

# Hardman Structural Engineers

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## Basement Impact Assessment

For

New Basement Works

To

195-199 Grays Inn Road, London

Ref. 2630

Date. 11<sup>st</sup> January 2018

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## 1 Introduction

This report references and follows the Camden Planning Guidance document entitled "Basements and Lightwells CPG4" issued on July 2015. Reference has also been made to the "Camden Geological, Hydrogeological and Hydrological Study" by Arup.

The level of assessment that has been undertaken is considered to be appropriate for the size of the project.

## 2 Screening

### 2.1 Background information

The site is currently occupied by a single storey office with no basement. A site location plan and photographs are shown in Figures 1 and 2.

There are basements to the adjoining properties No. 3-7 Mecklenburgh Street.

The front of the property is bounded by a pavement to Grays Inn Road. To the rear and sides of the property, there are garden areas.

Historical maps show that properties on the sites at No. 3-7 Mecklenburgh Street and No.195-197 Grays Inn Road date back to between 1874 and 1882. The existing building on Grays Inn Road has been re-built in a more modern style.

Geological maps indicate that the soil for the area is London Clay with no superficial deposits.

A Sitecheck environmental report dated 4<sup>th</sup> November 2013 was carried out by Landmark Information Group. It examined the sources of potential contamination in terms of historic land use, environmental data and current land uses where known. Strategic FRA by URS (2014) was referenced for the consideration of topography of the surrounding area with nearby watercourses/waterbodies. For details refer to Appendix A. In summary, the report highlighted no particular risks other than those posed by the underlying London Clay soils.

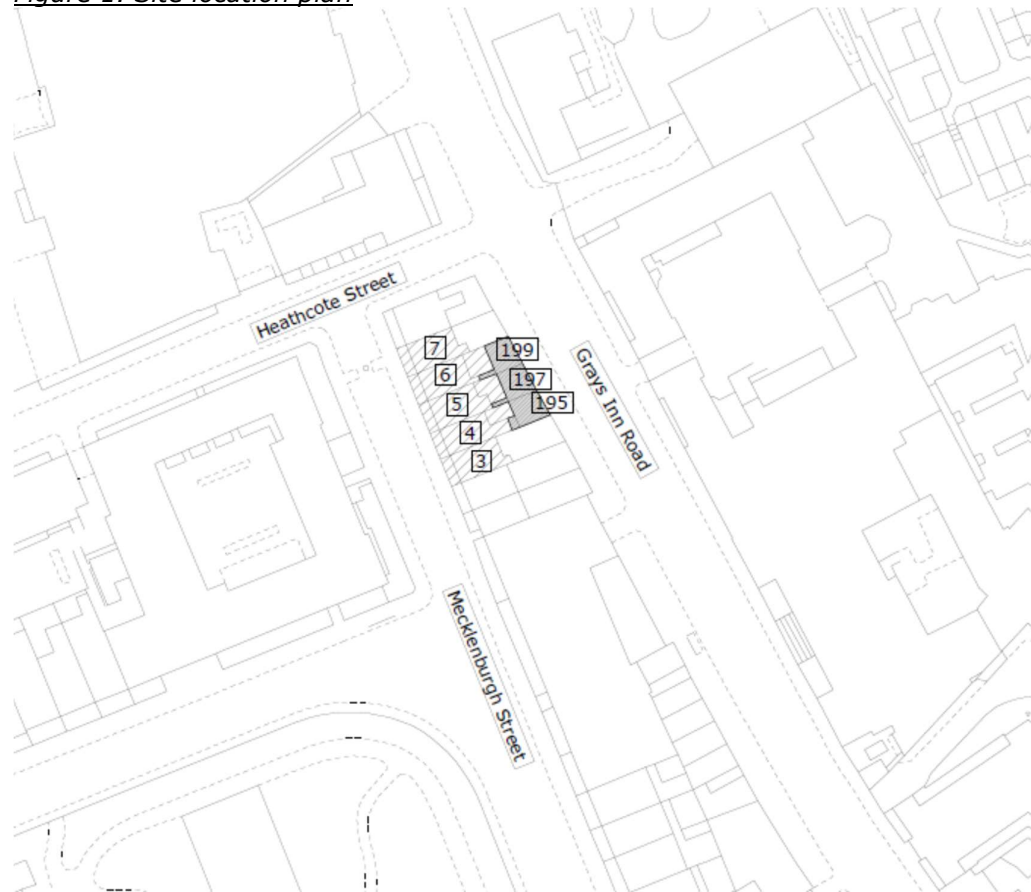
The National Grid reference for the property is 530650, 182500.

It is proposed to form a new three storey building with one storey of basement. Refer to Appendix B for existing and proposed structural drawings.

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*Figure 1. Site location plan*



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*Figure 2. Front elevation*



## 2.2 Groundwater flow

In relation to Figure 23 of the Camden Geological, Hydrogeological and Hydrological Study by Arup, the proposed basement will form an obstruction in the ground to any groundwater flow. It is more significant that the underlying soil stratum predicted on the geological maps is London Clay.

In relation to Figure 1 of the Camden Planning Guidance for Basements and Lightwells, the following are responses to the questions posed regarding subterranean ground water flow:

*Question 1a:*

No. According to the Camden Aquifer Designation Map, the site is located where London Clay outcrops at the surface so the site is not directly above an aquifer.

*Question 1b:*

No. From the study of boreholes, the highest water table level was found to be 14m below ground, which is significantly lower than the proposed basement level.

*Question 2:*

No. Hydrological and Geological maps indicate that the site is not within 100 m of a watercourse, well or spring line.

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*Question 3:*

No. The site is not within the catchment of the ponds to Hampstead Heath.

*Question 4:*

No. The new building footprint is the same as the existing building footprint. Therefore, there will not be an increase in hard surface paved areas.

*Question 5:*

No. There will be no increase in surface water discharge into the ground. Rain water and run-off will be transferred to surface water drains as it is now.

*Question 6:*

No. The site is not close to any ponds or springs.

## 2.3 Land Stability

In relation to Figure 2 of the Camden Planning Guidance for Basements and Light wells, the following are responses to the questions posed regarding slope stability:

*Question 1:*

No. From the topography and site inspection, the site and surrounding area are fairly level.

*Question 2:*

No. There will be no re-profiling of the existing landscape greater than 7 degrees.

*Question 3:*

No. The Neighbour's land does not have a slope greater than 7 degrees.

*Question 4:*

No. The site is not within a wider hillside setting in which the slope is greater than 7 degrees.

*Question 5:*

Yes. London Clay is the shallowest strata on site, as indicated on geological maps.

*Question 6:*

No. It is not proposed to fell any trees.

*Question 7:*

No. There is no sign of subsidence at the existing property and we are not aware of there being a history of seasonal shrink-swell subsidence in the local area.

*Question 8:*

No. Hydrological and Geological maps indicate that the site is not within 100 m of a watercourse, well or spring line.

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*Question 9:*

No. The historical maps do not indicate the site was worked ground.

*Question 10:*

No. According the Camden Aquifer Designation Map, the site located where London Clay does outcrop at the surface so the site is not directly above aquifer.

*Question 11:*

No. The site is not within 50m of the Hampstead Heath ponds.

*Question 12:*

Yes. The basement is within 5m of a highway or pedestrian right of way.

*Question 13:*

No. The proposed basement will only slightly increase the differential depth of foundations between No.4-6 Mecklenburgh Road and No. 195-199 Gray's Inn Road.

*Question 14:*

No. The site is not over any underground tunnels.

## 2.4 *Surface flow and flooding.*

A flood risk assessment has been carried out across the borough identifying streets that are at low risk of surface water flooding.

In relation to Figure 3 of the Camden Planning Guidance for Basements and Lightwells, the following are responses to the questions posed regarding surface flow and flooding:

*Question 1:*

No. Hampstead Heath Surface Water Catchments and Drainage Map indicate that the property is not within the catchment of the pond chains on Hampstead Heath.

*Question 2:*

No. It is proposed for the new surface water flows from the new basement to be similar to the existing.

*Question 3:*

No. There will be no change in the proportion of hard standing / paved areas from the new development.

*Question 4:*

No. There will be no change in inflows of surface water being received by the adjacent buildings.

*Question 5:*

No. There will also be no change in the quality of surface water being received by the adjacent properties or downstream water courses.

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## *Question 6:*

No. The property is not within the areas with the potential to be at risk of surface water flooding.

In summary, in terms of groundwater flow, land stability, surface flow and flooding, the impacts on the neighbouring properties and the natural environment from the proposed scheme are investigated. Only minimal effects to the land stability are identified.

## **3 Scoping**

Where the answer was yes or unknown in the Groundwater Flow and Land Stability sections of the screening section our response is as follows:

### Land Stability

#### *Question 5:*

*Yes. London Clay is the shallowest strata on site, as indicated on geological maps.*

#### *Question 12:*

Yes. The basement is within 5m of a highway or pedestrian right of way.

To address ground stability issues associated with the above issues, piled foundations will be used to construct the proposed basement.

The heave effect to the building from the underlying London Clay will be addressed by suspending the basement slab.

Pile design will be required to withstand loading from the highway in both the temporary and permanent states.

In summary, the ground stability issue due to the underlying London Clay will be addressed by providing appropriate ground retaining methods.

## **4 Desktop Site Investigation and Study**

### *4.1 Scope and Summary*

Due to existing site constraints and the current occupancy of the existing building, it is not practical to undertake site investigation works on the site at this stage.

Regarding the existing soil conditions, they have been assessed by making reference to boreholes undertaken on surrounding adjacent sites. For details refer to Appendix A.



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The boreholes are consistent with geological maps for the area with London Clay encountered at approximately 4m deep below ground. The highest ground water level is found to be 14m deep below ground.

A borehole site investigation will be carried out at a later stage to confirm these soil conditions and to establish soil properties such that a detailed pile design may be prepared. This will also be used to test samples for contamination.

## 4.2 *Assessment of Site Investigation*

### 4.2.1 Discussion

The site is underlain by London Clay with no superficial deposit.

### 4.2.2 Design Proposal

Two structural schemes are proposed for the basement development. For the first scheme, the existing building including the party walls will be demolished to ground floor level. For the second scheme we will maintain the party walls and the rest will be demolished down to ground floor level. Appropriate temporary propping will be required to restrain the walls.

The new basement will be constructed using micropiles which will be lined with an in-situ reinforced concrete wall.

A capping beam will be provided at the head of the piled wall to allow the piles to be propped at ground level in both the temporary and permanent conditions.

The basement floor slab will be sit on a compressible layer to protect against heave pressures. The construction will be phased to allow some relaxation of the ground (heave) to take place as the excavation proceeds.

An internal tanking system will be employed in order to waterproof the basement.

It would be prudent to undertake monitoring of the nearby properties during the construction works which is outlined in Section 5 and Appendix D.

In summary, although it is not practical to undertake site investigation works on the site at this stage due to current site occupancy and constraint, the underlying soil properties will be referenced to the nearby building borehole record. Appropriate temporary propping will be provided to construct the basement safely.

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## 5. Impact Assessment

### 5.1 Overall assessment

The main risks with the proposed works are associated with ground stability. These issues will be dealt with primarily by using a piled concrete box to form the basement construction.

Monitoring works will be undertaken of nearby properties to check compliance of the works with the overall strategy.

### 5.2 Preliminary ground movement assessment

The main sources of potential ground movement for the proposed basement development will be the disturbance to surrounding soil due to the deflection of piles during the construction stage and heave of the underlying London Clay.

Pile foundation will be adopted to retain the lateral load acting from the highway and both gardens to the neighbouring properties in the temporary stage. Temporary propping will also be provided towards the head of the pile to afford lateral restraint to the pile head to control deflection. This will be limited to a maximum 10mm. The temporary propping will be replaced by the permanent action of the ground floor slab. In the permanent stage, there will be a 250mm thick reinforced concrete retaining wall constructed in front of the pile to retain the lateral load. Refer to Appendix E for the detail calculation of the basement wall.

The heave is not significant as there will be pile foundation around the perimeter of the building which helps to restraint the soil. Cellcore is provided under the basement slab to reduce the uplift force transmitted to the structure from ground heave and also the relatively narrow excavation will mean that heave will be resisted by the soil on either side of the excavation.

Underpinning to the No.4 Mecklenburgh Road will protect the adjacent footing. Given that the underpinning depth is relatively shallow and remains within the London Clay. Differential settlement of the neighbouring properties is not considered to be an issue.

A detail ground movement assessment will be carried out as part of the site investigation.

### 5.3 Sequence of works

A sequence of works to mitigate movement of the adjoining properties is shown in Appendix C.

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## 5.4 *Monitoring*

During the period of formation of the new basement area, monitoring of the adjacent properties to No. 4 Mecklenburgh Street, No. 5 Mecklenburgh Street and No. 6 Mecklenburgh Street will be carried out, subject to the successful agreement between respective party wall surveyors. This is intended to monitor the impact of the works at No. 195-199 Gray's Inn Road on the adjacent properties to ensure they are not adversely affected by the works.

Monitoring will be carried out by forming fixed points as references in conjunction with targets placed on the walls of No. 4 Mecklenburgh Road, No. 5 Mecklenburgh Road, No.6 Mecklenburgh Road and No.7 Mecklenburgh Road respectively closest to the works.

Refer to the Appendix D for details of these positions.

The points for the structural scheme 1 may be summarised as follows:

- P1: on South elevation to No.4 Mecklenburgh Road rear extension
- P2: on East elevation to No. 4 Mecklenburgh Road rear extension
- P3: on East elevation to No. 4 Mecklenburgh Road main building
- P4: on East elevation to No. 5 Mecklenburgh Road rear extension
- P5: on East elevation to No. 5 Mecklenburgh Road rear extension
- P6: on East elevation to No. 6 Mecklenburgh Road main building
- P7: on North elevation to No. 7 Mecklenburgh Road rear extension

The points for the structural scheme 2 may be summarised as follows:

- P1: on East elevation to No.4 Mecklenburgh Road rear extension
- P2: on East elevation to No. 4 Mecklenburgh Road rear extension
- P3: on East elevation to No. 5 Mecklenburgh Road main building
- P4: on East elevation to No. 5 Mecklenburgh Road rear extension
- P5: on East elevation to No. 5 Mecklenburgh Road rear extension
- P6: on East elevation to No. 6 Mecklenburgh Road main building
- P7: on East elevation to No. 6 Mecklenburgh Road rear extension

Initially, at the start of the basement works, readings will be taken on a weekly basis. Assuming no significant movement is identified, the intervening period will be increased after approximately six weeks. As the basement works progress further the frequency of the readings will be reviewed.

After each round of readings, a review will take place to compare those taken and to determine whether any significant movement has taken place. A summary report would be prepared each month for issue to the Party Wall Surveyor.

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For the purposes of this exercise any movement recorded of between 3-5mm would be immediately declared to the Party Wall Surveyor. Any movement recorded of greater than 5mm would lead to works ceasing immediately whilst an assessment was made of the cause of any such movement.

Standpipes will be installed to monitor the ground water level and rainfall will be monitored for comparison by on-site monitoring.

## 5.5 Flood risk assessment

According to maps in Strategic FRA by URS (2014), the site is located in the very low risk of flooding from surface water zone (< 1 in 1000 year). It is also in flood zone 1 which has a low probability of flooding according to Environment Agency Flood Map for Planning (Refer to Appendix A). Flood risk assessment is not required.

## 5.6 Preliminary hydrogeology assessment

The proposed basement development will not extend below the ground water level and the site is not located above any aquifer. There will be minimal individual and cumulative impact to the ground water flow and hydrogeology. A detail hydrogeology assessment will be carried out as part of the site investigation to assess the impact to the ground water flow by the proposed basement development.

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