

BASEMENT IMPACT ASSESSMENT

BEAULIEU HOUSE COMPTON AVENUE

HARINGEY



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LBHGEO

Document Control			
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NON-TECHNICAL SUMMARY

It is proposed to extend the existing building with two side wings and a rear extension. A new basement is to be created beneath the footprint of the existing part of the building and the new northern side wing extension. The new basement is to include a swimming pool, gym and changing area, together with a lounge and TV room. Staff accommodation and a plant room are also proposed at this level.

This report provides an assessment of the potential impacts that the basement development may have upon the host building, neighbouring structures and the local environment.

GEOLOGY

The basement is expected to extend into the sandy levels of the Claygate Beds.

HYDROGEOLOGICAL IMPACTS

The new basement is not expected to extent significantly below any water table and hence will not have an adverse impact upon groundwater flow.

HYDROLOGICAL IMPACTS

The site is not assessed as being at risk of flooding and there will be no change to the flood risk as a result of the development.

A SuDS scheme is to be included as part of the development.

STABILITY IMPACTS

Ground movement assessments have been undertaken to demonstrate the acceptability of the proposed basement construction methodology upon the neighbouring structures, resulting in a prediction of a maximum of Burland Category 1 (Very Slight) damage. Negligible impact is predicted to the highway.

CONCLUSION

The assessment concludes that no adverse residual or cumulative stability, hydrological or hydrogeological impacts are expected to occur to either neighbouring structures or the wider environment as a result of this development.

FOREWORD-GUIDANCE NOTES

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBHGEO disclaims any liability to such parties.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBHGEO has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Any use of or reliance upon the report in circumstances other than those for which it was commissioned shall be at the client's sole risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in such altered circumstances.

THIRD PARTY INFORMATION

The report may present an opinion based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. INTRODUCTION

1.1 BACKGROUND

It is proposed to extend the existing building with two side wings and a rear extension. A new basement is to be created beneath the footprint of the existing part of the building and the northern side wing extension.

The new basement is to include a swimming pool, gym and changing area, together with a lounge and TV room. Staff accommodation and a plant room are also proposed at this level.

1.2 BRIEF

LBHGEO have been appointed to prepare a Basement Impact Assessment (BIA) in support of a planning application to the London Borough of Haringey.

1.3 PLANNING POLICY

The July 2017 Haringey Development Management DPD Policy DM18: Residential Basement Development and Light Wells reads as follows:

“A Householder extensions to existing basements, and the construction of new basements, including in existing dwellings will only be permitted where it can be demonstrated that the proposal:

- a. Will not adversely affect the structural stability of the application building, neighbouring buildings and other infrastructure, including the adjoining highway, having regard to local geological conditions;*
- b. Does not increase flood risk to the property and nearby properties from any source (see Policy DM24);*
- c. Avoids harm to the appearance or setting of the property or the established character of the surrounding area;*
- d. Will not adversely impact the amenity of adjoining properties by reason of noise or increased levels of internal or external activity;*
- e. Will not adversely impact the local natural and historic environment;*

And, where the proposed basement extends beneath the garden area:

- f. Will not cause loss, damage or long-term threat to trees of townscape or amenity value;*
- g. Maintains adequate soil depth satisfactory for preservation of landscaping consistent with neighbouring properties;*

And during the construction phase:

- h. Will not cause harm to pedestrian, cycle, vehicular and road safety, adversely affect bus or other transport operations, significantly increase traffic congestion, nor place unreasonable inconvenience on the day to day life of those living, working or visiting nearby; and*
- i. Will minimise construction impacts such as noise, vibration and dust for the duration of the works.*

B Proposals for basements must not include habitable rooms or other sensitive uses in areas prone to flooding where there is no reasonable means of escape.

C In determining applications for light wells, the Council will consider whether:

- a. The architectural character of the building is protected;*
- b. The character and appearance of the surrounding area is harmed; and*
- c. The development results in the loss of more than 50% of the front garden or amenity area.”*

The following policies in the Development Management DPD are also relevant to basement development and will be taken into account when assessing basement schemes:

- “Policy DM1: Providing High Quality Design”;
- “Policy DM21: Sustainable Design Layout and Construction”;
- “Policy DM24: Managing and Reducing Flood Risk”;

This report follows the requirements for a Basement Impact Assessment, as set out in the June 2012 Haringey Council Basement Development Guidance Note.

1.4 REPORT STRUCTURE

This report commences with a characterisation of the site, before progressing to BIA screening and scoping assessments, whereby consideration is given to identifying the potential hydrogeological, hydrological and stability impacts that may be associated with the proposed development.

A ground model is then developed, which is followed by an outline basement construction methodology and an assessment of the potential ground movements affecting the neighbouring structures.

Finally, an assessment of the potential impacts of the proposed scheme is presented.

1.5 DOCUMENTS CONSULTED

- 2020 June Existing Plans & Elevations by BÜF Architects
Ref: A041-A-XX-DR-20-001, -002, -010, -011, -012, -020
- 2021 March Proposed Plans & Section by BÜF Architects
Ref: A041-A-XX-DR-SK-111 Rev. C, -112 Rev. C, -113 Rev. C, -110 Rev. C, -130 Rev. C
- 2021 March Tree Survey by Tyler Grange
Ref: 13343_TSS01

2. THE SITE

2.1 SITE LOCATION

The site is located at the southern end of Compton Avenue, near the junction with Hampstead Lane. The site may be approximately located by the postcode N6 4LH or by National Grid Reference 527200, 187655.



2.2 TOPOGRAPHICAL SETTING

The site lies on a north facing slope just beyond the ridge that forms the watershed between the Mutton Brook and the River Fleet.

The Mutton Brook rises at the far northern end of Compton Avenue, some 200m to the north of the site.

2.3 SITE DESCRIPTION

The site is roughly rectangular in shape and is occupied by a 1930s, three-storey detached house with a sunken garage extension at the northern side of the house.

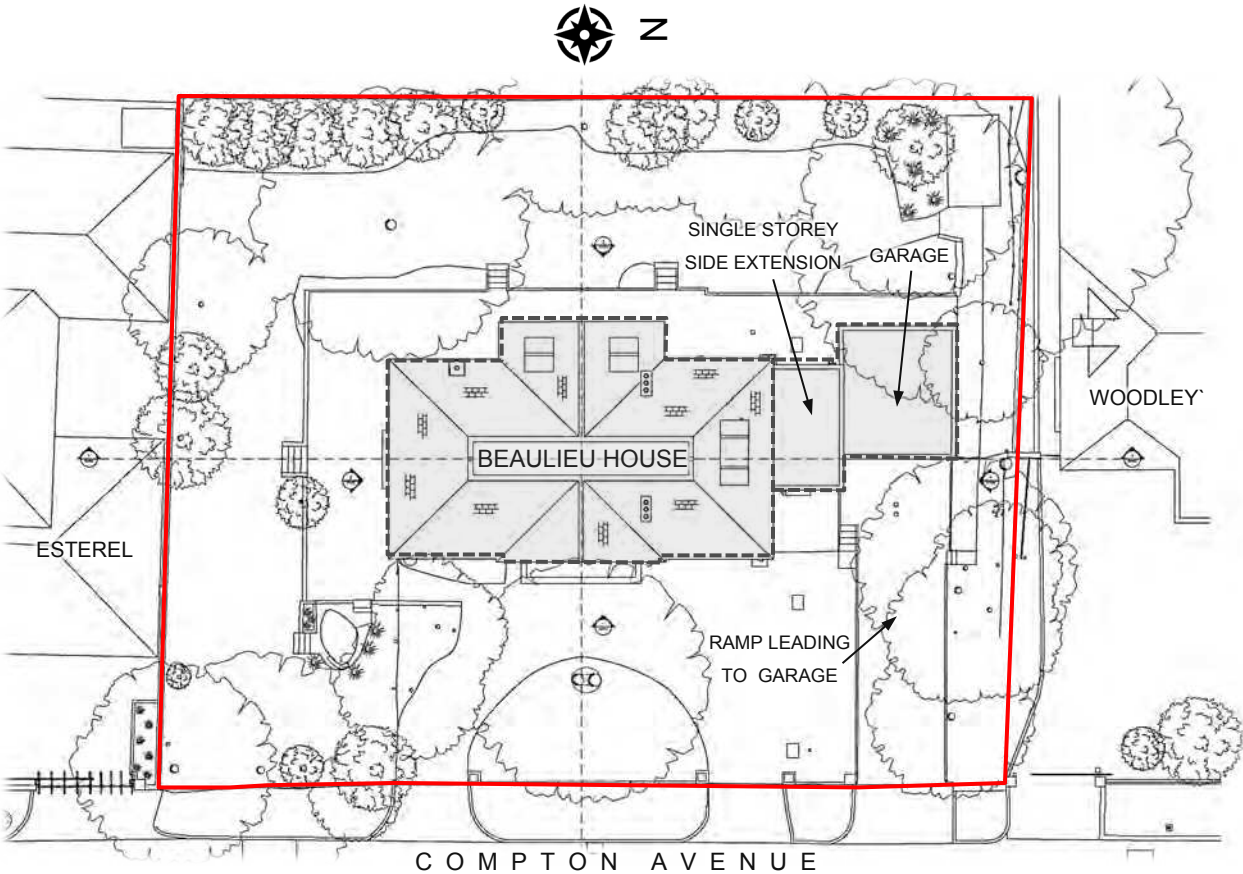
The site slopes gently to the north from approximately +113m OD in the southwestern corner to approximately +110m OD in the northeastern corner, while the existing property is cut into the slope. The patios / terraces around the building are set at the ground floor level, while the garden is elevated up to 1m above, behind low brick retaining walls. A number of mature trees are present.



REAR GARDEN AND ELEVATION



FRONT ELEVATION AND PATIO



EXISTING SITE PLAN



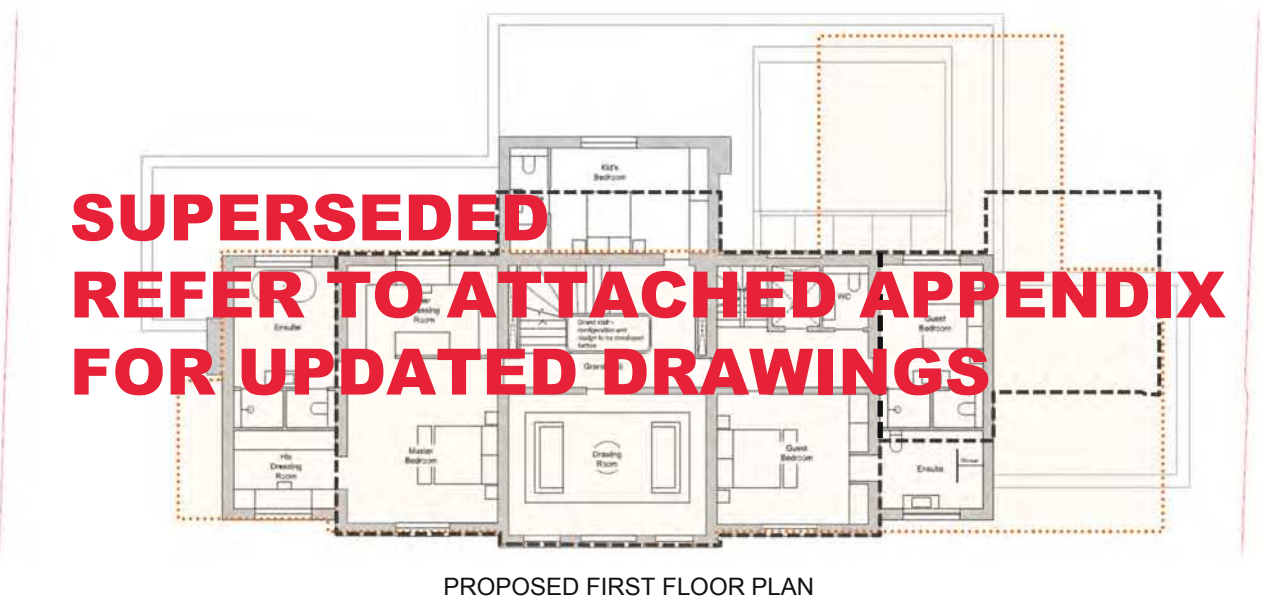
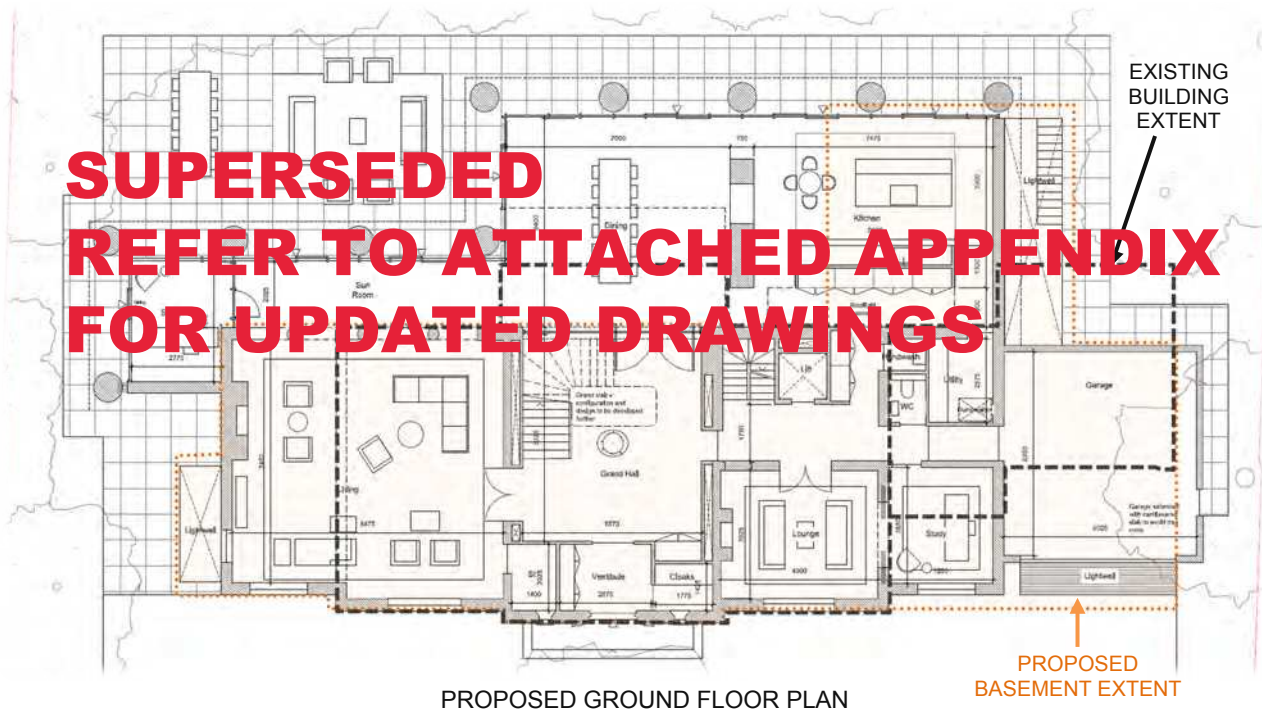
SIDE & REAR ELEVATION OF THE BUILDING

2.4 PROPOSED DEVELOPMENT

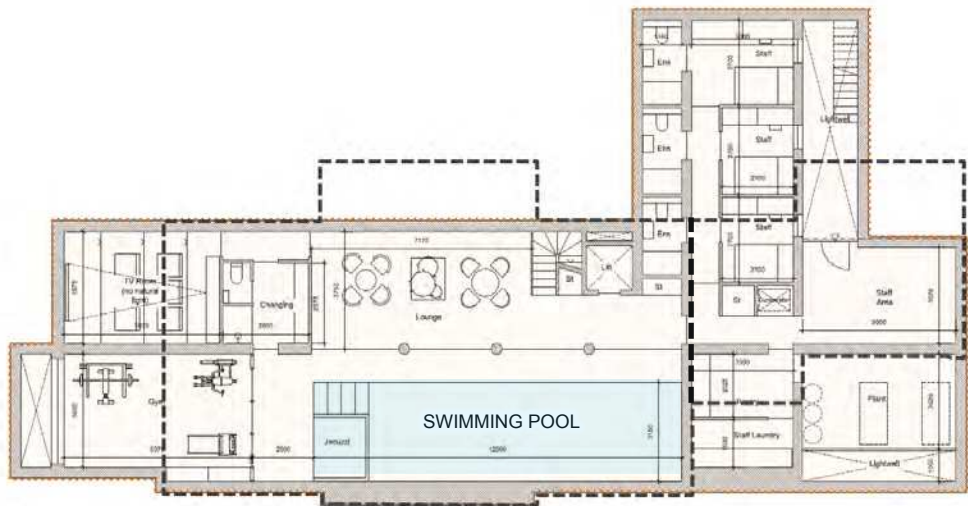
The existing garage and extensions are to be demolished to facilitate the new construction.

The new rear extension is to be single storey and is proposed to comprise a line of external columns along the rear elevation, enabling full glazing of the walls.

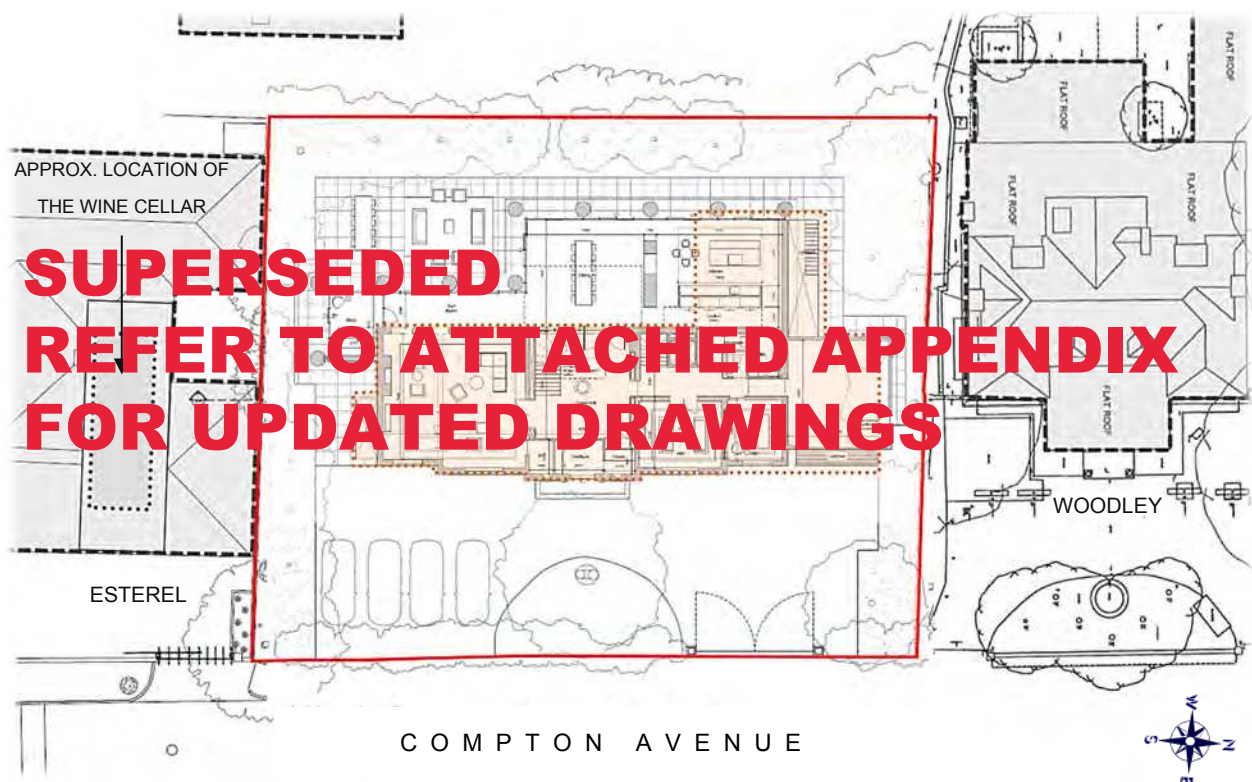
The rear garden will also be excavated to provide a larger rear terrace at ground floor level.



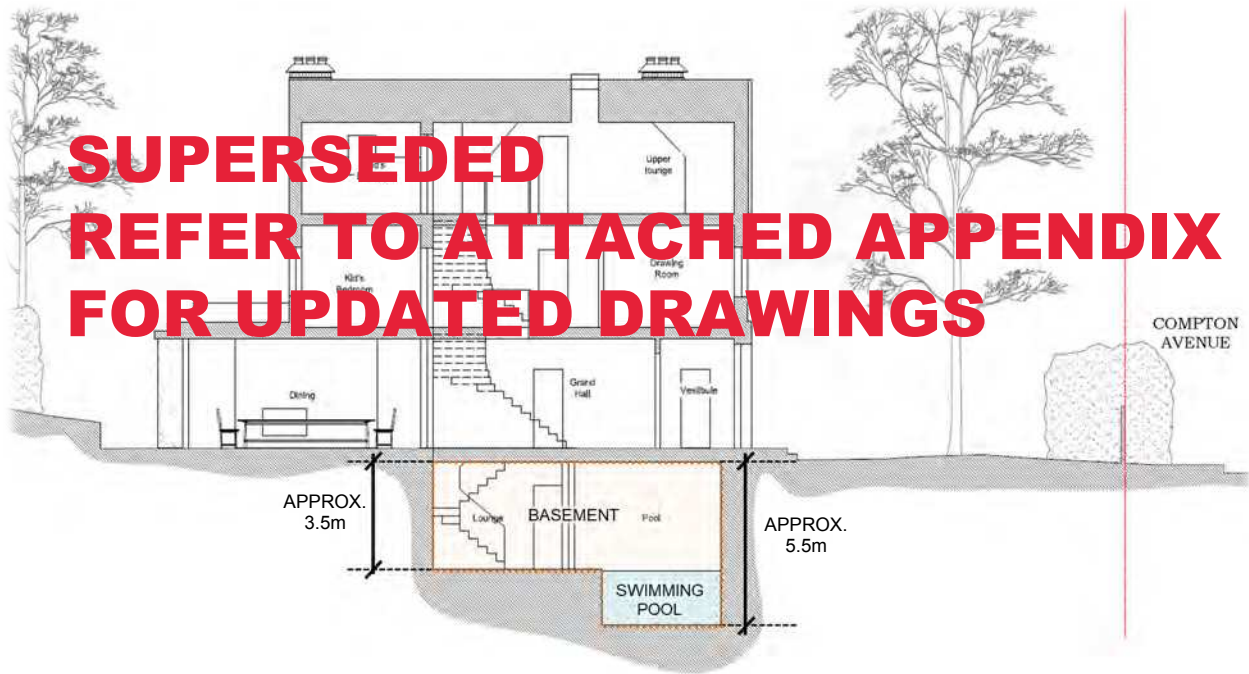
The basement is to extend to approx. 3.5m depth (+107.5m OD) below the existing ground level, increasing to approx. 5.5m depth (+105.5m OD) for the swimming pool.



PROPOSED BASEMENT PLAN



PROPOSED DEVELOPMENT PLAN SHOWING NEIGHBOURING BUILDINGS

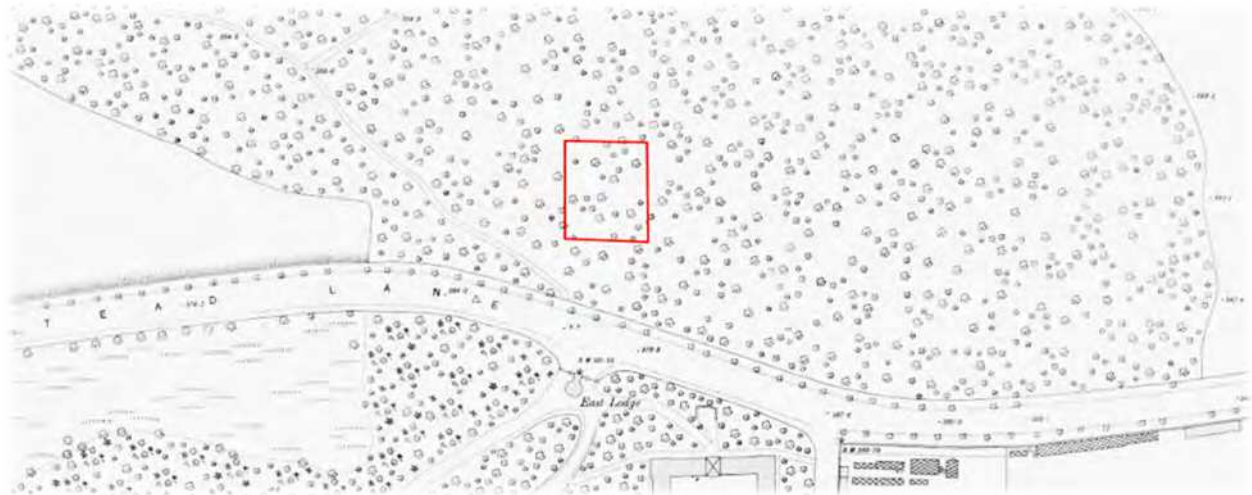


PROPOSED SECTION

3. DESK STUDY

3.1 SITE HISTORY

The site remained an undeveloped part of the Bishop's Wood to the north of Hampstead Lane until the early 20th Century.



1890s

Compton Avenue was established along with the other residential streets in this area in the early 1930s. Beaulieu House appears to have been constructed in the existing configuration, albeit it seems that the garden of the property had initially included the area to the south of the building, extending up to Hampstead Lane.



1960s

This garden area to the south was sold as a separate plot for the subsequent construction of Esterel House in the 1970s.

3.2 GEOLOGICAL INFORMATION

The British Geological Survey (BGS) records indicate that the site is underlain by a feather edge of the Bagshot Formation over the Claygate Member, with the London Clay underlying the site at depth.



EXTRACT OF FIGURE 2 OF THE CAMDEN CGHHS (LEFT) AND FIGURE 2.2 OF THE HARINGEY SFRA (RIGHT)

3.3 HYDROGEOLOGICAL INFORMATION

Figure 2.2 of the Haringey SFRA (above right) indicates that the headwaters of the Upper Mutton Brook appear as an open channel approximately 200m to the north of the site, at the northern end of Compton Avenue.

Some groundwater may possibly be encountered within the lower levels of the more permeable sandy layers of the Claygate Member at around the maximum envisaged depth of excavation.

3.4 HYDROLOGICAL INFORMATION

Environment Agency (EA) surface water flood maps suggest that the site and the surrounding area are at a very low risk of surface water flooding.



EXTRACT OF EA SURFACE WATER FLOOD RISK MAP

4. SCREENING & SCOPING ASSESSMENTS

In absence of a clear guidance in terms of the Screening & Scoping stage for a Basement Impact Assessment in LB Haringey, this has been carried out with reference to Appendices E and F the Camden Geological, Hydrogeological and Hydrological Study (CGHHS). This process determines whether or not a full BIA is required.

4.1 SCREENING ASSESSMENT

The Screening Assessment consists of a series of checklists that identifies any matters of concern relating to the following:

- Subterranean (groundwater) flow
- Surface flow and flooding
- Slope stability

4.1.1 SCREENING CHECKLIST FOR SUBTERRANEAN (GROUNDWATER) FLOW

QUESTION	RESPONSE	JUSTIFICATION
Is the site is located directly above an aquifer?	Yes	The site is underlain by the Bagshot Formation and Claygate Beds, which are identified as Secondary A Aquifers.
Will the proposed basement extend beneath the water table surface?	Yes	Groundwater may possibly be encountered towards the base of the proposed basement excavation.
Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	The site is located approximately 200m to the south of the headwaters of Mutton Brook.
Is the site within the catchment of the pond chains on Hampstead Heath?	No	
Will the proposed development result in a change in the area of hard-surfaced/paved areas?	Yes	The proposed development includes an extension of the existing patio into the areas occupied by the garden in the existing scenario, thereby increasing the proportion of hard-surfaced areas on site.
Will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	It is understood that all surface water falling within the development will be attenuated and discharged as per the existing arrangement.
Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than the mean water level in any local pond?	No	There are no nearby ponds.

4.1.2 SCREENING CHECKLIST FOR SURFACE FLOW AND FLOODING

QUESTION	RESPONSE	JUSTIFICATION
Is the site within the catchment area of the pond chains on Hampstead Heath?	No	
As part of the site drainage, will surface water flows (e.g. rainfall and run-off) be materially changed from the existing route?	No	It is understood that the existing drainage arrangement discharging to the public sewer will be maintained.
Will the proposed basement development result in a change in the proportion of hard-surfaced/paved areas?	Yes	The proposed development includes an extension of the existing patio into the areas occupied by the garden in the existing scenario, thereby increasing the proportion of hard-surfaced areas on site.
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	It is understood that the existing drainage arrangement discharging to the public sewer will be maintained.
Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	It is understood that the existing drainage arrangement discharging to the public sewer will be maintained.
Is the site in an area known to be at risk from surface water flooding, 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 site is located within EA Flood Risk Zone 1. The EA Long Term Flood Risk service indicates the area of Beaulieu House is at a very low risk of surface water flooding.

4.1.3 SCREENING CHECKLIST FOR STABILITY

QUESTION	RESPONSE	JUSTIFICATION
Does the existing site include slopes, natural or manmade, greater than 7 degrees?	No	
Does the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees?	No	
Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees?	No	

Is the site within a wider hillside setting in which the general slope is greater than 7 degrees?	Yes	The site is located in an area of 7° to 10° slopes, but also locally steeper.
Is London Clay the shallowest strata at the site?	No	The Bagshot Formation is the shallowest strata on site, overlying the Claygate Beds and the London Clay Formation at depth.
Will trees be felled as part of the proposed development and/or are works proposed within tree protection zones where trees are to be retained?	Yes	There are a number of mature trees on site, near the proposed basement extent; some will be retained, while some are to be felled.
Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	
Is the site within 100m of a watercourse or a potential spring line?	No	The site is located approximately 200m to the south of the headwaters of Mutton Brook.
Is the site within an area of previously worked ground?	No	
Is the site within an aquifer?	Yes	Although the Bagshot Beds and Claygate Member are identified as a Secondary A Aquifers groundwater may possibly not be encountered by the proposed basement excavation. The indications from nearby boreholes is that the deepest levels of excavation may be expected to experience some inflow.
Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Yes/No	
Is the site within 50m of the Hampstead Heath ponds?	No	
Is the site within 5m of a highway or pedestrian right of way?	No	The proposed excavations for the basement will be undertaken approximately 10m away from the pavement of Compton Avenue.
Will the proposed basement significantly increase the differential depth of foundations relative to the neighbouring properties?	Yes	With the exception of a small wine cellar beneath Esterel house to the south, the neighbouring properties do not appear to comprise basements and therefore the proposal will most likely increase the differential depth of foundations relative to these.
Is the site over (or within the exclusion zone of) tunnels, e.g. railway lines?	No	

4.2 SCOPING ASSESSMENT

Where the checklist is answered with a “yes” or “unknown” to any of the questions posed in the flowcharts, these matters are carried forward to the scoping stage of the BIA process. The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

The scoping produces a statement which defines further the matters of concern identified in the screening stage. This defining should be in terms of ground processes, in order that a site specific BIA can be designed and executed (Section 6.3 of the CGHHS).

4.2.1 SCOPING FOR SUBTERRANEAN (GROUNDWATER) FLOW

- *The site is underlain by an aquifer.*

The guidance advises that potentially the basement may extend into the underlying aquifer and thus affect the groundwater flow regime.

- *The basement may extend beneath the water table surface.*

The guidance advises that the groundwater flow may be altered by the proposed basement. Changes in flow regime could potentially cause the groundwater level within the zone encompassed by the new flow route to increase or decrease locally. For existing nearby structures then the degree of dampness or seepage may potentially increase as a result of changes in groundwater level.

- *Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?*

The guidance advises that the sealing off of the ground surface by pavements and buildings to rainfall will result in decreased recharge to the underlying ground. In areas underlain by an aquifer, this may impact upon the groundwater flow or levels. In areas of non-aquifer (i.e. on the London Clay), this may mean changes in the degree of wetness which in turn may affect stability. The guidance advises that a change in the proportion of hard surfaced or paved areas of a property will affect the way in which rainfall and surface water are transmitted away from a property. This includes changes to the surface water received by the underlying aquifers, adjacent properties and nearby watercourses. Changes could result in decreased flow, which may affect ecosystems or reduce amenity, or increased flow which may additionally increase the risk of flooding.

4.2.2 SCOPING FOR SURFACE WATER FLOW AND FLOODING

- *Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?*

The guidance advises that a change in the proportion of hard surfaced or paved areas of a property will affect the way in which rainfall and surface water are transmitted away from a property. This includes changes to the surface water received by the underlying aquifers, adjacent properties and nearby watercourses. Changes could result in decreased flow, which may affect ecosystems or reduce amenity, or increased flow which may additionally increase the risk of flooding.

4.2.3 SCOPING FOR STABILITY

- *The site is within a wider hillside setting in which the general slope is greater than 7 degrees.*

The guidance advises that the development may cause slope instability within neighbouring sites.

- *Works may be proposed within tree protection zones where trees are to be retained and several trees are proposed to be removed.*

The guidance advises that the soil moisture deficit associated with felled tree will gradually recover. In high plasticity soils (such as London Clay) this will lead to gradual swelling of the ground until it reaches a new value. This may reduce the soil strength which could affect slope stability. Additionally the binding effect of the tree roots can have a beneficial effect on stability and the loss of a tree may cause loss of stability.

- *The site is underlain by an aquifer, and;*
- *The basement may extend beneath the water table surface.*

The guidance advises that dewatering can cause ground settlement. The zone of settlement will extend for the dewatering zone, and thus could extend beyond a site boundary and affect neighbouring structures. Conversely, an increase in water levels can have a detrimental effect on stability.

- *The proposed basement will significantly increase the differential depth of foundations relative to neighbouring properties.*

The guidance advises that excavation for a basement may result in structural damage to neighbouring properties if there is a significant differential depth between adjacent foundations.

5. GROUND CONDITIONS

5.1 AVAILABLE INVESTIGATION DATA

A number of ground investigations have been undertaken in the local area as presented on the plan below.

- | | | |
|------------|---------------------------------|--------------------------------|
| • 2004 May | Palladio, Compton Avenue | LBH, Ref. LBH3338 |
| • 2007 Aug | Roundhill House, Compton Avenue | LBH, Ref. LBH3663 |
| • 2015 Mar | Oak Lawn, Compton Avenue | Risk Management, Ref. RML 5731 |
| • 2015 Aug | Compton House, Compton Avenue | SAS, Ref. 15/23905 |
| • 2015 Nov | Far End, Compton Avenue | Risk Management, Ref. RML 5928 |
| • 2019 Sep | 42 Hampstead Lane | GEA, Ref. J14154 |
| • 2020 Mar | Nice Place, Compton Avenue | GEA, Ref. J11150B |



5.2 GROUND MODEL

It is assessed that the site is likely to be underlain by the Claygate Member with a capping of Bagshot Beds.

5.2.1 BAGSHOT FORMATION

The site is expected to be immediately underlain by a capping of Bagshot sand, which typically comprises medium dense orange-brown clayey silty sand.

5.2.2 CLAYGATE MEMBER

The Claygate beds down to a level of around 5m depth (+105m OD) or more are expected to comprise orange-brown clayey silty sand of similar composition to the overlying Bagshot beds, passing down into stiff orange-brown mottled grey, becoming grey silty sandy clay containing subordinate interbedded seams of sand and silt.

The Claygate Member are expected to extend to approximately 15m depth (+95m OD) in this locality.

5.2.3 LONDON CLAY FORMATION

The London Clay is present below the Claygate Member and comprises stiff, becoming very stiff, grey fissured silty clay.

5.3 GROUNDWATER

Although some limited water seepage may possibly emanate from the Bagshot / Claygate beds, the expectation is that the proposed basement may not extend a sufficient depth to reach any groundwater table within the Claygate.

The likely presence of groundwater increases as one approaches the lower horizon of the sandy upper layers upper of the Claygate and boundary with the underlying more clayey and impermeable lower layers of the Claygate. Where this boundary emerges from the hillside a spring line often develops and this is likely to be the situation giving rise to the headwaters of the Mutton Brook some distance to the north of the site.

6. GEOTECHNICAL ASSESSMENT

6.1 BASEMENT EXCAVATION

The proposed basement will require generally require excavation into the Claygate Member of approximately 3.5m depth, but will be increased locally to facilitate the construction of a lift pit and swimming pool, potentially requiring approximately 5.5m excavation.

The existing building is to be largely retained, with the existing ground floor removed in order to facilitate proposed excavations and construction.

Conventional hit-and-miss underpinning of the existing structure is proposed; however this will only be feasible where groundwater is not present or can be excluded from excavations.

6.1.1 PROPOSED UNDERPINNING

The new basement retaining walls are to be constructed using a conventional hit-and-miss underpinning sequence with maximum 1m wide pins. The sequence of the underpinning will be an extended 1, 3, 5, 2, 4 & 6 type numbering, such that any given underpin will be completed, dry packed, and a minimum of 48 hours lapsed before an adjacent excavation is commenced to form another underpin.

Two-stage underpinning is expected for the deeper area (swimming pool) of the basement at the front, while single-stage underpinning may be feasible elsewhere.

Where the new basement is to extend outside of the existing building footprint, the same underpinning methodology can also be applied.

The underpinning will need to be propped at both high and low levels, with the high level props introduced across the basement area prior to commencement of main excavations. A third level of propping should be considered where the second stage of underpinning is undertaken for the swimming pool and lift pit areas.

Structural monitoring of the host building and neighbouring properties should be undertaken throughout the basement development in order to enable additional mitigation to be effectively implemented in the event of observed movement approaching the maximum predicted.

6.1.2 GROUNDWATER INGRESS

Full depth trial monitoring wells should be installed in advance of construction to confirm the groundwater conditions.

Some groundwater may possibly be encountered within the more permeable lenses of the Bagshot / Claygate beds, but the expectation is that no permanent ground water table being present.

The likely presence of groundwater increases as one approaches the lower horizon of the sandy upper layers upper of the Claygate and boundary with the underlying more clayey and impermeable lower layers of the Claygate.

Should a groundwater table be encountered, measures will be required to exclude this from the basement excavations.

Consideration could in this event be given to forming an in ground barrier inside the southern boundary of the site to reduce any substantial flow, as this may be expected to be following the natural topography down the hillside. Consideration could variously be given to the installation of sheet piles, a bentonite cut-off or to forming a grouted cut-off.

Given the inherent uncertainty regarding both the presence of groundwater, it is suggested that in due course additional ground exploration should be undertaken by means of boreholes or trial excavations in order to confirm an absence of groundwater or to permit better assessment of any groundwater risk.

6.2 BASEMENT CONSTRUCTION

The basement itself is to be formed within a rigid concrete box formed through connection of the new walls created by underpinning with the basement slab and a new ground floor slab.

A degree of heave movement may be expected following the basement excavations. A detailed assessment of the potential ground movements and their impact on the neighbouring properties is provided in Section 7 of this report.

6.3 RETAINING WALLS

The following parameters may be considered in the design of new retaining walls:-

RETAINING WALL DESIGN PARAMETERS			
STRATUM	BULK UNIT WEIGHT	EFFECTIVE COHESION	EFFECTIVE FRICTION ANGLE
	(kN/m ³)	(c' - kN/m ²)	(ϕ' - degrees)
Claygate Member	20	Zero	25

6.3.1 WATERPROOFING

There is potential for water to collect behind the new retaining walls in the long term; hence the whole new below-ground structure is to be waterproofed and designed to withstand hydrostatic pressures in accordance with BS8102:2009, Code of Practice for the Protection of Below-Ground Structures against Water from the Ground. A design hydrostatic level of +110.0m OD, approximately equal to the existing ground level at the site, is to be adopted for the purposes of assessing these hydrostatic pressures.

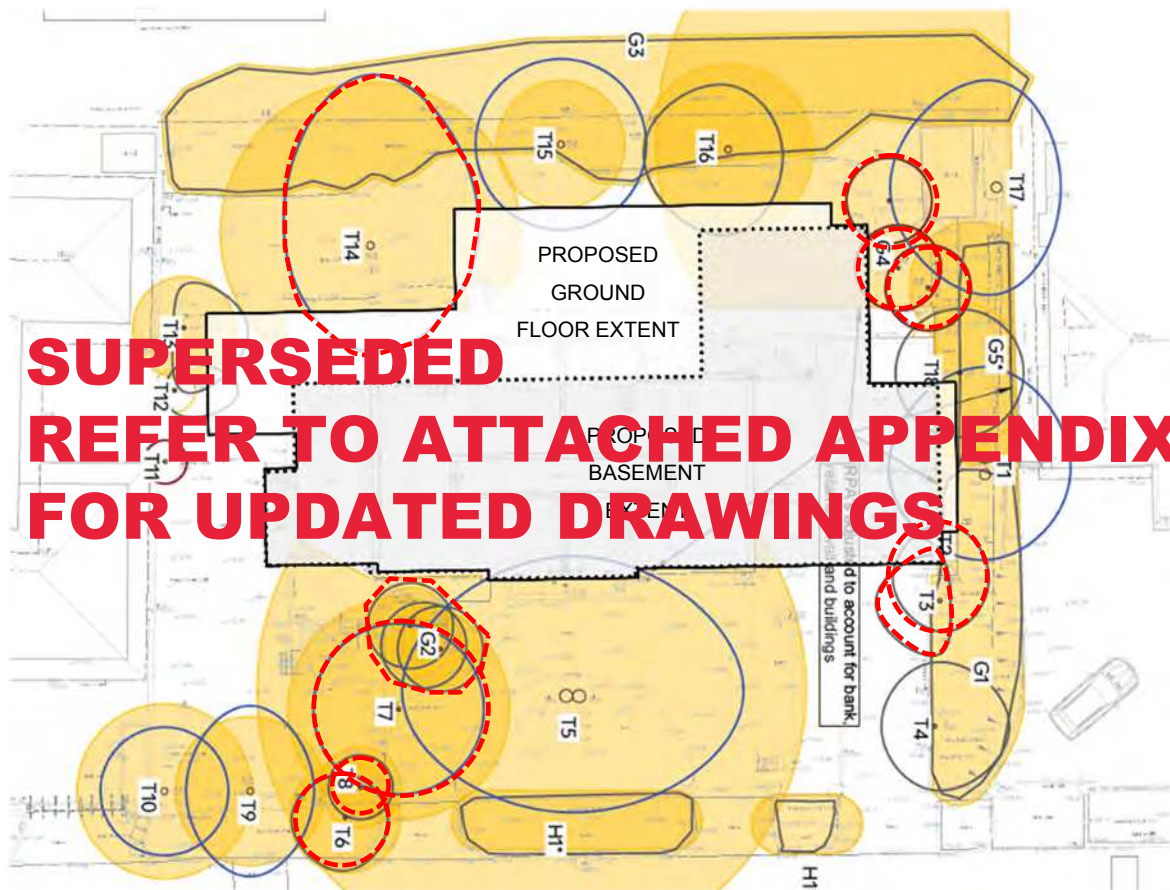
6.4 EFFECT OF TREES

Eighteen individual trees are present on the site as well as five groups of trees, as reported by the Tree Survey by Tyler Grange. The majority of the trees are proposed to be retained, with the exceptions marked on the plan overleaf.

The proposed depth of basement excavation is expected to obviate any concerns associated with ground heave due to the potential impact of excavation within the zone of soil that may have been affected by historical water extraction by tree roots.

The foundations and flooring design outside of the basement extent will, however, need to be designed with due consideration to the influence of trees.

The potential impact of the trees on the proposed structure can be estimated using the NHBC Chapter 4.2 'Building near trees' in the form of the required founding depth for the structure in order to avoid adverse influence of trees.



TREE SURVEY OF THE SITE SHOWING THE ROOT PROTECTION AREAS (YELLOW) AND PROPOSED TREES TO BE REMOVED (RED OUTLINE)

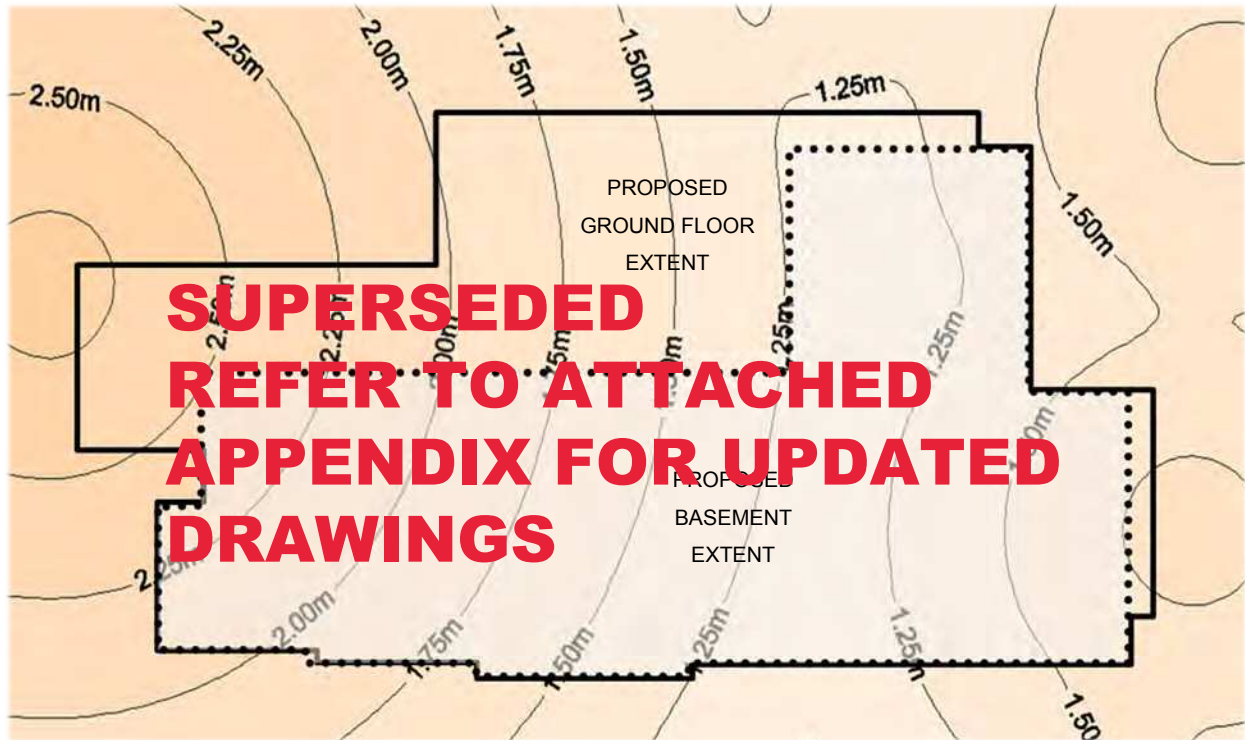
In practice only the trees located towards the sides and rear of the existing property will contribute to the potential root presence and potential desiccation beneath the proposed ground floor where it extends beyond the proposed basement footprint.

Using the NHBC guidance it is assessed that the high water demand Goat Willow tree at the southern part of the site (T13) will pose the largest risk, followed by the T15 and T16 Hornbeam trees at the northern boundary.

Given the variability of the underlying Claygate member, a medium volume change potential has been assumed as a worst case scenario, should there be a predominantly cohesive material be encountered at the surface. In practice, a predominantly sandy material would negate the impact of the trees.

The areas of assessed foundation depth requirements are presented on an analysis visualisation overleaf.

Based on this assessment, it is also suggested that suspended flooring will be required for the area of ground floor that extends beyond the basement. The suspended slabs are to be underlain by a layer of Cordek or similar heave protection layer.



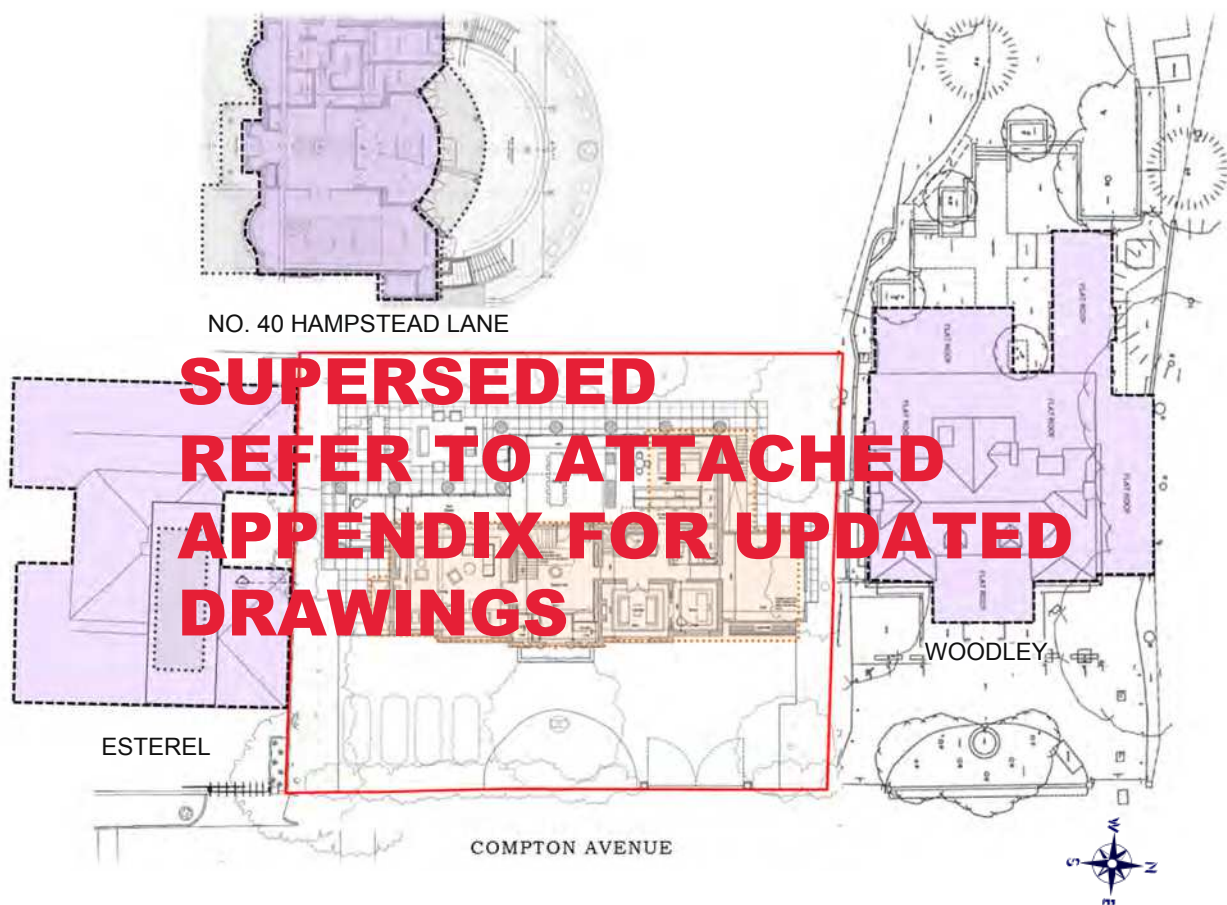
NHBC PREDICTED REQUIRED DEPTH OF FOUNDATIONS DUE TO THE INFLUENCE OF TREES
(ON THE BASIS OF MEDIUM SHRINKABILITY SOILS)

7. GROUND MOVEMENT TO NEIGHBOURING PROPERTIES

Haringey Council will seek to ensure that harm will not be caused to neighbouring properties by basement development. No set guidelines for damage limits is provided by the documents by London Borough of Haringey; however it is common practice to demonstrate that the proposed basement scheme has a risk of damage to the neighbouring properties no higher than Burland Scale 1 'Very Slight'.

There will be potential ground movement associated with both the proposed underpinning and as a result of unloading due to soil excavation.

7.1 STRUCTURES CONSIDERED FOR EFFECT OF GROUND MOVEMENT



7.1.1 NO. 40 HAMPSTEAD LANE

No. 40 Hampstead Lane is a large three-storey 1930s detached house with basement, present to the west of the site. This property was originally constructed at a similar time to Beaulieu House and was redeveloped at the turn of the Century, involving the construction of a new basement and remodelling of the rear patio at basement level.

The basement of the property is understood to be set at approximately +111m OD, coincident with the existing ground floor level of Beaulieu House.

7.1.2 ESTEREL

Esterel is a two-storey 1970s detached house, present to the south of the site. The building comprises a small basement in the form of a centrally located wine cellar which does not extend outside of the building footprint. The overhanging roof of this property extends to the site boundary, whilst the northern elevation is actually situated approximately 1m inside the boundary.

The ground floor is expected to be set at approximately +112.5m OD. The depth of the wine cellar is not currently known but it is not expected to extend more to more than 3m depth.

7.1.3 WOODLEY

Woodley is present to the north of the site and comprises a three-storey 1930s detached house with single storey rear and side extensions.

The property was constructed at approximately the same time as Beaulieu House with a ground floor level set at approximately +109.5m OD. The property does not comprise a basement floor.

7.2 MODELLED GROUND CONDITIONS

Excavation for the new basement will result in unloading of the clay, leading to theoretical heave movement of the underlying soil in both the short and long term. An analysis of the vertical movements has been carried out using the soil stiffness model detailed in the table below.

Poisson's Ratios of 0.5 and 0.1 have been used for short term (undrained) and long term (drained) conditions, respectively. The analysis uses the above parameters for stratified homogeneity with the introduction of an assumed rigid boundary at approximately 35m depth.

STRATUM:	UNDRAINED ELASTIC MODULUS E_u (kN/m ²)	DRAINED ELASTIC MODULUS E' (kN/m ²)
Claygate Member	39,150kN/m ² at proposed excavation level increasing linearly to 138,375kN/m ² at 35m depth	21,750kN/m ² at proposed excavation level increasing linearly to 76,875kN/m ² at 35m depth

7.3 VERTICAL GROUND MOVEMENTS

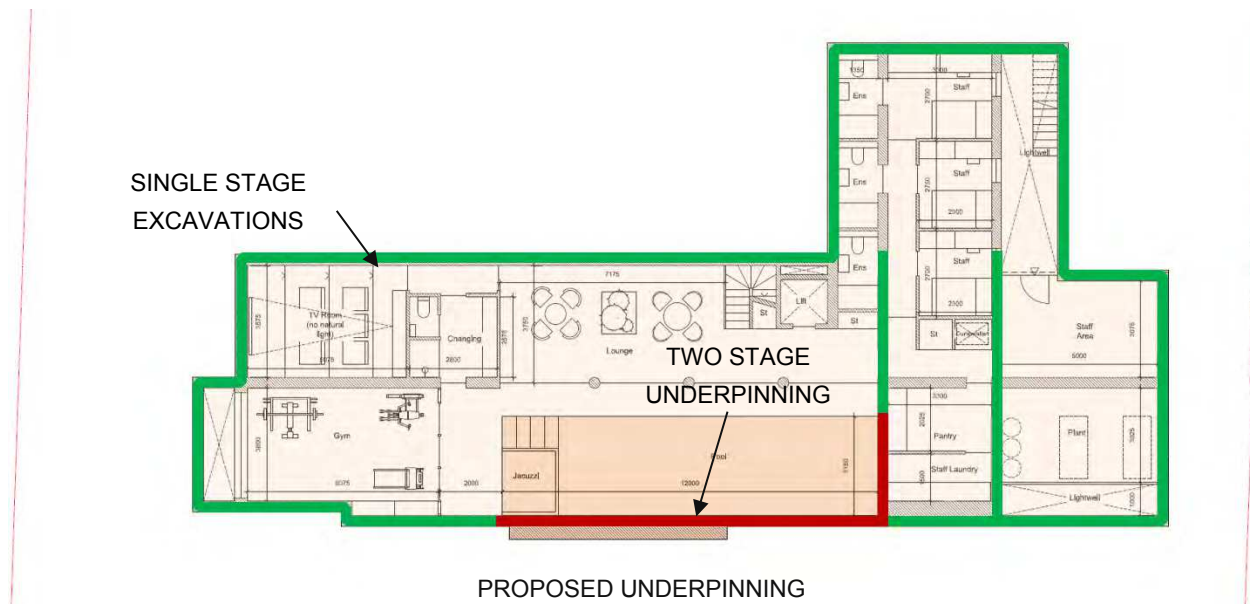
There are two components of vertical movement that could potentially interact to affect the neighbouring structures.

These components are firstly progressive sagging movements of any underpinned party walls due to the underpinning process itself, and secondly elastic heave of the ground in and around the new excavation as a direct response to the net unloading of the weight of soil removed in the basement excavation.

7.3.1 MOVEMENTS DUE TO UNDERPINNING

It is not possible to rigorously model the extent of wall settlement arising from underpinning and the amount of movement is dependent on the competence of the contractor. Given dry conditions and good workmanship, the amount of vertical movement of the party wall can be expected to be a maximum of

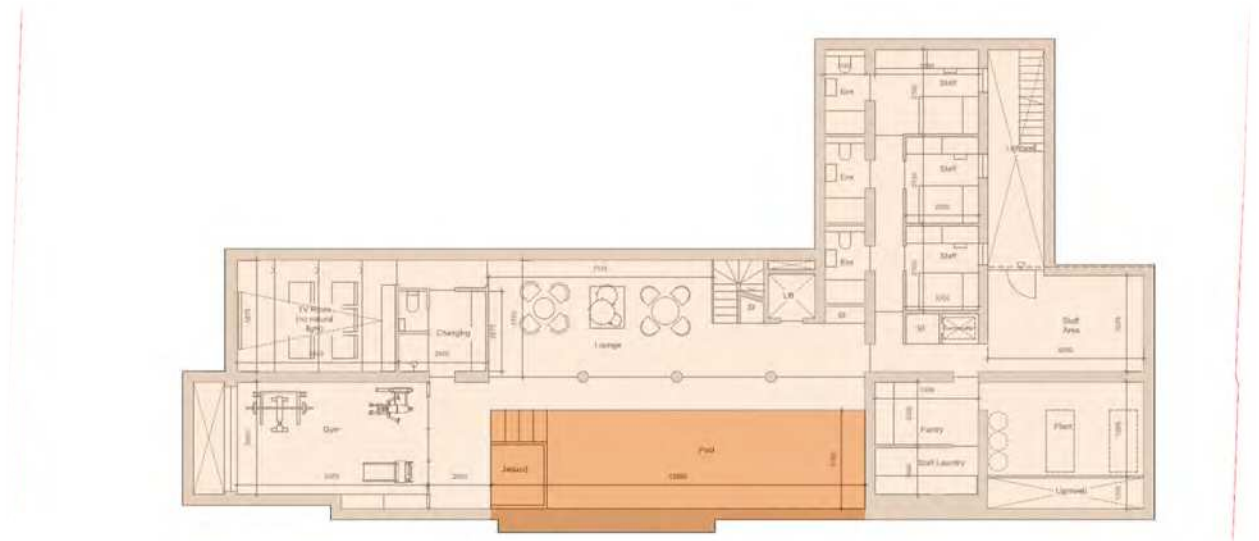
5mm per stage of underpinning. Hence, settlements of up to some 10mm of the underpinned wall are predicted.



7.3.2 MOVEMENTS DUE TO EXCAVATION UNLOADING

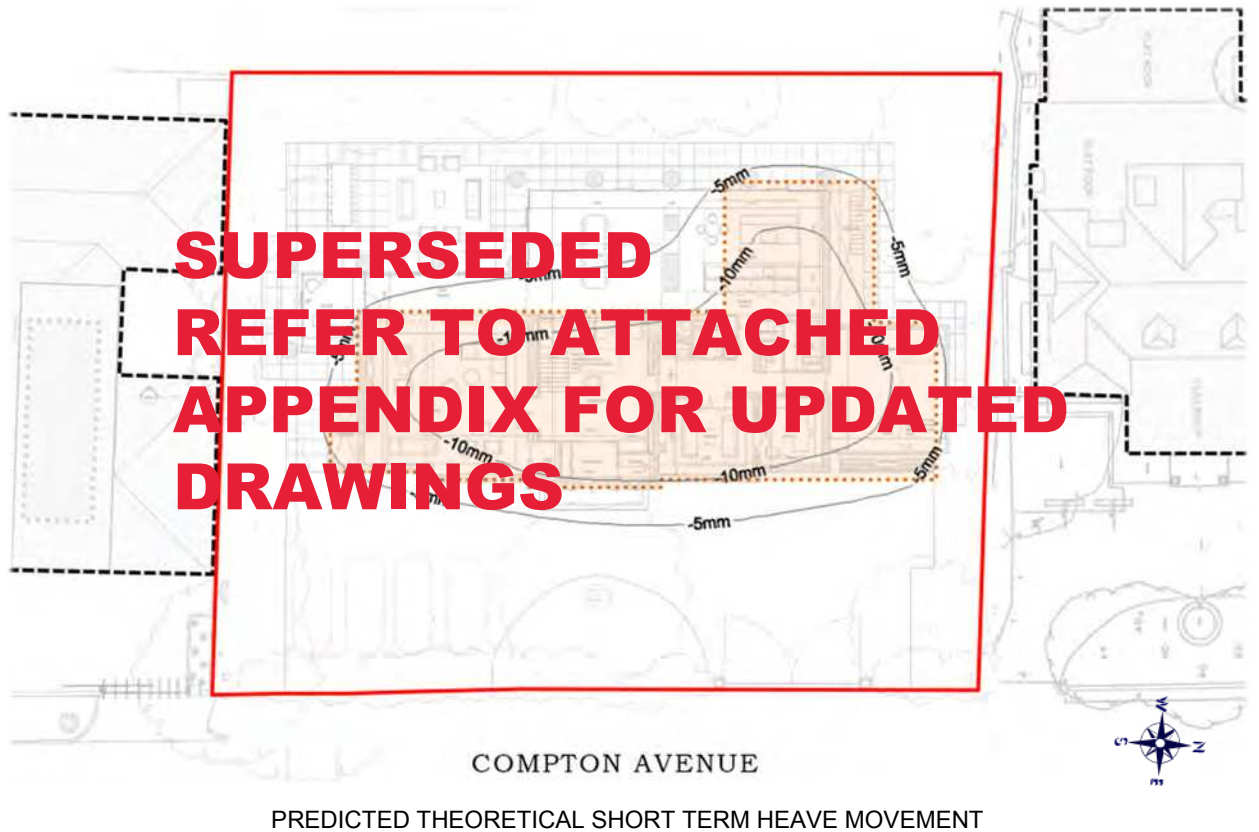
The basement excavations will extend to between approximately 3.5m and 5.5m depth below the existing ground level at the site. The effect of the excavation has accordingly been considered as an unloading of between -70kN/m^2 and -110kN/m^2 within the proposed basement areas.

As the basement will be excavated within the Claygate Member, a heave elastic response of the ground as a result of unloading can be expected to occur both immediately following the basement excavations and in the post-construction long-term scenario.



7.3.2.1 SHORT TERM HEAVE

The analysis suggests that up to 15mm of short term heave is expected at the centre of the excavations, reducing to less than 5mm outside of the basement extent.



7.3.2.2 POST CONSTRUCTION HEAVE

The drained elastic model predicts a potential for on-going post construction term heave movement of a similar order of magnitude to the short term movement. In practice this movement, which theoretically could proceed for decades, is expected to be constrained by the presence and rigidity of the new construction.

7.4 HORIZONTAL MOVEMENTS

Horizontal soil movements are expected to occur due to yielding of the soil behind the underpinned walls.

As a first approximation, the magnitude of the horizontal movement at the underpinned wall is assumed to equal to the vertical movement at the wall (up to 10mm for the two-stage underpinning), reducing to zero at a distance of 4 times the excavation depth (up to approx. 22m) behind the wall.

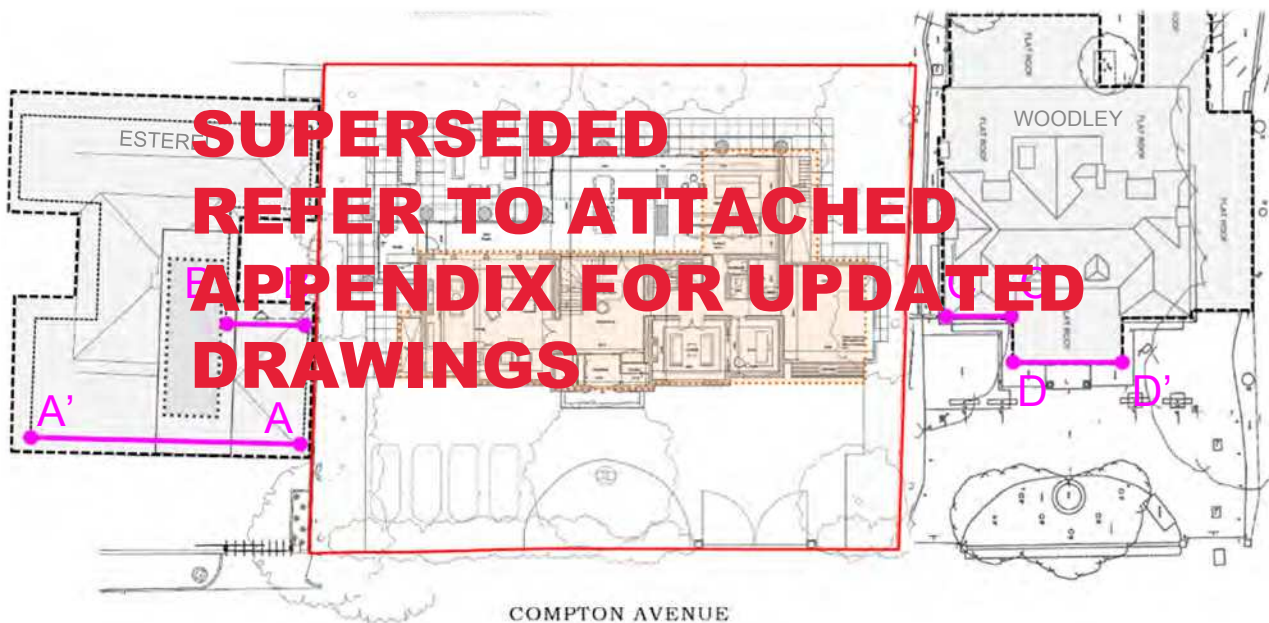
7.5 IMPACT ON NEIGHBOURING STRUCTURES

Although in practice it can be understood from the above discussion that there may be some potential counteraction of movements, the neighbouring structures are located a sufficient distance from the proposed excavations to not be affected by the potential heave.

The effect of the predicted vertical and horizontal deflections have been assessed using the Burland damage category assessment process, which is based upon consideration of a theoretical masonry panel of a given length (L) and height (H).

The potential degree of the predicted ground movements on the assessed structures can be estimated by the correlation of maximum horizontal strain, ϵ_h , with the maximum deflection ratio, Δ/L , where Δ is the vertical distortion over the wall length under assessment (where the wall length L is actually less than the distance to the point at which zero vertical movement is assumed, a minimum distortion of 1mm is assumed).

7.5.1 SECTIONS FOR ANALYSIS



7.5.2 NO. 40 HAMPSTEAD LANE

No. 40 Hampstead Lane is located approximately 16m away from the closest proposed basement retaining wall; which is assessed as being a sufficient distance to not be impacted by the proposed development.

7.5.3 ESTEREL

7.5.3.1 SECTION A-A'

The length (L) of the wall is taken as 19m and the wall height (H) as 3m. The closest edge of the wall is located approx. 8m away from the proposed underpinning and therefore up to 1.7mm of settlement and 2.1mm of horizontal movement is predicted at this wall.

The maximum horizontal strain, $\epsilon_h (\Delta h / L)$ is assessed as 0.0113%, producing a maximum deflection ratio $\Delta / L = -0.0074$, within a limiting tensile strain of 0.035%, for a Burland Category 0 'Negligible' condition.

7.5.3.2 SECTION B-B'

The length (L) of the wall is taken as 6m and the wall height (H) as 3m. The closest edge of the wall is located approx. 6m away from the proposed underpinning and therefore up to 2.5mm of settlement and 2.9mm of horizontal movement is predicted at this wall.

The maximum horizontal strain, $\epsilon_h (\Delta h / L)$ is assessed as 0.0372%, producing a maximum deflection ratio $\Delta / L = -0.01667$, within a limiting tensile strain of 0.060%, for a Burland Category 1 'Very Slight' condition.

7.5.4 WOODLEY

7.5.4.1 SECTION C-C'

The length (L) of the wall is taken as 5m and the wall height (H) as 6m. The closest edge of the wall is located approx. 5m away from the proposed underpinning and therefore up to 3mm of settlement and 3.2mm of horizontal movement is predicted at this wall.

The maximum horizontal strain, $\epsilon_h (\Delta h / L)$ is assessed as 0.0518%, producing a maximum deflection ratio $\Delta / L = -0.02$, within a limiting tensile strain of 0.065%, for a Burland Category 1 'Very Slight' condition.

7.5.4.2 SECTION D-D'

The length (L) of the wall is taken as 7.5m and the wall height (H) as 6.5m. The closest edge of the wall is located approx. 10m away from the proposed underpinning and therefore up to 0.9mm of settlement and 1.4mm of horizontal movement is predicted at this wall.

The maximum horizontal strain, $\epsilon_h (\Delta h / L)$ is assessed as 0.0190%, producing a maximum deflection ratio $\Delta / L = -0.0133$, within a limiting tensile strain of 0.030%, for a Burland Category 0 'Negligible' condition.

7.5.5 PUBLIC HIGHWAY

The proposed basement excavation is located approximately 10m from the pavement of Compton Avenue, where various buried utilities are expected to be located.

The analysis indicates that negligible movement will occur at this distance.

8. IMPACT ASSESSMENT

The screening and scoping stages identified potential aspects of the geological, hydrogeological and hydrological environment that could lead to the development having an unacceptable impact.

This stage is concerned with evaluating the direct and indirect implications of each of these potential impacts.

8.1 HYDROGEOLOGICAL IMPACT ASSESSMENT

The new basement is not expected to extent significantly below any water table and hence should not have an adverse impact upon groundwater flow. Ground exploration is to be undertaken prior to construction in order to confirm the groundwater situation.

8.2 HYDROLOGICAL IMPACT ASSESSMENT

The proposed development will increase the hardstanding area on the site and therefore will be required to provide sufficient drainage attenuation in order to maintain the present water discharge regime.

There will be also a need to provide Sustainable Drainage Systems (SuDS) to provide an overall reduction in discharge rates.

8.3 POTENTIAL STABILITY IMPACTS

8.3.1 SLOPE STABILITY

The site and immediately surrounding neighbours do not contain slopes in excess of 7°.

No significant re-profiling is proposed and the proposed basement is not expected to have any adverse impact on the wider hillside.

8.3.2 EFFECT OF TREES

The basement excavations will be undertaken to a sufficient depth to obviate the potential adverse effect of trees. It is understood that the impact of the basement upon the trees to be retained has been assessed separately by an arboriculturist.

The proposed ground floor extending outside of the proposed basement footprint will be required to provide suitably deeper foundations in order to protect against the potential movement due to tree influence, as a result of the moderate and high water demand trees to be retained on site.

Suspended flooring is to be adopted in this area.

8.3.3 GROUND MOVEMENTS

A key requirement for basement design is to avoid excessive damage to neighbouring properties.

The predicted neighbouring buildings damage levels due to ground movements associated with the proposed development have been analysed and found to be limited to Burland scale Category 1 'Very Slight'. Negligible movement to the public highway is predicted.

9. CONCLUSION

The assessment has demonstrated that no adverse residual or cumulative stability, hydrological or hydrogeological impacts are expected to either neighbouring structures or the wider environment as a result of this development.

Appendix A

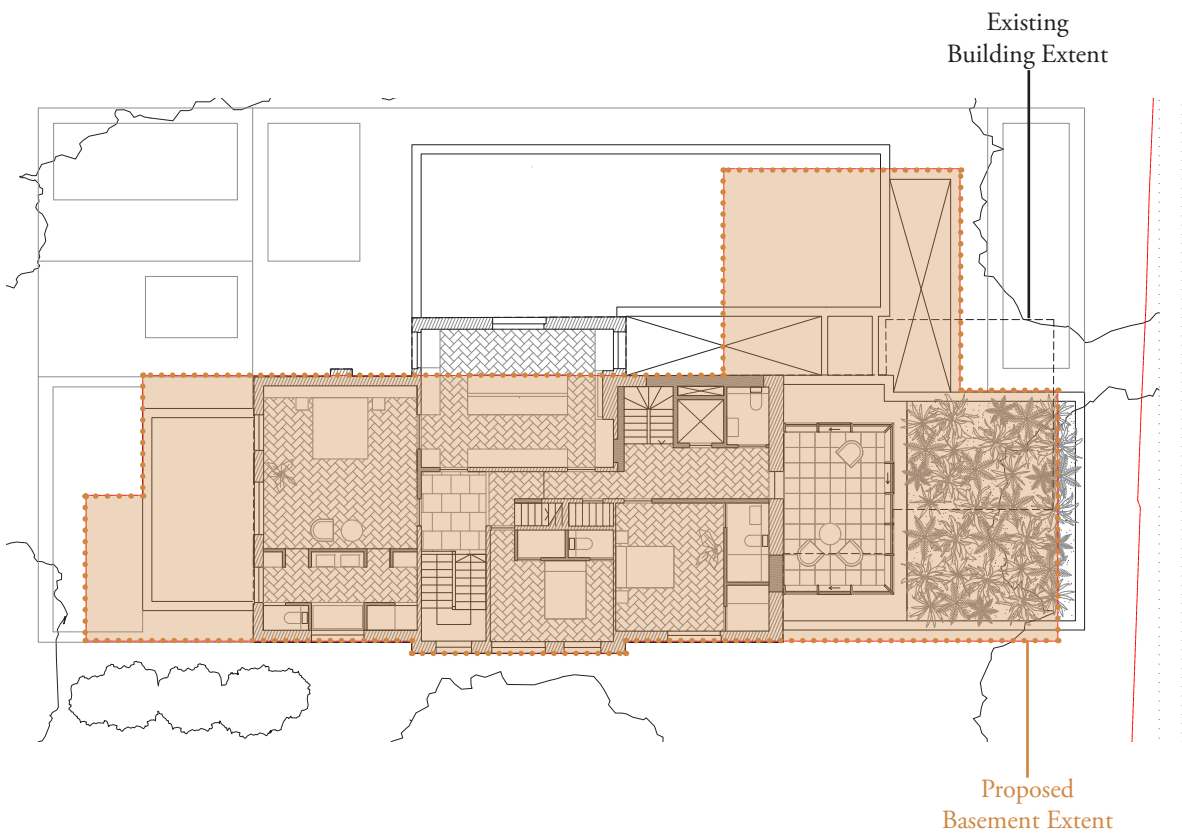
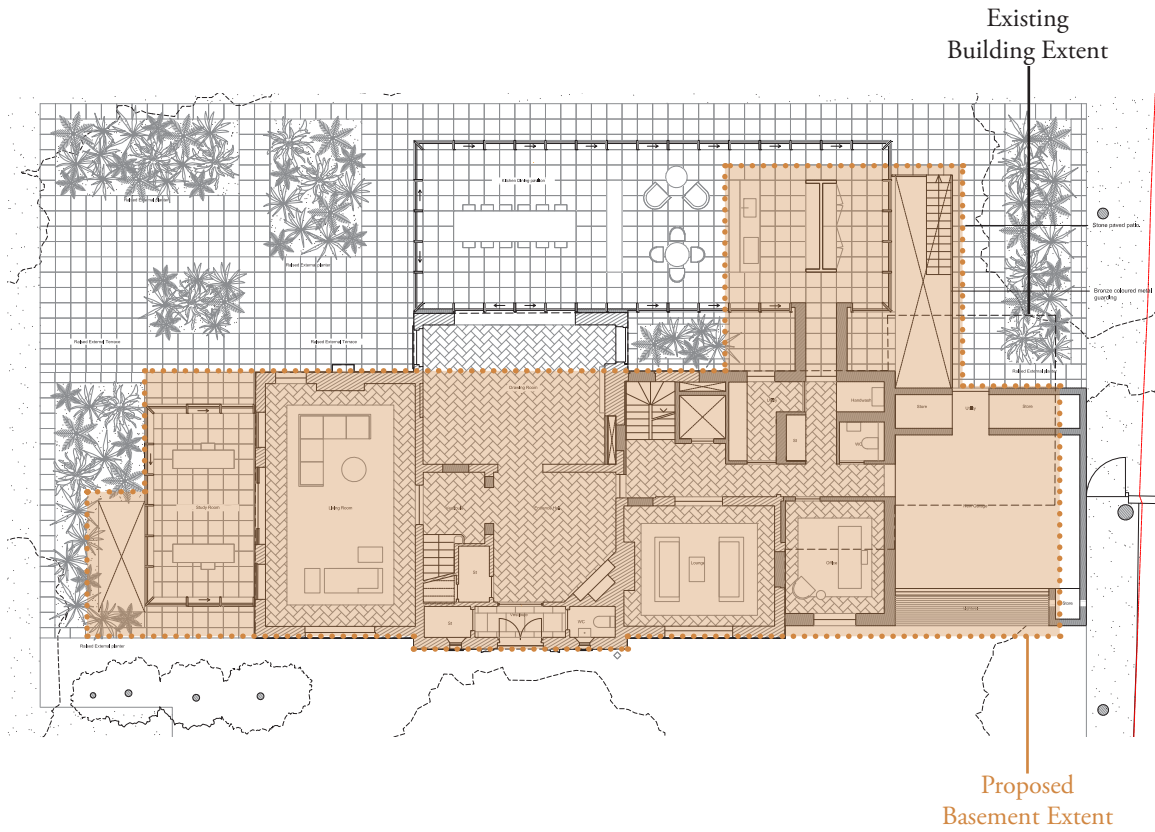
Updated Diagrams

1.1 Page 12 - 2.4 Proposed Development

Below

Proposed Ground Floor Plan

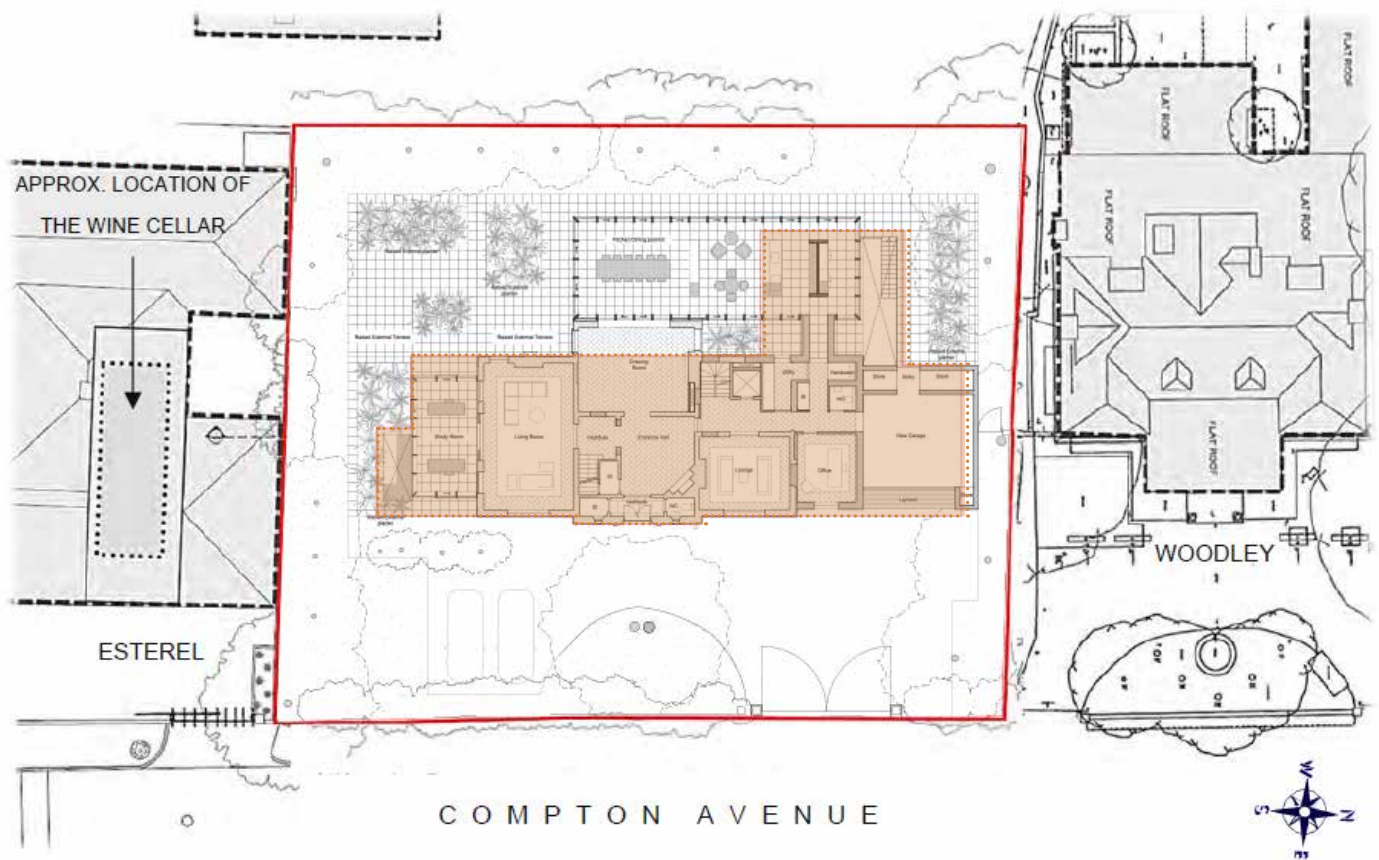
Proposed First Floor Plan



1.2 Page 13 - 2.4 Proposed Development

Below

Proposed Ground Floor Plan in context



1.3 Page 14 - 2.4 Proposed Development

Below

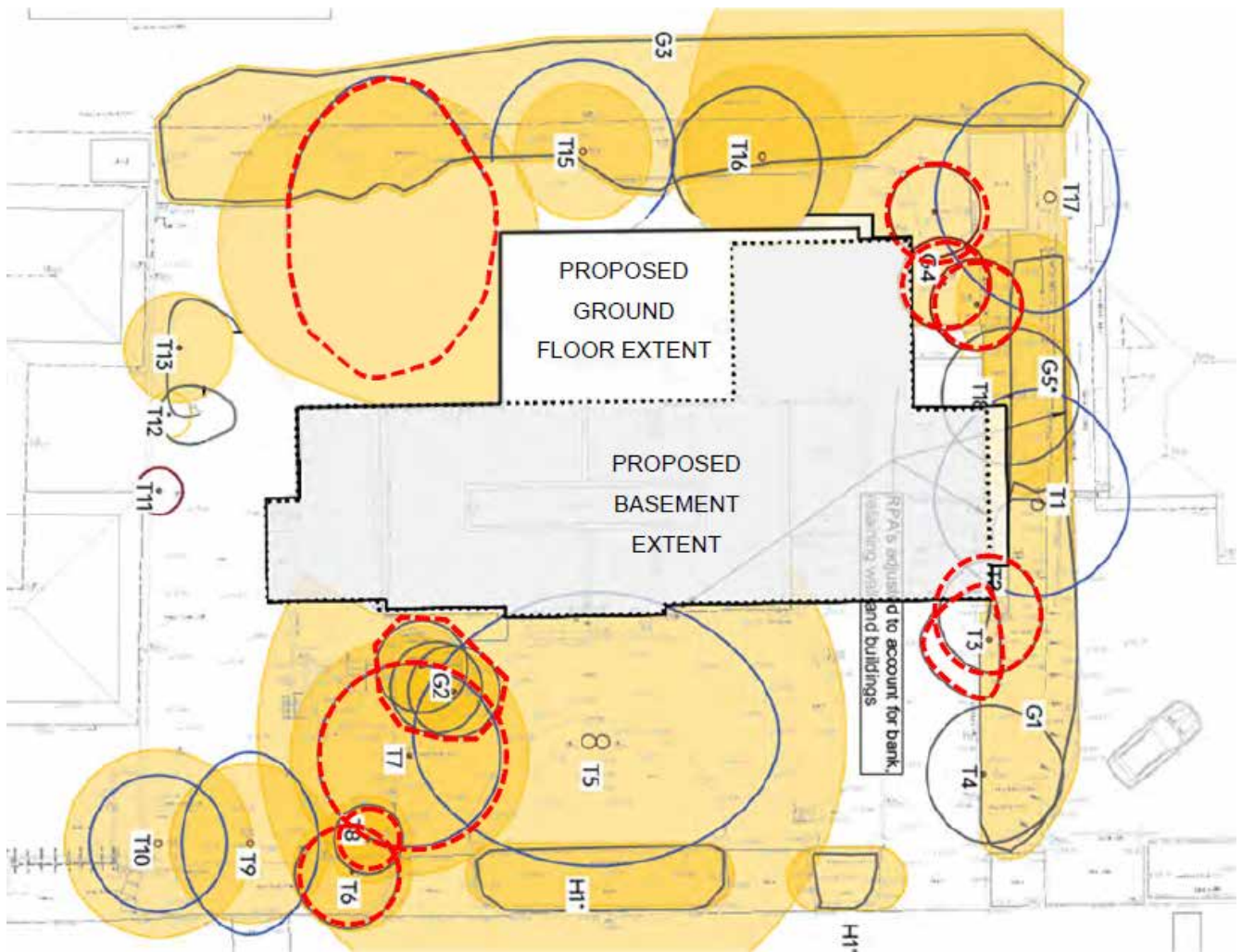
Proposed Section



2.1 Page 27 - 6.4 Effect of Trees

Below

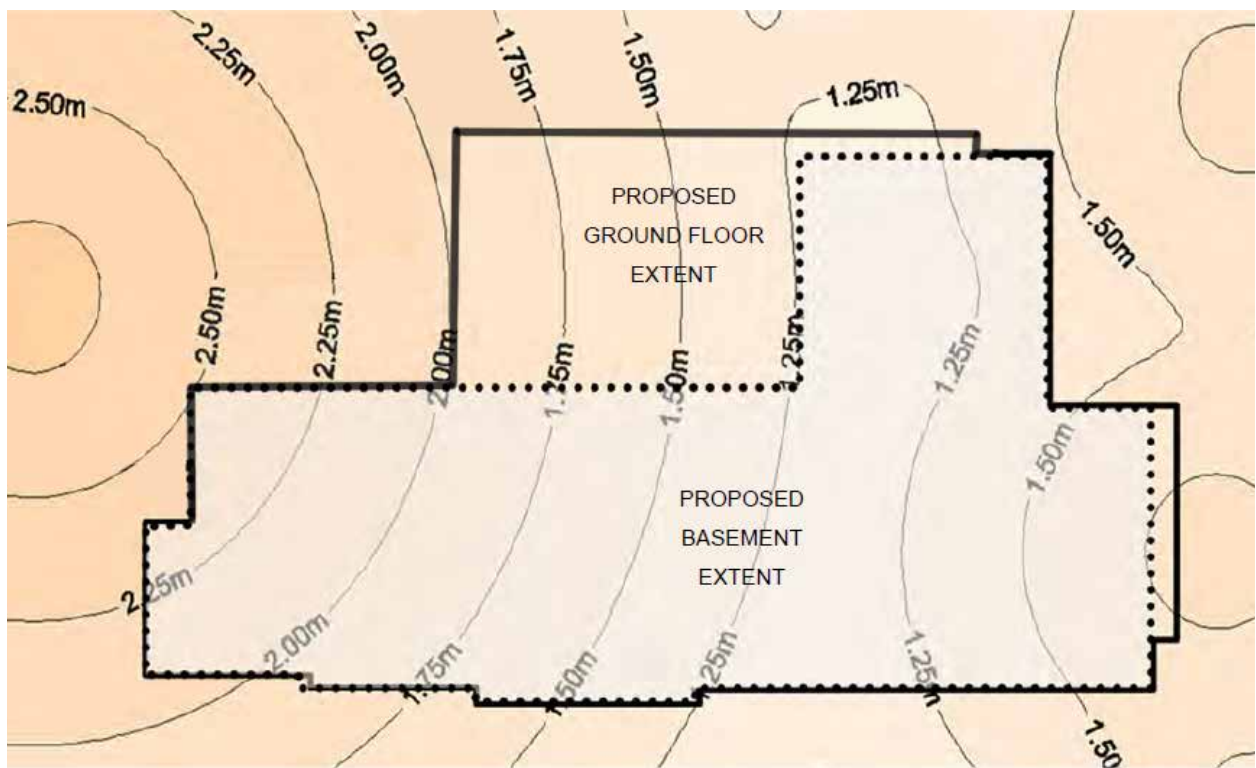
Tree survey of the site showing the root protection areas (yellow) and proposed trees to be removed (red outline)



2.1 Page 28 - 6.4 Effect of Trees

Below

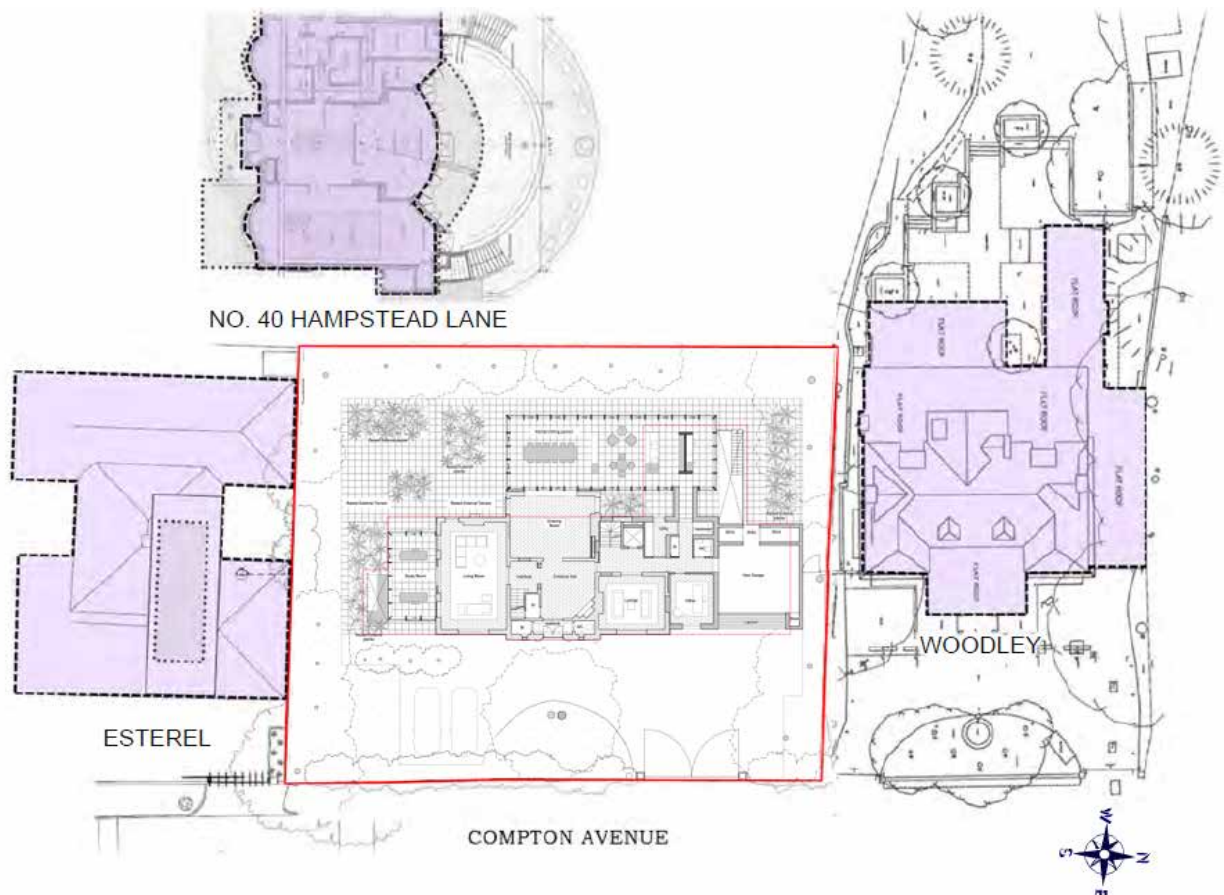
NHBC predicted required depth of foundations due to the influence of trees (on the basis of medium shrinkability soils)



2.2 Page 29 - 7.1 Structures considered for effect of ground movement

Below

Structures considered for effect of ground movement

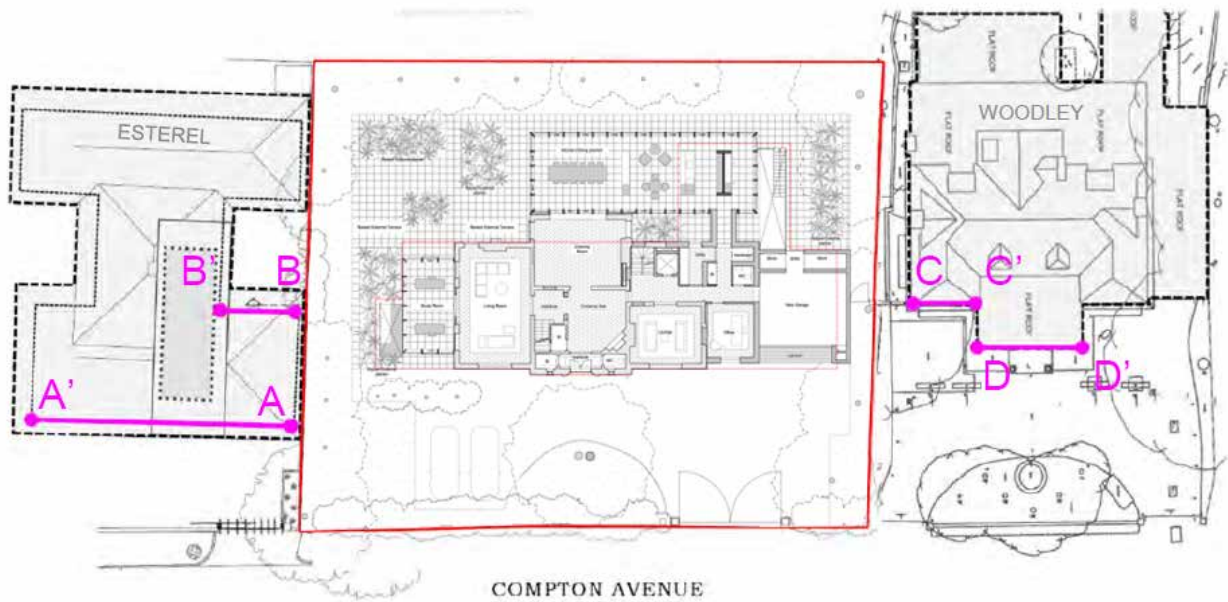


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2.2 Page 34 - 7.5.1 Sections for Analysis

Below

Section for Analysis



End.