Appendix 1 – Chelmer BIA report

Basement Impact Assessment

Site	13a Pond Street London NW3 2PN
Client	Spencer Baylin
Date	November 2017
Our Ref	BIA/8222 Revision 2

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Foreword

This report has been prepared in accordance with the scope and terms agreed with the Client, and the resources available, using all reasonable professional skill and care. The report is for the exclusive use of the Client and shall not be relied upon by any third party without explicit written agreement from Chelmer Global Ltd.

This report is specific to the proposed site use or development, as appropriate, and as described in the report Chelmer Global Ltd. accept no liability for any use of the report or its contents for any purpose other than the development or proposed site use described herein.

This assessment has involved consideration, using normal professional skill and care, of the findings of ground investigation data obtained from the Client and other sources. Ground investigations involve sampling a very small proportion of the ground of interest as a result of which it is inevitable that variations in ground conditions, including groundwater, will remain unrecorded around and between the exploratory hole locations; groundwater levels/pressures will also vary seasonally and with other man-induced influences; no liability can be accepted for any adverse consequences of such variations.

This report must be read in its entirety in order to obtain a full understanding of our recommendations and conclusions.

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F: Chelmer Factual Report FACT/8222

G: PDISP Modelled Net Changes in Vertical Pressure

1.0 INTRODUCTION

1.1 This report presents the outcome of a Basement Impact Assessment (BIA) for the proposed development of 13a Pond Street, London NW3 2PN. The local planning authority is the London Borough of Camden.

1.2 Chelmer Site Investigation Laboratories Ltd (Chelmer) was instructed in December 2016 to by Spencer Baylin to complete this report. The report was prepared by Alexandra Ash MEng and Joel Slater BEng, and reviewed by Dr Martin Preene BEng PhD CEng FICE CGeol FGS CSci CEnv C.WEM FCIWEM. Dr Preene is a UK Registered Ground Engineering Adviser with 30 years' experience of geotechnical engineering.

1.3 The revised ground movement assessment completed in November 2017 was prepared by Patrick O'Toole BEng, of Chelmer Global Limited, on the instruction of Toby Maclean of Entuitive Structural Engineers, to re-assess the movement analysis using an updated approach with the aim to reduce the damage category assessment (to Category 1) if possible.

1.4 This report presents a BIA that is compliant with Camden Borough CPG4 planning document (July 2015). As required by the CPG4, screening flow charts covering the three main issues (surface flow and flooding, land stability and groundwater flow) have been provided in Appendix A.

1.5 The BIA aims to identify any detrimental impacts the proposed basement may have to the local area or neighbouring properties through its potential impacts to surface water, groundwater and ground movement. This has been performed by using the Stage 1 Screening assessment set out in CPG4 and completing the screening flow charts in Appendix A. Where Stage 1 identifies potential impacts these have been addressed in Appendix A, which refers to the relevant Conceptual Site Model sections in this report. The third stage of the BIA includes a site investigation and desk study; these are detailed in Section 3.0. The Conceptual Site Model, Section 4.0, evaluates the implications of the proposed development (Stage 4). Finally, a Ground Movement and Damage Category Assessment has been undertaken that identifies potential impacts to neighbouring properties (Stage 4).

1.6 The site comprises 13a Pond Street, London NW3 2PN and is located at approximate Ordnance Survey grid reference (OSNGR) 527120E, 185500N. The site comprises a two storey cottage with a single storey extension to the east and south of the original building. The property has a small garden and is surrounded by mature trees. The site is accessed via an alleyway next to The Roebuck pub and sits behind buildings on Pond Street.

1.7 It is to our understanding that the proposed development involves replacement of the original cottage building with a new four-storey cottage, including a basement level. The existing single storey extension is to be retained. The proposed footprint will be slightly smaller than the existing footprint. Existing and proposed plans are presented in Appendix B.

1.8 A site inspection (walk-over survey) was undertaken on 9th January 2017 by Jake Solomon of Chelmer, photos from which are presented in Appendix C. Desk study data have been collected from various sources including borehole/well logs from the vicinity of the site from the British Geological Survey (BGS) (Appendix D) and geological data, environmental data and historic maps from Groundsure which are presented in Appendix E. Relevant information from the desk study and site inspection is presented in Sections 2.0 and 3.0.

1.9 A ground investigation was undertaken by Chelmer (2017) on 21st December 2016 and 10th and 11th January 2017 and the findings are summarised in Section 3.0. The Factual Report from the ground investigation is presented in Appendix F.

1.10 The following site-specific documents in relation to the proposed basement have been considered:

Gianni Botsford Architects

Drawing 201 100 (Existing – Site Location Plan)
Drawing 201 101 (Existing – Ground Floor Plan)
Drawing 201 102 (Existing – Second Floor Plan)
Drawing 201 103 (Existing – Roof Plan)
Drawing 201 110 (Existing – South Elevation)
Drawing 201 111 (Existing – East Elevation)
Drawing 201 112 (Existing – North Elevation)
Drawing 201 113 (Existing – West Elevation)
Drawing 201 120 (Existing – Section A-A)
Drawing 201 121 (Existing – Section B-B)
Drawing 201 122 (Existing – Section C-C)
Drawing 201 123 (Existing – Section D-D)
Drawing 201 124 (Existing – Section E-E)

Drawing 201 200 P03 (Proposed – Site Location Plan)
Drawing 201 201 P03 (Proposed – Basement Plan)
Drawing 201 202 P03 (Proposed – Ground Floor Plan)
Drawing 201 203 P03 (Proposed – First Floor Plan)
Drawing 201 204 P03 (Proposed – Second Floor Plan)
Drawing 201 205 P03 (Proposed – Roof Plan)
Drawing 201 210 P03 (Proposed – South Elevation)
Drawing 201 211 P03 (Proposed – East Elevation)
Drawing 201 212 P03 (Proposed – North Elevation)
Drawing 201 213 P03 (Proposed – West Elevation)
Drawing 201 214 P03 (Proposed – South Elevation from Neighbouring Properties)
Drawing 201 215 P03 (Proposed – East Elevation from Neighbouring Properties)
Drawing 201 216 P03 (Proposed – North Elevation from Neighbouring Properties)
Drawing 201 217 P03 (Proposed – West Elevation from Neighbouring Properties)
Drawing 201 220 P03 (Proposed – Section A-A)
Drawing 201 221 P03 (Proposed – Section B-B)

Drawing 201 222 P03 (Proposed – Section C-C)
Drawing 201 223 P03 (Proposed – Section D-D)
Drawing 201 224 P03 (Proposed – Section E-E)
Drawing 201 225 P03 (Proposed – Section F-F)

Entuitive Structural Engineers

Drawing 3985/SK10 Rev.A (Annotated Basement Plan with Load Takedown)
Drawing 3985/SK11 (Annotated Ground Floor Plan with Load Takedown)
Drawing 3985/SK20 (Section 1-1 and Section 2-2 Perimeter Detail)
Drawing 3985/SK21 (Section 3-3 Perimeter Detail)
Drawing 3985/SK22 (Section 4-4 Basement Slab Edge Detail)

2.0 PROPERTY AND AREA DETAILS

2.1 The property is located in the centre of Pond Street, to the rear of No.15 Pond Street (The Roebuck public house) and is accessed via an alleyway. The site is approximately 185m south west of Hampstead Heath London Overground station. The site occupies an area of approximately 260 m^2 and is centred on Ordnance Survey National Grid Reference 527120, 185500.

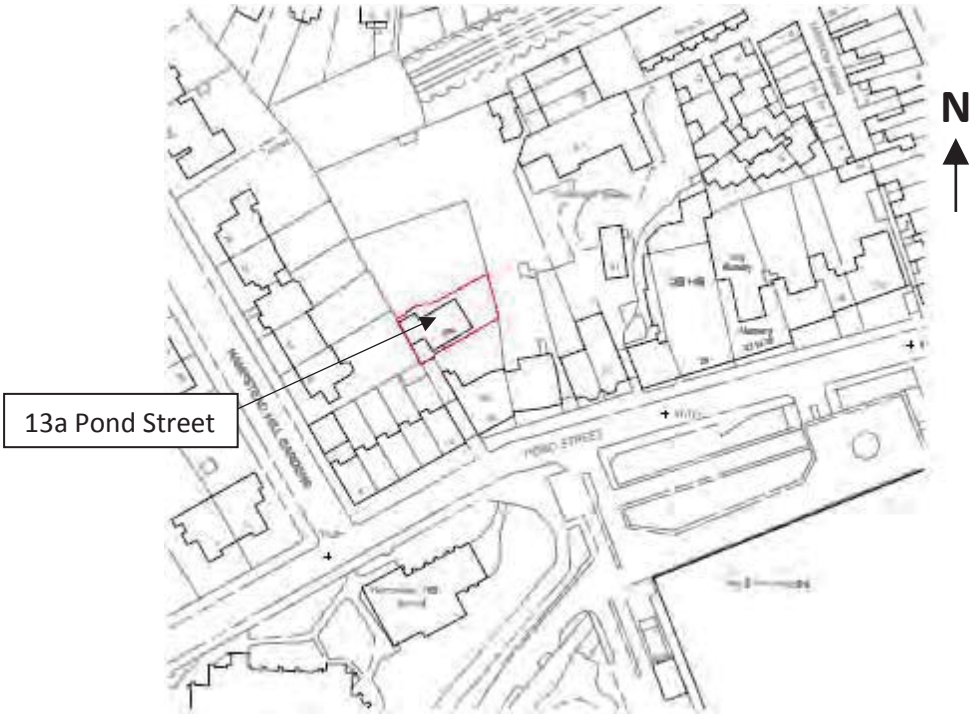

Figure 1. Site Location Plan (taken from Gianni Botsford Architects drawing 201 100)

2.2 The site comprises 13a Pond Street, London NW3 2PN which is a two storey detached residential brick built cottage with a single storey extension to the east and south of the original building. The property has a small garden and is surrounded by mature trees. The property is neighboured by No. 15 (The Roebuck) to the south, No. 33 Hampstead Hill Gardens to the west, the garden of No. 17 Pond Street to the east and to the north the shared garden of No's 29, 31 & 33 Hampstead Hill Gardens.

2.3 A site inspection (walk-over survey) was undertaken on 9th January 2017 by Jake Solomon of Chelmer, photos from which are presented in Appendix C. The property appeared to be in a good state of repair during the site inspection visit.

2.4 The proposed development involves replacement of the original cottage building with a new four-storey cottage, including a basement level. The existing single storey extension is to be retained. The proposed footprint will be slightly smaller than the existing footprint. Existing and proposed plans are presented in Appendix B.

2.5 As detailed by Entuitive the proposed basement floor level is anticipated to be at 66.93 m AOD (with a slightly lower level for the proposed sunken garden) with the founding level at 66.46 m AOD (3.8 m bgl) or 66.18 m AOD (4.1 m bgl) if a cellcore is required for heave. Scaling from Drawings 201 220 P02 and 201 222 P03 the sunken garden will be founded at approximately 65.8 m AOD (4.5 m bgl) and the small deeper excavation for the plant will be at approximately 65.4 m AOD (4.9 m bgl).

2.6 A search has been made of planning applications on the London Borough of Camden website in order to obtain details of any other basements which have been constructed, or are planned, in the vicinity of the site. This search found a single planning application relating to a modern basement within the vicinity of the site at No.17 Pond Street (Camden planning application no. 2012/0254/L) for '…replacement single storey rear conservatory with basement excavation…'. Further planning applications around the site as well as street view imaging indicate original basements beneath No's 5 to 15, 19 & 21 Pond Street and No's 29 to 33 Hampstead Hill Gardens.

2.7 No information is available on the foundation depths of neighbouring structures. In this study we have assumed a conservative foundation level of 0.5 m bgl for the single storey rear extensions to the properties on Pond Street. Any historic basements/cellars are likely founded at depths of between 2.0 m and 4.0 m bgl.

3.0 PHYSICAL SETTING

3.1 Site History and Age of the Property

3.1.1 Historic maps (presented in the Groundsure Report in Appendix E) indicate residential development along Pond Street from the location of No.15 towards the east on the 1871 map. Haverstock Hill is present at the west end of Pond Street and Hampstead Heath station and its associated tunnel is indicated to the north. The original cottage building is first indicated on the 1894/1896 maps. Also on this map, Hampstead Hill Gardens is indicated to the west of the site, the current No's 1-13 Pond Street are present, the configuration of No.15 Pond Street has changed and is now indicated as a Public House and St Stephen's Church is indicated on the south side of Pond Street. On the 1915 map a hospital (The Royal Free) is indicated to the south of Pond Street. Haverstock Hill is now recorded as Rosslyn Hill. On the 1952 to 1954 maps a small building is indicated in the south east corner of the site. On the 1972 to 77 map the small building is no longer present and the single storey extension footprint is indicated. It is understood that the extension was constructed in 1969. The Royal Free Hospital has a new large building indicated to the south of Pond Street. The historic maps identify very few developments in the area since 1977.

3.2 Topography

3.2.1 The detached, two-storey building is located to the rear of No's 13 and 15, close to the centre of Pond Street. The Pond Street carriageway slopes down eastwards and Hampstead Hill Gardens to the west of the site slopes down northwards in the area closest to the site. The BGS Onshore GeoIndex indicates that the surrounding land slopes down to the east/north east approximately 1 in 10 (<6°).

3.3 Hydrological Setting (Rivers and Watercourses)

3.3.1 The site lies approximately 6 km to the north-west of the River Thames. The nearest surface water feature, identified in the Groundsure Report, is 235 m north east of the site. Furthermore, the Groundsure Report identified the Hampstead Ponds 326 m north of the site and two culverts within 500 m of the site, one 80 m east of the site and one 498 m north of the site. The BGS Onshore GeoIndex identifies the nearest well as being located approximately 220 m to the north east of the property.

3.3.2 The book 'The Lost Rivers of London' (Barton, 1992) identifies the lost River Fleet running east of the site. A map of the tributaries of the Thames and showing the approximate location of No.13a Pond Street is presented in Figure 2 and the location of the Fleet relative to No.13a Pond Street is presented in Figure 3. Although the River Fleet is indicated as being approximately 200 m to the east in Figure 3 it is likely that the culverted river detailed in Section 3.3.1 (80 m to the east) is that of the River Fleet as the Groundsure Detailed River Network map indicates it joining up with the Hampstead Ponds, as the River Fleet is expected to, with no other culverts indicated as joining up with the Hampstead Ponds.

3.3.3 Hydrological data have also been obtained from the Groundsure Report (see Appendix E), which indicates:

- There are no surface water abstraction licences within 2000 m of the site.
- There are no flood defences, no area benefitting from flood defences, and no flood storage areas within 250m of the site.

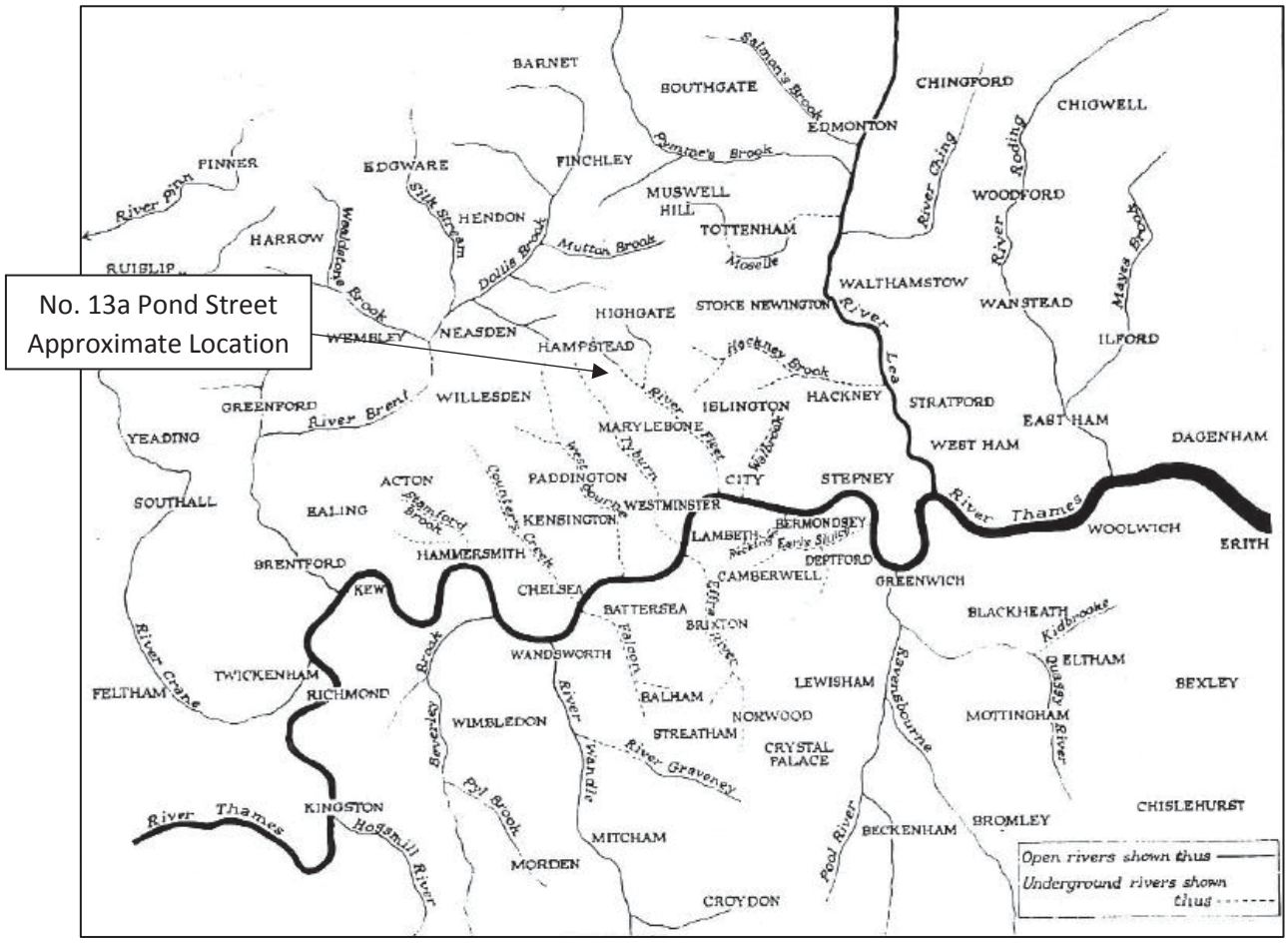

Figure 2. Tributaries of the Thames from Kingston to Erith identified in 'The Lost Rivers of London' (Barton, 1993)

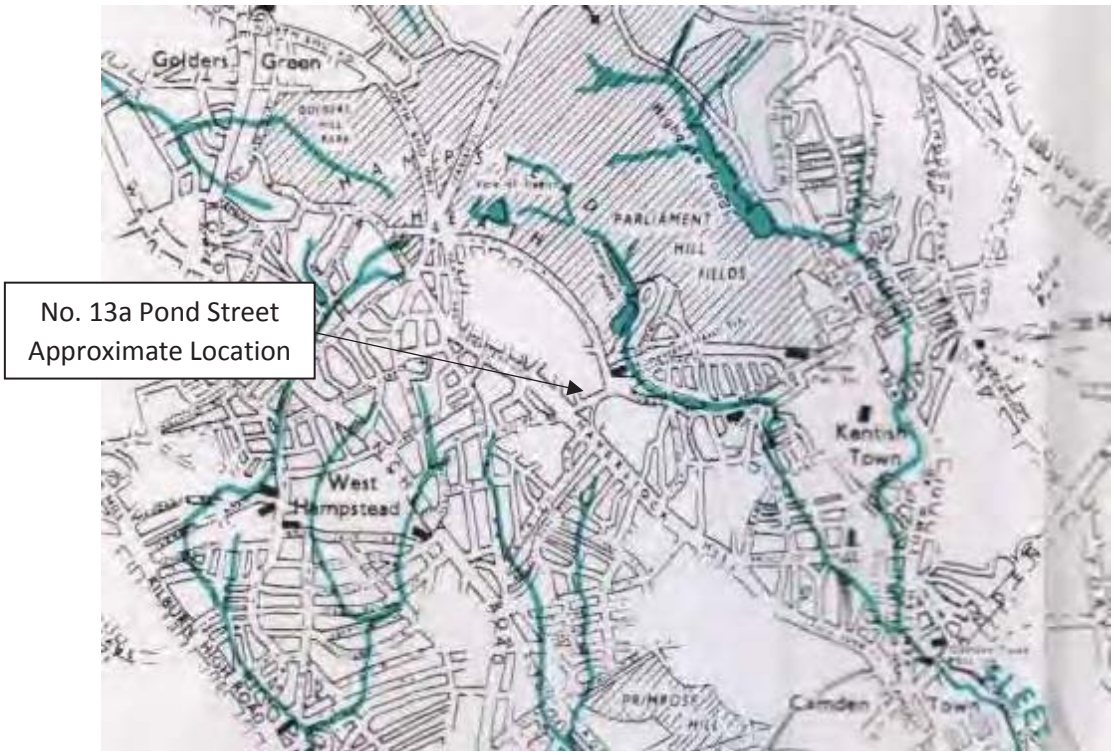

Figure 3. Location of Counters Creek relative to 13a Pond Street (Extract from map posted on londonbygaslight.wordpress.com)

3.4 Flood Risk

3.4.1 The Environment Agency (EA) website shows that the property lies within flood risk Zone 1 which is defined as areas where flooding from rivers and the sea is very unlikely, with less than a 0.1 per cent (1 in 1000) chance of such flooding occurring each year.

3.4.2 The Gov.uk website also identifies the area as being at a very low risk of flooding. The flood risk from surface water is presented in Figure 4 below; the property itself is entirely within the area identified as being at very low risk. In addition, the maximum extent of flooding from reservoirs is presented in Figure 5 below.

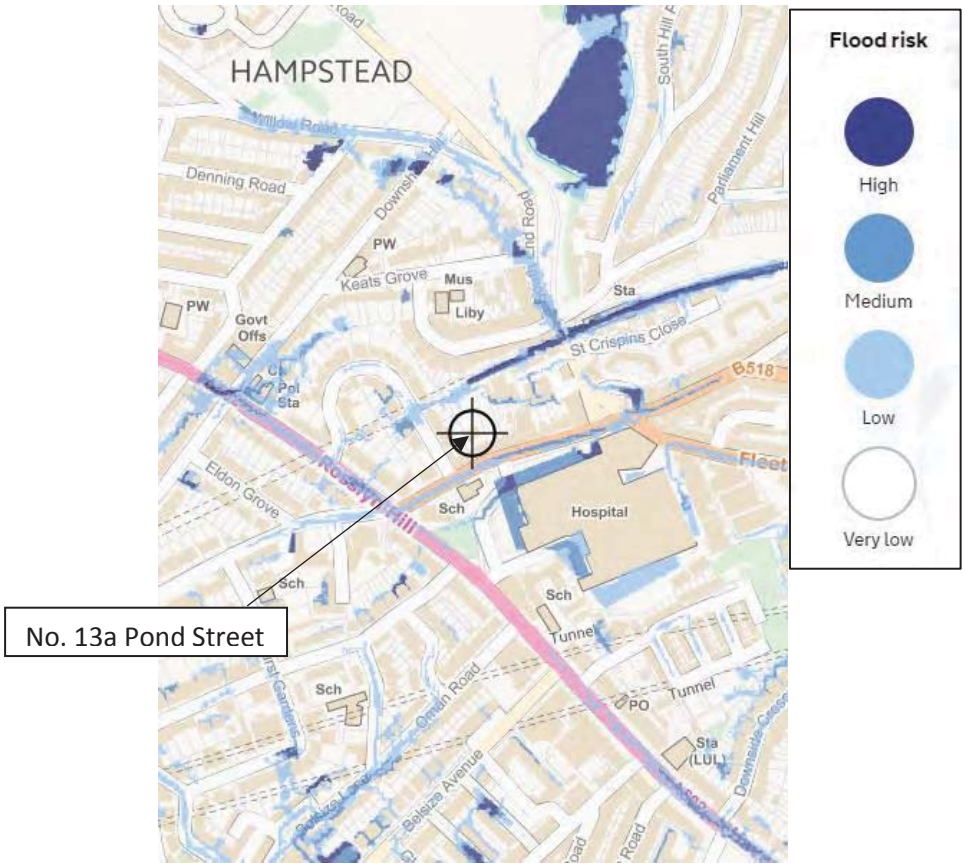

Figure 4. Flood Risk from Surface Water (Contains public sector information licensed under the Open Government Licence v3.0)

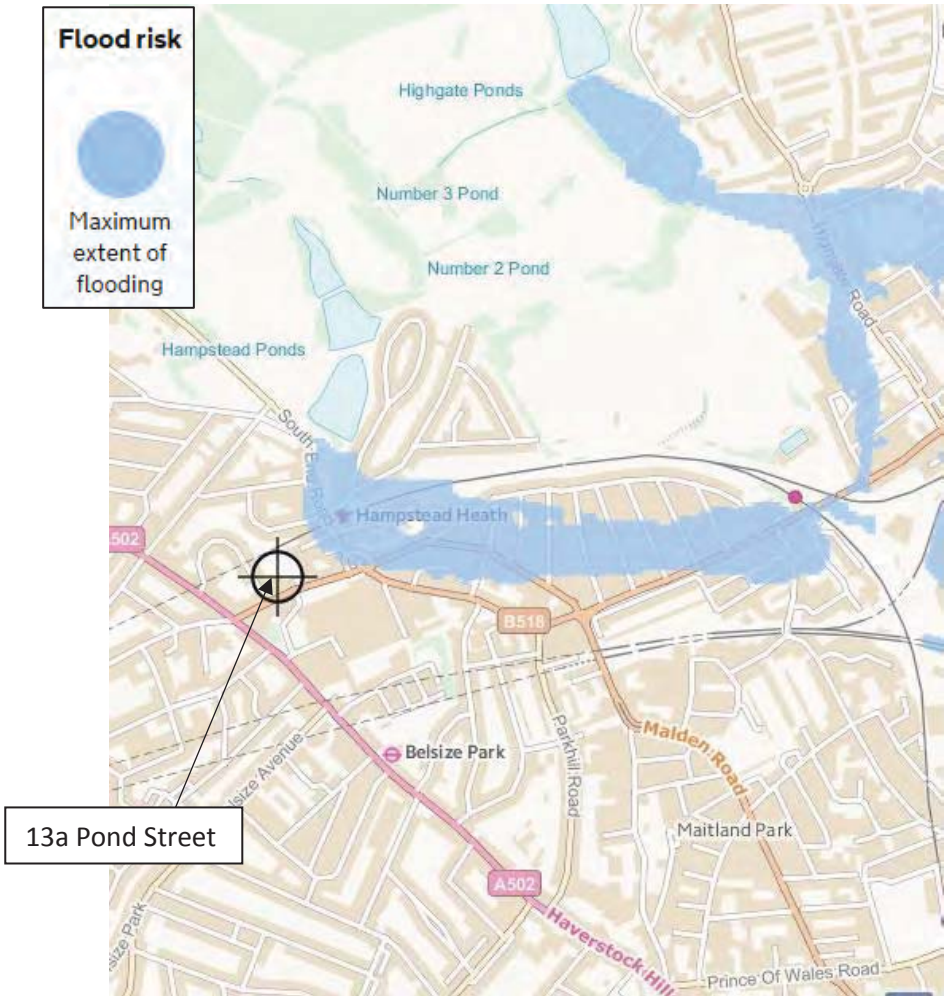

Figure 5. Flood Risk from Reservoirs (Contains public sector information licensed under the Open Government Licence v3.0)

3.4.3 Figure 15 'Surface Water Flood Risk Potential' from the Camden Geological, Hydrogeological and Hydrological Study (GHHS) by Arup (November 2010) does not show any historic flooding on Pond Street in either the 1975 or 2002 floods. Figure 6 below shows the extent of surface water flooding across most of the borough in both the 1975 and 2002 flood events and the potential at risk of surface water flooding.

Figure 6. Surface Water Flood Risk Potential (Camden Geological, Hydrogeological and Hydrological Study, Arup (November 2010))

3.4.4 Figure 5a of the London Borough of Camden Strategic Flood Risk Assessment (SFRA) by URS (July 2014) shows that the site is not in an area affected by internal sewer flooding and Figure 5b shows the site is not within an area affected by external sewer flooding.

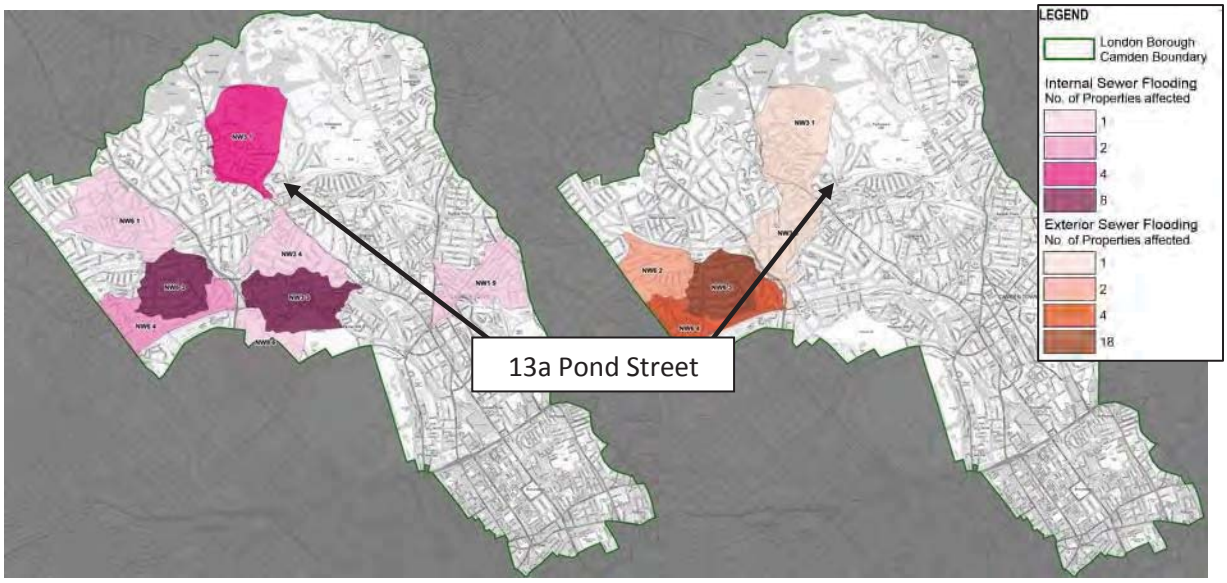

Figure 7. Extracts from Figures 5a and 5b of the SFRA (URS, 2014)

3.4.5 Figure 6 of the SFRA shows that the site is not in a Critical Drainage Area. An extract of Figure 6 is displayed in Figure 8 below.

Figure 8. Extract from Figures 6 of the SFRA (URS, 2014)

3.5 Geological Setting (Ground Conditions)

3.5.1 Mapping by the British Geological Survey (BGS) indicates that the site is underlain by the London Clay Formation, with no overlying superficial deposits recorded. The BGS geological plan showing the site is presented in Figure 9 below. The BGS indicates the same geology is encountered for over a 1 km radius from the north east through to the south west from the site. To the north and west of the site the Claygate Member and Bagshot Formation are present, at their closest 150 m and 600 m west of the site respectively.

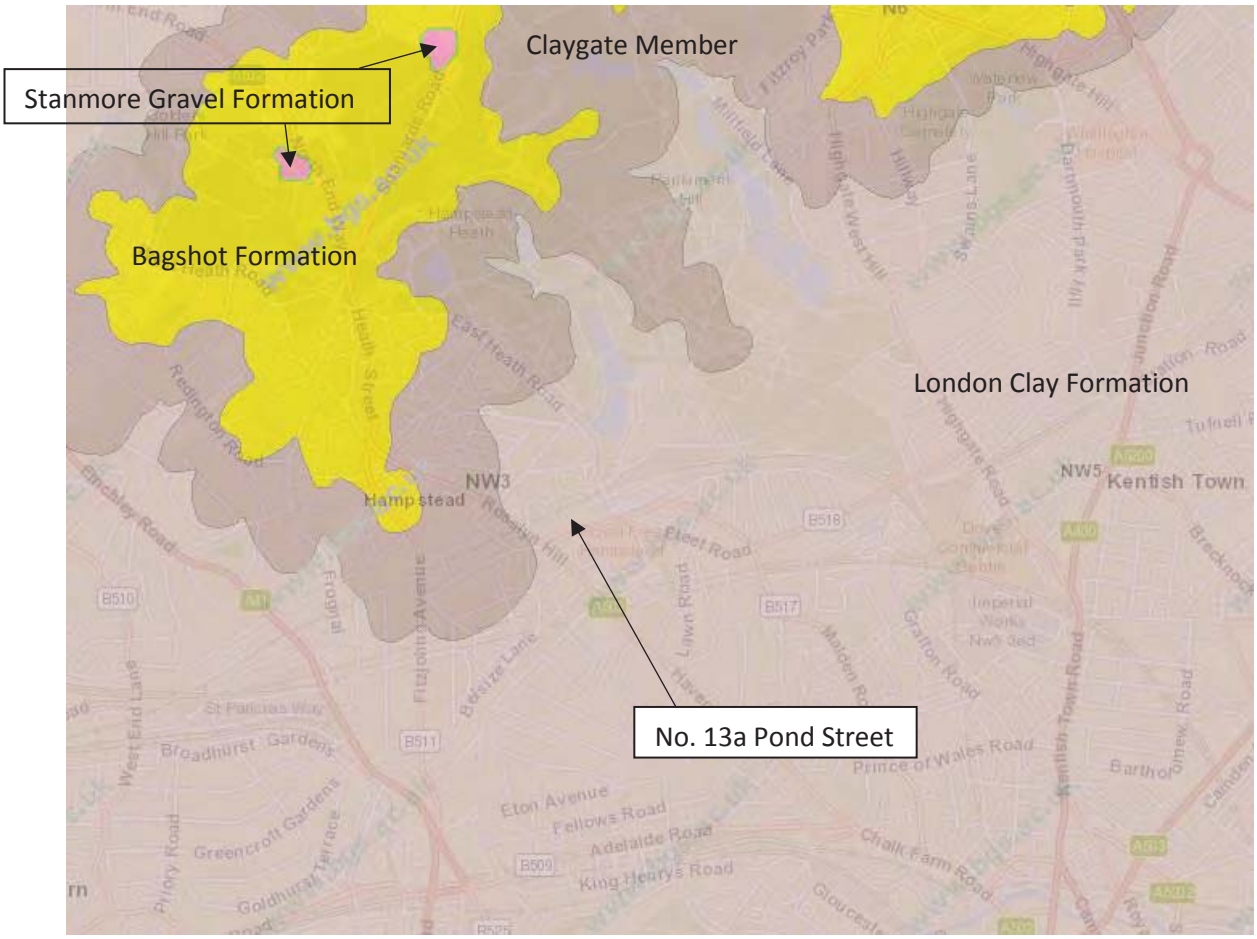

Figure 9. Site BGS Geological Plan (Contains British Geological Survey materials © NERC 2016. Base mapping is provided by ESRI)

3.5.2 The London Clay Formation consists of mainly dark blue-grey to brown-grey clay containing variable amounts of fine-grained sand and silt. The London Clay Formation generally weathers to an orange-brown colour with pockets of silty fine sand. The formation is particularly susceptible to swelling and shrinking when subjected to moisture content changes and is commonly intensely fissured. In addition, gypsum (selenite) crystals and pyrite nodules are commonly found throughout the formation.

When exposed to the weathering process the upper regions of the London Clay Formation oxidise to brown in colour. It usually contains selenite crystals, often grouped in bands or layers, which are thought to have originated from the decomposition of shell fragments. London Clay contains clay minerals in the form of illite, kaolinite and smectite. The presence of smectite renders the London Clay Formation particularly susceptible to changes in moisture content and is prone to shrinkage and swelling (settlement and heave) caused by alternate wetting and drying near the surface. In addition, weathering and possible slight transportation of semi-frozen material “en-masse” in glacial or peri-glacial regions is believed to have occured. This action often completely destroys the structure of the material and can involve a serious loss of strength. As the soil composition is derived mostly from materials local to the point of deposition, the lithology can be variable and reflects that of the parent strata.

3.5.3 Figure 17 'Land Stability: Areas of Significant Landslide Potential (BGS)' from the Camden Geological, Hydrogeological and Hydrological Study (GHHS) by Arup (November 2010) shows an area of significant landslide potential in the area where the Claygate Member outcrops, approximately 150 m west of the site. Figure 10 below shows this area relative to the site. However, the Groundsure Report states that there are no records of landslip within 500 m of the site boundary and the hazard rating for the site is very low.

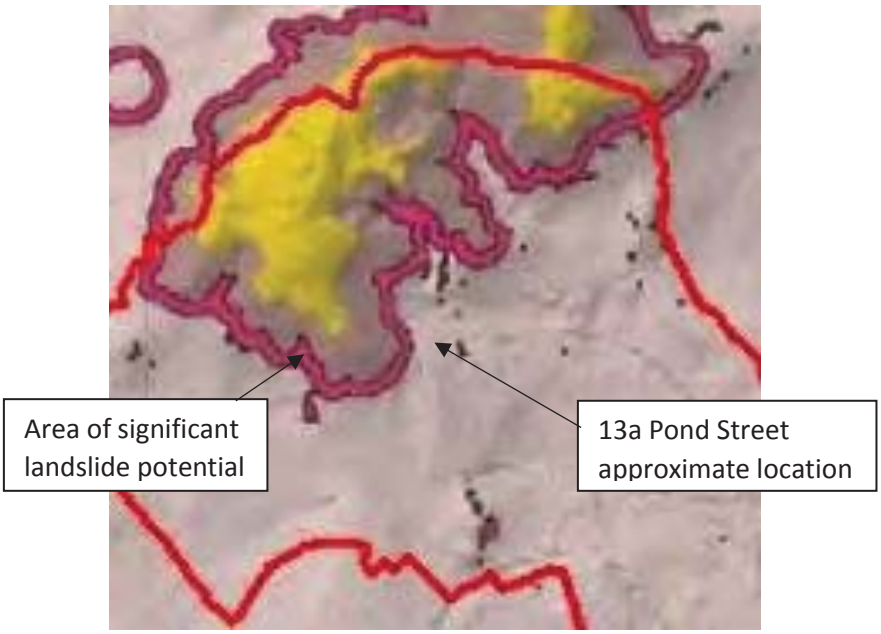

Figure 10. Land Stability: Areas of Significant Landslide Potential (BGS) (Camden Geological, Hydrogeological and Hydrological Study, Arup (November 2010))

3.5.4 A search of the BGS borehole database was undertaken for information on previous ground investigations and any wells in the vicinity of the site, the approximate locations of which are presented on the location plan in Figure 11 below. The borehole logs are presented in Appendix D.

3.5.5 Six BGS boreholes were reviewed, with the deepest borehole extending to 183 m bgl. Some boreholes showed a thin stratum of Made Ground to a maximum depth of 3.1 m bgl over the London Clay Formation whilst others showed London Clay Formation from surface. The London Clay Formation generally comprised brown and blue silty clay with a basement bed of rock in borehole TQ28NE5 and also a more sandy, shelly base in borehole TQ28NE6. The London Clay Formation was recorded to a maximum depth of 110 m bgl and was underlain by the Lambeth Group (Woolwich and Reading Beds) and Thanet Formation (Thanet Sand). The Woolwich and Reading Beds were shown as mainly clay with some pebbles towards the base. The Thanet Sand comprised mainly sand with flints at the base. The Woolwich and Reading Beds were recorded to a maximum depth of 125 m bgl and the Thanet Sand to a maximum depth of 135 m bgl. The Thanet Sand was found to be underlain by Chalk bedrock to the maximum recorded borehole depth of 183 m bgl.

Groundwater levels recorded in the boreholes are detailed in Section 3.6.3.

Figure 11. BGS Borehole Locations (Contains British Geological Survey materials © NERC 2016. Base mapping is provided by ESRI)

3.5.6 The ground Investigation completed by Chelmer (2016/2017) comprised two cable percussive boreholes (BH1 & BH2) to 10.10 m bgl, to the south and north of the existing building respectively, and three hand excavated trial pits (TP1 – TP3) to examine the current properties foundations. The ground investigation indicated that the London Clay Formation was present beneath Made Ground at depths of between 1.05 m and 2.00 m bgl. The London Clay Formation consisted of a firm to stiff brown silty CLAY. The base of the London Clay Formation was not proven at the maximum drilling depth of 10.10 m bgl. Table 1 below presents a summary of the ground conditions encountered and the borehole and trial pit records are presented within the Factual Report in Appendix F.

Table 1: Summary of Ground Conditions Encountered		
Depth to top of stratum (m bgl)	Depth to base of stratum (m bgl)	Description
0.0	0.03/0.40	Concrete / Sand / Tarmac / Paving Slabs / Ballast
0.03/0.40	1.05/2.00	Made Ground
1.05/2.00	6.00	London Clay Formation: *firm yellowish brown grey veined silty CLAY with occasional partings of fine orange sand*
6.00	10.10+	London Clay Formation: *stiff brown silty CLAY with occasional disseminated selenite crystals and rare partings of fine orange sand*

3.6 Hydrogeological Setting (Groundwater)

3.6.1 The Groundsure Report (see Appendix E) indicates that the London Clay Formation which the property is situated on is classified as being an 'Unproductive' aquifer.

3.6.2 Additional hydrogeological data obtained from the Groundsure Report, includes:

- There are no groundwater abstraction licences are within 1000 m of the site.
- No Source Protection Zones (SPZs) have been identified within 500 m of the site.
- There are no BGS groundwater flooding susceptibility areas within 50 m of the site and the site is not prone to groundwater flooding.

3.6.3 Groundwater information recovered from the BGS boreholes near the site (Figure 11) are detailed in Table 2 below.

Table 2: Summary of Groundwater Records from BGS Boreholes		
Location	Date	Groundwater Standing Level (m bgl)
TQ28NE5	1833	67*
TQ28NE6	1878	99*
TQ28NE77	1971	12.2
TQ28NE78	1971	2.2
TQ28NE79	1971	1.5
TQ28NE277	1999	95.65*

Notes: * These very deep groundwater levels may be associated with the lower aquifer (Lambeth Group/Thanet Sand/Chalk).

3.6.4 No groundwater was observed during the drilling process of the ground investigation performed by Chelmer (2016/2017), where BH1 & BH2 were drilled to 10.10 m depth and monitoring standpipes were installed to 5.0 m bgl. Two return monitoring visits have been completed on the 18th and 27th January 2017; groundwater was recorded in BH1 at depths of 5.06 m and 4.90 m bgl and in BH2 at depths of 0.97 m and 1.59 m bgl.

3.6.5 Figure 4e of the SFRA (URS, 2014) indicates that the site is not in an area with increased susceptibility to elevated groundwater, which is defined as an area 'where there is increased potential for groundwater levels to rise within 2m of the ground surface following periods of higher than average recharge'. However, it does show an Environment Agency groundwater flood incident approximately 50 m east on Pond Street (see Figure 12 below).

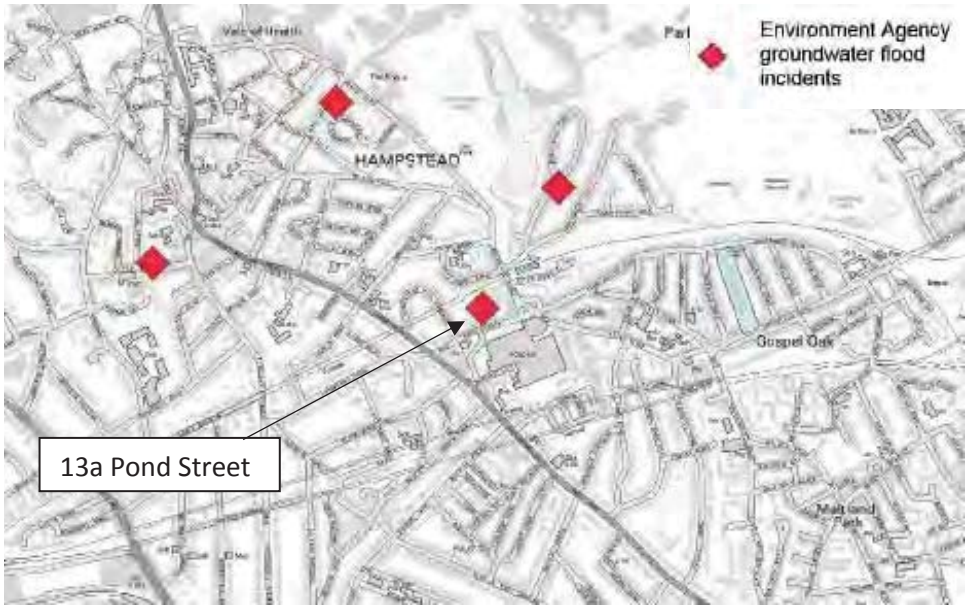

Figure 12. Extract from Increased Susceptibility to Elevated Groundwater (London Borough of Camden Strategic Flood Risk Assessment (SFRA) by URS (2014))

4.0 CONCEPTUAL SITE MODEL

4.1 Basis of Conceptual Site Model

4.1.1 The Conceptual Site Model has been built using desk study evidence together with the ground investigation findings, as outlined in Section 3 of this report. The ground investigation was completed on 11th January 2017 (Appendix F).

4.1.2 The Impact Assessments contained in the sections below are based on the Screening Assessment in Appendix A and any concerns identified in Sections 2.0 and 3.0.

4.1.3 The Conceptual Site Model can be summarised as:

- The proposed basement excavation is to 4.1 m bgl with the sunken garden and plant going to 4.5 m and 4.9 m bgl respectively.
- The surrounding land slopes down to the east/north east approximately 1 in 10 (<6°).
- The nearest surface water feature identified is 235 m north east of the site. Furthermore, the Hampstead Ponds were identified 326 m north of the site and two culverts were identified within 500 m of the site, one 80 m east of the site and one 498 m north of the site. The nearest well was identified as being located approximately 220 m to the north east of the property.
- The site is an area where flooding from rivers and seas is reported as very unlikely, and the flood risk from surface water is reported to be very low.
- Ground conditions comprise, below a layer of Made Ground (maximum 2.0 m thick), firm to stiff brown silty clay of the London Clay Formation to the base of the boreholes drilled to 10.10 m depth.
- The site is located above an unproductive stratum, formed by the clay of the London Clay Formation.
- Groundwater was not encountered during drilling of the on-site boreholes (BH1 & BH2) to 10.10 m bgl, however, during the two monitoring visits groundwater was recorded in BH1 at depths of 5.06 m and 4.90 m bgl and in BH2 at depths of 0.97 m and 1.59 m bgl.

4.2 Groundwater Flow Impact Assessment

4.2.1 The site is located above an 'Unproductive' stratum formed by the clay of the London Clay Formation. No groundwater was observed during the drilling process of the ground investigation performed by Chelmer (2016/2017), where BH1 & BH2 were drilled to 10.10m depth and monitoring standpipes were installed to 5.0 m bgl. Two return monitoring visits have been completed on the 18th and 27th January 2017; groundwater was recorded in BH1 at depths of 5.06m and 4.90m bgl and in BH2 at depths of 0.97m and 1.59m bgl.

4.2.2 The permeability within the London Clay Formation at the site is expected to be very low due to the high clay content. This hydrogeological regime (ie: groundwater levels and pressures) will be affected by long-term climatic variations as well as seasonal fluctuations and other man-induced influences, all of which must be taken into account when selecting a design water level for the permanent works. No long term, multi-seasonal groundwater monitoring data are available so a conservative approach will be needed, as required by current geotechnical design standards.

4.2.3 The proposed basement level will be founded within the London Clay Formation. The monitoring performed in the on-site boreholes (BH1 & BH2) indicated groundwater level was up to 3.5 m above the founding level of the proposed basement. However, the anticipated low permeability of the ground is likely to allow little or no natural groundwater flow. Thus, the proposed basement is not anticipated to have any impact on the groundwater flows/levels. Therefore, there would be no significant impact on neighbouring properties.

4.3 Surface Water Impact Assessment

4.3.1 The site is in an area where flooding from rivers and seas is defined as very unlikely and the flood risk from surface water is very low. This combined with no record of historic flooding on Pond Street in either the 1975 or 2002 floods and the maximum extent of flooding from reservoirs draining away to the east can lead to the conclusion that conventional measures of managing surface water run-off should be sufficient to minimise any potential hydrological impacts.

4.3.2 The proposed basement footprint will extend further into the garden than the existing cottage building, as shown on Gianni Botsford Architects Drawing 201 201 P03 in Appendix B, however this area is currently occupied by hardstanding. Therefore, the basement would not result in an increase in impermeable surfacing.

4.3.3 Due to the very low risk of surface water flooding then conventional measures of managing surface water run-off should be sufficient; such as up-stands to protect lightwells and a ground level difference at external doorways.

4.4 Ground Stability Impact Assessment

4.4.1 The site is located on an east/north east slope with a slope gradient of approximately 1 in 10 (<6°), therefore slope stability will be highly unlikely to cause any problems with the proposed basement.

4.4.2 Neighbouring properties could be affected by the excavation and construction of the proposed basement. This issue is addressed in the Damage Category Assessment section (Section 6.0) of this report.

4.4.3 The Groundsure Report (Appendix E) states there is a moderate hazard for shrink-swell clays at the property location.

4.4.4 A high quality of workmanship and use of best practice methods of temporary support are therefore crucial to the satisfactory control of ground movements alongside basement excavations. All cracks in load-bearing walls which have weakened their structural integrity should be fully repaired in accordance with recommendations from the appointed structural engineer before excavations for the underpinning works begin.

4.4.5 Under UK standard practice, the contractor is responsible for designing and implementing the temporary works, so it is considered essential that the contractor employed for these works should have completed similar schemes successfully. For this reason, careful pre-selection of the contractors who will be invited to tender for these works is recommended. Full details of the temporary works should be provided in the contractor's method statements.

4.4.6 Soil parameters, including the bearing capacity of the London Clay Formation, are detailed in the Chelmer Geo-Environmental Interpretative Report, ref. GENV/8222 dated February 2017.

4.4.7 The Groundsure Report indicates a railway running to the north of the site with a railway tunnel 52 m north west of the site. In addition, a Northern Line tunnel has been identified running 114m south west of the site.

5.0 GROUND MOVEMENT ANALYSIS

5.1 Basement Geometry and Stresses

5.1.1 Analyses of vertical ground movements (heave or settlement) arising from changes in vertical stresses caused by excavation of the basement have been undertaken using proprietary software (Oasys PDISP™). The analysis is based on Boussinesq's theory of analysis for calculating stresses and strains in soils due to vertically applied loads; the predicted ground movements are derived by integration of vertical strains derived from Boussinesq's equations. These preliminary analyses have not modelled the horizontal forces on the retaining walls, and so have simplified the stress regime significantly. In addition, consistent with Boussinesq theory, the soils are assumed to comprise semi-infinite isotropically homogeneous elastic medium.

5.1.2 The layout of the basement used within the analysis is based on Drawing 201 201 P03 provided by Gianni Botsford Architects, and is presented in Figure 13 below. The proposed basement is approximately 11.0 m long by 9.2 m wide with excavation generally extending to a depth of approximately 3.825 m bgl (assuming an existing ground level of approximately 70.000) with the sunken gardens extending to approximately 4.825 m bgl. The basement is understood to be constructed by contiguous piled walls.

5.1.3 The excavation depths for the basement have been modelled using Drawing 201 220 P03 to estimate the gross pressure reductions (unloading) across the development. Figure 14 below illustrates the layout of all load zones, positive and negative (unloading), used to model the proposed basement in PDISP. These include the excavation and loads on the external piled walls, the self-weight of walls, and construction of the concrete slab and excavation of central area from existing ground level.

5.1.4 The table in Appendix G presents the net changes in vertical pressure for each load zone for the four major stages in the sequence of stress changes which will result from excavation and construction of the basement (see 5.3.1 below for details). All the pressures used in PDISP analysis have been calculated from loads and information provided by Entuitive.

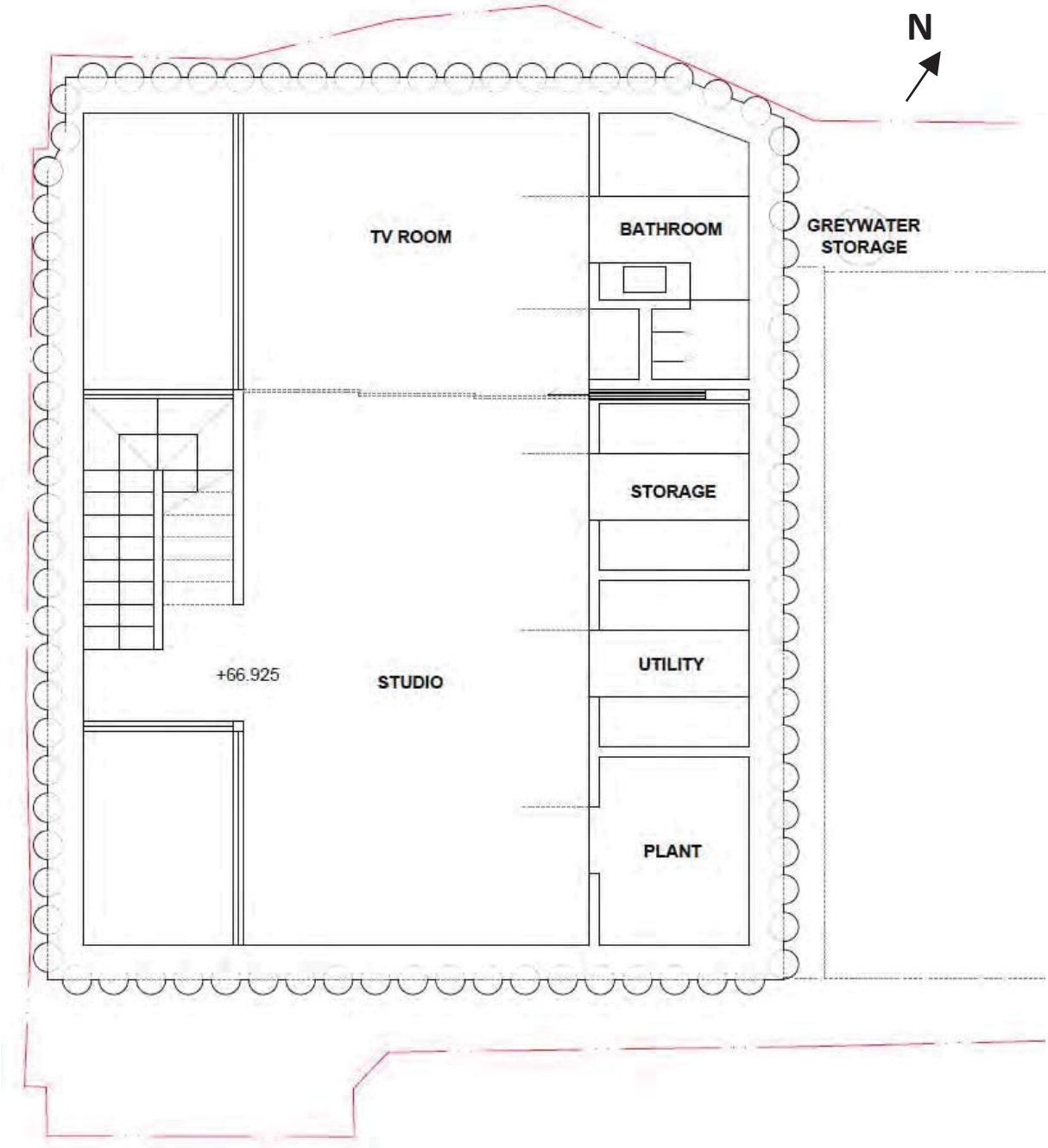

Figure 13. Layout of the proposed basement (Drawing 201_201_P03)

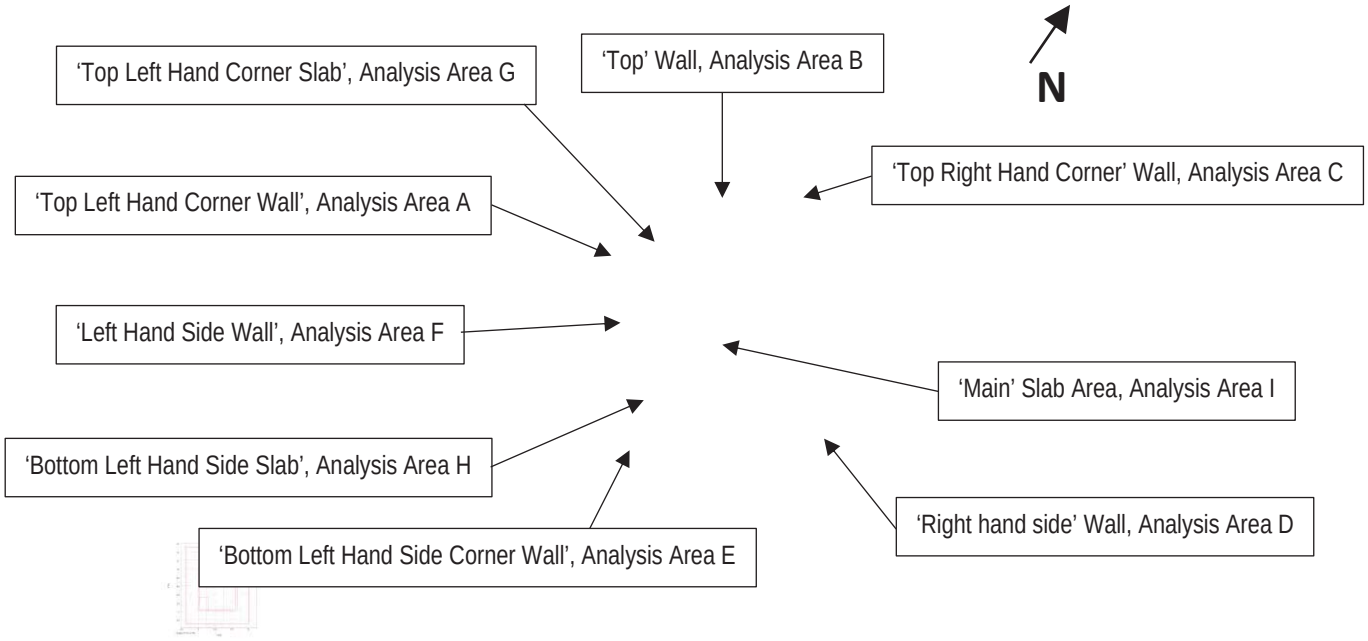

Figure 14. Detail of geometry introduced to PDISP

5.2 *Ground Conditions*

The short-term and long-term geotechnical properties used in the analysis are summarised in Table 3 below. These were based on the Chelmer (2016/2017) ground investigation, and on data from previous Chelmer projects in similar ground conditions. All Made Ground will be excavated and therefore only the change in vertical pressure, due to its excavation, is required for the PDISP analyses. Geotechnical parameters for the Made Ground are therefore not used in the analysis.

Table 3 - Soil parameters for PDISP analyses

Strata	*Depth (m bgl)*	*Short-term, undrained Young's Modulus, E_u (MPa)*	*Long-term, drained Young's Modulus, E' (MPa)*
London Clay Formation	1.6 6.0	45 + 4.6z 65 + 1.5z	33.75 + 3.45z 48.75 + 1.125z

Undrained Young's Modulus, $E_u = 1000 * C_u$
Drained Young's Modulus, $E' = 0.75 * E_u$

Where no C_u data are available:
Undrained Shear Strength, C_u has been estimated by extrapolation previous data.

A Poissons ratio of 0.5 has been adopted for the undrained London Clay Formation over its modelled thickness, and 0.25 when modelling the drained parameters

5.3 PDISP Analysis:

5.3.1 Three dimensional analyses of vertical displacements have been undertaken using PDISP software and the basement geometry, loads/stresses and ground conditions outlined above in order to assess the potential magnitudes of ground movements (heave or settlement) which may result from the vertical stress changes caused by excavation of the basement. PDISP analyses have been carried out as follows:

- Stage 1 – Construction of external piled walls – Short-term (undrained) condition
- Stage 2 – Bulk excavation of central area to basement formation level – Short-term (undrained) conditions
- Stage 3 – Construction of the basement slab, walls and superstructures – Short-term (undrained) conditions
- Stage 4 – Construction of the basement slab, walls and superstructures – Long-term (drained) conditions

5.3.2 The results of the analyses for Stages 1, 2, 3 and 4 are presented as contour plots on Figures 15 to 21.

Figure 15. Stage 1– Construction of external piled walls – Short-term (undrained) condition (0.05 mm settlement contours). Displacement grid shown at -3.825m bgl

Figure 16. Stage 2 – Bulk excavation of central area to basement formation level (3.85m bgl) – Short-term (undrained) conditions (0.25mm settlement contours)

Figure 17. Stage 2 – Bulk excavation of central area to basement formation level (4.825m bgl) – Short-term (undrained) conditions (0.25mm settlement contours)

Figure 18. Stage 3 – Construction of the basement slab, walls and superstructures - level (3.825m bgl) – Short term (undrained) conditions (0.25mm settlement contours)

Figure 19. Stage 3 – Construction of the basement slab, walls and superstructures - level (4.825m bgl) – Short term (undrained) conditions (0.25mm settlement contours)

Figure 20. Stage 4 – Construction of the basement slab, walls and superstructures - level (3.825m bgl) – Long term (drained) conditions (0.25mm settlement contours)

Figure 21. Stage 4 – Construction of the basement slab, walls and superstructures - level (4.825m bgl) – Long term (drained) conditions (0.25mm settlement contours)

5.4 Heave/Settlement Analysis

5.4.1 Excavation of the basement and construction of the underpins will cause immediate elastic heave/settlements in response to the stress changes, followed by long term plastic swelling/settlement as the underlying clays take up groundwater or consolidation occurs. The rate of plastic swelling/consolidation will be determined largely by the availability of water and as a result, given the low permeability of the London Clay Formation, can take many years to reach full equilibrium. The basement slab will need to be designed to enable it to accommodate the swelling displacements/pressures developed underneath it.

5.4.2 The ranges of predicted short-term and long-term movements for each of the main sections of the proposed basement are presented in Table 4 below. These analyses indicated that the perimeter basement walls are predicted to undergo movements ranging from 0.3mm settlement to 2.5mm heave. The basement slab is predicted to undergo slightly greater displacements, from 0.25 mm settlement to 4.75 mm heave. All values are approximate owing to the simplification of the stress regime and include only displacements caused by stress changes in the ground beneath the basement.

Table 4: Summary of Predicted Ground Movements from PDISP

Location / Building Element	*Stage 1 (short term)*	*Stage 2 (short term)*	*Stage 3 (short term)*	*Stage 4 (long term)*
North-western perimeter of basement	0.2 – 0.25mm settlement	1.5 – 2.25 mm heave	1.0 – 1.25 mm heave	1.5 – 2.0 mm heave
North-eastern perimeter of basement	0.2 – 0.3mm settlement	1.25 – 2.25 mm heave	0.25mm settlement to 0.75mm heave	0.0 – 1.25 mm heave
South-eastern perimeter of basement	0.25 – 0.3mm settlement	1.25 - 2.0 mm heave	1.0 – 2.0 mm heave	0.0 – 1.75 mm heave
South-western perimeter of basement	0.2 – 0.25mm settlement	1.25 – 2.25 mm heave	1.0 – 1.5 mm heave	1.5 – 2.5 mm heave
Basement Slab (3.825mbgl)	0.1 – 0.25 mm settlement	1.5 – 3.75 mm heave	0.25 settlement to 2.75mm heave	0 – 4.75mm heave
Basement Slab (4.825mbgl)	0.1 – 0.25 mm settlement	1.5 – 3.5 mm heave	1.0 – 2.5mm heave	1.75 – 4.0mm heave

5.4.3 All the short-term elastic displacements would have occurred before the basement slab is cast, so only the post-construction incremental heave/settlements (the difference from Stages 3, short-term, to 4, long-term) are relevant to the slab design.

5.5 *Bored Pile Retaining Walls*

5.5.1 Some ground movement is inevitable when basements are constructed, even when using bored pile walls. Ground movements alongside the piles have been assessed using relationships developed from extensive empirical case history data published in CIRIA's Report C580 (Gaba et al, 2003). That report notes that "ground movements cannot be predicted accurately, but it is possible to estimate them based on … an empirical approach …" as presented in the following paragraphs. The movements generated in the ground around a basement are highly dependent on the stiffness of the support provided by the retaining structures. Use of a 'bottom-up' would be classified as 'Moderate support stiffness', provided that an appropriate construction sequence is followed with high stiffness props installed at high level. CIRIA Report C580 presents charts that relate estimated ground surface movements alongside bored pile retaining walls in stiff clays to pile installation (Figure 2.8 of CIRIA Report C580) and excavation in front of the wall (Figure 2.11 of CIRIA Report C580).

5.5.2 For 'High support stiffness' walls designed and constructed in accordance with best practice the estimated ground surface movements resulting from installing a contiguous bored pile wall to approximately 9.5 m bgl and then excavating to depths of 3.825 m and 4.825m would be as given in Table 5 (conservatively interpolated between CIRIA guidance for high and low stiffness support). The pile depth has been estimated because, under standard UK practice, the design analyses for bearing piles are undertaken by the piling contractor.

Table 5: Potential approximate movements of ground surface immediately alongside the bored pile wall on northern and southern perimeters		
High support stiffness – 9.5 m deep wall / 3.825 m depth of excavation		
Ground surface movements due to:	*Horizontal movement*	*Vertical movement*
Bored pile wall installation:	0.04% of wall depth = 3.8 mm	0.04% of wall depth = 3.8 mm
Excavation in front of wall:	0.15% of excavation depth = 5.7375(11.475 mm)	0.1% of excavation depth = 3.825(9.5625 mm)
Totals:	9.5(15.3 mm)	7.6(13.4 mm)
High support stiffness – 9.5 m deep wall / 4.825 m depth of excavation		
Ground surface movements due to:	*Horizontal movement*	*Vertical movement*
Bored pile wall installation:	0.04% of wall depth = 3.8 mm	0.04% of wall depth = 3.8 mm
Excavation in front of wall:	0.15% of excavation depth = 7.2375(14.475 mm)	0.1% of excavation depth = 4.825(12.06 mm)
Totals:	11.0(18.3 mm)	8.6(15.9 mm)

5.6 *Excavations*

5.6.1 The clays exposed at formation level would readily absorb any available water, which would lead to softening and loss of strength. It will therefore be important to ensure that the clays at formation level are protected from all sources of water, with suitable channelling to sumps for any groundwater or surface water seeping into the excavations. The formation should be inspected, any unacceptably soft/weak clays must be excavated and the whole formation must then be blinded with concrete immediately after completion of final excavation to grade.

5.6.2 Care should be taken to ensure that any seepages from the gaps between the contiguous piles are collected and removed efficiently, and that water is not allowed to pond on the exposed clay in the excavation adjacent to the perimeter pile wall.

6.0 DAMAGE CATEGORY ASSESSMENT

6.1 Predicted displacement for the ground around the basement resulting from construction of the basement will be a combination of the heave/settlement predicted by the PDISP analyses and the horizontal and vertical displacements from installation of the bored pile walls (BPWs) and excavation of the basement within the piled 'box' that forms the basement.

6.2 In order to relate these predicted ground movements to possible damage which adjacent properties might suffer, it is necessary to consider the strains and the angular distortion (as a deflection ratio) which they might generate using the method proposed by Burland (2001, in CIRIA Special Publication 200, which developed earlier work by himself and others).

6.3 As identified in Section 2.6 the neighbouring properties in close proximity to the proposed development, No.'s 13, 15 and 17 Pond Street and No.'s 31 and 33 Hampstead Hill Gardens all have basements beneath them and therefore have a reduced risk of potential damage caused by the development. There is however no evidence that that the single storey rear bedroom at No 13 Pond Street and the single storey rear extension at No. 15 Pond Street have basements beneath them. Furthermore, these are the closest structures to the proposed development and will therefore be the worst case scenarios for potential damage.

Figure 22. Approximate widths and distances of adjacent structures (Not to Scale)

6.4 The PDISP analyses have predicted long-term movements ranging from 0.25 to 2 mm along the perimeter of the proposed basement. However, the settlement is predicted to reduce rapidly away from the basement, with the settlements being almost 0 mm approximately 2 to 4 m from the basement.

6.5 Table 2.4 in CIRIA C580 states that the zone of vertical ground movements (i.e. settlement) and horizontal ground movements associated with the excavation in front of bored pile walls in stiff clay soils extend a maximum distance of 4 times the depth of the excavation.

Rear wall of rear single storey bedroom of No. 13 Pond Street:

6.6 The relevant geometries are as follows:

Depth of foundations	=	0.5 m (assumed, see Section 2.7)
Depth of excavation	=	4.85 – 0.5 = 4.35 m
Zone of influence	=	4.35 x 4 = 17.4 m
Width (L) of structure	=	6.0 m (scaled from Drawing 201 100)
Height (H) of structure	=	3.3 m (estimated based on planning documents) + 0.5 m (footing depth) = 3.8 m
Hence L/H	=	1.6

6.7 The predicted 11.0 mm maximum horizontal displacement (see Table 5) reduces to 10.3 mm when the assumed depth of the single storey rear bedroom footings are taken into account. Horizontal movements have also been shown to reduce by 40–50% at the corners of excavations due to the beneficial presence of the adjacent un-excavated ground. Thus, the strain beneath the structure would, theoretically, be in the order of $\varepsilon_h = 3.58 \times 10^{-4}$ (0.036%) assuming a 40% reduction in horizontal displacement due to the corner effects of the proposed development.

6.8 In general, heave from the vertical unloading created within the basement is favourable, because it offsets the settlements caused by relaxation of the ground alongside the basement in response to excavation. In this case, the worst case scenario predicted by the PDISP analyses for the structure will be in Stage 1 where approximately 2 mm heave was predicted beneath the closest point of the development. This must be added to the settlement profile presented in Figure 2.11(b) of CIRIA Report C580 for the low stiffness ground support scenario, as CIRIA C580 does not provide a curve for moderate support stiffness systems.

6.9 The total predicted settlement (due to excavation) of 8.6 mm (see Table 5) is reduced to 8.1 mm when the assumed depth of the bedroom foundations are taken into account. The total combined settlement of 6.375 mm (8.1 mm predicted by the CIRIA methods minus the 1.75 mm heave predicted by PDISP) is detailed as the point immediately alongside the proposed basement (0 m) in Figure 23 below. Figure 23 presents the settlement curve from the basement wall to the maximum distance of affected ground, 17.4 m (see Section 6.6).

6.10 The deflection at the rear bedroom is calculated as the difference between the tangent of the relevant width of the wall (the length within the zone of influence for vertical settlement) and the total 'combined' predicted ground surface movements curves (from the PDISP analysis and Figure 2.11(b) of CIRIA C580). For the high stiffness ground support case, settlement is convex and gives a maximum vertical deflection, $\Delta = 0.6$ mm as displayed in Figure 23 below, which represents a deflection ratio $\Delta/L = 9.67 \times 10^{-5}$ (0.01%).

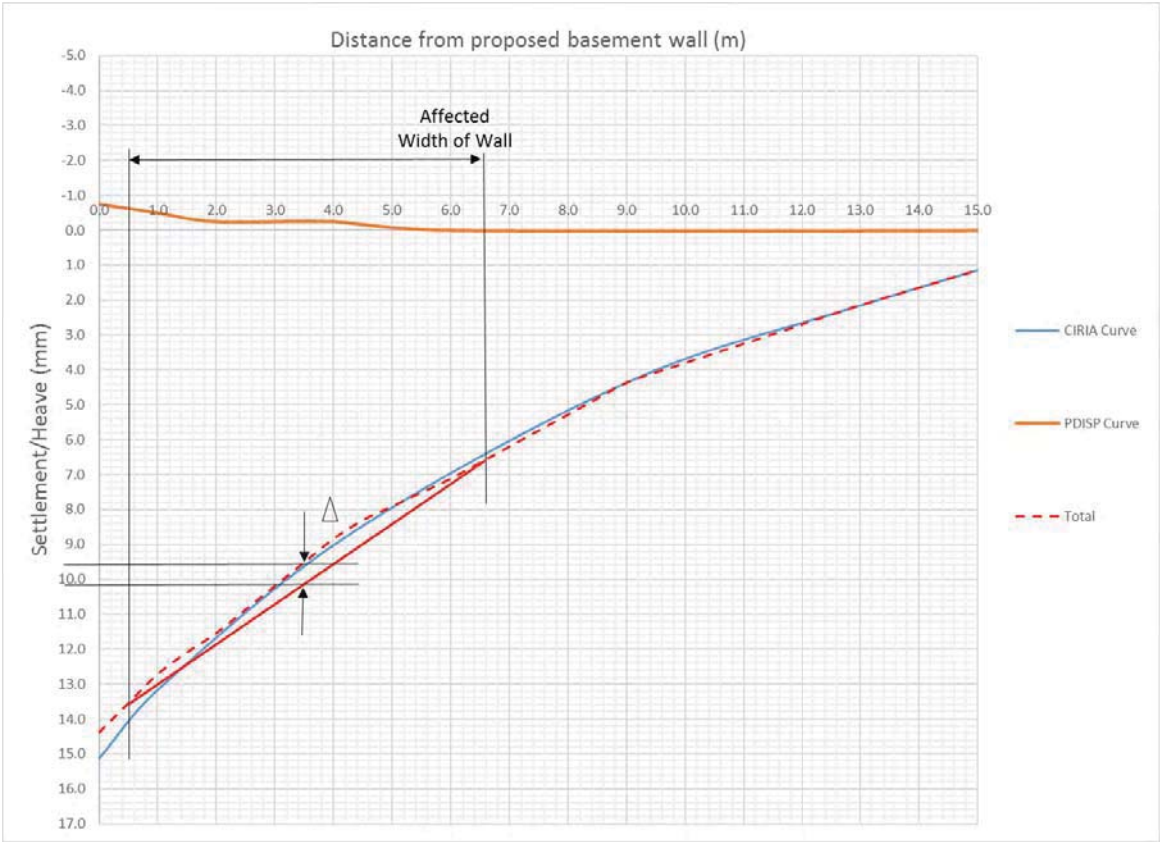

Figure 23. Combined displacements for No. 13's rear bedroom due to excavation of proposed basement

6.11 Using the damage category ratings and graphs given in CIRIA SP200, for L/H = 1.5 (the closest for the L/H of 1.6 defined in Section 6.6), these deformations represent a damage category of 'very slight' (Burland Category 1), as illustrated in Figure 24 below.

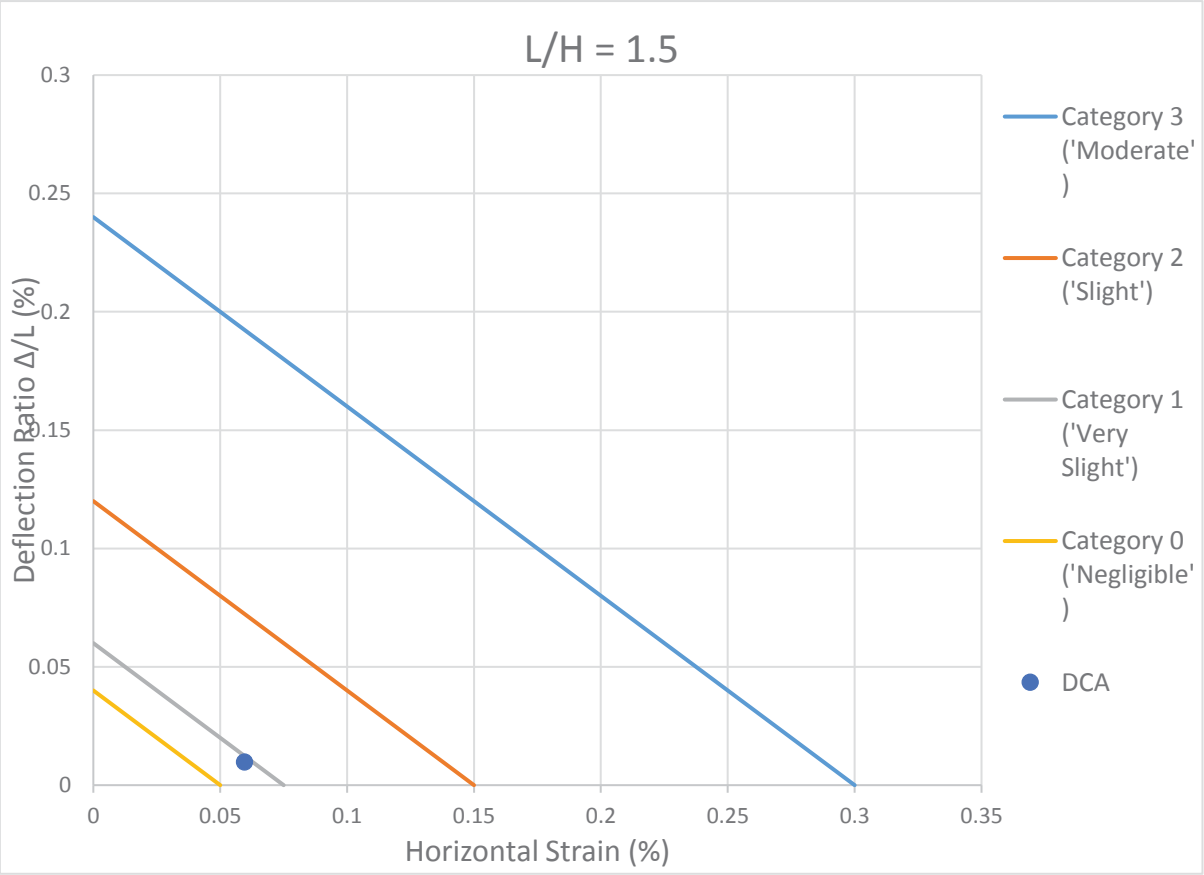

Figure 24: Damage category assessment for No. 13's rear bedroom

No. 15's Single Storey Rear Extension

6.12 The relevant geometries are as follows:

Depth of foundations	=	0.5 m (assumed, see Section 2.7)
Depth of excavation	=	3.825 – 0.5 = 3.325 m
Zone of influence	=	3.325 x 4 = 13.3 m
Width (L) of structure	=	5.6 m (scaled from Drawing 201 100)
Height (H) of structure	=	3.0 m (estimated) + 0.5 m (footing depth) = 3.5 m
Hence L/H	=	1.6

6.13 The predicted 9.5 mm maximum horizontal displacement (see Table 5) again reduces to 8.78 mm when the assumed depth of the single storey rear extensions footings are taken into account. Thus, the strain beneath the structure would, theoretically, be in the order of $\varepsilon_h = 6.6 \times 10^{-4}$ (0.07%).

6.14 In this case, the worst case scenario predicted by the PDISP analyses for the structure will be in Stage 3 where 0.5 mm settlement was predicted beneath rear extension. Therefore, the settlement profile will be based solely on the profile presented in Figure 2.11(b) of CIRIA Report C580 for the high stiffness ground support scenario.

6.15 The total predicted settlement (due to excavation) of 7.6 mm (see Table 5) is reduced to 7.1 mm when the assumed depth of the adjacent foundations are taken into account. The total combined settlement of 7.6 mm (7.1 mm predicted by the CIRIA methods plus the 0.5mm settlement predicted by PDISP) is detailed as the point immediately alongside the proposed basement (0 m) in Figure 25 below. Figure 25 presents the settlement curve from the basement wall to the maximum distance of affected ground, 13.325 m (see Section 6.12).

6.16 The deflection at the rear extension is calculated as the difference between the tangent of the relevant width of the wall (the length within the zone of influence for vertical settlement) and the predicted ground surface movements curve from Figure 2.11(b) of CIRIA C580. For the low stiffness ground support case, settlement is convex and gives a maximum vertical deflection, Δ = 0.4 mm as displayed in Figure 23 below, which represents a deflection ratio $\Delta/L = 6.25 \times 10^{-5}$ (0.006%).

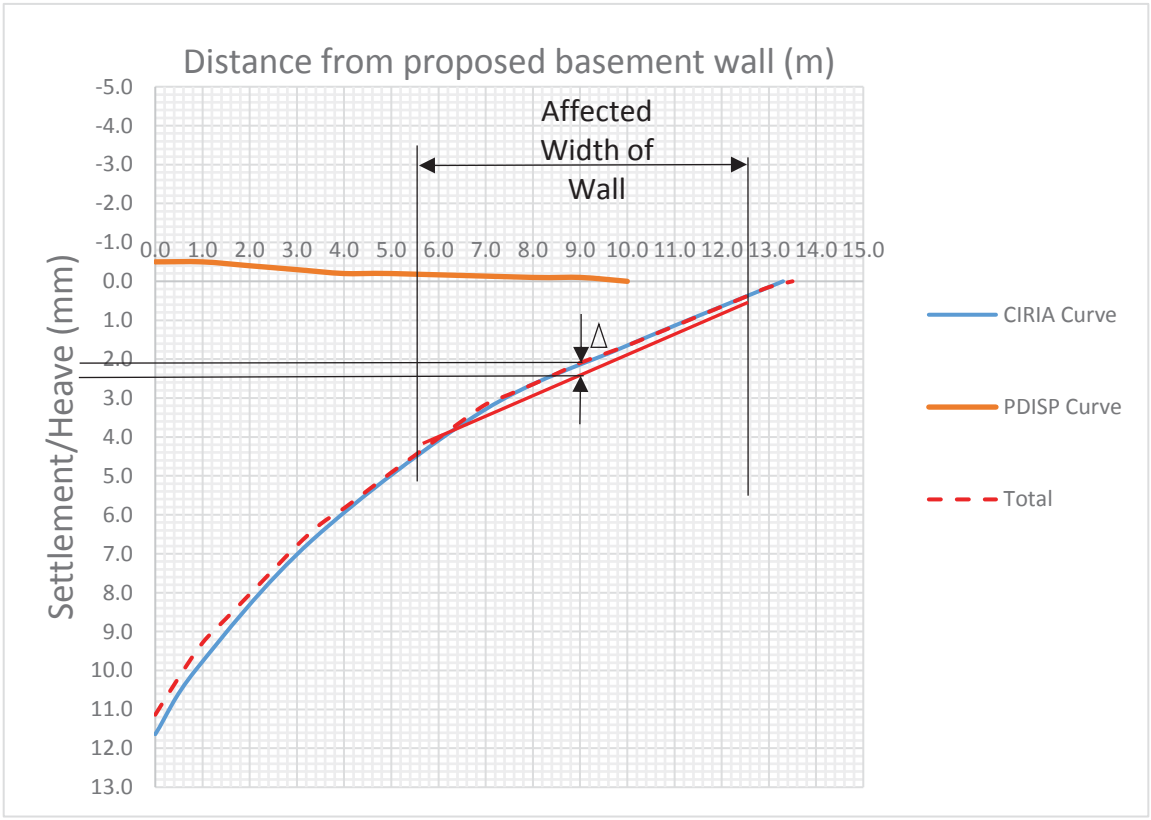

Figure 25. Combined displacements for No. 15's rear extension due to excavation of proposed basement

6.17 Using the damage category ratings and graphs given in CIRIA SP200, for L/H = 1.5 (the closest for the L/H of 1.6 defined in Section 6.12), these deformations represent a damage category of 'slight' (Burland Category 1), as illustrated in Figure 26 below.

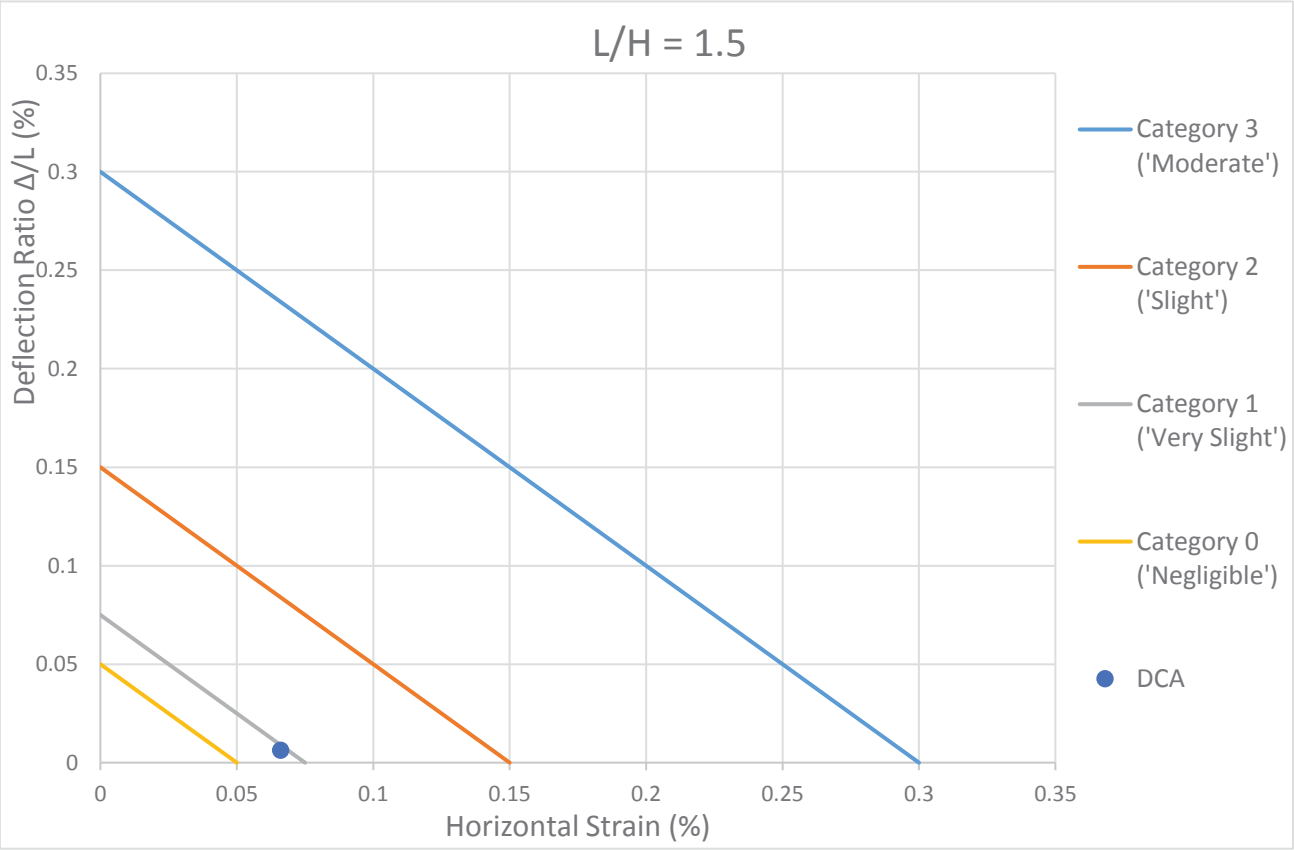

Figure 26: Damage category assessment for No. 15's rear extension

6.18 Due to the geometry and distance of other neighbouring structures from the proposed basement development it is assumed the development will have a lower potential to cause damage to them than those assessed above. Therefore, other structures have not been assessed in detail, and the damage category assessment to all other surrounding developments is assumed to be Category 1 'Very Slight' or lower.

6.19 Under UK standard practice the contractor (and/or their designer) is responsible for designing and implementing the temporary works. Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions. Pre-construction condition surveys of neighbouring properties are also recommended and a system of monitoring adjoining and adjacent structures should be established before the works start.

6.20 Long term groundwater monitoring has not been undertaken. Care should be taken to ensure that any seepages from the exposed clay are collected and removed efficiently, and that water is not allowed to pond on the exposed clay in the excavation adjacent to the perimeter pile wall.

7.0 CONCLUSIONS

7.1 These conclusions consider only the primary findings of this assessment; the whole report should be read to obtain a full understanding of the matters considered.

7.2 The site is in an area where flooding from rivers and seas is defined as very unlikely and the flood risk from surface water is very low. This combined with no record of historic flooding on Pond Street in either the 1975 or 2002 floods and the maximum extent of flooding from reservoirs draining away to the east can lead to the conclusion that conventional measures of managing surface water run-off should be sufficient to minimise any potential hydrological impacts.

7.3 The site is located above an 'Unproductive' stratum formed by the clay of the London Clay Formation. Groundwater was observed at less than 1.0 m bgl on one of the return monitoring visits. However, the anticipated low permeability of the ground is likely to cause little or no natural groundwater flow. Thus, the proposed basement is not anticipated to have any impact on the groundwater flows/levels. Therefore, there would be no significant impact on neighbouring properties.

7.4 The standpipes installed on site should be maintained so that further groundwater level monitoring readings can be taken during the detailed design and prior to the start of construction.

7.5 The site is located on an east/north east slope with a slope gradient of approximately 1 in 10 (<6°), therefore slope stability will be highly unlikely to cause any problems with the proposed basement.

7.6 Contour plots of displacement in response to the changes in vertical pressure caused by the excavation and construction of the proposed basement are presented in Figures 15 – 21.

7.7 A Damage Category Assessment (DCA) was undertaken for the worst case scenarios in the adjacent structures, based on the maximum displacements predicted by the PDISP analyses, combined with the ground movements alongside the basement in response to the lateral stress releases, as predicted by CIRIA C580.

7.8 In the assessed cases, the rear single storey bedroom of No. 13 Pond Street, fell within Burland Category 1 'very slight' (as given in CIRIA SP200, Table 3.1) and the rear single storey extension of No. 15 Pond Street fell within Category 1 'very slight'. The damage category results have been plotted graphically in Figures 24 and 26 above.

7.9 No further damage category assessments have been carried out as the assessed cases are considered the worst case scenarios and therefore all other structures will be classified as Category 1 'very slight' or lower.

7.10 Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions. Pre-construction condition surveys of neighbouring properties are also recommended and a system of monitoring adjoining and adjacent structures should be established before the works start.

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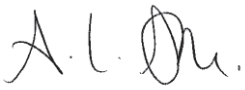
End of report

Report prepared by:



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b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.

c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.

d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, CGL has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.

e) CGL acknowledges that it is being retained, in part, because of its knowledge and experience with respect to environmental matters. CGL will consider and analyse all information provided to it in the context of our knowledge and experience and all other relevant information known to us. To the extent that the information provided to us is not inconsistent or incompatible therewith, CGL shall be entitled to rely upon and assume, without independent verification, the accuracy and completeness of such information.

f) The content of this report represents the professional opinion of experienced environmental consultants. CGL does not provide specialist legal advice and the advice of lawyers may be required.

g) In the Summary and Recommendations sections of this report, CGL has set out our key findings and provided a summary and overview of our advice, opinions and recommendations. However, other parts of this report will often indicate the limitations of the information obtained by CGL and therefore any advice, opinions or recommendations set out in the Executive Summary, Summary and Recommendations sections ought not to be relied upon unless they are considered in the context of the whole report.

h) The assessments made in this report are based on the ground conditions as revealed by walkover survey and/or intrusive investigations, together with the results of any field or laboratory testing or chemical analysis undertaken and other relevant data, which may have been obtained including previous site investigations. In any event, ground contamination often exists as small discrete areas of contamination (hot spots) and there can be no certainty that any or all such areas have been located and/or sampled.

i) There may be special conditions appertaining to the site, which have not been taken into account in the report. The assessment may be subject to amendment in light of additional information becoming available.

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q) In addition CGL will not be liable for any loss whatsoever arising directly or indirectly from any opinion within this report.

APPENDIX A

SCREENING ASSESSMENT

Subterranean (ground water):

1) a) Is the site located directly above an aquifer?

No, the site is located above an 'Unproductive' stratum. The proposed basement is not anticipated to have any impact (see Section 4.2).

b) Will the proposed basement extend beneath the water table surface?

Yes. The monitoring performed in the on-site boreholes (BH1 & BH2) encountered groundwater up to to 3.5 m above the founding level of the proposed sunken garden area of the basement. The basement will require waterproofing and appropriate groundwater control and dewatering during construction will be required.

2) Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

Yes. Only a culvert was identified identified within 100 m, located 80 m east of the site, which may be the culverted River Fleet. This is not anticipated to produce any adverse impacts.

3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

No. Although the proposed basement footprint will extend further into the garden than the existing cottage building, this area is currently occupied by hardstanding

4) As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?

As above.

5) 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 or spring line?

Yes. The nearest surface water feature identified is 235m north east of the site and the Hampstead Ponds lie 326m north of the site. From OS mapping some of the Hampstead Pond chain is at a higher level than the site. However, due to the distances between the proposed basement and the Hampstead Ponds they are not expected to impact on each other.

Slope stability

1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approx. 1 in 8)

   No. The surrounding land slopes down to the east/north east approximately 1 in 10 (<6°) (see Section 4.4).

2) Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees? (approx. 1 in 8)

   No. No re-profiling planned.

3) Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees? (approx. 1 in 8)

   No. The surrounding land slopes down to the east/north east approximately 1 in 10 (<6°) and the nearest railway cutting is approximately 60m north of the site.

4) Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approx. 1 in 8)

   No. See above.

5) Is the London Clay the shallowest strata at the site?

   Yes. The ground investigation identified no overlying superficial deposits.

6) Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?

   Likely, the property is surrounded by mature trees. It is recommended that an Arboricultural Impact Assessment is undertaken to advise any root protection zones.

7) Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at site?

   Yes. The Groundsure Report indicates a moderate hazard for shrink-swell clays.

8) Is the site within 100 m of a watercourse or a potential spring line?

   Yes. Only a culvert was identified identified within 100 m, located 80 m east of the site, which may be the culverted River Fleet. This is not anticipated to produce any adverse impacts.

9) Is the site within an area of previously worked ground?

   No. Historic maps do no indicate any previous land uses that would indicate worked ground and none was identified in the ground investigation performed by Chelmer.

10) Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?

No, the site is located above an 'Unproductive' stratum.

11) Is the site within 5 m of a highway or pedestrian right of way?

No. The site lies to the rear of No. 15 Pond Street (The Roebuck Public House).

12) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?

Yes. It is likely that the foundations of the single storey rear extensions to the properties on Pond Street are set on shallow foundations. The existing basements are likely set at a similar depth to the proposed basement. A Damage Category Assessment has been carried out to assess the potential damage to neighbouring properties (see Section 6.0).

13) Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?

No. The Groundsure Report indicates a railway running to the north of the site with a railway tunnel 52m north west of the site. In addition a Northern Line tunnel has been identified running 114m south west of the site.

Surface flow and flooding

1) As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?

   No. Although the proposed basement footprint will extend further into the garden than the existing cottage building, this area is currently occupied by hardstanding and plans do not show adjustments to the site drainage.

2) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

   No. As above.

3) 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. As above, the proposed basement will be within the existing cottage footprint and areas of hardstanding and therefore there will be no change in surface water inflows and drainage.

4) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

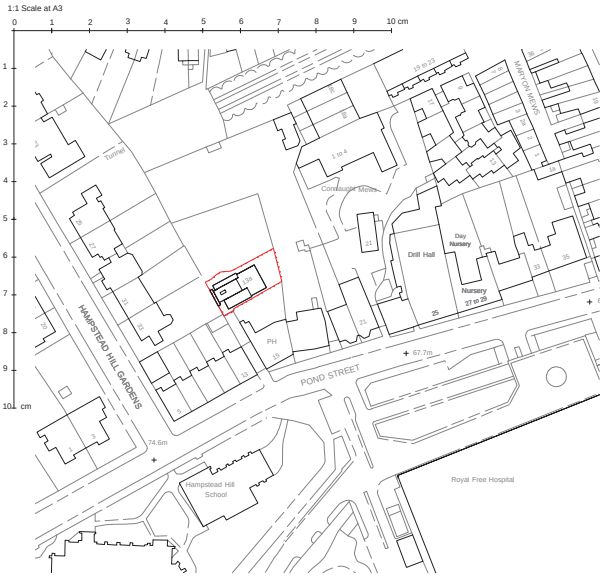
   No. As above.

5) Is the site in an area identified to have surface water flood risk or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?

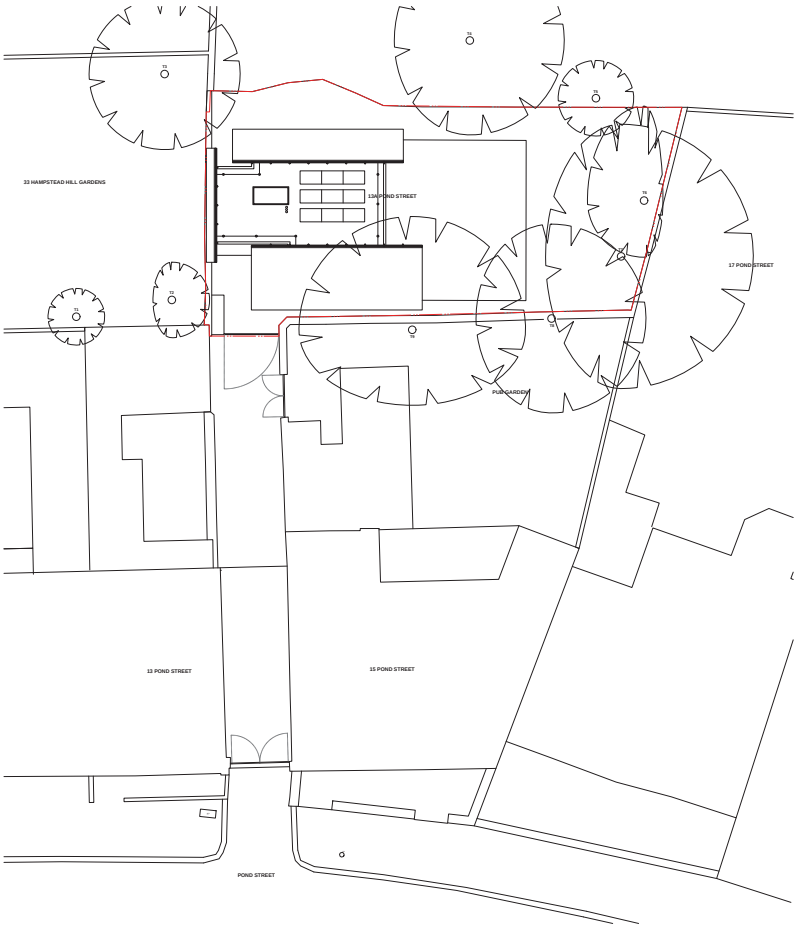
   Yes. Although surface water modelling by the Environment Agency indicated a 'Very Low' flood risk (the lowest) the groundwater level at the site has been recorded above the proposed basement level. Therefore the basement will require waterproofing and appropriate groundwater control and dewatering during construction will be required.

Chelmer
Consultancy Services
'Groundbreaking Services'

APPENDIX B



01 Site Location Plan
1:250 @ A3 / 1:125 @ A1



02 Proposed - Site Plan
1:200 @ A3 / 1: 100 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

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Drawing Title: Proposed - Site Location Plan

Project: 201

Scale: 1:100 @ A1 1:200 @ A3

Drawing Number: 201 200

Revision: P03

Client: SPENCER BAYLIN

Date: 25.05.2016

Drawn By: HT

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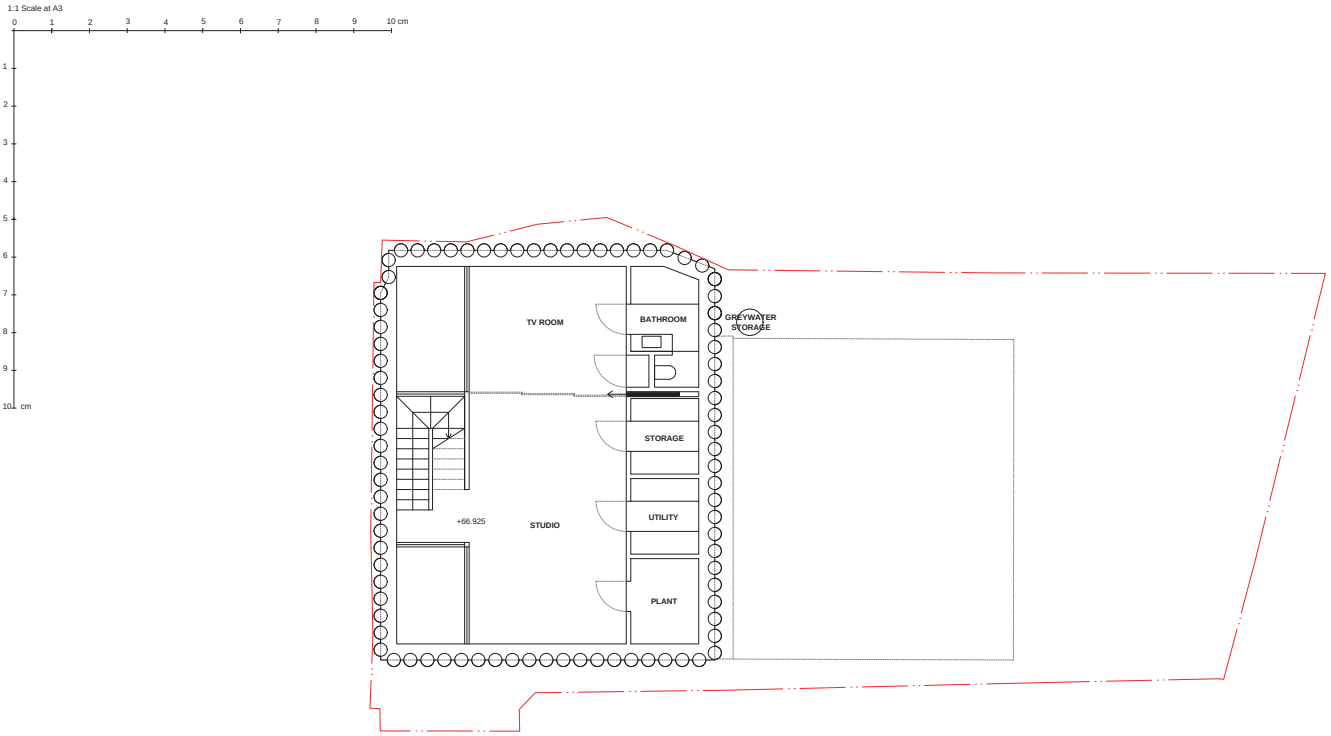
1:1 Scale at A3



01 Proposed - Basement Plan
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Basement Plan
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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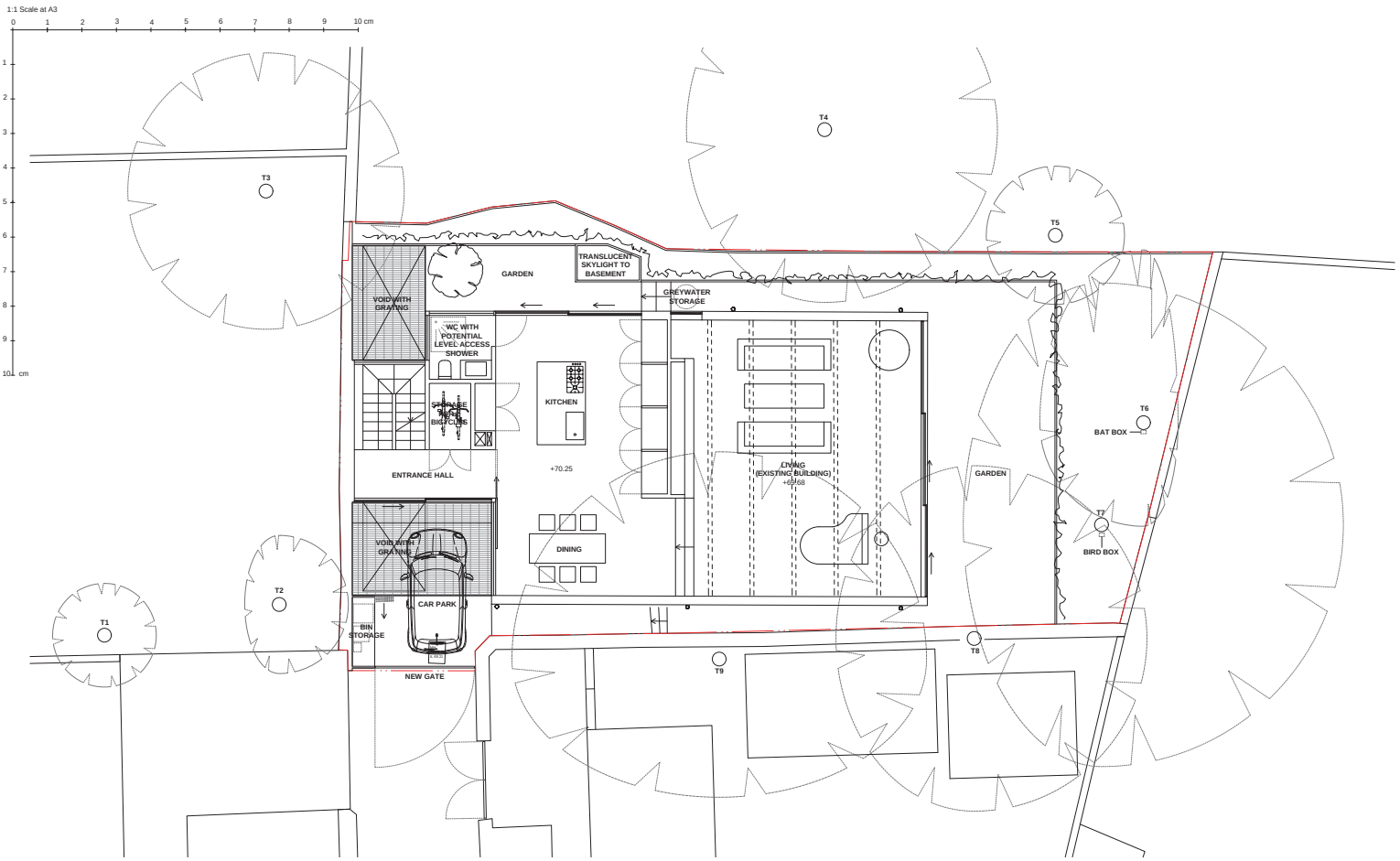

01 Proposed - Ground Floor Plan
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Ground Floor Plan
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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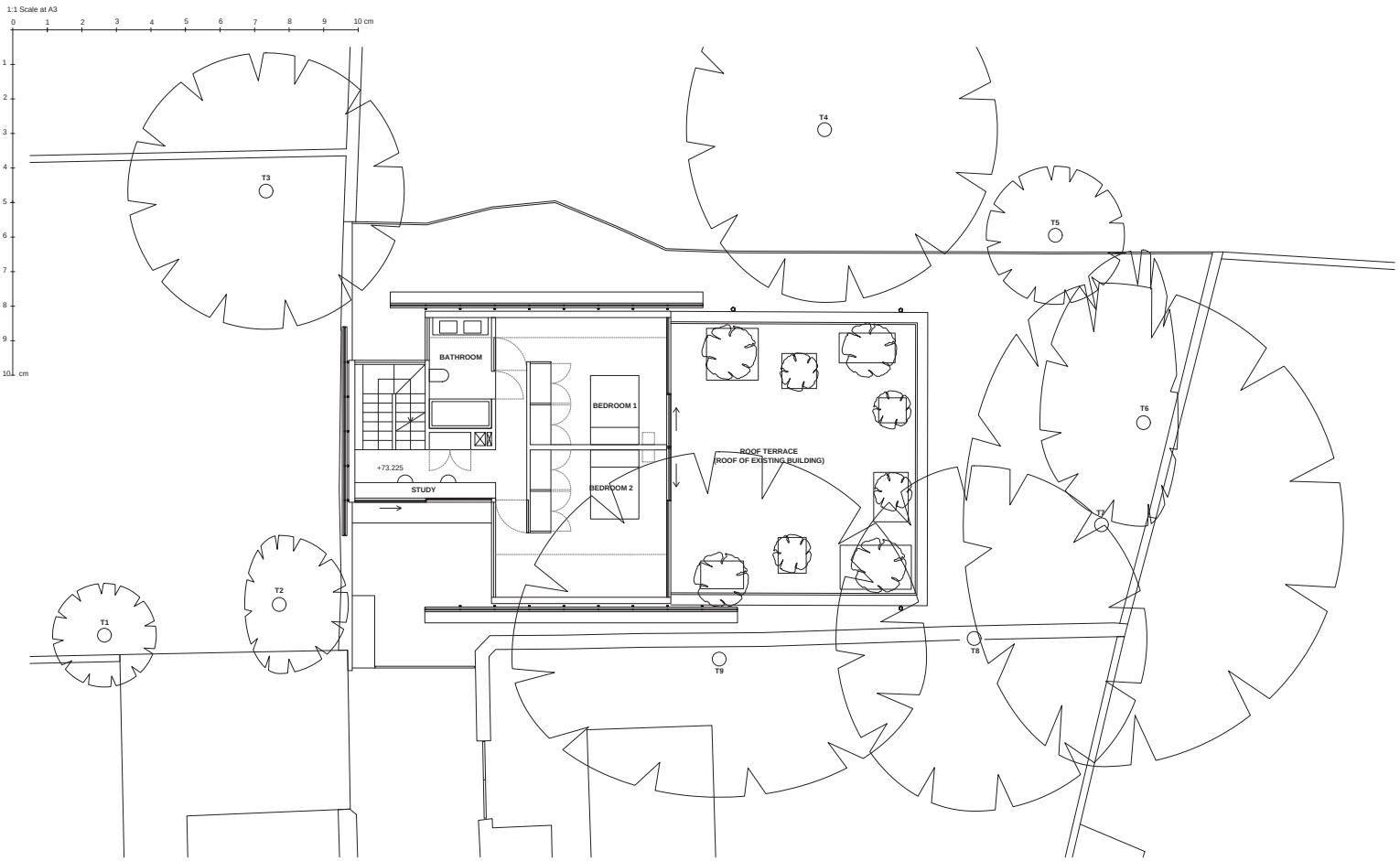

01 Proposed - First Floor Plan
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - First Floor Plan
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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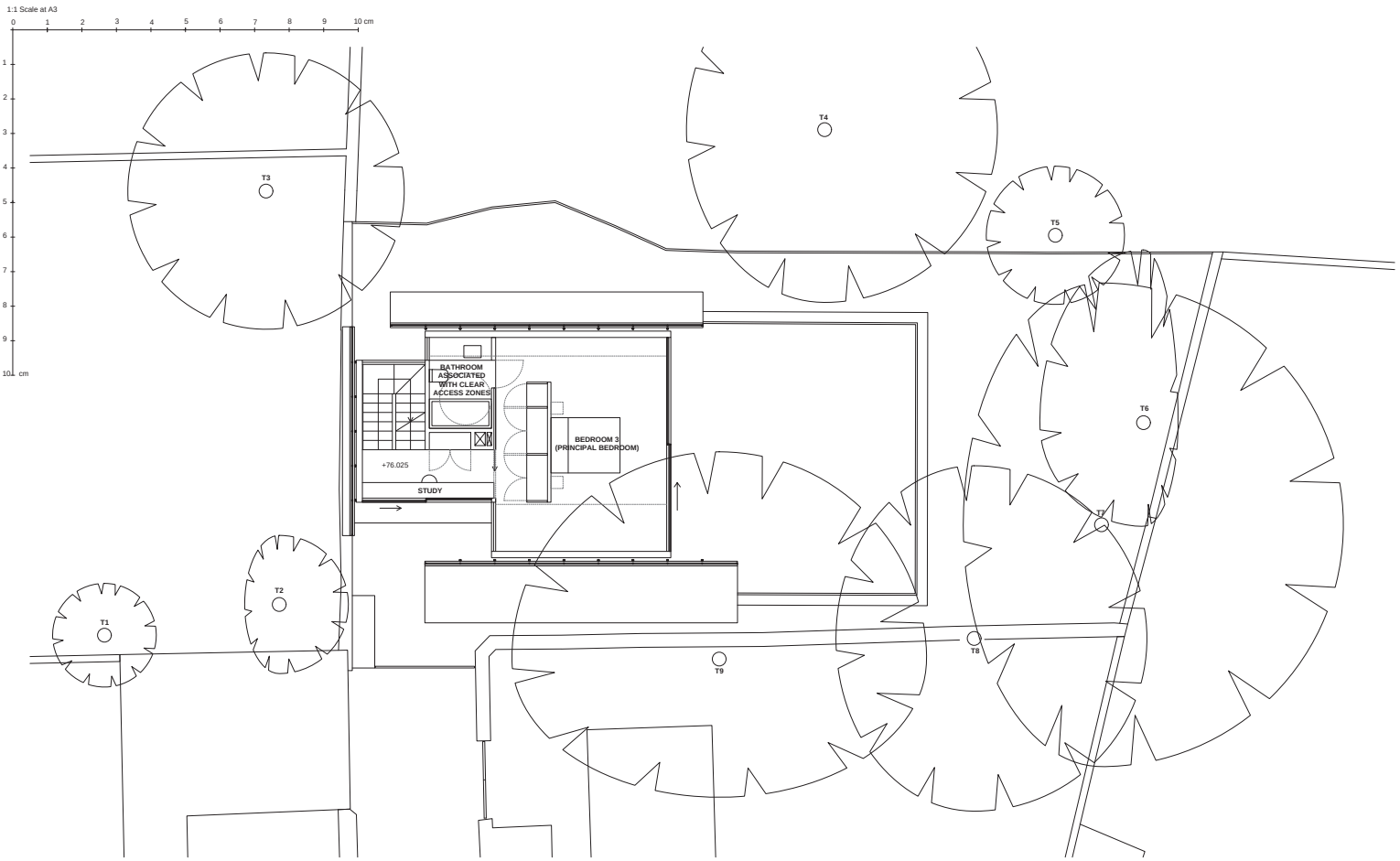

01 Proposed - Second Floor Plan
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Second Floor Plan
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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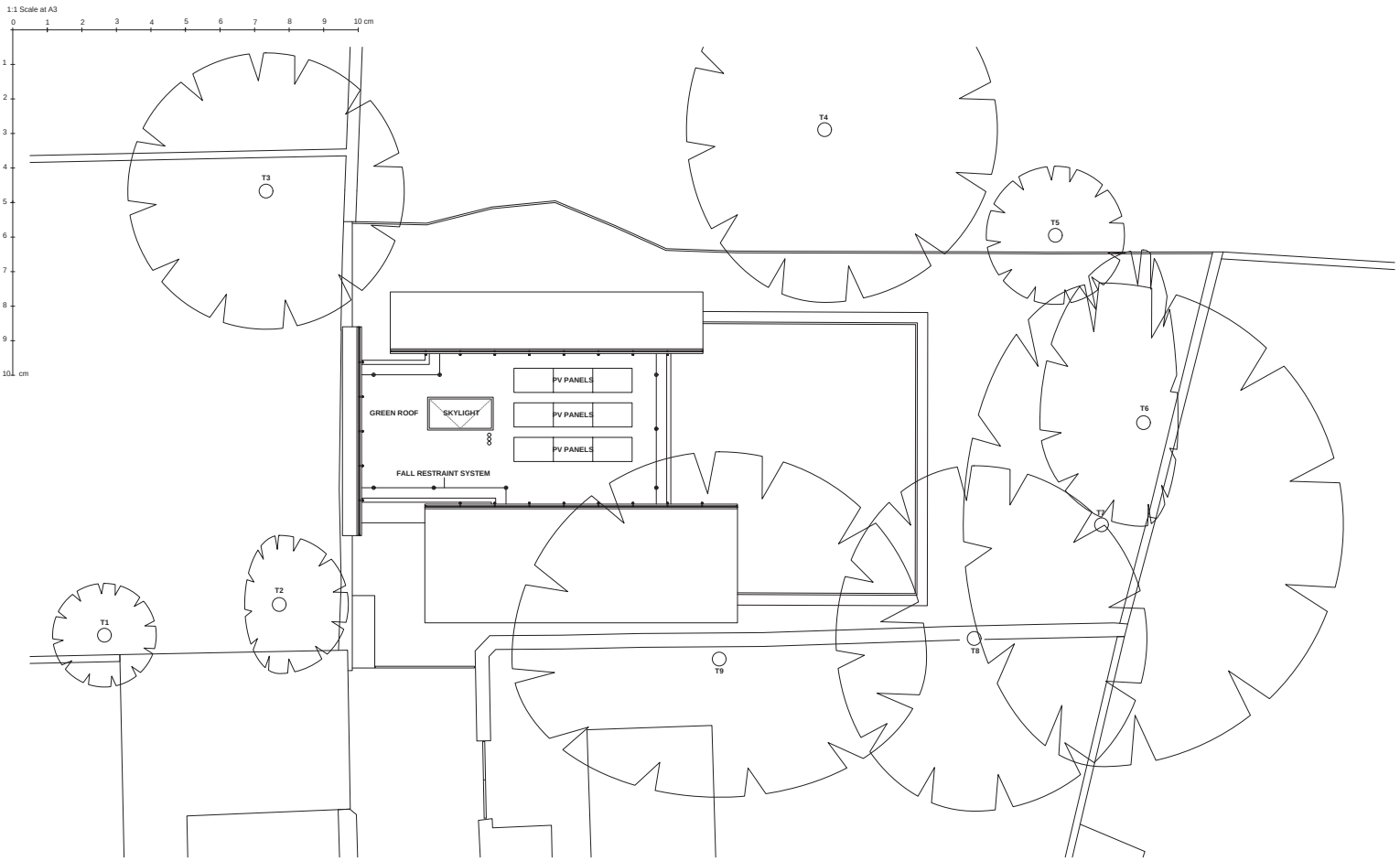

01 Proposed - Roof Plan 1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Roof Plan

Project: 201

Scale: 1:50 @ A1 1:100 @ A3

Drawing Number: PLANNING

Revision: P03

Client: SPENCER BAYLIN

Date: 25.05.2016

Drawn By: HT

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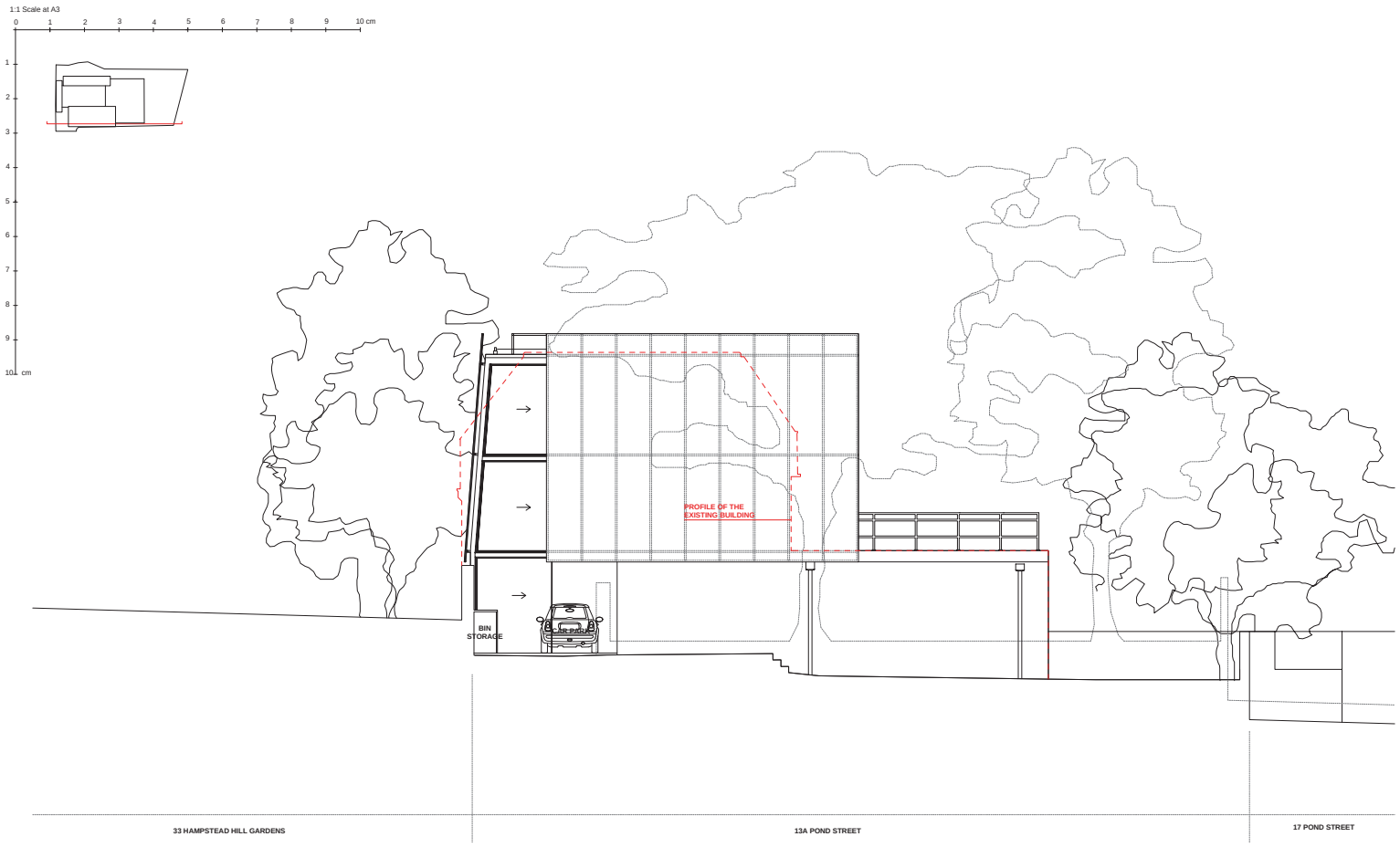

01 Proposed - South Elevation
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - South Elevation
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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1:1 Scale at A3

01 Proposed - East Elevation
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - East Elevation
Project: 201
Scale: 1:50 @ A1, 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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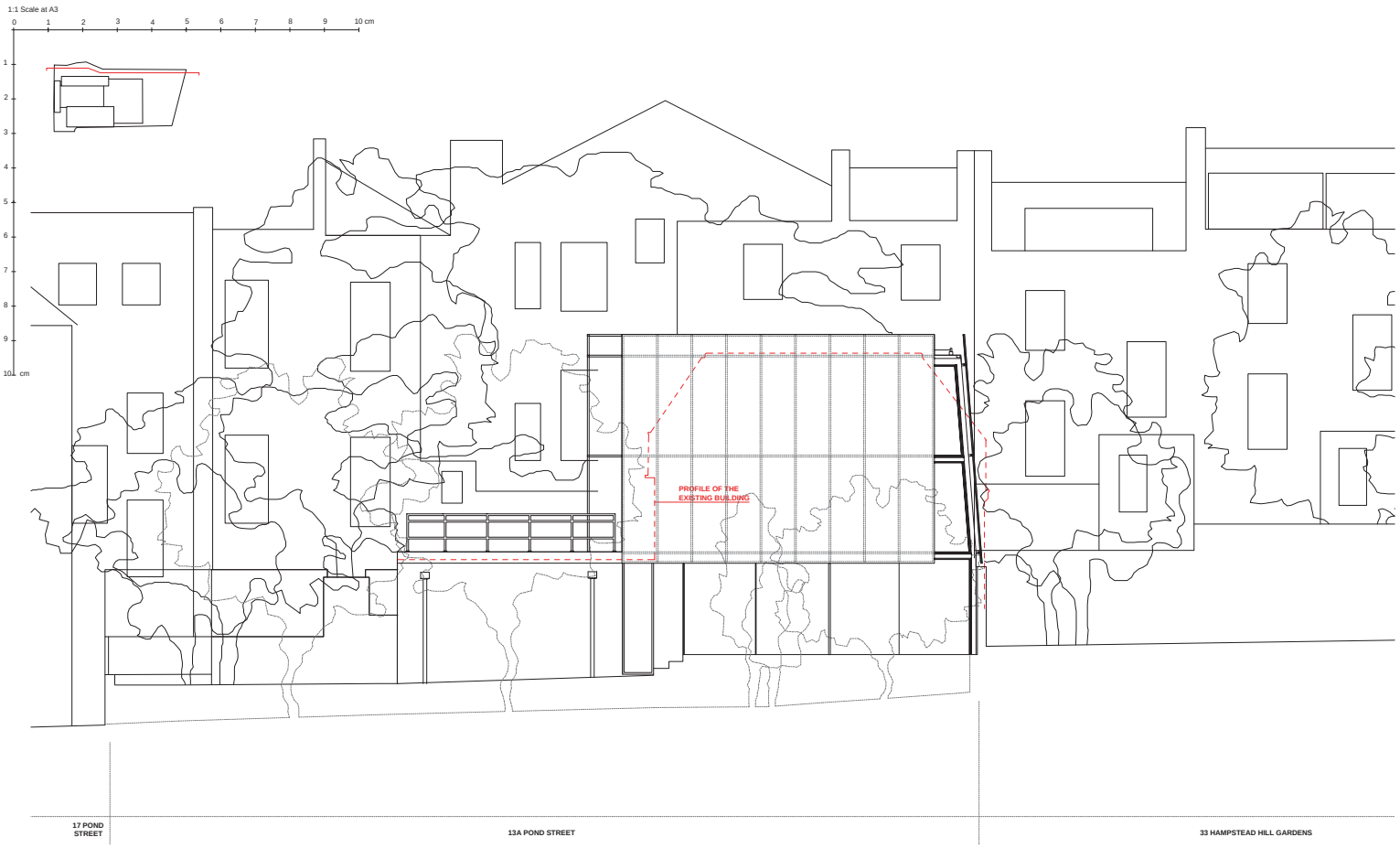

01 Proposed - North Elevation
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

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Drawing Title: Proposed - North Elevation
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
Project: 13A Pond Street, London, NW3 2PN
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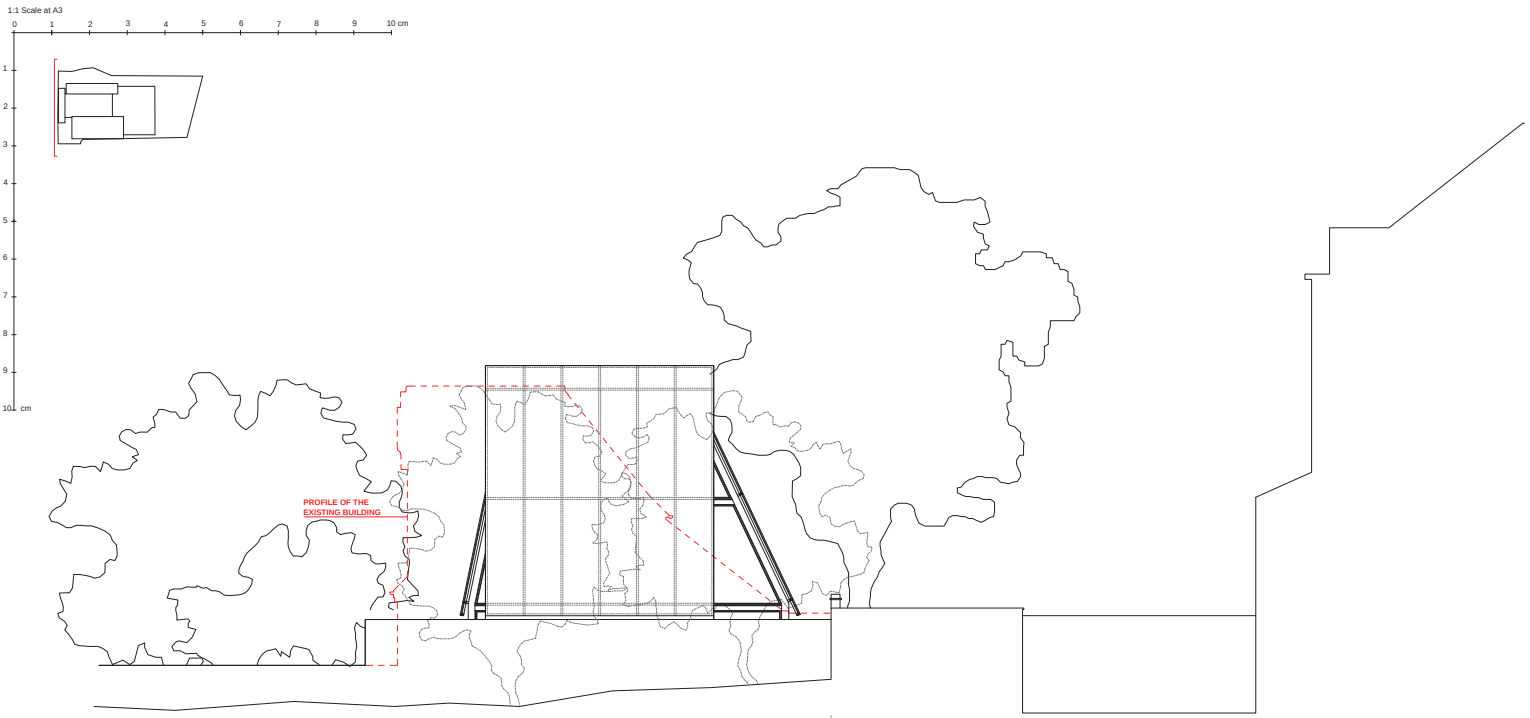

01 Proposed - West Elevation
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - West Elevation

Project: 201

Scale: 1:50 @ A1, 1:100 @ A3

Drawing Number: PLANNING

Revision: P03

Client: SPENCER BAYLIN

Date: 25.05.2016

Drawn By: HT

201 213

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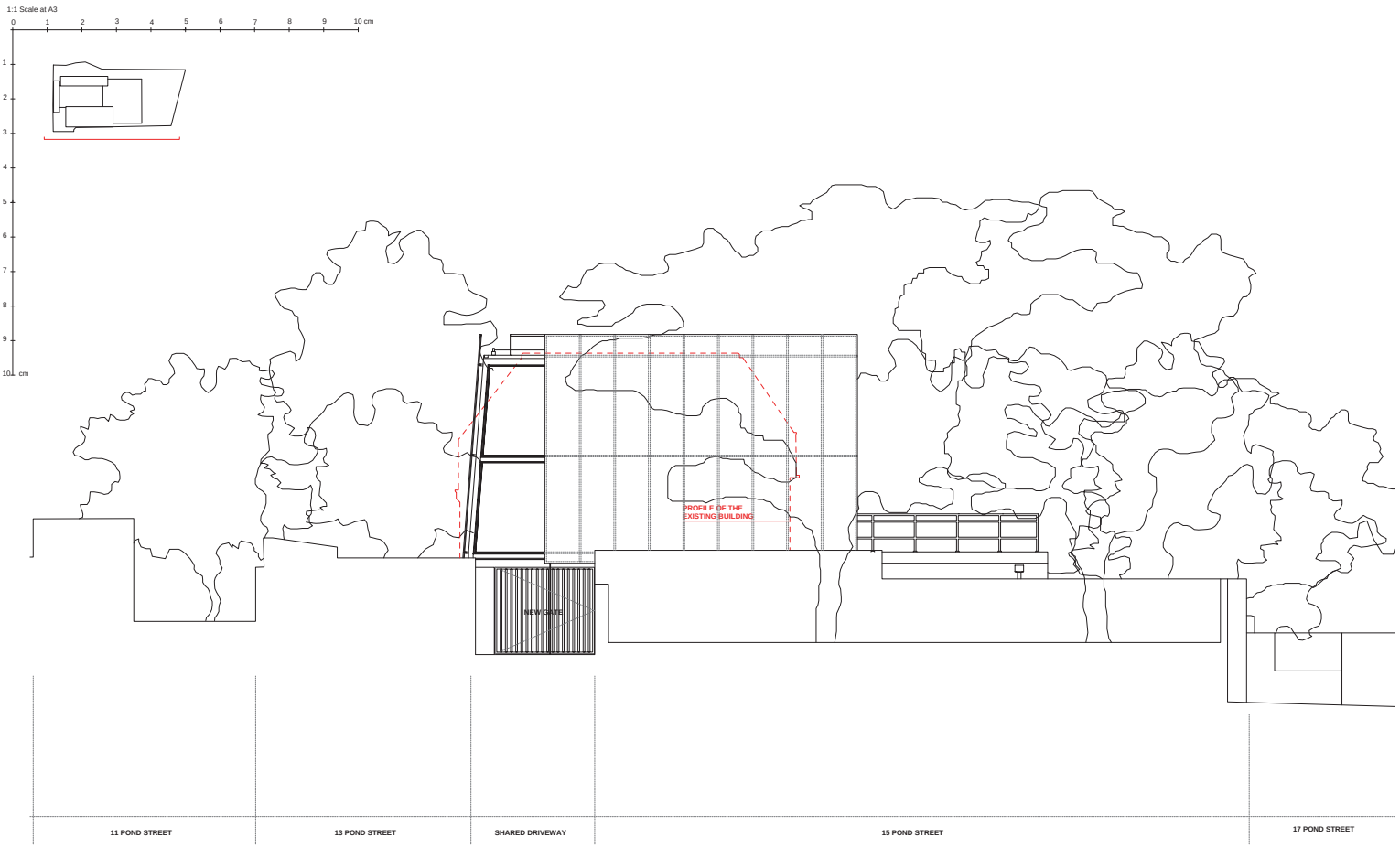

01 Proposed - South Elevation from Neighbouring Properties
1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - South Elevation from Neighbouring Properties
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
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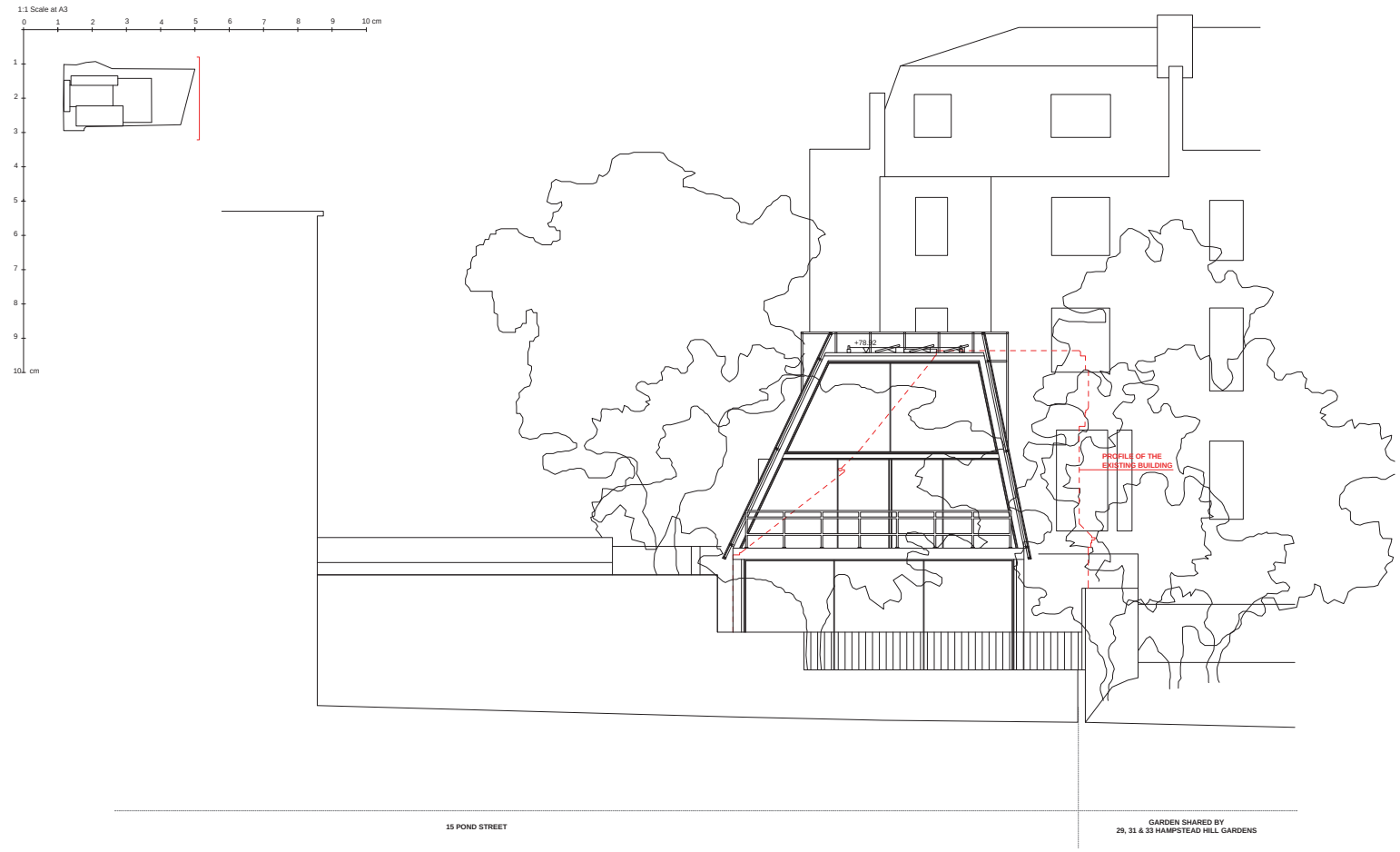

01 Proposed - East Elevation from Neighbouring Properties
1:100 @ A2 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - East Elevation from Neighbouring Properties
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
201 215
Project: 13A Pond Street, London, NW3 2PN

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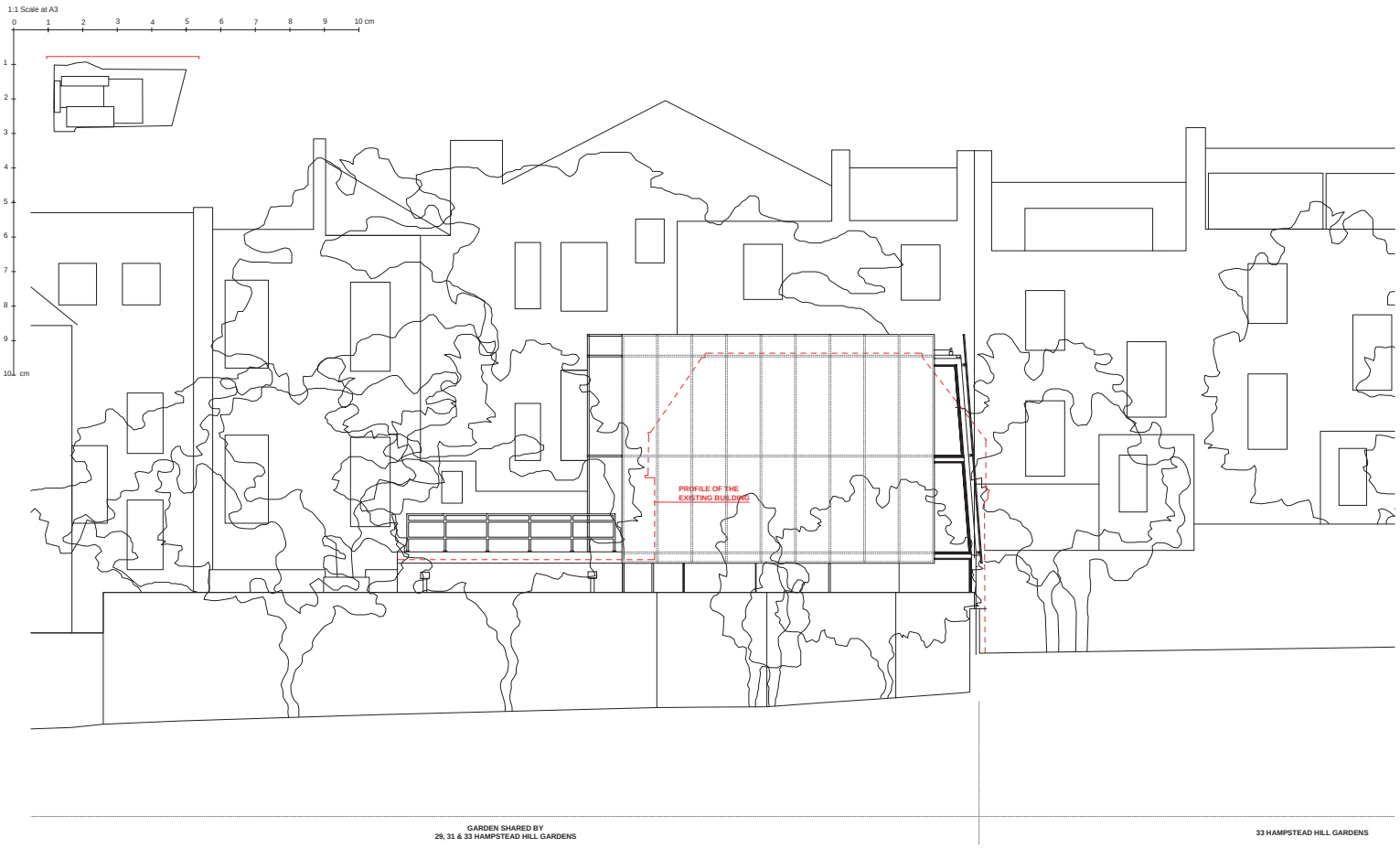

GARDEN SHARED BY
29, 31 & 33 HAMPSTEAD HILL GARDENS

33 HAMPSTEAD HILL GARDENS

01 Proposed - North Elevation from Neighbouring Properties
1:100 @ A1 / 1:50 @ A3

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

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Drawing Title	Proposed - North Elevation from Neighbouring Properties
Project	201
Scale	1:50 @ A1 1:100 @ A3
Drawing Number	PLANNING
Revision	P03
Client	SPENCER BAYLIN
Date	25.05.2016
Drawn By	HT
Project	83-84 BISHOPS SQ 13A Pond Street, London, NW3 2PN
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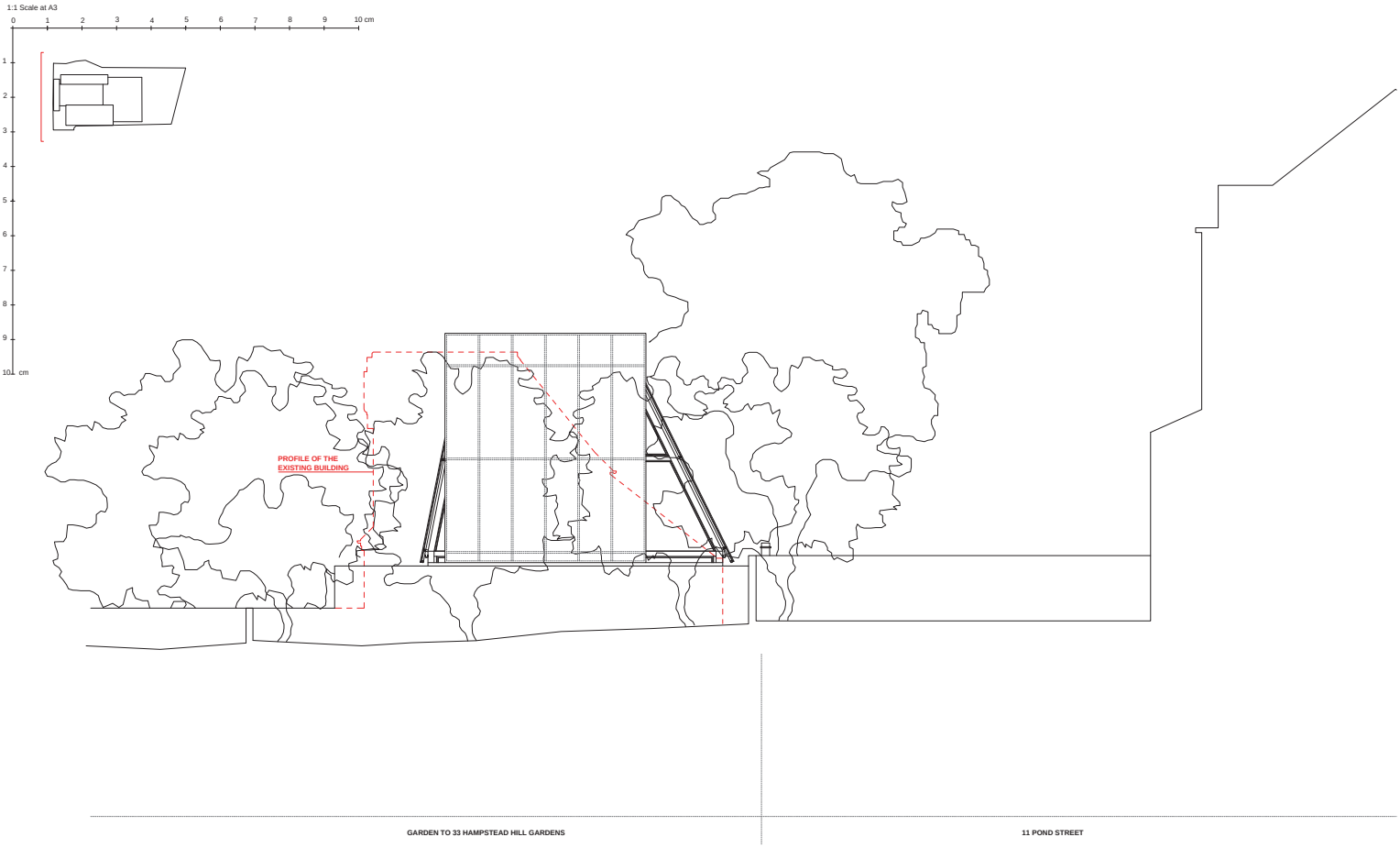

01 Proposed - West Elevation from Neighbouring Properties
1:100 @ A0 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

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Drawing Title: Proposed - West Elevation from Neighbouring Properties
Project: 201
Scale: 1:50 @ A1 1:100 @ A3
Drawing Number: PLANNING
Revision: P03
Client: SPENCER BAYLIN
Date: 25.05.2016
Drawn By: HT
201 217
Project: 13A Pond Street, London, NW3 2PN
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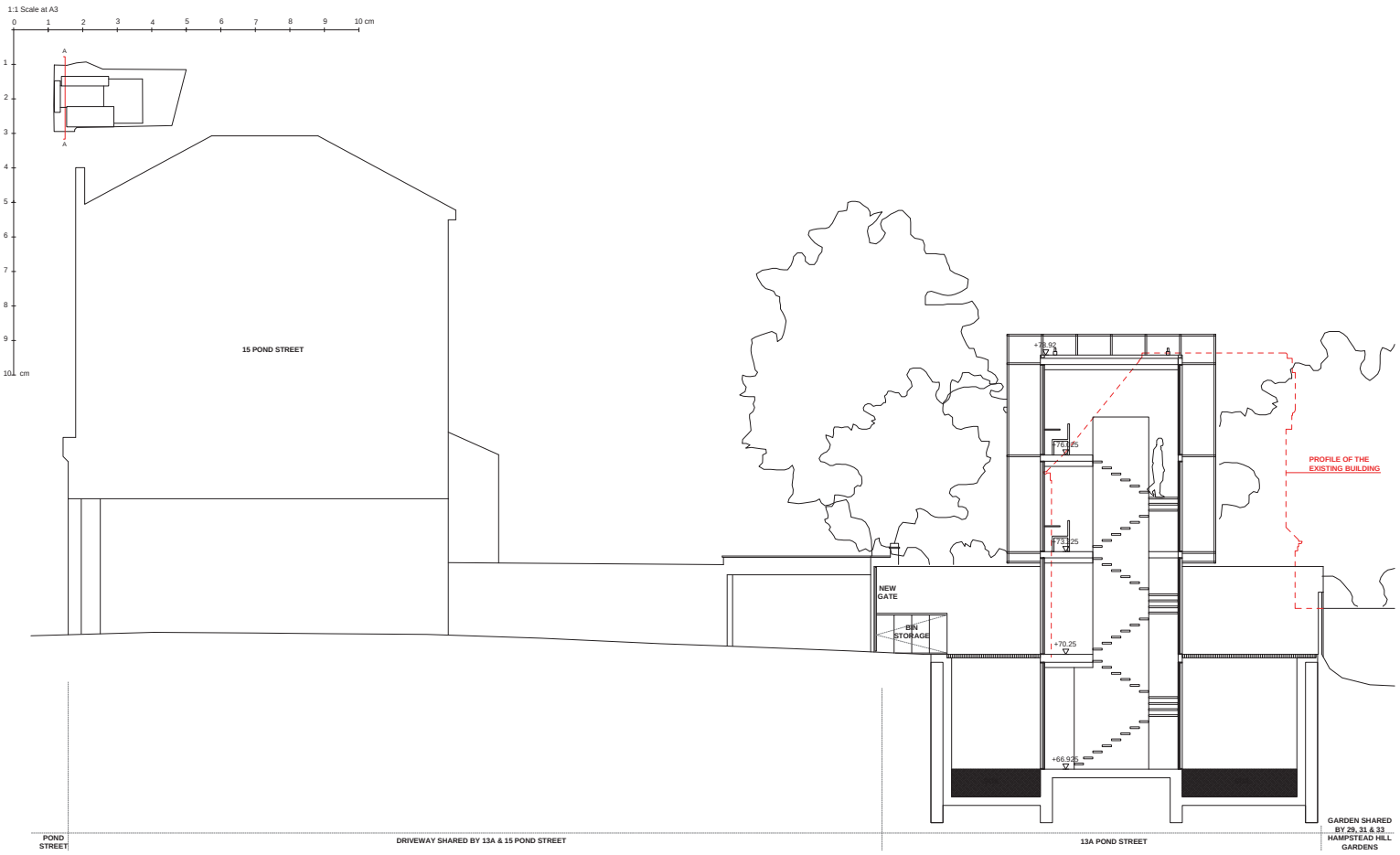

01 Proposed - Section A-A 1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Section A-A

Project: 201

Scale: 1:50 @ A1 1:100 @ A3

Drawing Number: PLANNING

Revision: P03

Client: SPENCER BAYLIN

Date: 25.05.2016

Drawn By: HT

201 220

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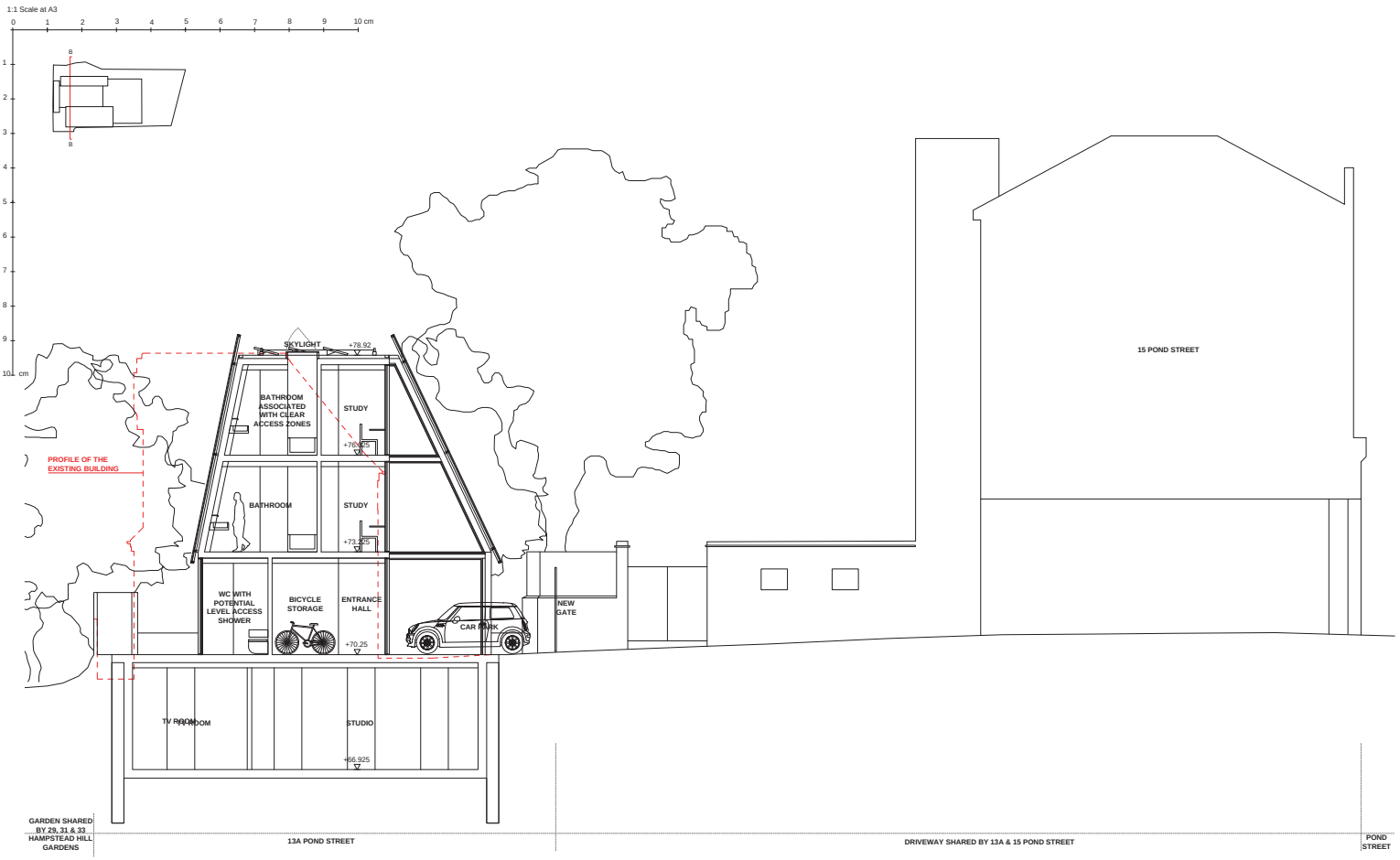

01 Proposed - Section B-B 1:100 @ A3 / 1:50 @ A1

Revision	Date	Comments
P01	29.11.2016	Minor changes on details
P02	27.01.2017	Minor changes according to pilling position
P03	24.02.2017	Minor changes to add PV panels

Drawing Title: Proposed - Section B-B

Project: 201

Scale: 1:50 @ A1 1:100 @ A3

Drawing Number: PLANNING

Revision: P03

Client: SPENCER BAYLIN

Date: 25.05.2016

Drawn By: HT

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