15 December 2014

Addendum to MBP 'Outline Construction Methodology & Basement Impact Assessment' for 74 Charlotte Street, W1, London

This document will serve as an official amendment to the Structural Engineer's Report - 'Outline Construction Methodology and Basement Impact Assessment' prepared in February 2012 by Michael Barclay Partnership.
Purpose of this document is to support application for planning consent for revised scheme for redevelopment of 74 Charlotte Street, London.

The following comments are hereby added to the report:

The report is to support application for planning consent submitted by Kahuna Limited for revised scheme for redevelopment of 74 Charlotte Street, London.

All information included in the report dated December 2012 is valid and applicable to the revised scheme.

Yours sincerely,

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STRUCTURAL ENGINEER'S REPORT
Outline Construction Methodology & Basement Impact Assessment

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MBP

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Version	Issue	Date	By
v.1	For planning submission	16.02.12	NP

1.0 TERMS OF REFERENCE

The report is in support of the application for planning consent submitted by *KCB Geotechnics SND BHD*.

2.0 INTRODUCTION

General
Michael Barclay Partnership LLP (MBP) has been appointed by *KCB Geotechnics SND BHD* to act as consulting structural engineers on the redevelopment of 74 Charlotte Street.

The report outlines the structural implications of the development proposals. Its principal purpose is to address the concerns of the Planning Authority in respect of the practicality of executing the works and the impact of the structural proposals on the neighbouring buildings. In particular it addresses potential impacts associated with the proposal to reduce the level of the existing basement.

Impact of basement works
With respect to the basement, reference was made to *Camden Planning Guidance Note 4 (CPG 4)* and London Borough of Camden, *Camden geological, hydrogeological and hydrological study – Guidance for subterranean development*; Report prepared by Arup; 2010, in preparing this report. Preliminary consultations were also made with the borough's planning department, through CBRE.

Screening
The *Screening* process is presented in sections 3 and 4. No significant risks were identified in respect of geology and hydrogeology.

Scoping
However as part of the *Scoping* the need for site specific geotechnical information for the design of the proposed development's substructure and information on the foundations of adjacent structures was identified. This is covered under section 4.3.

Assessment of impact
The *impact assessment* follows the process suggested in the flow charts in *CPG 4* and the *Camden geological, hydrogeological and hydrological study*. The relevant issues are identified and addressed.

No adverse impacts are identified in respect of hydrology and hydrogeology. Land stability is shown to not be an issue.

The principal impact is shown to relate to measures necessary to safeguard the stability of neighbouring structures during construction of the works. Proposals for ensuring that the neighbouring properties will not be adversely impacted on are presented in sections 6 and 7.

Façade retention
Sections 6 and 7 also show the measures proposed to safeguard and retain the façade.

3.0 DEVELOPMENT PROPOSALS

The proposal is to redevelop the site to provide restaurant facilities at ground floor and the basement and residential accommodation on the upper levels. To do so it is proposed that new building is constructed behind the existing façade on Charlotte Street. The remainder of the existing building would be demolished, with the exception of the party wall between 72 and 74 Charlotte Street. The party wall between 74 and 74a, is no longer used by 74a and would therefore be demolished during construction. A new liner wall would however be reinstated for the permanent condition.

The new development is planned as 5 floors above basement at the front, facing Charlotte Street, but stepping down to 2 storeys, with a mansard roof set back, above the basement towards Charlotte Mews.

To be able to accommodate a restaurant in the basement, its level needs to be reduced from the existing condition. The proposed reduction in the finished floor level is nominal – 200mm.

4.0 THE SITE

4.1 LOCATION, BUILDINGS AND ACCESS

The site is located in a terrace of buildings on the east side of Charlotte Street extending to Charlotte Mews at the rear.

It is currently occupied by an 18c building which has 3 storeys above ground floor and faces Charlotte Street. The building has been much altered and has an addition at the back which been extends it to the Mews. A single storey basement extends the full depth of the site.

On the northern boundary there is a 20c development – number 74a Charlotte Street. This has 7 storeys above a basement facing Charlotte Street with an extension which has 2 storeys above ground floor at the rear facing Charlotte Mews. The rear extension has a basement over part of its footprint. Number 74a is a reinforced concrete framed building. It has been built independently of the existing 18c party wall.

On the southern boundary the building shares a party wall with number 72 Charlotte Street, which is also an 18c building, listed Grade II. The mews building at the rear of number 72 dates to a later period. The wall on the boundary to the mews property appears to be a party structure, but its status is subject to confirmation.

Access to the site is from Charlotte Street and Charlotte Mews. The latter is entered through wide passages at either end of the mews that pass under existing buildings. The heights of the passages appear sufficient to allow access by concrete lorries and muck-away trucks.

4.2 HISTORICAL BACKGROUND, GEOLOGICAL & HYDROGEOLOGICAL DESK STUDY

Charlotte Street runs from Percy Street to Howland Street, south to north. John Rocque's map of 1746 shows that development had started on Tottenham Court Road, which lies to the east of Charlotte Street and at its southern fringes around Rathbone Place. At that time the area around Charlotte Street is shown as fields and orchards. A waterworks is shown at the top of Rathbone Place and there are what might perhaps be small ponds in various locations.

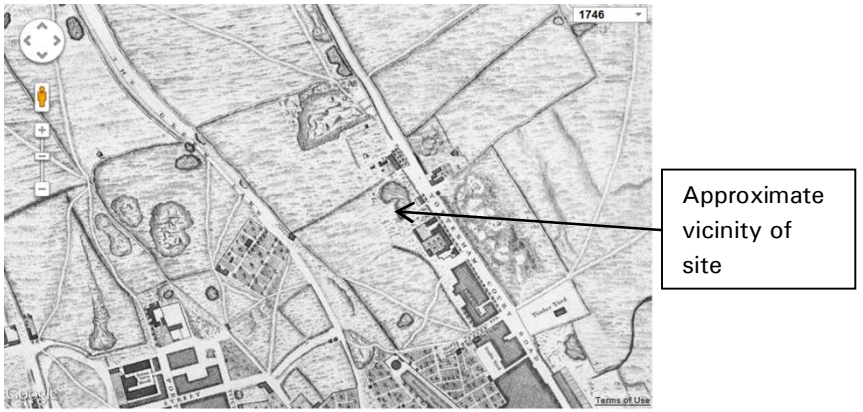


Figure 1: John Rocque 1746 [4]

The Survey of London says that development had started on the west side of Charlotte Street in 1766. By 1869 the street pattern we see today was more or less in place.

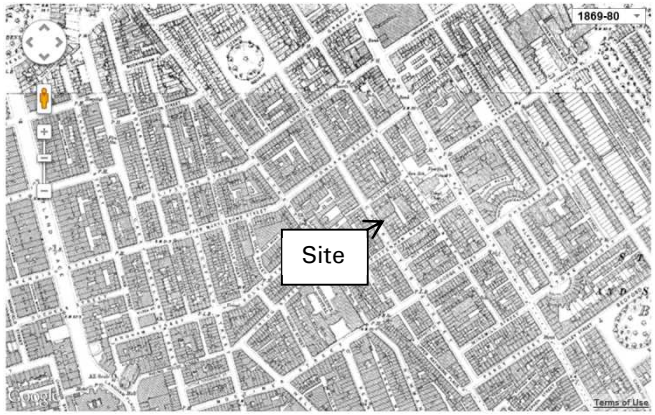


Figure 2: Ordnance Survey 1869 [4]

The London County Council Bomb Maps show that both 74 and 72 Charlotte Street suffered "serious damage".

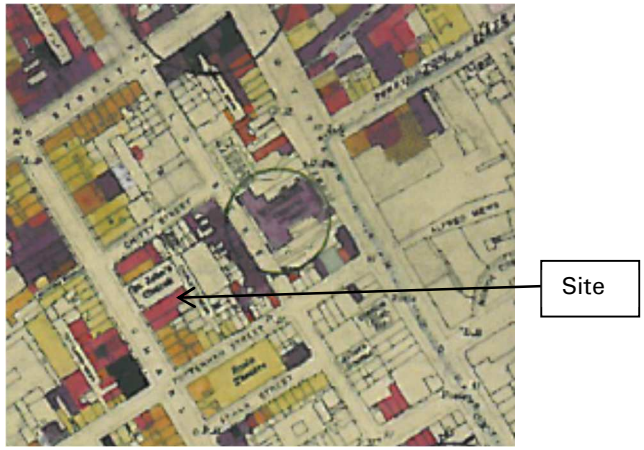


Figure 3: London County Council Bomb Map [5]

No references are made in the *Lost Rivers of London* to any streams in the vicinity of the site. However the map shows the top of Tottenham Court Road as the source of a tributary of the Fleet.

No streams or watercourses are shown on any of the historical maps we consulted, but the presence of ponds in the vicinity is noted.

Figure 4: Extract from "Lost Rivers of London" [6]

The Geological Survey shows the area underlain by Terrace Gravels overlying the London Clay. This general stratification was confirmed by borehole logs on the BGS website and by reference to site investigation data from our own database for the area – a cluster of sites around Great Titchfield Street and sites along Gower Street – all of which are within 0.5 to 1km from the site.

London Borough of Camden, *Camden geological, hydrogeological and hydrological study – Guidance for subterranean development*; Report prepared by Arup; 2010, was consulted. The report also confirms this general stratification:

"In the south of the Borough (approximately south of Euston Road) River Terrace Deposits are found at the surface."

A part of Figure 6 from that document, which shows contours of the thickness of River Terrace Deposits, in the vicinity of the site, is reproduced here as Figure 5. The approximate location of the site is shown on the diagram.

There are two main aquifers in this area. However as reference 2 states, "for basements in the Borough, the Upper Aquifer is most relevant". This comprises the groundwater in the River Terrace Deposits and gravelly soils that overlie the London Clay.

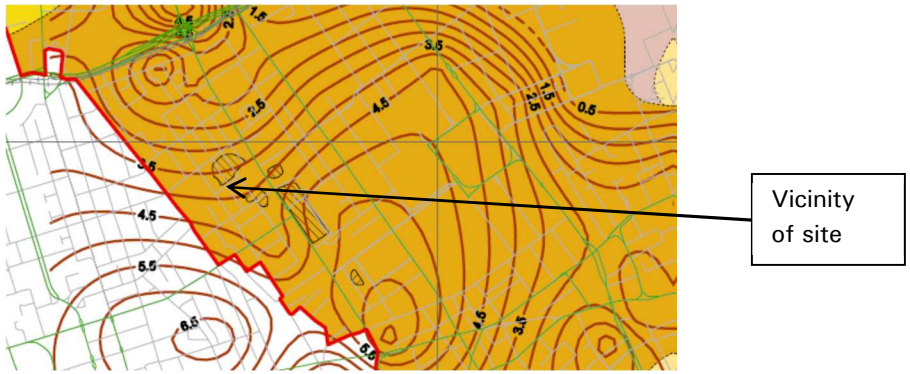


Figure 5: Contours of Terrace Gravels, extract from reference 2

4.3 GROUND CONDITIONS

A specific ground investigation was planned and commissioned on behalf of the client. The investigation was carried out by RSK and the fieldwork was done in January 2012. A report of the detailed findings is in progress and has yet to be issued. The following is therefore based on our own observations during the fieldwork and on verbal reports from RSK.

The investigation comprised several observation pits and 3 boreholes. A standpipe was installed in one borehole to measure any water on the site.

The observation pits were specified to find out the geometry and bearing stratum of the foundations to the existing building. Boreholes were specified to ascertain the stratification to depth and assess the water regime at the site.

The broad stratification found below the basement was made ground overlying the London Clay. At the upper levels directly underlying the basement and party wall foundations, the made ground comprised a brown granular material with abundant brick debris. The material was variably cemented. Beneath this the made ground was reported by RSK generally, black organic sands and clays/silts, with brick and clay tile fragments and other evidence of human activity. The London Clay was found at approximately 5.6m below the basement level, which corresponds to approximately 8.2m below Charlotte Street pavement level.

As noted above existing foundations were found to be bearing on the made ground. The party walls on both sides comprised simple corbelled brick footings, founded approximately 400mm below the basement level. There was some evidence that the ground beneath the corbelled footing had been locally cemented to form weak concrete footings to the brick corbel foundations.

At the front of the building, at the corner of 74 and 72 Charlotte Street, a large concrete base approximately 1m deep was found in the basement. This was perhaps installed as a form of underpinning, although we saw no signs of any unusually large settlement or any particular past distress to that part of the property.

Water was found in all the observation pits and in the boreholes. RSK reported some local variation in the water level found. In general the water level encountered is reported as varying between approximately 0.8m and 1.4m below the deepest section of the existing basement. The water is reported as extending down to the London Clay.

A pump test was carried out to measure the permeability of the soil – the borehole was pumped dry and the inflow of water measured. The water is reported to have taken approximately 1.5 hours to come back up to its previous level. RSK say that the permeability is of the order of 1×10^{-6} m/s. A fairly low

permeability and poor drainage characteristics, typical of silts/silty sands/stratified clays. Although there is no direct correlation between the ponds shown on the maps and the location of the site, the fill material found is suggestive of some form of pond fill.

5.0 IMPACT OF BASEMENT PROPOSALS

Surface flow and flood screening

The following observations are made:

- The site is not within the catchment of the pond chains at Hampstead Heath.
- The Building Services Engineers have advised that the proposed site drainage is not expected to be materially changed from the existing route.
- The development occupies the same footprint as the existing structures on the site and no net change in hard surfaced/paved areas is expected.
- The Building Services Engineers have advised that no adverse impact on surface water flows are expected.
- The site is not in a known area of risk from flooding and does not appear in the list of streets referred to in London Borough of Camden's (LBC) planning guidance note *CPG4*.

Subterranean flow

The findings on this site are unusual for the broader area south of Euston Road. The deep layer of made ground above the London Clay found on this site, is not typical of the surrounding area, which is predominantly composed of Terrace Gravels with variable depths of made ground near the surface.

The level of the water table found is also unusual. The desk study and references all show the Upper Aquifer at the top of the London Clay. Its level is not expected to be more than 1 or 2 metres above the London Clay. The water found on the site is therefore thought to be a perched water table. The indications from the pump test are that the material is moderately impermeable. This seems to be supported by the general context of the ground stratification, in that the wider lateral surrounding area is expected to comprise permeable sands and gravels.

LBC's guidance report for subterranean development prepared by Arup also notes that construction of basements in this area is not considered to be particularly sensitive in terms of potential impact on hydrogeology. Notwithstanding any of this, it is proposed to avoid potential for adverse impact by ensuring that the general excavation level is maintained above the water level identified in the site investigation. It might be necessary to excavate *locally* below the water level – for example to install or renew building services. It is emphasised that these are expected to be small in scale and relatively shallow. De-watering would be expected to be local and have minimal, if any, impact on the overall site.

Stability of adjoining properties

There is no impact in terms of slope stability. The site is nominally flat and although the external ground level changes between Charlotte Street and Charlotte Mews, that has no relevance to overall stability in this context.

The proposal is to lower the current basement to approximately the same level as the basement that exists at number 74a. This building is reported as piled[1], a fact supported by the ground conditions discovered at number 74. Although its extension has no basement adjacent to the boundary, its columns are set back from the boundary. Given the ground conditions on the 74 side of the boundary it would be extremely unlikely that the conditions at the rear of 74a varied to the extent that spread foundations could be adopted and it is considered probable that the building is piled. Moreover and in any event, we consider that the setback of the 74a foundations would enable excavation to take place without undermining their footings. It is noted that the existing basement at number 74 was in place at the time the extension next door was constructed.

The party wall between 74 and 74a will be demolished and the new slab will be constructed against the existing basement of 74a.

Number 72 appears to have a basement at approximately the same level as at number 74. The excavation depth necessary to lower the basement at 74 would be slightly lower than the level of the foundations to the party wall found from the site investigation. To ensure the continued stability of the party wall it will be underpinned.

Since the London Clay is at depth and there is no intervening natural ground, the new basement slab will be piled. The edge of the slab will be cantilevered over the piles to support the party wall. Construction of the slab will be sequenced as with conventional underpinning – i.e. sections will be excavated, reinforced and cast in maximum widths of 1.5m; with no two excavations adjacent to each other.

Drawing number MBP-4127-SK120 shows a typical section across the site illustrating the structural proposal for the basement.

6.0 CONSTRUCTION METHODOLOGY, TEMPORARY WORKS ETC.

The following broad sequence of work is envisaged to ensure that the existing façade and the retained party walls are stable and the construction can take place safely. Drawings in Appendix show key stages of the proposed enabling works.

- Establish site with a temporary closure of the pavement.
- Insert a line of piles in the lightwell, preparatory to principal works – the purpose of the piles is two-fold:
    - as part of the permanent works to provide enhanced resistance to the existing pavement retaining structures and,
    - to form a firm base for temporary props during alterations to the façade.
- Back prop vault and erect a gantry over the pavement:
    - The gantry is expected to be constructed with hot-rolled steel sections, with a mixture of moment resisting connections and braced bays to ensure stability under lateral loads.
    - It will serve as a façade retention structure in the temporary construction stage condition.
    - At pavement level the gantry will be open to allow free passage beneath it.
    - The upper levels will serve as access for repairing and restoring the façade and siting cabins for site accommodation and for temporary storage.
- Using a cut-down rig, pile inside the existing shell to provide foundations for the temporary shoring and retention system required to support the party wall between 74 and 72 Charlotte Street.
- Erect retention system and commence demolition.
- Once the demolition is complete install the piling to the basement.
- Excavate the centre of the site, leaving an undisturbed strip along the perimeter to ensure that the foundations to the adjoining site boundaries are left undisturbed.
- Reinforce and cast the new basement slab in this central zone.
- Proceed to cast the perimeter strips of slab, using an underpinning sequence to ensure the continued stability of the adjoining structures.
- On completion of the basement slab, needle the façade using the new basement slab as a foundation for props, and insert steel frames to form the “shop-front” openings at basement and ground floor.
- Cast the reinforced concrete basement “liner” wall and internal columns and core walls up to ground floor. The liner walls will be cast in short lifts to ensure adjoining structures are not damaged by the lateral pressure exerted by the wet concrete.
- Construct structure level by level, progressively removing the party wall retention system at lower levels as the permanent construction is completed.
- Tie the façade to the permanent structure at each level to ensure its stability in the permanent condition.

To ensure that the adjoining party walls and the retained historic façade remain in a safe and stable condition throughout the construction work, a system for monitoring movement will be specified.

7.0 NEW PERMANENT STRUCTURE

The structure will be a framed structure with stability provided generally by reinforced concrete shear walls. Floor slabs are planned to be reinforced concrete flat slabs:

- 375mm deep raft at basement level;
- 300mm deep at ground floor;
- 250mm deep at upper levels.

Vertical structure is expected to be a mixed structure of reinforced concrete elements – walls and columns – and steel columns. Between basement and ground floor the perimeter structure comprises a reinforced concrete wall which acts to distribute and spread concentrated column loads from above down to the cantilevered edge of the basement raft.

Ground movements are expected to be small, and any resulting damage to structures in the vicinity to be very minor – category 0 to 1 as defined in Table 2.5 of CIRIA Report C580.

8.0 SUMMARY AND CONCLUSIONS

Michael Barclay Partnership has considerable experience in this kind of work. The practice has acted as consulting structural engineer on many projects in London, which have involved similar work. That work has included the formation of basements – including double basements – and adaptation of historic buildings. A number of projects have involved the retention of existing facades. Recent work in the London Borough of Camden includes *Witanhurst, Highgate West Hill*, where the Grade II* listed building is being altered and extended and a large and deep basement constructed; The refurbishment of *134-136 Gower Street* and *23 Gower Place* to form new facilities for the Student Union at UCL; *41 Elsworthy Road*, *Primrose Hill*, where the existing facades are retained, a new basement constructed and the house extended.

The structural design for the basement at 74 Charlotte Street avoids impacting on the hydrogeological conditions at the site and is designed to safeguard against adverse impact on the stability of adjoining structures.

An outline scheme for retaining the historic façade has been established. A construction methodology and sequence of work to demonstrate viability is presented.

Detailed specifications will be prepared and method statements procured to ensure that good practice is followed and that adequate supervision and monitoring is provided throughout the works.

We consider that, using current good practice in executing the works, the proposed development can be realised safely while safeguarding historic fabric and neighbouring properties.

9.0 REFERENCES

1. *Camden Planning Guidance, Basements and lightwells, CPG4*, London Borough of Camden

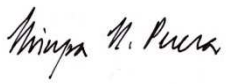
2. *Camden geological, hydrogeological and hydrological study* (prepared for and published by London Borough of Camden); Arup; London; 2010

3. *The Survey of London volume 21*; J.R. Howard Roberts & Walter H Godfrey (editors); 1949 – Online edition

4. Mapping from internal library (including A-*Z of Georgian London*; London; 1981) and websites *Locating London's Past and reference 1.*

5. *London County Council Bomb Damage Maps 1939-1945*; London Edited by Ann Saunders; London Topographical Society & London Metropolitan Archive; 2005

6. *The Lost Rivers of London*; Nicholas Barton; Historical Publications Ltd; Herts; 1982



Report prepared by Nirupa Perera BSc CEng FIStructE Date: 15.02.12

[Nirupa is a principal of Michael Barclay Partnership. He is a Fellow of the Institution of Structural Engineers, and has over 32 years of professional experience.]

Reviewed by Keith Jeremiah MSc CEng FICE MIStructE FGS Date: 15.02.12

[Keith is a consultant and former partner of Michael Barclay Partnership. He is a Fellow of the Institution of Civil Engineers, a Fellow of the Geological Society and a Member of the Institution of Structural Engineers]