6 John Street and 10/11 King's Mews

Structural Strategy Report for Planning Submission *incorporating Engineering Interpretation of Basement Impact Assessment*

Ref No: **23325**

Date: November 2012

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1.0 INTRODUCTION

1.1 Background

Fluid Structures has been appointed by the client, Mr. Philip Laniado, to provide structural engineering input into the proposed redevelopment of the site to the rear of the existing property at 6 John Street (London, WC1N 2ES), incorporating a new lower ground floor (basement) level structure and a new three storey frame above ground, fronting onto King's Mews.

Fluid has acted on the client's behalf to commission a Site Investigation and Basement Impact Assessment for the proposed scheme. This has been undertaken by Geotechnical and Environmental Associates (GEA), with guidance / assistance from Fluid Structures, and is described in a separate report, **Geotechnical and Environmental Associates; Desk Study and Basement Impact Assessment Report: Rear of 6 John Street, London, WC1N 2ES; October 2012**. GEA's Basement Impact Assessment report and this report together are intended to address the issues raised in the document **London Borough of Camden; Camden Planning Guidance document CPG4: Basements and Lightwells.**

1.2 Purpose

The purpose of this report is to:

- Provide a structural engineering interpretation of the Basement Impact Assessment and Site Investigation undertaken by Geotechnical and Environmental Associates, in order to…
- Identify and describe a safe method (or methods) of constructing the proposed new basement and also the new above-ground structure intended for the rear of the site, and in addition to…
- Demonstrate that the proposed method of forming the new basement will not adversely affect the structural stability of the neighbouring buildings, nor cause them to move excessively either during or subsequent to the proposed construction works.

In the study provided by Geotechnical and Environmental Associates (referenced above), the Basement Impact Assessment process is undertaken with specific reference to stages 1-4 as described in Camden document CPG4 (Screening, Scoping, Site Investigation, Impact Assessment). This report is intended to pick up on the 'Impact Assessment' stage of this study and to develop it further by identifying a sensible basement construction metholodogy for this specific site, given the particular ground conditions and boundary configurations that exist on the site, and in light of the need to ensure that the stability and integrity of the neighbouring structures is at no point jeopardised by the proposed works.

2.0 ABOUT FLUID STRUCTURES

Fluid Structures is one of the UK's leading design oriented structural engineering practices. The firm was established in 1999 and has gained an exemplary reputation for the quality of its engineering design. Fluid has been commissioned to work at the Science Museum (twice), and the Royal Festival Hall, and has acted as a consultant to the BBC. The sectors in which the company works regularly include education, retail, residential and commercial. Projects to date have ranged in value from £500,000 to in excess of £100 million.

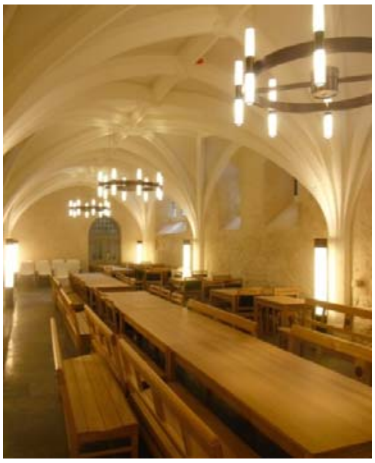
Fluid's approach is characterised by a desire to develop an engineering solution that complements the architectural aspiration whilst also responding to the client's core requirements and maintaining a sensitivity to the priorities of other stakeholders, such as Planning Authorities; Conservation Officers; the Public and the End User.

The practice considers itself to be a technical design house and offers a number of areas of expertise that include:

- The appraisal and refurbishment of existing buildings and structures
- The design of complex basements and substructures
- Design of façade engineering including double façades and solar shading
- Value engineering reports on potential developments
- An in depth knowledge of construction materials including steel, concrete, timber, masonry, glass, aluminium and fabric
- Preparation of comparison matrices to determine appropriate construction solutions
- Sustainable design solutions: working within the constraints of individual projects to minimise the carbon footprint of buildings and maximise their positive impact in relation to the environment, the economy and society at large.

Fluid's experience demonstrates the practice's ability to deliver sensitive engineering solutions.

This report has been written by Rachel Sandbrook, who is Chartered with both the Institution of Structural Engineers and the Institution of Civil Engineers. It has been checked by John Graham, who is chartered with the Institution of Structural Engineers (and has been for the past twenty years).



3.0 GROUND CONDITIONS

3.1 Investigatory Work Undertaken

The investigatory works undertaken in relation to the site by Geotechnical and Environmental Associates (GEA) have comprised:

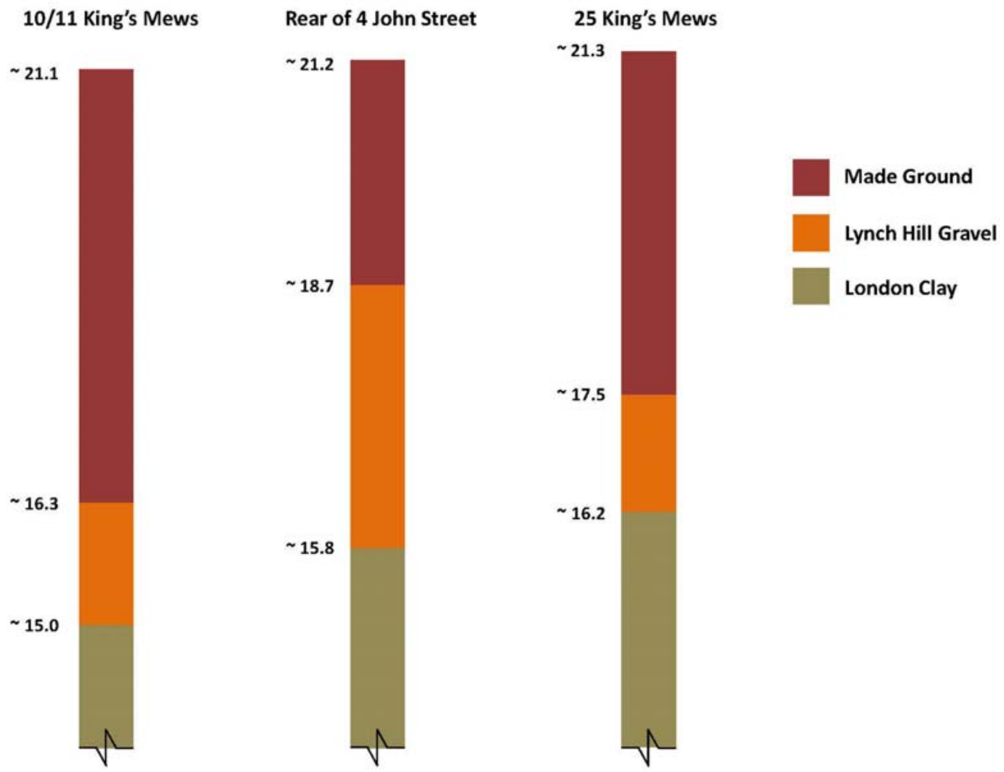
- A desk study, incorporating a review of geotechnical and hydrogeological maps for the local area, and also of historical ordnance maps.
- A Site Investigation, incorporating 1no. 15m long cable percussion borehole (BH1); 3no. manually excavated trial pits and the installation and monitoring of a groundwater monitoring standpipe, plus associated geotechnical and contamination testing of the soil samples recovered from the site.
- Review of data retrieved from previous Site Investigations undertaken by GEA at the rear of 4 John Street and also at 25 King's Mews. The site to the rear of 4 John Street is next door but one to 10/11 King's Mews. 25 King's Mews is approximately opposite the site to the rear of 4 John Street. These boreholes are both therefore approximately 20m from the boundary to 10/11 King's Mews.

3.2 Ground Conditions

The rear portion of the site as it stands was found to be capped with a 300mm thick concrete slab. Based on the borehole undertaken in the centre of the existing carpark, the ground strata on the site have been found to be as described below (from uppermost stratum, extending downwards):

- Made Ground, comprising silty sand, silty sandy clay, gravel, brick, concrete and coal fragments, extending to a depth of 4.80m below ground level.
- Lynch Hill Gravel, comprising slightly clayey sandy fine to coarse subrounded to angular gravel, extending to a depth of 6.10m below ground level.
- London Clay, proven to the maximum depth investigated.

If the data above is compared with that gathered from the other two nearby boreholes undertaken as part of previous Site Investigations, the ground strata profile varies as shown in the diagram overleaf. It is noted that the depth at which the Lynch Hill Gravel stratum begins is variable across the three boreholes, giving a minimum Made Ground thickness of 2.5m and a maximum thickness of 4.8m.



Ground Strata, based on borehole information (levels are provided in metres A.O.D)

3.3 Ground Water

Groundwater inflows were encountered at depths of 3.10m (in the Made Ground); 6.00m (in the Lynch Hill Gravel); and 13.80m (in the London Clay) during the Site Investigation undertaken by GEA. In two subsequent groundwater monitoring visits, the 'at rest' groundwater level was measured at 3.50m and 3.60m below ground level. This is presumed to be a 'perched' groundwater table that sits atop the (relatively) impermeable London Clay.

3.4 Ground Contamination

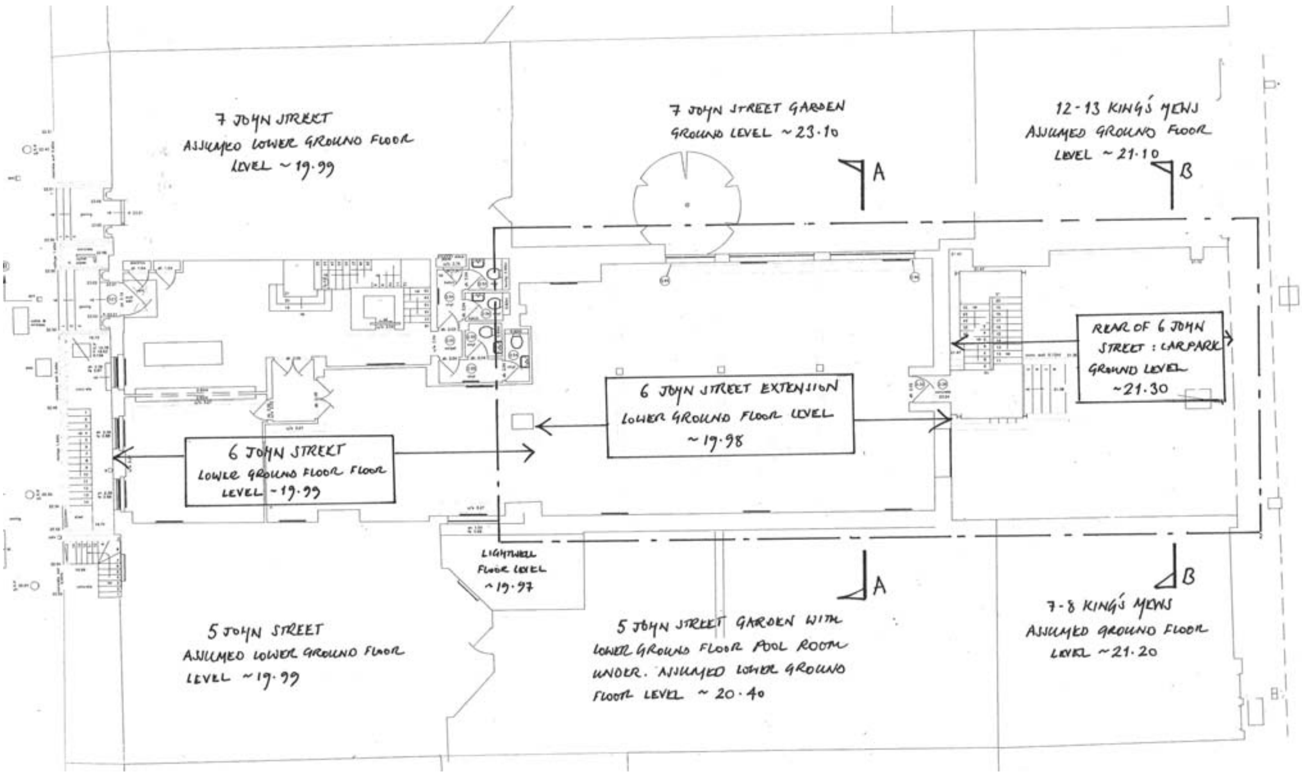
Elevated concentrations of lead were noted in the limited Made Ground samples that were tested by GEA, with no elevated concentrations of any other contaminants. GEA have undertaken a Site Specific Contamination Risk Assessment. This indicates that the elevated lead levels are unlikely to pose a risk to the site end users since the majority of the shallow Made Ground across the site will be excavated as part of the proposed site works, and the remainder of the proposed new building will cover the whole of the site, thereby creating a barrier between any remaining contaminated Made Ground and sensitive receptors.

3.5 Unexploded Ordnance

It is noted that the review of historical maps, and also of the London Bomb Damage Maps, as undertaken by GEA, indicates that the site is likely to have been bombed during World War II. Given that the site was a bomb target, the possibility of buried unexploded ordnance existing on the site cannot entirely be discounted (though the likelihood would appear low). This represents a potential risk during the proposed building works and therefore will be communicated to the contractor prior to the commencement of the works so that he can make necessary provision for monitoring by a UXO Specialist during the site works.

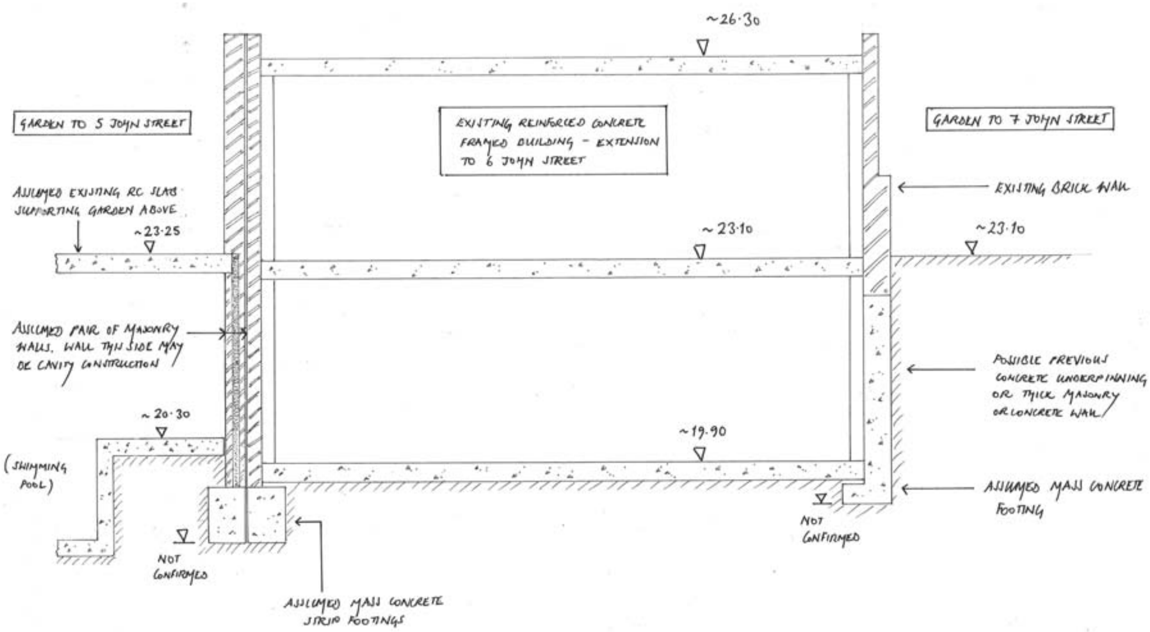
4.0 SITE AND BOUNDARY CONDITIONS

The front of the existing site comprises a large, Georgian house, fronting onto John Street. This is currently in use as offices. The house has a lower ground floor level, which is visible from John Street via a light well. At the rear of the house, a two storey (lower ground floor and upper ground floor level) extension has been constructed, and this structure would appear to comprise a reinforced concrete frame, with a reinforced concrete upper ground floor level and also, seemingly, a reinforced concrete roof slab. The walls to this building appear predominantly to be brick, possibly with some intermediate reinforced concrete columns. This building stops short of King's Mews by some 10m, leaving space at the rear of the site for a small carpark. The carpark ground level lines through approximately with that of the King's Mews road, and is thus some 1.2m above the lower ground floor level within the existing building adjacent, and some 2.0m below the upper ground floor level.

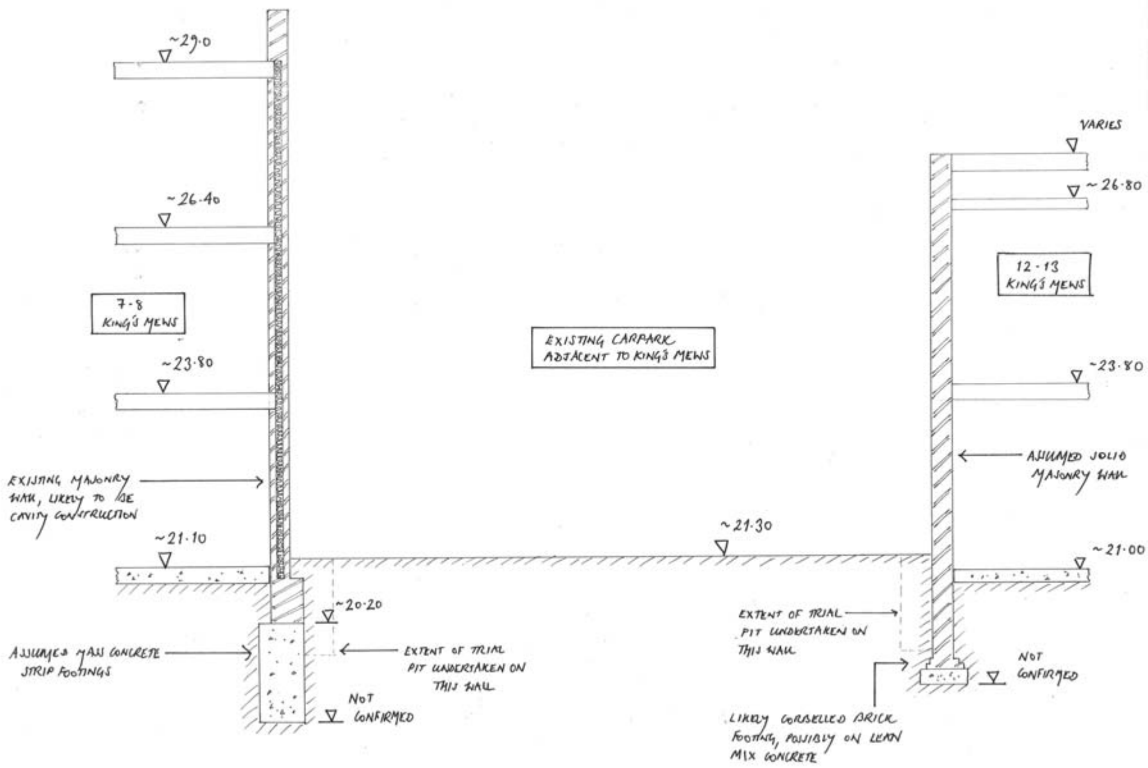


Existing site plan, showing approximate levels of lowest floors

The boundary conditions around the site are summarised in the figures that follow. It has not been possible to retrieve a great deal of information relating to the nature of the structures to either side of the site. However, the adjacent sites can be viewed clearly from high level within 6 John Street, and it has been possible to determine likely approximate overall party wall thicknesses from this position. A topographical survey has been carried out and this has indicated the 'garden' levels for the properties to either side of 6 John Street. Similarly, the ground floor levels to the buildings on King's Mews can be determined approximately based on the topographical survey information relating to the road. Finally, information has been retrieved from the Camden planning portal relating to proposed building works to 5 John Street and 7/8 King's Mews, and it is believed that these works have now been carried out. Fluid has also spoken with the structural engineers for this development and they have confirmed that the footings to the buildings on this side are strip footings, and not piles. It has also been possible to speak to the architect who has designed recent refurbishment works for 12/13 King's Mews, on the other side of 10/11, and he has confirmed that this building has no basement level. It is evident from the age of the building on this side that the footings, similarly, are likely to be strip footings rather than piles.



Existing section AA (refer to plan on previous page for section location)



Existing Section BB (refer to plan on previous page for section location)

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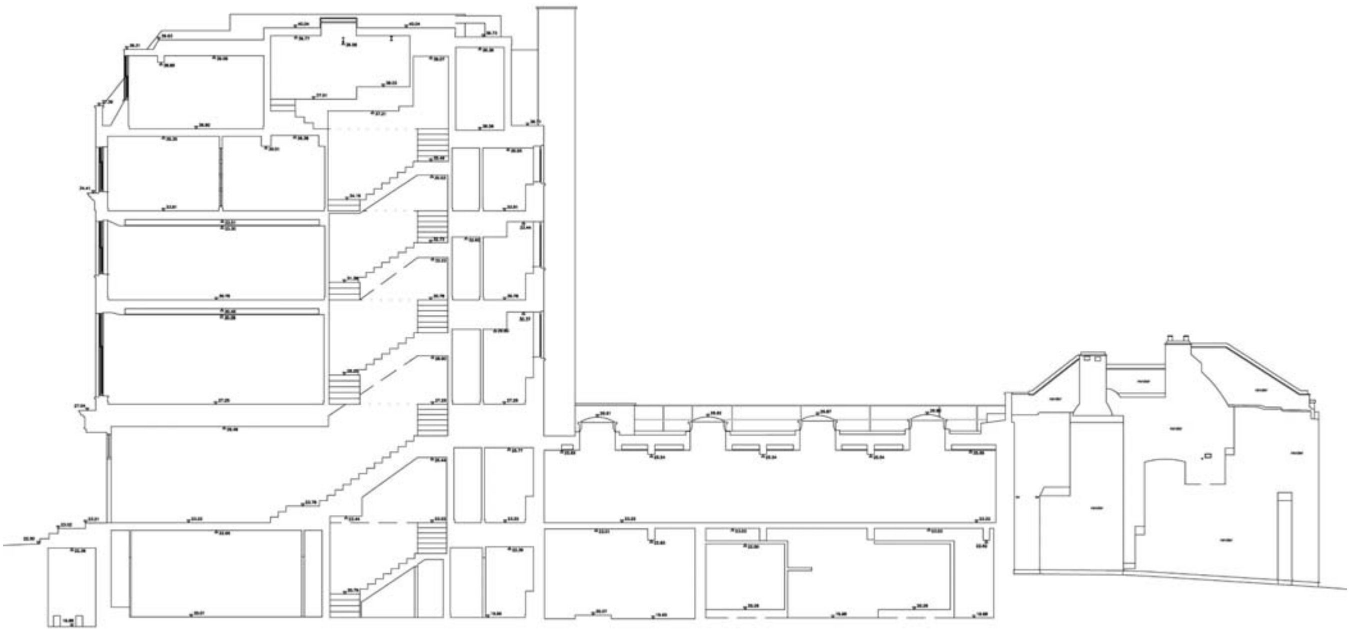
5.0 DESCRIPTION OF PROPOSED SCHEME

The proposed scheme for 6 John Street and 10/11 King's Mews is described fully in the separate Design and Access statement, and accompanying plan, section and elevation drawings prepared by Foundation Architecture.

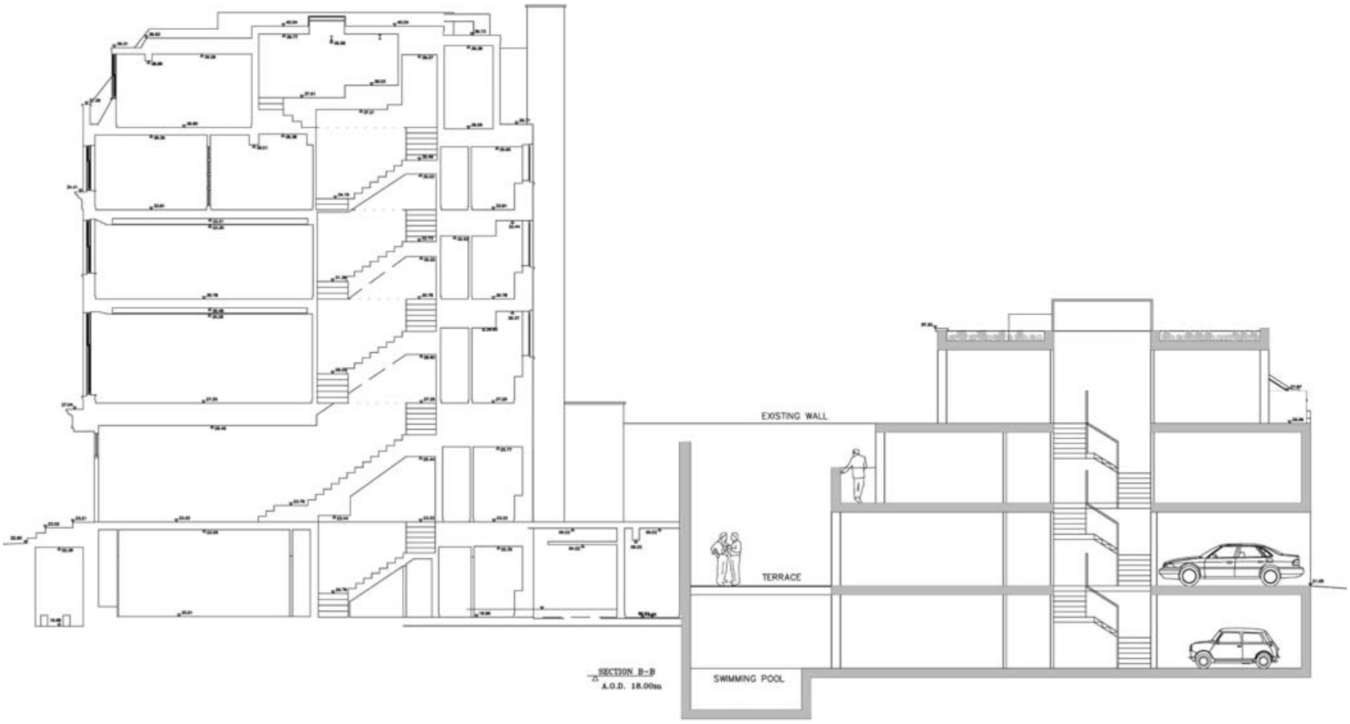
The main terraced brick building to 6 John Street is to be retained as is. The two storey building occupying the central part of the site between John Street and King's Mews is to be demolished. A new building is to be constructed, occupying both the plot of land directly adjacent to King's Mews and the central portion of the site between John Street and King's Mews.

The new proposed building will comprise a single, private residence. It will have a lower ground floor (basement) level, the floor level for which will be some 2.0m below the floor level of the existing lower ground floor to 6 John Street (and some 3.0m below the King's Mews street level). It will have a further three above ground storeys fronting onto King's Mews.

The lower ground floor level to the new property will incorporate a small swimming pool, located towards the centre of the site.



Existing cross-section through long axis of site (John Street on left)



Proposed cross-section through long axis of site (John Street on left)

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6.0 BASEMENT CONSTRUCTION METHODOLOGY

6.1 Foundation Strategy – Preferred Option

This section should be read with reference to section 8.0 of the report, **Geotechnical and Environmental Associates; Desk Study and Basement Impact Assessment Report: Rear of 6 John Street, London, WC1N 2ES; October 2012**. This section outlines the possible foundation and retaining wall strategies that could be used on the site.

It is proposed that the walls to the full perimeter of the site should be underpinned, most likely using mass concrete in the main, to facilitate the party wall awards. These concrete pins will extend to the natural Lynch Hill Gravel, thereby transferring the existing wall loads, and eventually the added loads from the new property, directly into natural ground. Mass concrete strip footings will be utilised within the new building footprint to support new wall and column loads, again taken down on to the Lynch Hill Gravel. It is noted that the Lynch Hill Gravel is observed to be a capable bearing stratum in the above GEA report, offering an allowable bearing pressure of 150kN/m^2 (limited to ensure settlements are of negligible magnitude).

At this stage, it has been assumed that a suspended reinforced concrete slab, cast onto a void former, will be required at basement floor level, thereby allowing for heave effects, and with the slab designed for uplift resulting from a future high groundwater case. However, a further heave analysis will be undertaken during the detailed design stage to ascertain whether it is possible to employ a reinforced groundbearing slab.

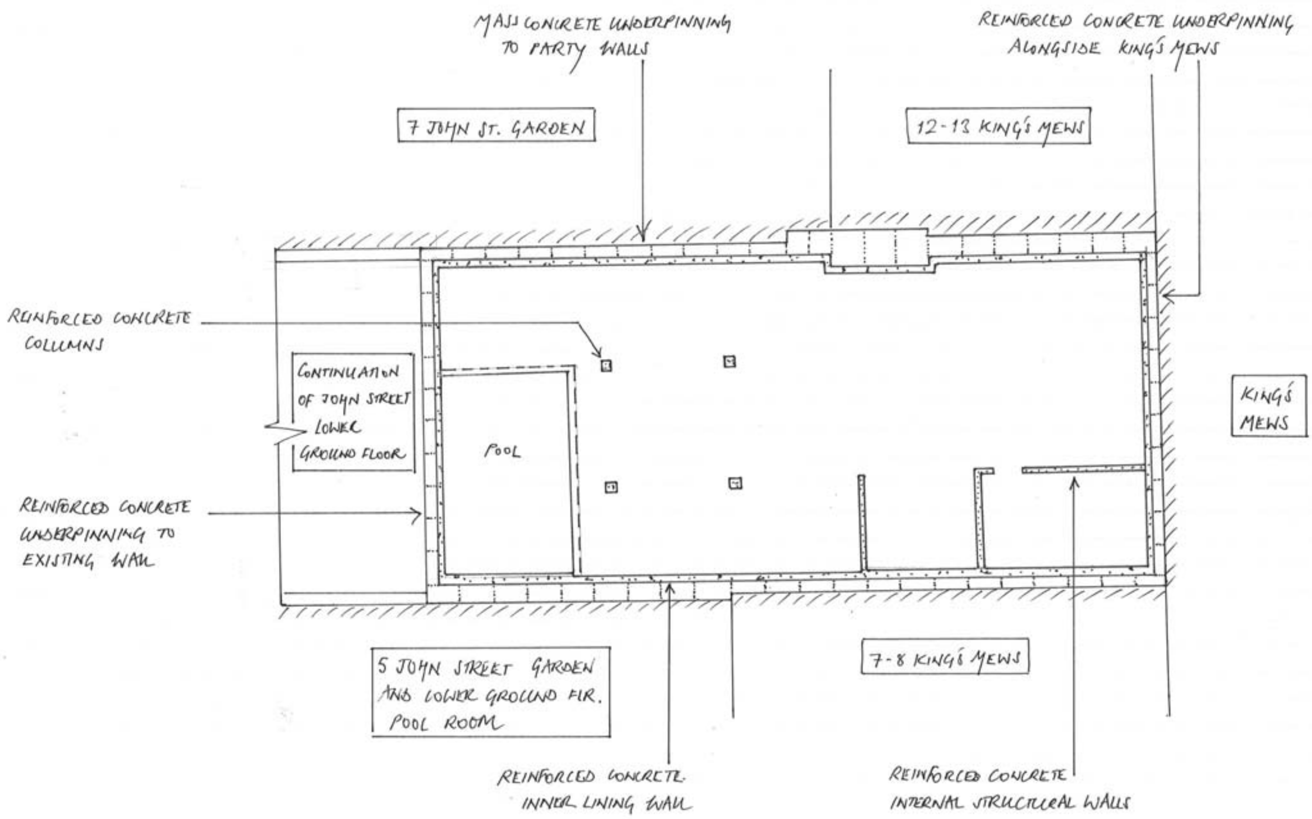
The perimeter walls to the basement level will comprise reinforced concrete, designed in general to act as propped retaining walls (propped by the upper ground floor level slab) in the permanent condition. In local cases where there is to be no ground floor level slab (at the car lift and stair for example), these walls will be designed to cantilever off the basement level slab.

The waterproofing strategy for the basement will employ a drained cavity system, most likely in combination with either tanking to the perimeter walls, or the use of a waterproof additive in the concrete perimeter walls and basement slab.

The upper ground floor will also comprise a reinforced concrete slab, supported on the perimeter concrete walls and on some internal loadbearing (concrete) elements.

There is a possibility that the proposed underpinning will need to extend below the existing groundwater level. This is to be further investigated during the detailed stage via further groundwater monitoring, and additional window sampling to verify the depth at which the Lynch Hill Gravel stratum occurs. The single borehole undertaken on the proposed site indicates that the gravels are at a depth of 4.8m from the King’s Mews roadway level, but it is anticipated that this may be a case specific to where the borehole was undertaken as the boreholes carried out on adjacent sites located the gravel stratum at shallower depths. Since it is highly plausible that the groundwater is typically perched on top of the underlying clays, it may well be that there is a small depth of dig required below the groundwater level to get to the gravels. The intention therefore will be to undertake a series of trial digs for the underpins at the commencement of the construction works, and to pump out any groundwater encountered. At this point, the time taken for the groundwater to return will be measured, and this will confirm whether underpinning to the depth required is viable. Although the excavations for the underpinning will be laterally propped at all times, as described below, these trial digs will also provide confirmation that the shallow soils are sufficiently cohesive, and not so collapsible as to prevent a safe, and structurally stable, process of underpinning. Of specific consideration will be the verification that, in excavating for each underpin, the loss or movement of soils from the sides and back of the pit can be minimised such that there would be negligible scope for settlement of the existing walls in the temporary condition.

Providing the trial pinning described above show favourable results, an underpinning methodology will be adopted as described below (in 6.2), and the final lower ground floor structure will be as outlined above. If, however, the trial pinning does not provide total confidence that this methodology is safe and viable then an alternative foundation strategy and construction methodology will be employed. This alternative approach is summarised in section 6.3 below.



Proposed basement structural plan

6.2 Construction Methodology – Preferred Option

To demonstrate the proposed construction methodology for the basement, it is best to consider two separate cases. The first of these cases applies to the central portion of the site, where the structure is bounded to either side by gardens/terraces (in the case of the southern site, with the terrace constructed over a lower ground floor level). The second case applies to the rear portion of the site, adjacent to King's Mews, where there are domestic scale properties to each side, neither of which has an existing lower ground floor. In practice, the construction works for the two cases will be being carried out simultaneously.

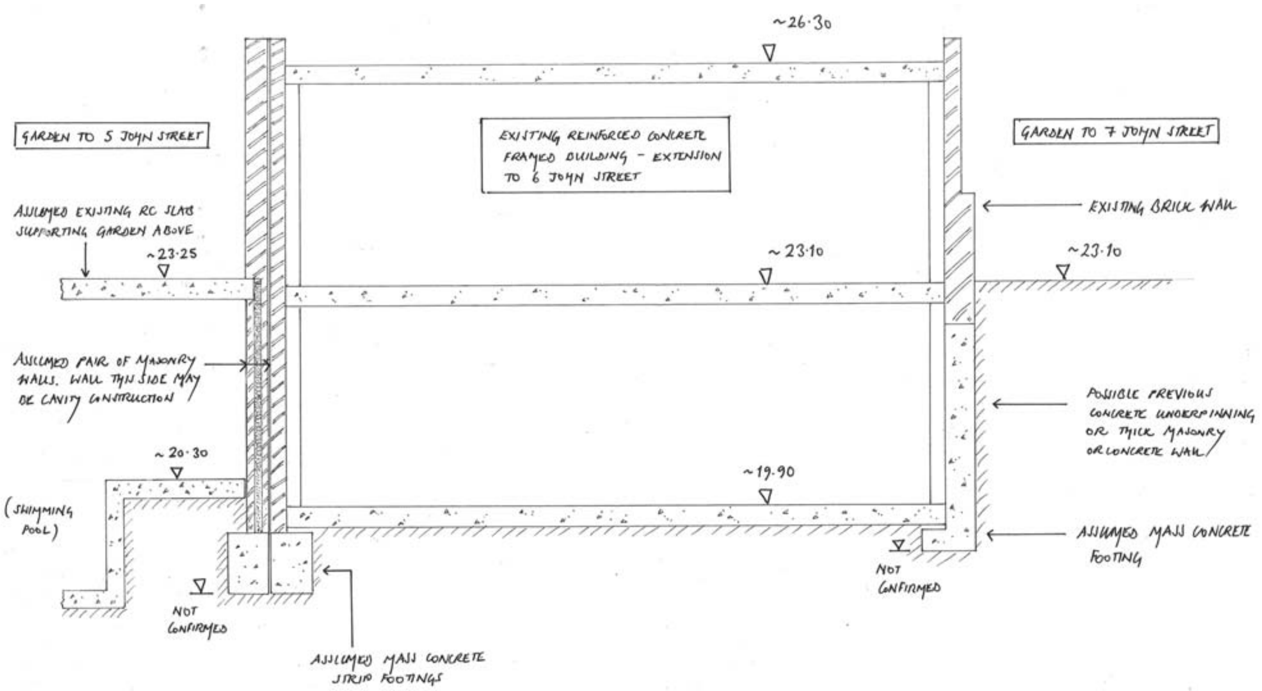
In each case, the underpinning itself is to be undertaken in a conventional hit and miss sequence, with the pins being taken down to the natural gravels. It is hoped that this process can be carried out in a single underpinning lift, but if the gravels are deep, underpinning in two lifts could be considered. The back of the excavation for each pin will be lined with trench sheeting and the excavations will be laterally propped throughout. If necessary, jet grouting will be employed to stabilise the ground locally. Any groundwater will be pumped out of each excavation before each pin is cast.

Basement Construction Methodology for Central Portion (West Side) of Site

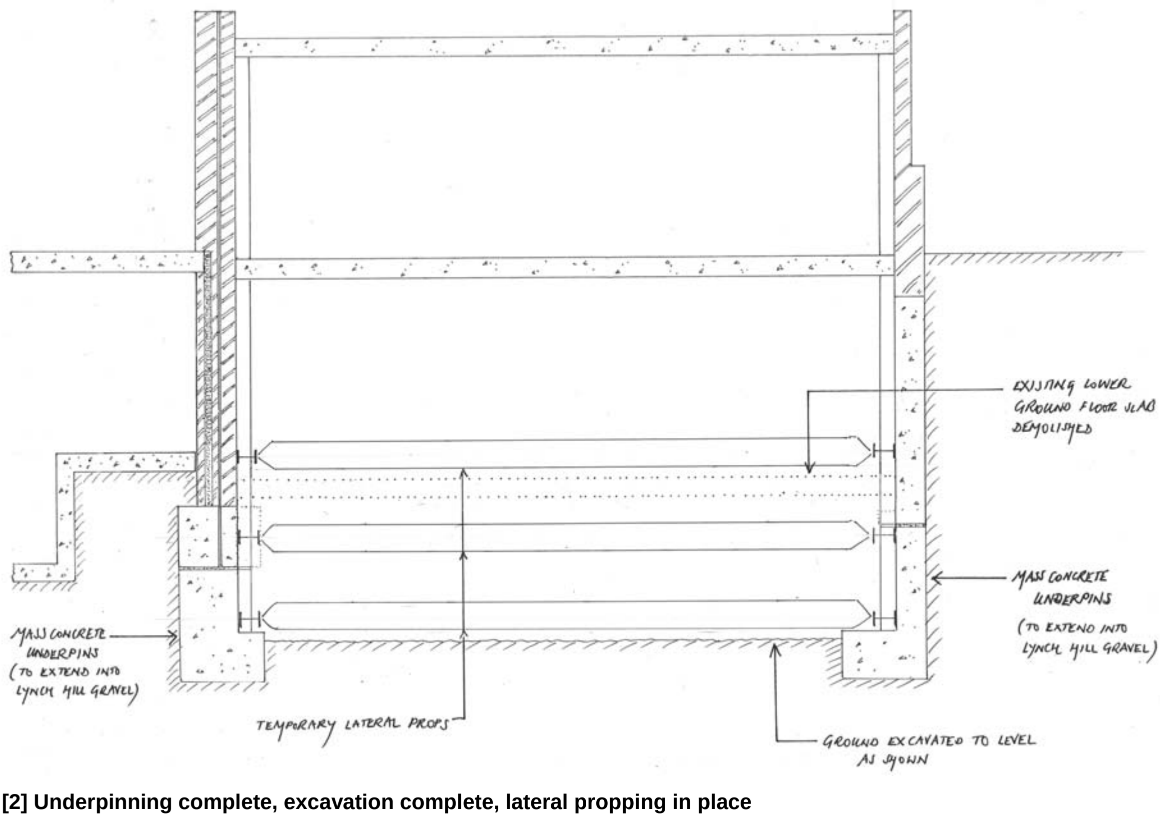
Refer to the diagrams overleaf showing the construction sequence.

The construction sequence can be summarised thus:

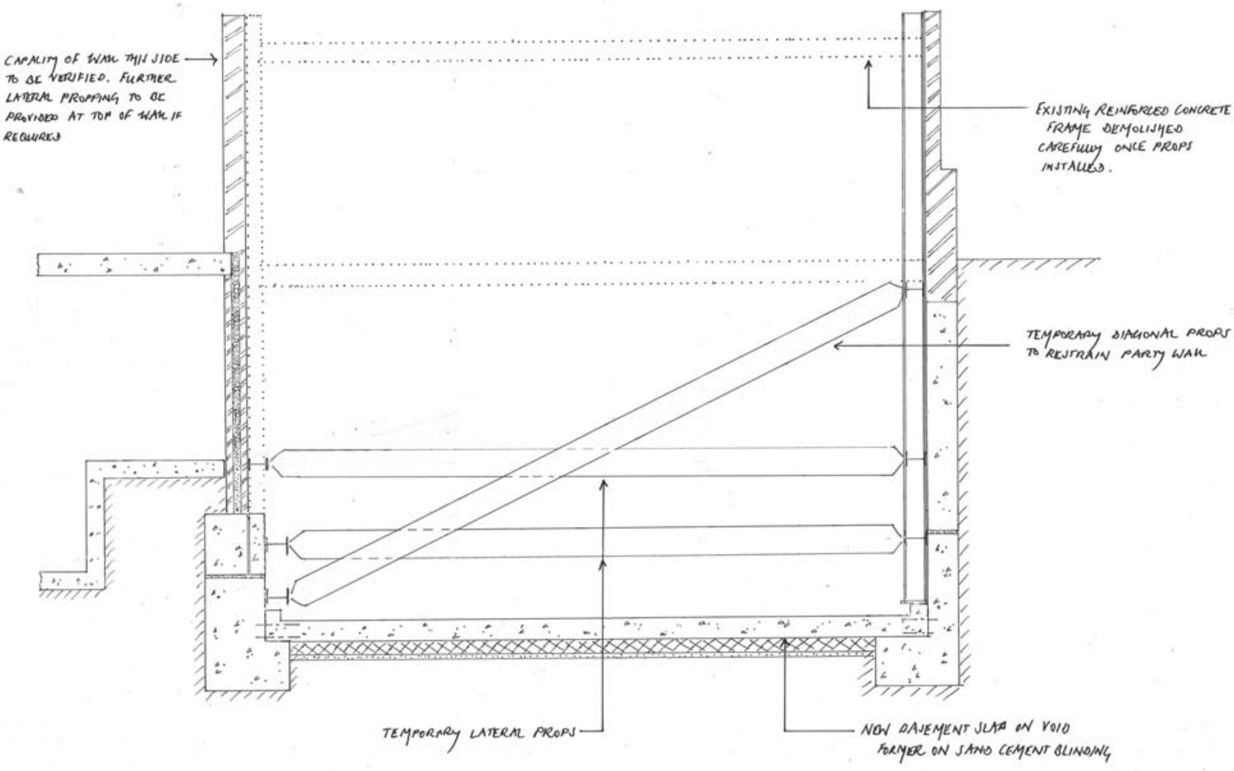
- Install low level lateral props running between party walls, just above existing lower ground floor slab level.
- Carefully demolish lower ground floor slab.
- Underpin perimeter walls in conventional hit and miss sequence, typically using mass concrete pins (reinforced concrete pins to be utilised on west side of site adjacent to the rear of the John Street property). Backfill after each underpin cast and packed.
- Excavate basement with small digger, installing lateral props at lower level as excavation proceeds.
- Excavate for and cast shallow footings within basement level footprint.
- Cast new basement level slab on void former on blinding, including swimming pool reinforced concrete base slab and walls.
- Install diagonal props from south side pins up to upper ground floor level on north side of plot, thereby mobilising passive earth pressure on south side of site against active earth pressure from garden on north side.
- Carefully demolish existing reinforced concrete frame structure and associated walls, leaving party wall / neighbour's wall in place.
- Cast perimeter reinforced concrete walls to basement level, retaining lateral props at upper ground floor slab level.
- Shutter up and cast upper ground floor level slab, leaving diagonal props to north garden in situ.
- Cast reinforced concrete retaining wall to upper ground floor level on north side of property. This to act as cantilevering wall in temporary condition.
- Remove diagonal props.



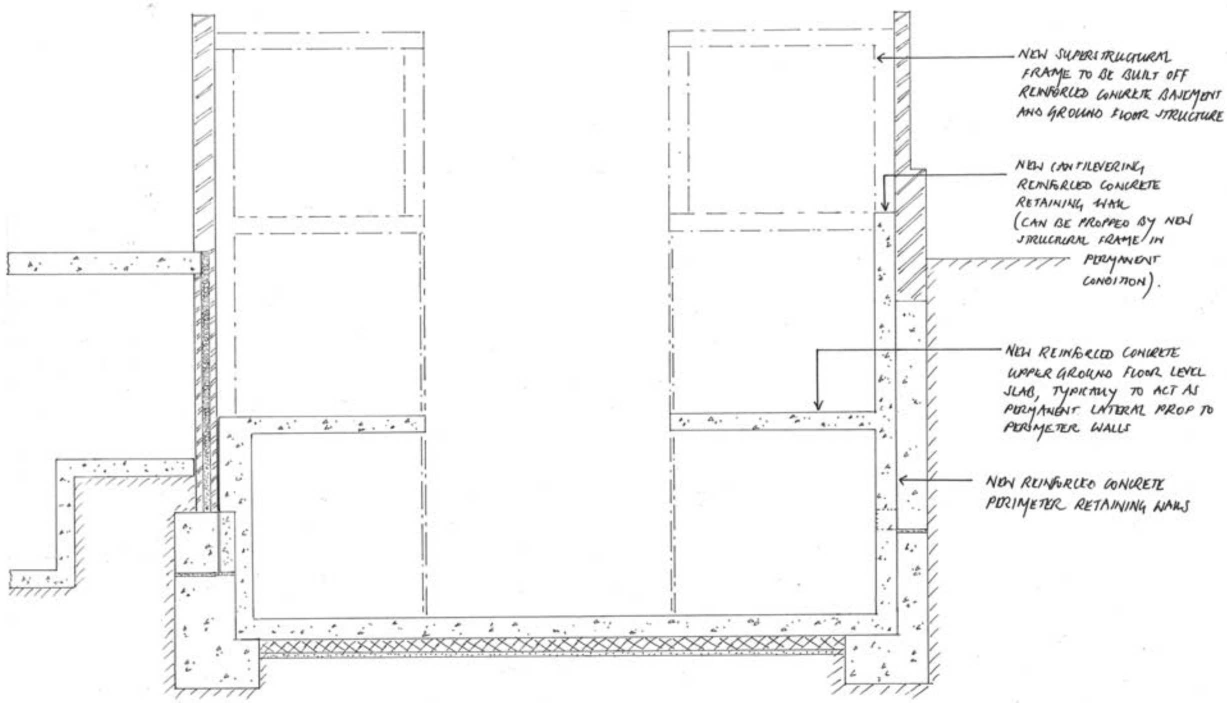
[1] Existing configuration



[2] Underpinning complete, excavation complete, lateral propping in place



[3] Perimeter walls laterally propped; existing RC frame demolished



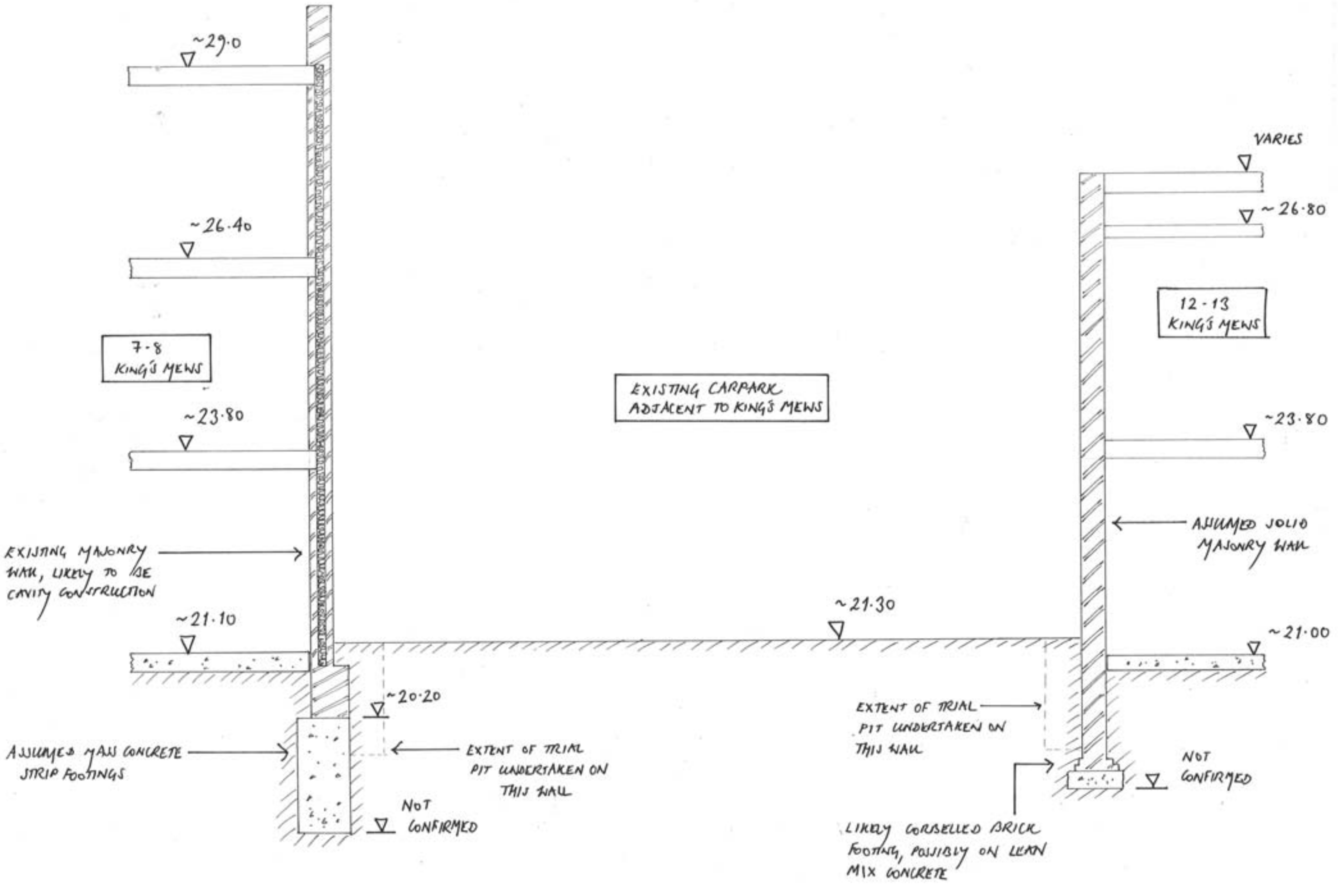
[4] Substructure works complete

Basement Construction Methodology for Rear Portion (East Side) of Site

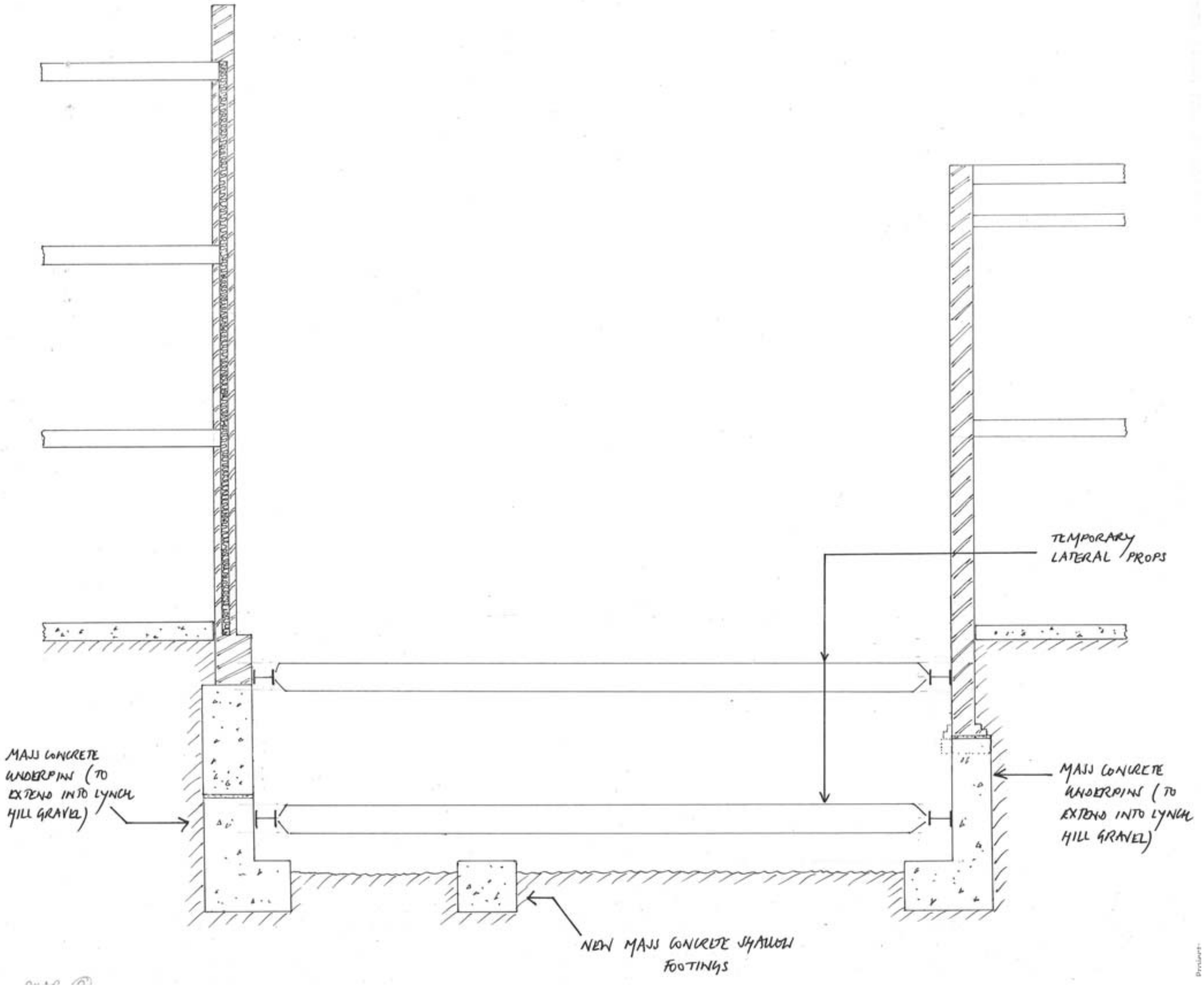
Refer to the diagrams below showing the construction sequence.

The construction sequence can be summarised thus:

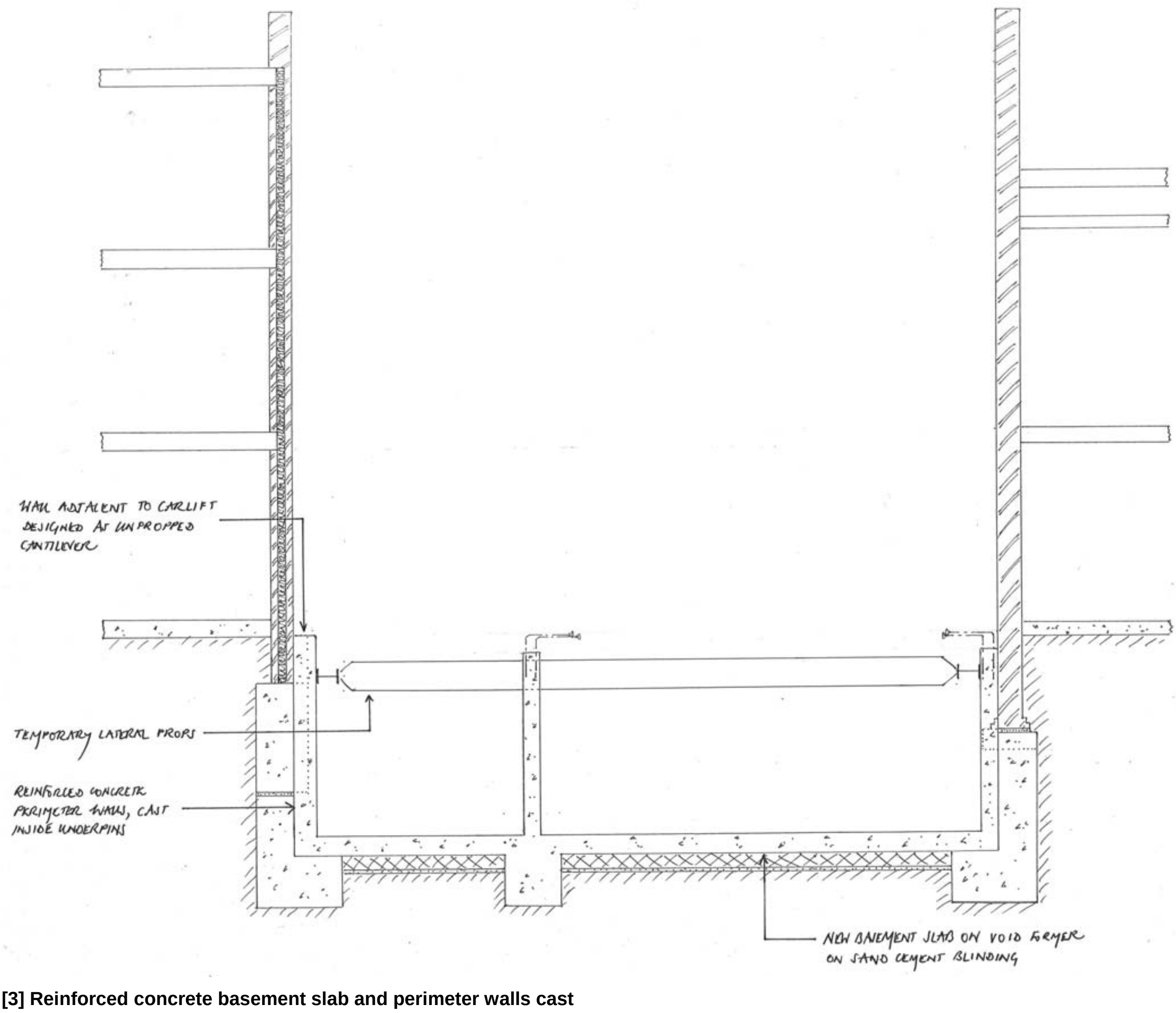
- Underpin perimeter wall in conventional hit and miss sequence, typically using mass concrete pins (reinforced concrete pins to be employed on east side of site, running adjacent to King's Mews). Backfill after each underpin cast and packed.
- Install low level lateral props running between party walls, just above existing ground level.
- Excavate basement with small digger, installing lateral props at lower level as excavation proceeds (including diagonal props to underpins adjacent to King's Mews).
- Excavate for and cast shallow footings within basement level footprint.
- Cast new basement level slab on void former on blinding.
- Cast perimeter reinforced concrete walls to basement level, retaining lateral props at upper ground floor slab level. (Note retaining wall by carpit will be designed to act as cantilevering retaining wall as this wall is not propped by the upper ground floor slab in the permanent condition).
- Shutter up and cast upper ground floor level slab.
- Remove remaining lateral props.



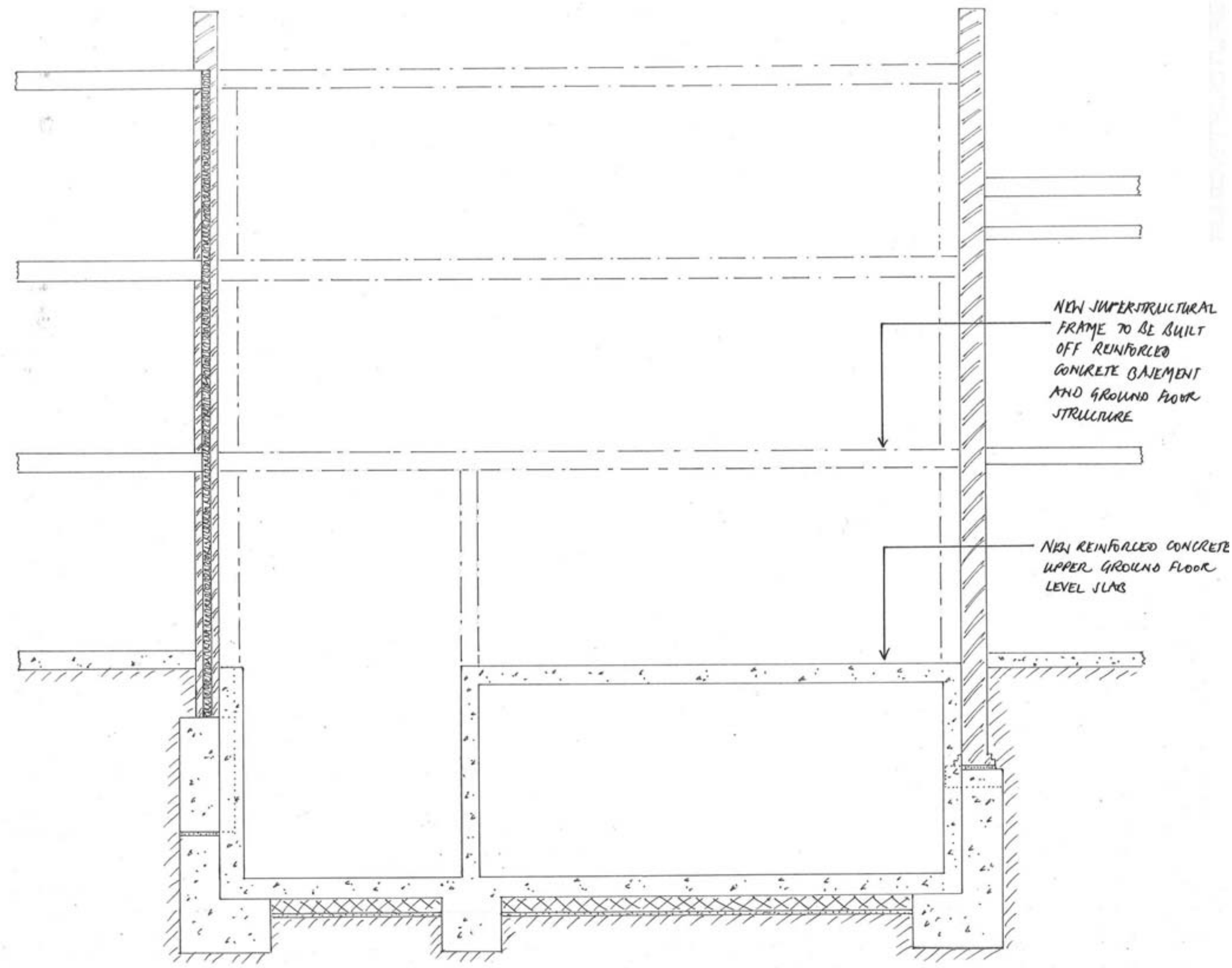
[1] Existing configuration



[2] Underpinning complete, excavation complete, lateral propping in place



[3] Reinforced concrete basement slab and perimeter walls cast



[4] Substructure works complete

6.3 Foundation Strategy and Construction Methodology – Alternative Option

Should it be determined via trial underpins that underpinning is not an appropriate option, the recommended alternative will be to form the perimeter walls to the basement with contiguous piled walls, installed within the existing boundary walls to the site. These piles will be continuous flight augured mini piles, installed with a small rig and using guide walls to minimise the distance from the existing boundary wall faces to the centreline of the piles. (Note if it is found during the trial underpinning that the groundwater is very high and the soil very free-draining then the use of a secant piled wall will be contemplated in lieu of a contiguous piled wall).

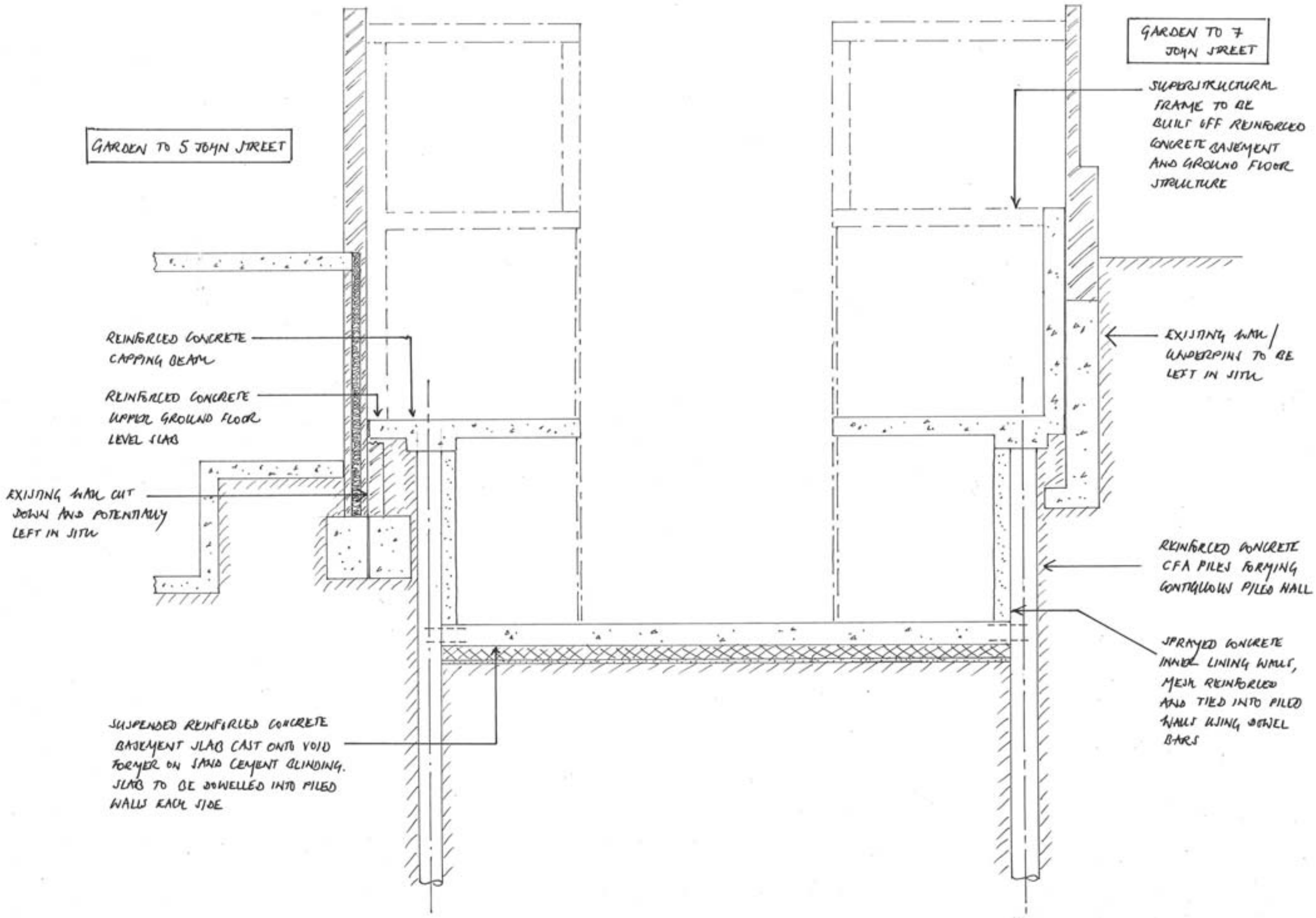
Piles will also be installed as foundations within the basement footprint (with these to be broken out down to basement level as excavation of the basement proceeds).

A capping beam will be cast on top of the piled walls, and this will be laterally propped whilst the basement is excavated, thereby allowing the piles to act as propped cantilever retaining walls in the temporary condition. Any groundwater will be pumped out as the excavation proceeds.

After excavation, the basement will essentially be constructed as a reinforced concrete 'box' (basement slab, sprayed concrete basement walls and ground floor slab) sitting inside the contiguous piled walls, and supported on the perimeter piles, and the internal piles, as permanent foundations. In the permanent condition, the contiguous piled walls can continue to act to retain the soil and surcharge pressures acting behind the walls. The sprayed concrete walls will be mesh reinforced and tied back into the piles via dowel bars at regular centres. They will be designed to span between piles under the worst case groundwater pressure arising from a future high groundwater event. In cases where there is no upper ground floor level slab (for example at the car pit and stair void), a shuttered concrete wall, cast in front of the piled wall, may be employed, designed to sustain the worst case soil and groundwater pressures as a vertical cantilever in the permanent case.

Again, waterproofing of the basement will be by means of a drained cavity system, in combination with either tanking to the perimeter walls, or the use of a waterproof additive in the concrete perimeter walls and basement slab.

This approach offers the advantage that retaining walls can essentially be installed before any excavation takes place. By propping at the head of the piles, and by employing piles with sufficient stiffness in themselves, during the subsequent excavation, there is minimal scope for lateral movement of the soil behind the piles at any level. Hence this methodology safeguards the stability of the surrounding properties very effectively, providing the piles and lateral propping are competently designed.



Typical cross-section (taken through central portion of site) show alternative piling option

Again, the basement construction methodology is best considered in terms of two cases: the central portion of the site and the rear (King's Mews) side of the site.

The construction sequence for the central (west side) portion of the site can be summarised thus:

- Install low level lateral props running between party walls, just above existing lower ground floor slab level.
- Carefully demolish lower ground floor slab.
- Lay granular fill across site and compact to form piling mat.
- Install concrete guide walls for piling rig.
- Install contiguous piled wall inside perimeter walls using low headroom mini-piling rig, sequentially moving lateral props as piling proceeds.
- Install piles, where required, within basement footprint.
- Break down heads of piles and cast reinforced concrete capping beam on top of piled wall.
- Excavate to depth of capping beam and install lateral props running between capping beams.
- Excavate basement with small digger, pumping out any groundwater encountered. Break out internal piles during excavation works, down to eventual basement level.

- Cast new basement level slab on void former on blinding. Slab to be dowelled into piled walls to each side.
- Install diagonal props from south side capping beam up to upper ground floor level on north side of plot.
- Carefully demolish existing reinforced concrete frame structure and associated walls, leaving party wall / neighbour's wall in place.
- Install dowels and mesh reinforcement and construct sprayed concrete wall in front of piles.
- Shutter up and cast upper ground floor level slab, leaving diagonal props to north garden in situ.
- Cast reinforced concrete retaining wall to upper ground floor level on north side of property. This to act as cantilevering wall in temporary condition.
- Remove diagonal props.

The construction sequence for the rear (east side) portion of the site can be summarised thus:

- Break out existing carpark slab, lay granular fill across site and compact to form piling mat.
- Install concrete guide walls for piling rig.
- Install contiguous piled wall inside perimeter walls.
- Install piles, where required, within basement footprint.
- Break down heads of piles and cast reinforced concrete capping beam on top of piled wall.
- Excavate to depth of capping beam and install lateral props running between capping beams.
- Excavate basement with small digger, pumping out any groundwater encountered. Break out internal piles during excavation works, down to eventual basement level.
- Cast new basement level slab on void former on blinding. Slab to be dowelled into piled walls to each side.
- Install dowels and mesh reinforcement and construct sprayed concrete wall in front of piles.
- Shutter up and cast upper ground floor level slab.
- Remove remaining lateral props.

7.0 SUPERSTRUCTURE CONSTRUCTION METHODOLOGY

The superstructure to the proposed new property will be a framed structure, most likely constructed in steelwork, though the use of reinforced concrete will also be considered, in light of its extensive employment at basement level. The columns to the structural frame will sit inside the party walls, thereby avoiding any substantial increase in the load acting directly on the party walls.

The new upper floor structures will comprise one of the following:

- Primary steel beams supporting secondary timber joists with plywood overlaid.
- Primary steel beams supporting secondary steel beams, in turn supporting a shallow concrete slab cast onto metal deck as permanent formwork.
- Reinforced concrete beams supporting concrete solid slabs.

Stability of the new structural frame will rely on the use of the above floor structures as diaphragms to transfer lateral loads out to shear walls. On the longitudinal (east-west) axis, the existing party walls will be employed as shear walls. On the north-west axis, a limited number of walls (for example to either side of the stair core) will be cross braced throughout their full height so that they may act as shear walls.

8.0 CONCLUSIONS

8.1 A Basement Impact Assessment has been undertaken by Geotechnical and Environmental Associates, and this should be read carefully alongside this report. The Basement Impact Assessment concludes that:

- The site is underlain by an aquifer, and the basement will most probably encounter the groundwater table. However, the basement will not form a significant barrier to groundwater flow and therefore will not have an adverse effect on the local hydrogeology.
- The site is within 5m of a highway (King's Mews). However, providing the basement walls are appropriately designed and propped, the excavation for the basement will not have an adverse effect on the stability of the highway.
- The basement will increase the differential depth of the foundations relative to neighbouring properties. However, providing the basement is designed and constructed in accordance with best practice, there is no reason for the excavation of the basement to cause instability of the surrounding structures.

8.2 The Site Investigation has determined that the typical ground strata on the site comprise Made Ground, to a depth of up to 4.8m below ground level, overlying Lynch Hill Gravel, to a typical depth of 6.1m below ground level, overlying London Clay. The equilibrium groundwater level has not necessarily been confirmed but initial groundwater monitoring indicated a groundwater level of approximately 3.5m below ground level. The trial pits undertaken to date, coupled with the knowledge of the existing ground levels at the property and in the adjacent properties, indicates that the walls bounding the site are typically supported on strip foundations which may well terminate in the existing Made Ground.

8.3 In light of the above, the recommended basement construction method is to underpin the perimeter walls, extending down into the gravels; to laterally prop the perimeter walls before excavating the basement (installing further lateral props during excavation); and then to construct a reinforced concrete basement slab, basement walls and ground floor level slab, thus forming a rigid concrete box inside the perimeter walls. This approach will minimise the scope for movement of the surrounding soils and the adjacent structures at every stage.

8.4 The ground conditions are not considered ideal for the above approach given the depth of the gravels and the relatively shallow groundwater. It is therefore recommended that measures be undertaken in advance to confirm the viability of the above construction method. These will include further groundwater monitoring, additional window sampling, and trial underpinning. In the event that these measures show underpinning not to be a suitable approach, an alternative basement construction method will be employed, utilising contiguous piled walls installed inside the site boundary walls.

8.5 It is observed that the approach described in 8.4 has been proposed so as to ensure that the right basement construction methodology is selected, with the foremost objective of minimising movement of the soils surrounding the site during the works, and thereby safeguarding the stability of the surrounding structures at all stages.