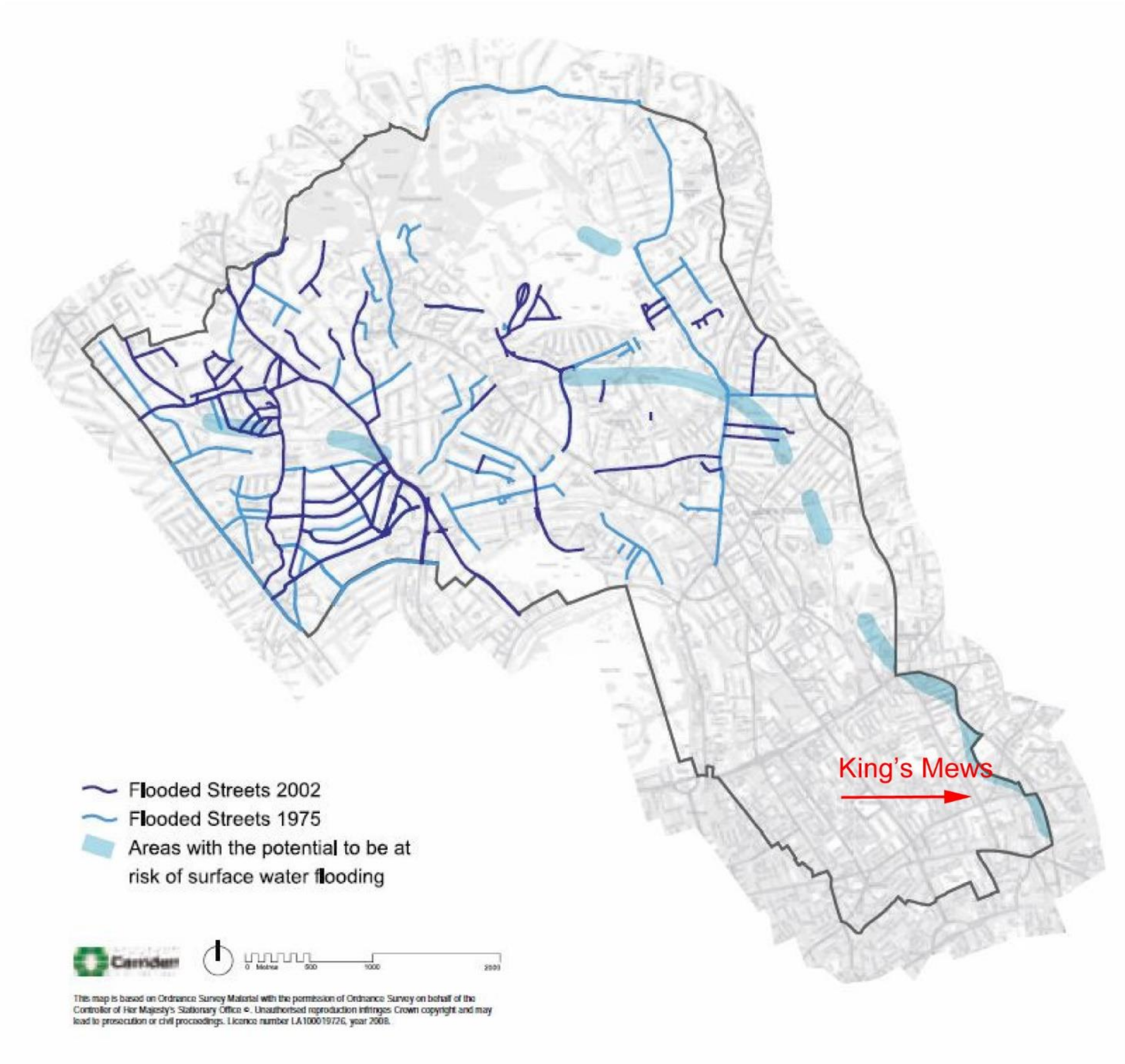
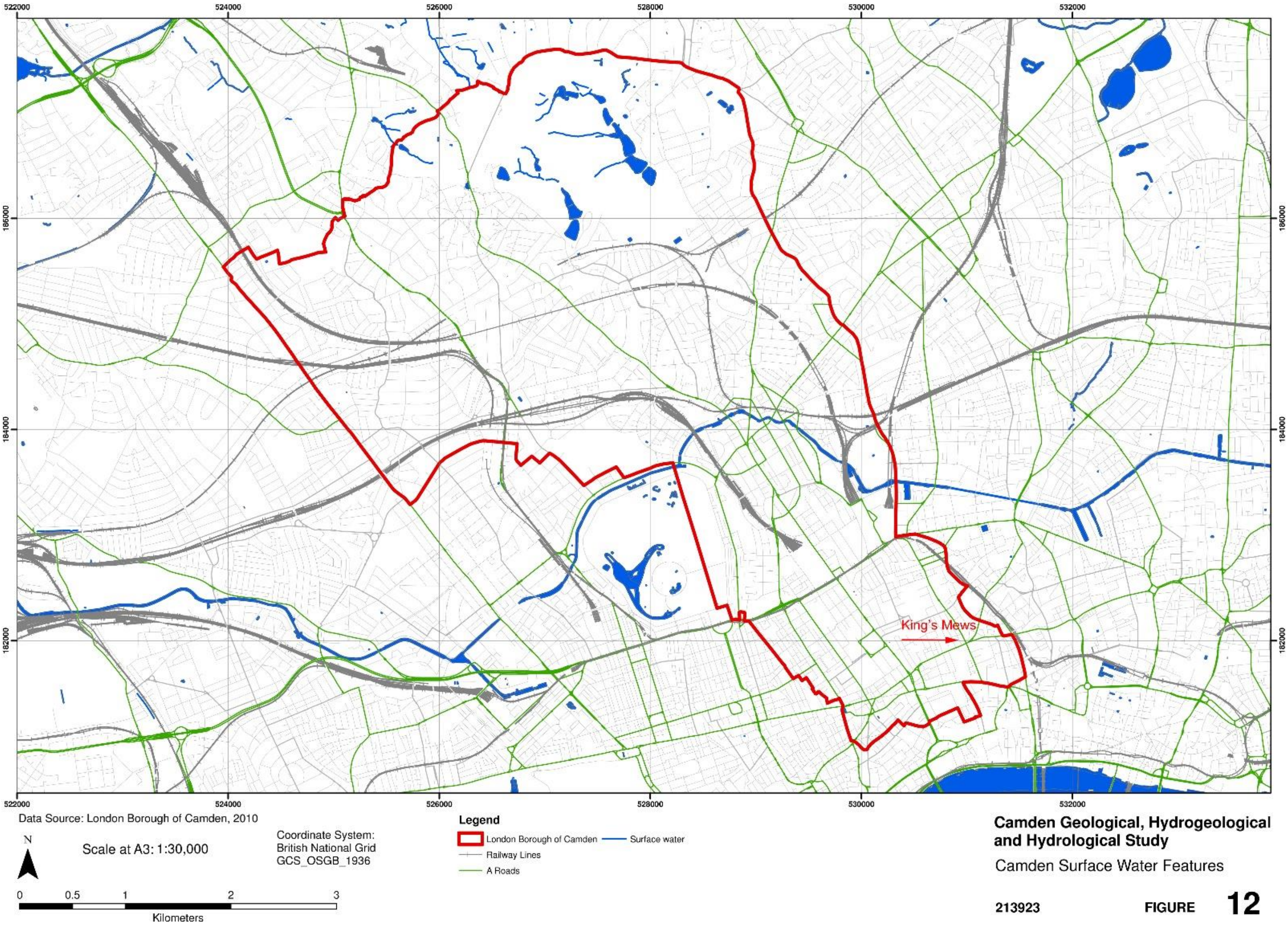


Figure 5 from Core Strategy, London Borough of Camden

Camden Geological, Hydrogeological and Hydrological Study
Flood Map

213923 **FIGURE 15**


522000
524000
526000
528000
530000
532000
186000
184000
182000
King's Mews
Data Source: London Borough of Camden, 2010
Scale at A3: 1:30,000
Coordinate System:
British National Grid
GCS_OSGB_1936
0 0.5 1 2 3
Kilometers
Legend
London Borough of Camden
Surface water
Railway Lines
A Roads
Camden Geological, Hydrogeological and Hydrological Study
Camden Surface Water Features
213923
FIGURE 12

6.0 SCOPING STAGE

The purpose of scoping is to assess in more detail the factors to be investigated in the impact assessment. Potential consequences are assessed for each of the identified potential impact factors.
It is considered that the scope of the investigation complies with the guidance issued by the Council and is therefore a suitable basis on which to assess the potential impacts

6.1 Groundwater Flow
This is addressed within the independent report on hydro-geology and should be read in association with this report. Please see attached report prepared by ESI Ltd ref Report reference**:** 64737R1D1, April 2016

6.2 Slope Stability

(5) London Clay is the shallowest stratum on this site and the structural design of the retaining walls and slabs will take this into account accordingly.

(10) The site lies within an area identified as a secondary aquifer. The nearby bore-hole records suggest that the water table is lower than the basement and it's associated works .

(12) The existence of basements in adjoining buildings is presumed to be absent. However, the structural engineering proposal for this scheme involves the use of underpinning to form the structural box below ground which should have no negative effect on neighbouring properties.

7.0 STRUCTURAL DAMAGE

7.1 By installing adequate temporary propping and new permanent works, the anticipated movements caused by the development it is predicted that the damage to the adjoining and nearby structures would generally be Category 0 (negligible), with limited areas of Category 1 (Very Slight) damage to the front right hand corner of the building/party wall due to differential movement from inconsistent loadings. On this basis, the damage that would inevitably occur as a result of such an excavation would fall well within the acceptable limits and to be limited to not exceed 2mm at any location within the adjacent properties.

Defined by Burland, and may include some or all of the following:-

- slight cracks, easily filled,
- redecoration probably required,
- several slight fractures showing inside of building,
- cracks visible externally, some re-pointing required externally to ensure weather-tightness,
- doors and windows may stick slightly.

7.2 For predicted damage assesment, refer to sections 9 & 10

8.0 CONSTRUCTION METHOD STATEMENT

This method statement has been prepared to provide information on the likely methods for Basement Construction for the Basement, subject to confirmation of details and final input from the successful contractor. The final methods will be subject to the limitations and constraints noted in this document. Any revised matters associated with the Method Statement will be issued for review and comment prior to any site construction works.

8.1 Prior to Commencement of Work

8.1.1 The method of construction is to be agreed by all parties, with specific reference to the potential for vibrations and noise from the underpinning process.

8.1.2 A detailed method statement for means of access, site logistics and intended vehicle movements, particularly spoil removal, will be agreed with the main contractor prior to commencing any site works and any variations reported accordingly.

8.1.3 Agreed working zones in relation to the Highways will be agreed prior to commencing any site works.

8.1.4 All services surveys, diversion agreements and temporary supply requirements will be agreed and approvals will be in place prior to commencement of works.

8.1.5 Existing building condition surveys of neighbouring property will be carried out prior to commencing any piling works,.

8.2 Sequence of Work

The key stages forming the core of the Construction Method Statement are :

8.2.1 Establish site access & hoarding.

The hoarding will be located around the property to enclose all works. All set up works to facilitate access will take account of the Method Statement for the project. A plywood hoarding will be erected with vertical standards, anchored to the ground. The hoarding will be fully secure with a lockable door for access. Suitable heights and colours will be in accordance with the Local Authority requirements.

8.2.2 Investigatory works as required for full detailed design.

Investigatory works undertaken in relation to the site have been limited by the ongoing use of the full footprint of the site and the results of trial holes which have been excavated are recorded in Appendix A. These exploratory works have been supplemented by a desk study, incorporating a review of geotechnical and hydrogeological maps for the local area, and also of historical ordnance maps. Boreholes undertaken on adjacent sites including 10/11 Kings Mews opposite, 25 Kings Mews and John Street have identified similar Ground Conditions generally consisting of:

- Made Ground, comprising silty sand, silty sandy clay, gravel, brick, concrete and coal fragments, extending to a depth of 3-4m below ground level. (Also as found on site trial pits)
- Lynch Hill Gravel, comprising slightly clayey sandy fine to coarse sub rounded to angular gravel, extending to a depth of approximately 6m below ground level
- London Clay, proven to depth

Copies of BGS Borehole logs are contained in Appendix B of the Hydrology Report of ESI

8.3 Construction Method

- Excavation to underpins to occur in the sequence specified on JMS drawing L15/284/12 – 501A _Stage 1, at half the final basement level (approximately 1.90m deep). Underpinned bays to be packed and backfilled once the underpin has been completed sufficiently to support the wall above.
- Once all bays have been completed at Stage 1, excavation to final basement level to occur in the sequence specified on drawing JMS L15/284/12 – 502A_Stage 2. Underpinning Bays to occur in a staggered position comparing to Stage 1 Underpinning Bays. Underpinned bays to be packed and backfilled once the leg of underpinning has been completed sufficiently to support the underpin above.
- Excavation to final formation level installing suitable propping
- Use of Kitten Pile Rig (or similar) and commencement of piling from basement formation level as shown on JMS drawing L15/284/12 – 501A _Stage 1.
- Construction of new Basement's slab and Retaining Walls and ground floor structure
- The final sequence of working in detail will be agreed with the successful main contractor and any variations reported accordingly. The foregoing is an indication of the likely process for the substructure works, subject to completion of all intrusive surveys, all agreements being in place and selection of the agreed final construction process subject to those intrusive site findings.

8.4 Ground Model

8.4.1 Basement Retaining Walls

The following parameters are suggested for the design of the permanent basement retaining walls.

Stratum	Bulk Density (kg/m3)	Effective Cohesion (c'-kN/m2)	Effective Friction Angle (O'-degrees)
Made Ground	1800	0	27
Lynch Hill Gravel	1850	0	32
London Clay	2000	0	25

Although not encountered in the trial pits, based on the adjacent site information, groundwater is likely to be encountered within the lower parts of the excavation, and the installation of standpipes for monitoring should be established at the earliest opportunity in order to establish equilibrium levels. Consideration should be given to the risk of groundwater and surface water collecting behind the retaining walls and unless a fully effective drainage system can be ensured it would be prudent to assume a design water level equivalent to two-thirds of the retained height. The advice in BS8102:20096 should be followed in the design of the basement retaining walls and with regard to waterproofing requirements.

8.4.2 Basement Heave

The excavation of an approximately 3.50 m to 4.50 m thickness of soil will result in an unloading of between 65 kN/m2 and 80 kN/m2. This unloading will result in heave of the underlying London Clay, which will comprise short term elastic movement and longer term swelling that will continue over a number of years. These movements will be mitigated to some extent by the remaining thickness of gravel and the pressure applied by the proposed building, although it is recommended that a more detailed analysis of the possible heave should be carried out once the basement design has been finalised.

8.4.3 Piled Foundations

Piled foundations should be considered, due to the ground conditions at this site and some form of bored pile is likely to be the most appropriate type in this situation. A conventional rotary augered pile may be appropriate, with temporary casing installed into the top of the clay in order maintain stability and prevent perched groundwater inflows. Alternatively, the use of bored piles installed using continuous flight auger (cfa) techniques could be considered, which would not require the provision of temporary casing. The final choice of pile type will be largely governed by the access restrictions and working area, which at this site is very small and it is most likely that the use of mini piling techniques will be required particularly as the rig will have to be lowered to basement level.

The following table of ultimate coefficients should be used for the preliminary design of bored piles:

Ultimate Skin Friction		**kN/m2**
Made Ground	GL to 4.0m	Ignore (basement)
Lynch Hill Gravel	4.0m to 5.0m	25
London Clay (alpha = 0.5)	5.0 to 15m	Increasingly linearly from 40 to 100
Ultimate End Bearing		
London Clay	12.0m to 15.0m	Increasingly linearly from 1400 to 1800

Guidance from the London District Surveyors Association (LDSA) suggests that a factor of safety of 2.6 should be applied to the above coefficients in the computation of safe theoretical working loads. On the basis of the above coefficients and a factor of safety of 2.6, it has been estimated that a 300 mm diameter pile founding at a depth of 15 m below ground level, should provide a safe working load of about 275 kN. Specialist piling contractors should be consulted with regard to the design of a suitable piling scheme for this site.

8.4.4 Basement Floor Slabs

Following the excavation, consideration should be given to suspending the slab over a void in order to accommodate heave movements and the requirement for heave protection should be reviewed once the proposed levels and loads are known. The slab is to be designed to withstand groundwater pressure and in accordance with BS8102, a design water level should be ¾ of the depth of the excavation.

8.4.5 Temporary Support to Underpinned Sections

It is anticipated that underpinning to deepen the existing foundations to the perimeter walls will be undertaken on a ‘hit and miss’ sequence, in a one or two stage sequence to be agreed with the temporary works engineer and under party wall agreement. Underpinning should be undertaken in short sections not exceeding 1.2 m in length, with no adjacent pin to be excavated until a minimum of 48 hours after the adjacent pin has been cast and dry-packed placed, with the sides of the excavation adequately shored and propped. Horizontal props and/or flying shores are to be provided to resist horizontal forces and it is anticipated that steel temporary props will be used with strut forces spread along the wall by steel waling beams fixed to the concrete stools. Although the detail of the propping is to be finalised there is the option to use hydraulic 'active' props where the propping force is applied prior to excavation in order to minimise movement at critical locations.

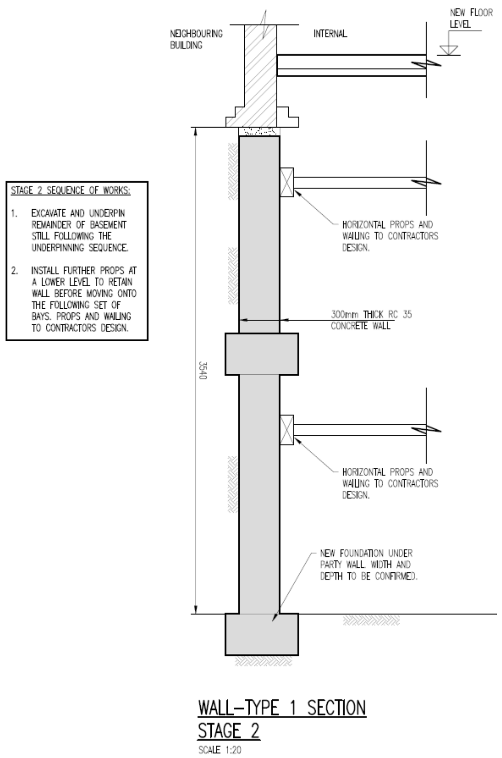
8.4.6 Permanent Works

When the final excavation depths have been reached, the permanent works will be formed and from the information provided these are understood to comprise reinforced concrete walls with a drained cavity lining supported off a reinforced concrete piled floor slab. Heave protection will be installed beneath the lowest level slab. Basement and ground floor slab are presumed to be of reinforced concrete and designed to act as permanent props to the vertically spanning walls. The superstructure is to be constructed off the piled basement and independent of the existing Party Walls.

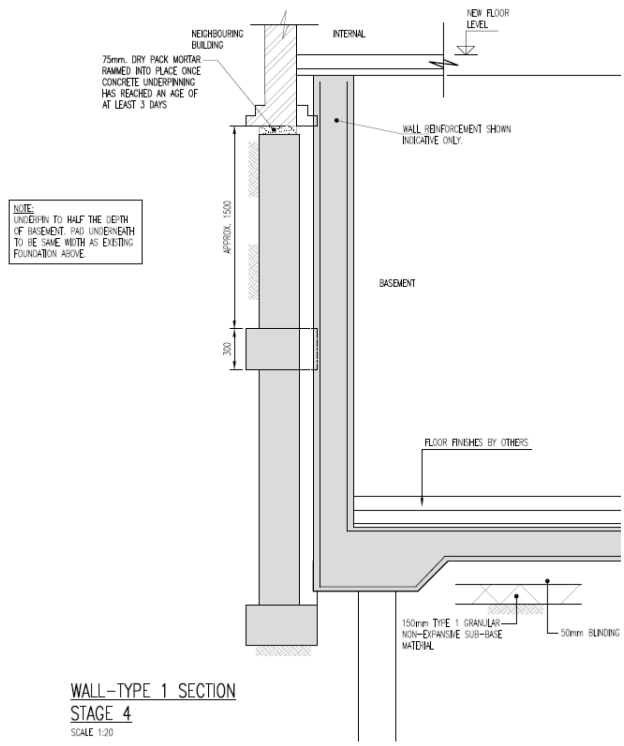
9.0 GROUND MOVEMENTS

9.1 Summary of Proposed Works to Existing Walls/Boundaries

- The buildings adjacent to the left hand side of the site, (Nos. 3 & 5 Northington Street / 18-19 King's Mews) are structurally independent from No 20-21 and both have existing 'dry' basements as confirmed by the owner of No. 5 Northington St and the trial pits (see Appendix A). As the proposed works to No. 20/21 is independently supported and not extending to any significant depth below that of No 3 & 5 Northington St., these buildings will not be effected by the proposed basement works. The left hand flank wall of No 20 is not a party wall although is to be underpinned to allow construction of the new basement structure.
- The front elevation is currently largely open construction and is to be supported at first floor level in the proposed scheme and is not effected by the proposed works
- The rear elevation is a party wall and is to remain largely unchanged. Resistance to horizontal movement following the formation of the basement is to be via a new concrete wall set in front of the existing wall. It is proposed that the wall will be underpinned to basement depth to allow construction of the basement wall.
- The right hand side elevation is a party wall and is to remain largely unchanged. Resistance to horizontal movement following the formation of the basement is to be via a new concrete wall set in front of the existing wall. It is proposed that the wall will be underpinned to basement depth to allow construction of the basement wall.
- Propping will be provided during the construction of the basement and in the permanent condition



TEMPORARY STATE



PERMANENT STATE

9.2 Ground Movements – Surrounding the Basement

On this site it is assumed that the mass concrete underpinning to deepen the existing side and rear walls will be of similar thickness as the walls above and with a footing of similar width. The increase in loading will be (24-18*3.5m) = 21 kN/m from the underpinning. However, this is offset by the reduction in load from the removal of the superstructure (1st Floor & Roof) which equates to approximately ($4*[1.5+0.75]_{live}+[0.5+0.65]_{dead}$) = 13.6 kN/m i.e. a Net increase of (21-13.6) = 7.4 kN/m. Such a nominal load increase will result in minimal settlement (i.e. less than 2mm).

Experience with respect to the construction of underpinned walls beneath existing structures, suggests that ground movements should remain typically within the range of 2 mm to 5 mm following completion of the works provided that they are installed by a reputable and experienced contractor in accordance with the guidelines published by the Association of Specialist Underpinning Contractors.

The estimated movements are considered to represent a worst case scenario, particularly as the movements resulting from basement excavation will be minimised due to control of the propping in the temporary works and a regime of monitoring

9.3 Movements within the Excavation (Heave)

At this site unloading of the London Clay will take place as a result of the basement excavation and the reduction in vertical stress will cause heave to take place. Values of stiffness for the soils at this site are readily available from published data and the creation of the basement will result in a net unloading of about approximately 45 kN/m2. Such a reduction would mean that by the time the basement construction is complete, approximately 12 mm of heave is likely to have taken place at the centre of the proposed excavations, reducing to less than 5 mm at the edges. In the long term, following completion of the basement construction, a further 8 mm of heave (at the centre) is estimated as a result of long term swelling of the underlying London Clay. It is, however, important to bear in mind that such figures are based on an unrestrained excavation as computer models are unable to take account of the mitigating effect of existing structures, the stiffness of the proposed floor slab, proposed underpins and the piles, which in reality will combine to restrict these movements within the basement excavation. The movements predicted at or just beyond the site boundaries are unlikely to be fully realised and should not therefore have a detrimental impact upon any nearby structures. In order to mitigate the effects of heave on the new building, the basement should be designed to transmit heave forces into the walls or onto tension piles within the basement. Alternatively, a void or layer of compressible material could be introduced beneath the slab designed to be able to resist the potential uplift forces generated by the ground movements. In this respect potential heave pressures to be accommodated are typically taken to equate to around 30% to 40% of the total unloading pressure.

10.0 DAMAGE ASSESSMENT

10.1 Damage to Neighbouring Structures

In addition to the above assessment of the likely movements that will result from the proposed development, some of the neighbouring structures have been considered as sensitive structures, requiring Building Damage Assessments, on the basis of the classification given in Table 2.5 of C580 .
The potential heave movements predicted have not been included in the assessment section 9.2, which can therefore be considered as conservative, as these movements are likely to have a mitigating effect on the downward settlement due to the increase in load.
Subsequently, it is predicted that the damage to the adjoining and nearby structures would generally be Category 0 (negligible), with limited areas of Category 1 (Very Slight) damage to the front right hand corner of the building/party wall due to differential movement from inconsistent loadings. On this basis, the damage that would inevitably occur as a result of such an excavation would fall well within the acceptable limits.

10.2 Monitoring of Ground Movements

The predictions of ground movement should be checked by monitoring of adjacent properties and structures. Condition surveys of the above existing structures should be carried out before and after the proposed works. The precise monitoring strategy will be developed at a later stage and it will be subject to discussions and agreements with the owners of the adjacent properties and structures. Contingency measures will be implemented if movements of the adjacent structures exceed predefined trigger levels. Both contingency measures and trigger levels will need to be developed within a future monitoring specification for the works.

10.3 Waterproofing Systems and Screed

For all basement areas, the Architect will prepare design details in conjunction with a specialist contractor. The waterproofing system will be installed in accordance with the Architects details in conjunction with the specialist contractor technical specifications once the basement slab is complete.
The floor finishes, which may include insulation and under floor heating, can then be laid in accordance with the Architects details. A cement and sand screed will be applied on the slab surface.
The height of the basement and relative level of the water table determines that Types A (barrier), B (structurally integrated) or C(drained) protection against ingress of water will be satisfactory, as defined by

BS 8102:2009. The basement will be constructed and detailed to achieve a Grade 3 Level of Performance, as defined by BS 8102:2009.

Table 2 **Grades of waterproofing protection**

Grade	Example of use of structure A)	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use B) Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a drier environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc.; leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

A) The previous edition of this standard referred to Grade 4 environments. However, this grade has not been retained as its only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning (see BS 5454 for recommendations for the storage and exhibition of archival documents). The structural form for Grade 4 could be the same or similar to Grade 3.

B) Seepage and damp areas for some forms of construction can be quantified by reference to industry standards, such as the ICE's *Specification for piling and embedded retaining walls* [1].

To achieve Grade 3 Performance we propose either a drained cavity installed in front of the concrete wall; or an applied waterproofing membrane applied and bonded to the internal faces of the pins. Waterproof concrete will also be employed.

11.0 Conclusion

The proposed re-development of 20-21 King's Mews can be achieved using standard construction techniques and materials. Where mechanical means are necessary to construct permanent works these can be of a type that generates low vibrations to which the surrounding buildings have a form and construction that is robust and resistant to. We can therefore conclude with confidence that the construction of the proposed development generally, and the subterranean basement in particular, will not affect the integrity of the surrounding building stock or overload the near-surface geology.

There are no critical utilities beneath the site that cannot be relocated easily to accommodate the construction and, as there is no change in use proposed there will be no significant increase in foul discharge to the sewer despite the increase in level of accommodation.

The techniques proposed for the subterranean element of the building and the nature of the underlying geology minimises the risk of instability, ground slip and movement.

The review of the proposals has concluded that the predicted damage to the neighbouring properties would generally be 'Negligible', with some limited areas of 'Very Slight' along the front right hand corner of the building. On this basis, the damage that would inevitably occur as a result of such an excavation underpinning, piling and subsequent excavation of the proposed basement, will in practice be separated by a number of weeks during which time construction will take place. This will provide an opportunity for the ground movements during and immediately after excavation to be measured and reviewed so that propping arrangements can be adjusted if required

On Behalf Of
JMS Consulting Engineers Ltd

Daniel Staines MIStructE CEng BEng PgDip (Const. Management)

Appendix A

Trial Hole Key Plan

POINT DRILLING SERVICES

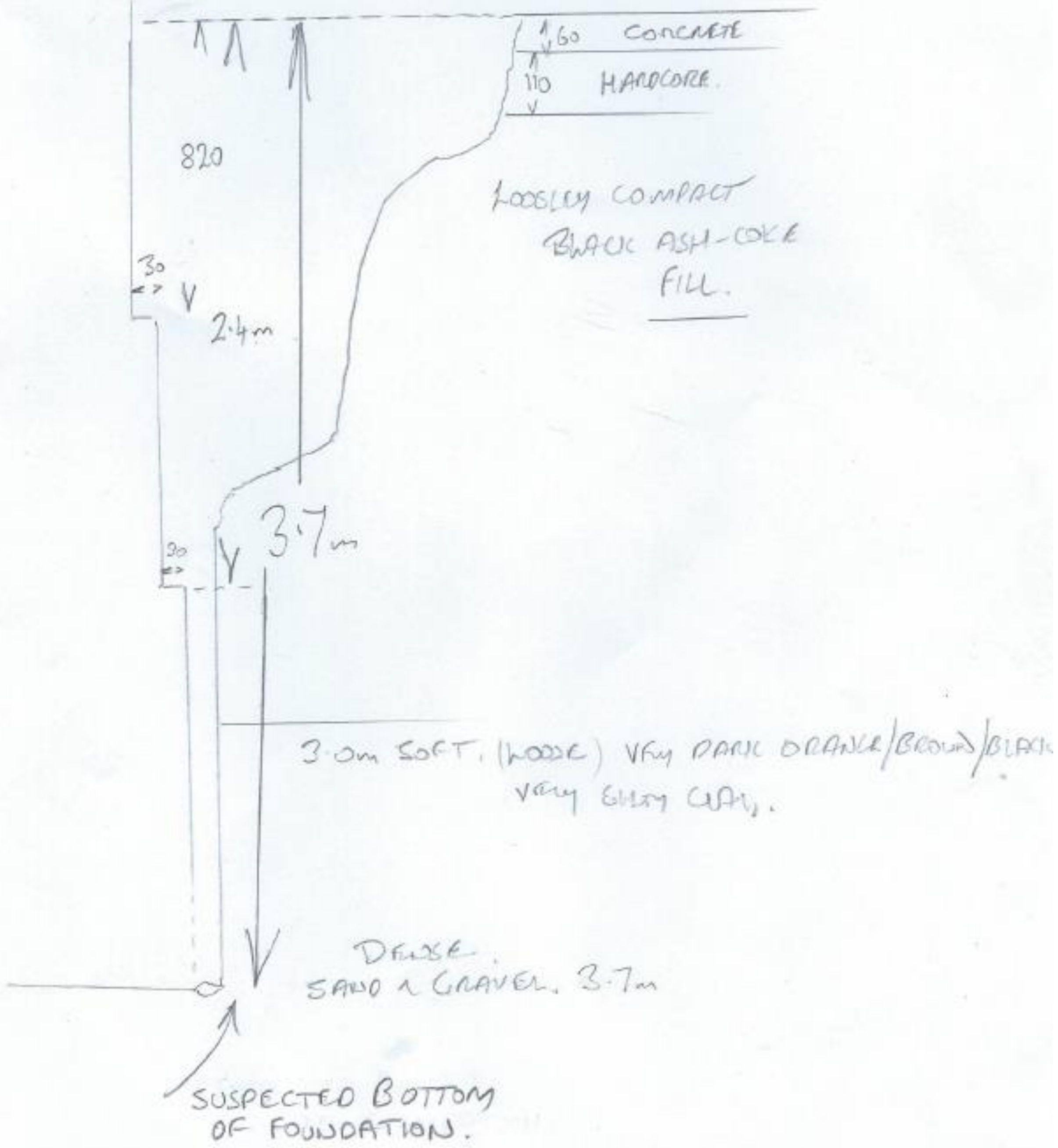
Birdsnest, Oakmead Road, St Osyth, Essex. CO16 8NL. Email: ylowther@aolcom

Telephone: 01255 821004 Mobile 07771533402

SITE INVESTIGATION TRIAL PIT LOG DATE: 24.3.16

SITE ADDRESS: 20-21 KINGS MEWS HOLBORN

TRIALPIT LOG REF: 2 **DESCRIPTION:**



KEY. DISTURBED SAMPLE. V.VANE TEST. MP. MACINTOSH PROBE TEST. R.ROOT SAMPLE.

POINT DRILLING SERVICES

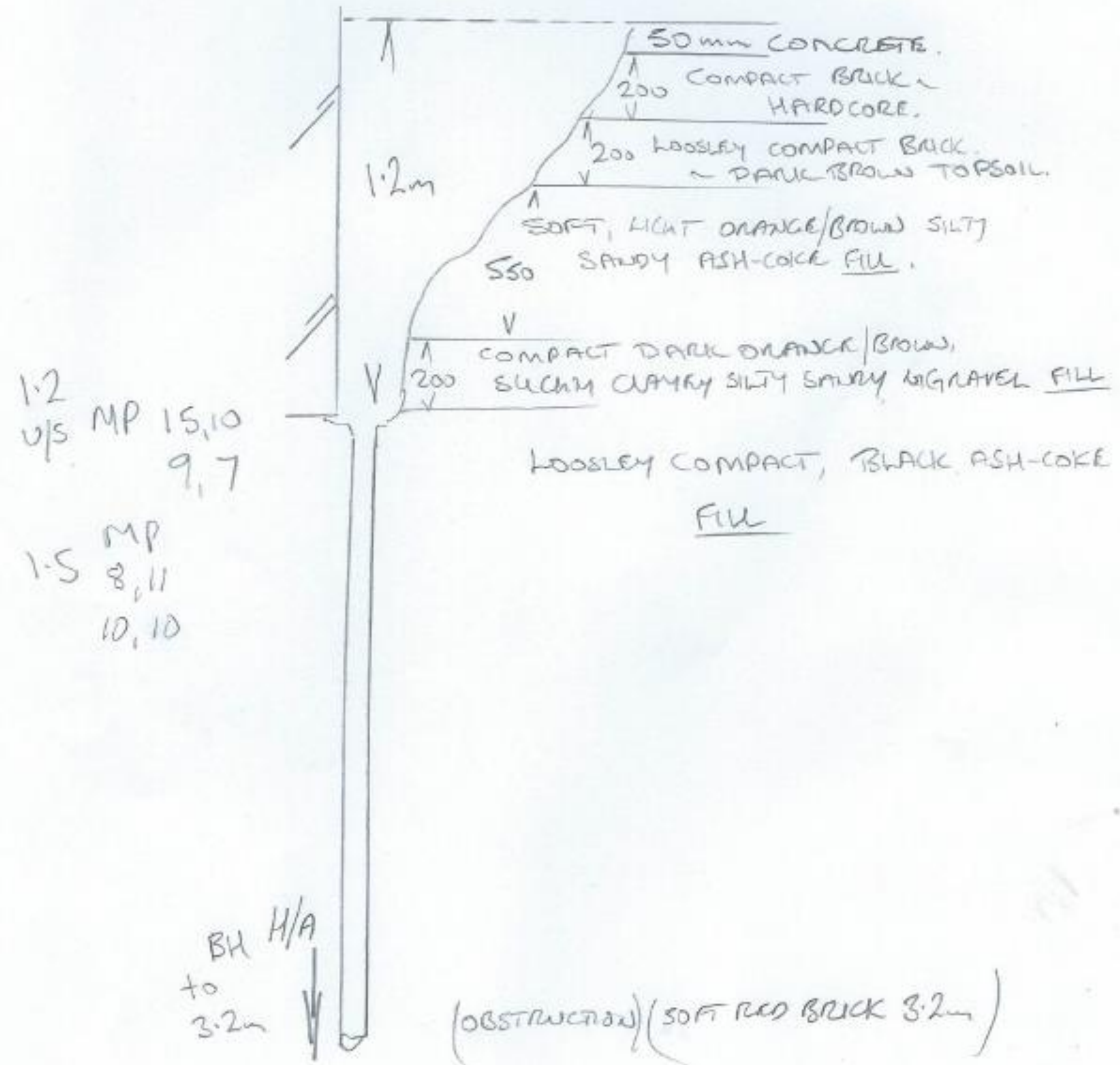
Birdsnest, Oakmead Road, St Osyth, Essex. CO16 8NL. Email: ylowther@aolcom

Telephone: 01255 821004 Mobile 07771533402

SITE INVESTIGATION TRIAL PIT LOG — DATE: 24.3.16

SITE ADDRESS: 20–21 KINGS MEWS. HOLBORN.

TRIALPIT LOG REF: 4 — DESCRIPTION:



KEY. DISTURBED SAMPLE. V.VANE TEST. MP. MACINTOSH PROBE TEST. R.ROOT SAMPLE.