1 INTRODUCTION

LBHGEO have previously prepared Basement Impact Assessments (BIA) to support planning applications for basement developments beneath several properties fronting Kentish Town Road and Camden Road, as follows:

- No. 6 Kentish Town Road
- No. 8 Kentish Town Road
- Nos. 10-12 Kentish Town Road
- No. 3a Camden Road
- No. 5 Camden Road

LOCATION PLAN

Each of the basement excavations will result in unloading of the soil, leading to theoretical ground heave movements.

This technical note has therefore been prepared to consider the cumulative impact of the basement developments on both the host structures and the adjacent properties.

2 PROPOSED BASEMENT DEVELOPMENTS

No. 8 & Nos. 10 – 12 Kentish Town Road

Basements have recently been excavated beneath No. 8 & Nos. 10-12 Kentish Town Road, involving a 4m deep exaction to approximately +22m OD.

No. 6 Kentish Town Road

A deeper basement is proposed beneath No. 6 Kentish Town Road, requiring excavation to +20.5m OD.

However, given the presence of an approximately 2.5m deep existing cellar, the actual soil excavation beneath this property will amount to approximately 3m.

No. 3a and No. 5 Camden Road

The proposed developments at these properties involve a similarly deep basement, requiring 5.5m deep excavations to approximately +20.5m OD.

3 GROUND MOVEMENT ASSESSMENT

3.1 METHODOLOGY

Although the basements beneath No. 8 and Nos. 10-12 have already been excavated, this assessment assumes that all five basements are excavated simultaneously in order to consider a theoretical worst case for the potential long term cumulative heave movements.

While the overall ground heave movement is considered in order to assess the impact on the neighbouring structures, it has been assumed that only the post-construction heave movement is relevant to the impact on the host structures, as any short term heave will be addressed during construction.

3.2 GROUND MODEL

Several ground investigations have been undertaken and have confirmed that, beneath a limited thickness of made ground, the sites are directly underlain by London Clay. The findings of the ground investigations have been discussed further in each of the respective Basement Impact Assessments.

For the purposes of this analysis, a conservative undrained strength profile has been adopted, assuming an average Cu of 70 kN/m^2 at the surface of the London Clay Formation, increasing by 8 kN/m^2 per m depth.

The Undrained Modulus of Elasticity (Eu) has been based upon an empirical relationship of Eu = 750 x undrained cohesion (Cu), and the Drained Modulus of Elasticity (E') has been based upon an empirical relationship of 350 x Cu.

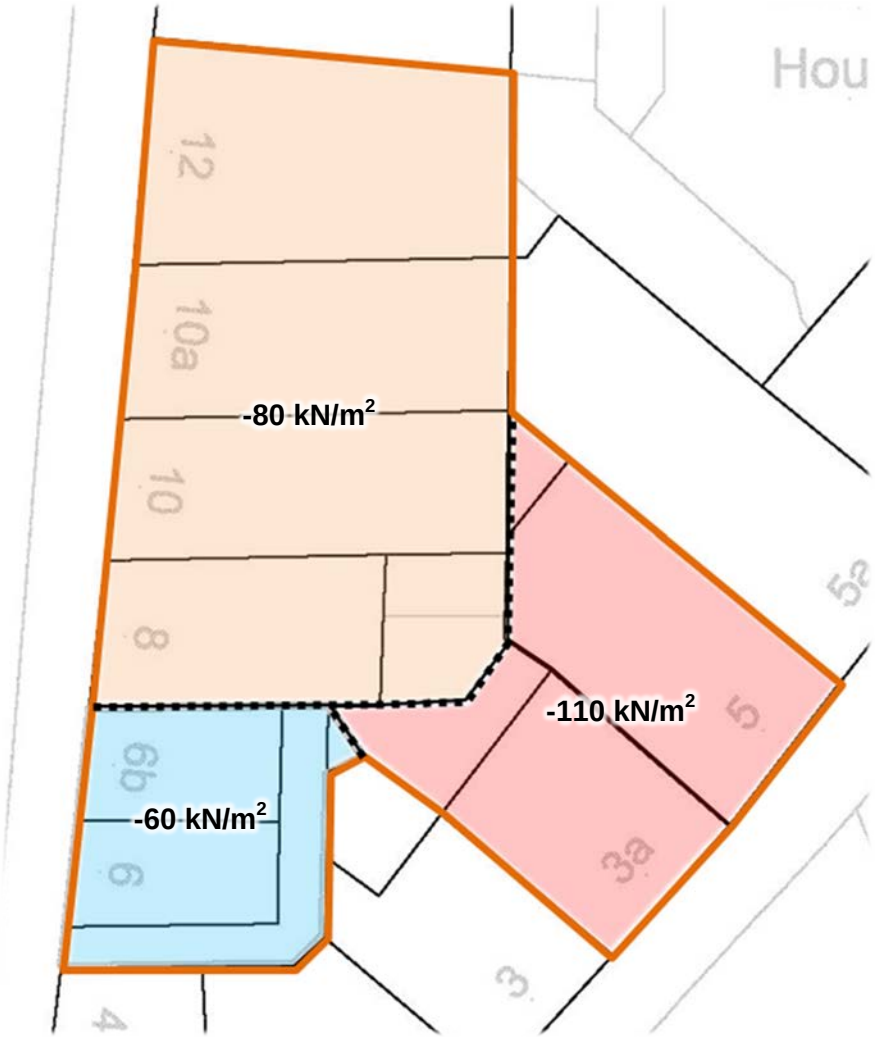
Stratum:	**Undrained Elastic Modulus Eu (kN/m^2)**	**Drained Elastic Modulus E' (kN/m^2)**
London Clay Formation	52,500kN/m^2 at surface increasing linearly to 322,500kN/m^2 at 40m depth	24,500kN/m^2 at surface increasing linearly to 150,500kN/m^2 at 40m depth

Poisson's Ratios of 0.5 and 0.2 have been used for short term (undrained) and long term (drained) conditions respectively.

The numerical analysis uses modified classic Boussinesq elastic theory, assuming a fully flexible foundation applying a uniform loading to a semi-infinite elastic half-space, using the above parameters for stratified homogeneity and with the introduction of an assumed rigid boundary at approximately 40m depth.

3.3 MODELLED UNLOADING

The unloading due to removal of soil has been modelled on the basis of the required excavation beneath each basement, as shown below.



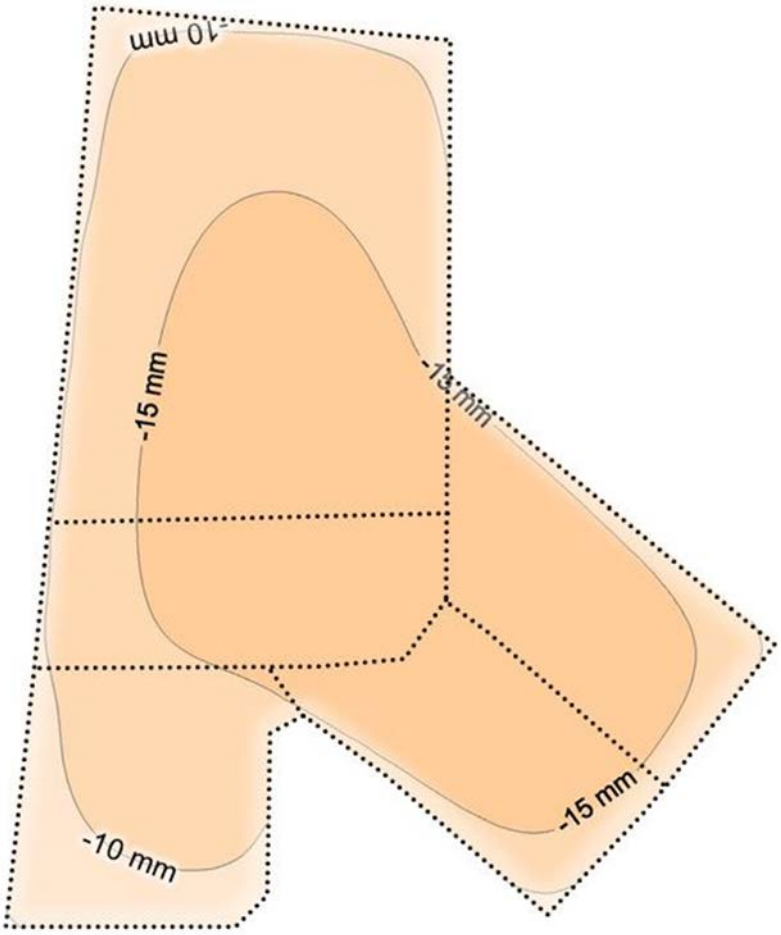
PLAN OF UNLOADED AREAS

3.4 CUMULATIVE IMPACT ON THE HOST STRUCTURES

The post-construction heave analysis suggests that less than 20mm of potential heave could theoretically occur at the boundary between No. 8 Kentish Town Road, No. 3a and 5 Camden Road.

It should be noted that the approximation presented below assumes fully flexible foundations. Given that the proposed basements are designed as reinforced concrete 'rigid box' structures, it is considered that the structural rigidity will combine to provide some resistance to the predicted movements.

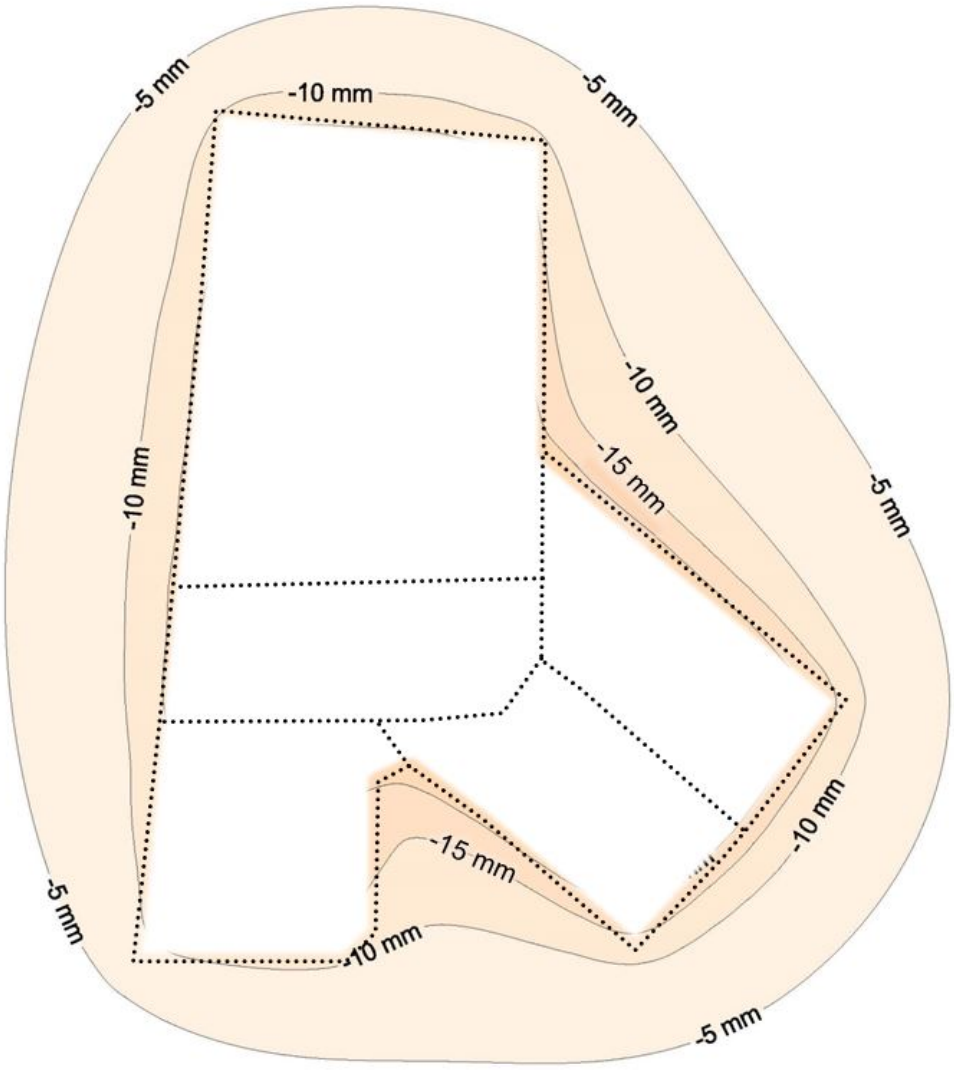
In any case, it is considered that any future unacceptable movement of the host structures can be corrected or, if necessary, repaired.



THEORETICAL PREDICTED POST CONSTRUCTION HEAVE

3.5 CUMULATIVE IMPACT ON NEIGHBOURING STRUCTURES

The analyses generally suggests less than 15mm of overall heave could theoretically occur at the party walls shared with the neighbouring properties, although this may reach 20mm between No. 5 and No. 5a Camden Road.



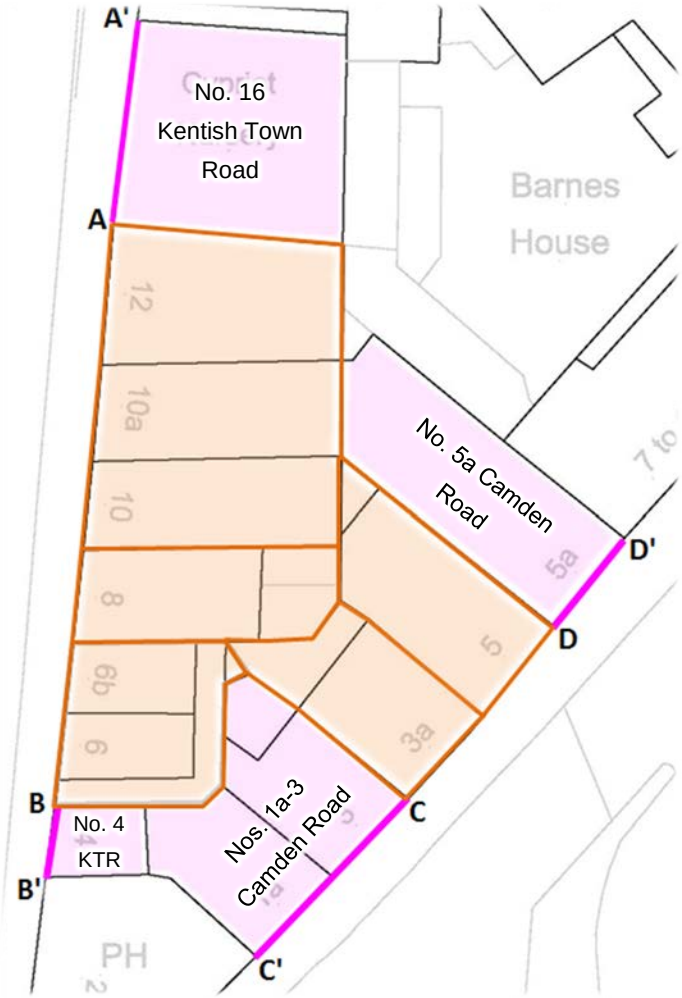
THEORETICAL PREDICTED OVERALL HEAVE

4 BUILDING DAMAGE ASSESSMENT

The neighbouring properties directly adjacent to the proposed basement excavations have been assessed for damage as a result of the predicted heave movement along the wall sections adjacent and perpendicular to the excavated basement area.

The potential degree of impact of the predicted ground movements on the assessed structures can be estimated by analyzing the maximum deflection ratio Δ/L, where Δ is the vertical distortion over the wall length under assessment.

The potential degree of damage due to the cumulative overall heave induced by the proposed basement excavations has been assessed for each neighbouring property using a series of sections, and a summary for each is shown below:



SECTIONS ASSESSED FOR STRUCTURAL DAMAGE

No. 16 Kentish Town Road – Section A –A'

The length of section (L) is taken as 11m and the wall height (H) as 3m.

8mm of heave has been modelled at the party wall, reducing to 2mm at the far end of the section.

A maximum deflection ratio is assessed as Δ / L = -0.033, within a limiting tensile strain of 0.035%, for a Burland Category 0 "Negligible" condition.

No. 4 Kentish Town Road – Section B – B'

The length of section (L) is taken as 4m and the wall height (H) as 10m.

7mm of heave has been modelled at the party wall, reducing to 3mm at the far end of the section.

A maximum deflection ratio is assessed as Δ / L = -0.025, within a limiting tensile strain of 0.025%, for a Burland Category 0 "Negligible" condition.

Nos. 1a – 3 Camden Road – Section C – C'

The length of section (L) is taken as 12m and the wall height (H) as 10m.

12mm of heave has been modelled at the party wall, reducing to 3mm at the far end of the section.

A maximum deflection ratio is assessed as Δ / L = -0.02, within a limiting tensile strain of 0.020%, for a Burland Category 0 "Negligible" condition.

No. 5a Camden Road– Section D – D'

The length of section (L) is taken as 6m and the wall height (H) as 14m.

12mm of heave has been modelled at the party wall, reducing to 5mm at the far end of the section.

A maximum deflection ratio is assessed as Δ / L = -0.033, within a limiting tensile strain of 0.035%, for a Burland Category 0 "Negligible" condition.

5 CONCLUSION

It is concluded that negligible damage will occur to the neighbouring properties as a result of the cumulative heave movements caused by the proposed basement excavations.