Chelmer
Consultancy Services
'Groundbreaking Services'

Basement Impact Assessment

Site	34 King Henry's Road London NW3 3RP
Client	Rupert West
Date	May 2017
Our Ref	BIA/7806

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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 Site Investigations Laboratories Ltd.

This report is specific to the proposed site use or development, as appropriate, and as described in the report Chelmer Site Investigations Laboratories 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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1.0 INTRODUCTION

1.1 This report presents the outcome of a Basement Impact Assessment (BIA) for the proposed development of 34 King Henry's Road, Camden, London NW3 3RP. The local planning authority is the London Borough of Camden.

1.2 Chelmer Site Investigation Laboratories Ltd (Chelmer) was instructed in October 2016 by Rupert West to complete this report. The report has been prepared by 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 structure of this report follows that of a BIA complaint with Camden Borough CPG4 (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.

1.4 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).

1.5 The site comprises 34 King Henry's Road, London NW3 3RF (No. 34) and is located at approximate Ordnance Survey grid reference (OSNGR) 527774E, 184252N. The site comprises a four-storey (including lower ground floor level), semi-detached residential property with associated rear garden and front lightwell. The lower ground floor is part of a separate leasehold property to the rest of the building.

1.6 It is to our understanding that the proposed development involves the extension of the lower ground floor south into the area of the front garden towards King Henry's Road and will extend across the full width of No. 34. Existing and proposed plans are presented in Appendix B.

1.7 A site inspection (walk-over survey) was undertaken on 10th November 2016 by James Blyth of Chemer, 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.

1.8 A ground investigation was undertaken by Chelmer (2016) on 11th October 2016, the Factual Report on the investigation is presented in Appendix F, and the findings are summarised in Section 3.0.

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

Sketch London Architects

Drawing 1079 000 A (Location Plan)
Drawing 1079 001 A (Site Plan)
Drawing 1079 100 A (Existing Lower Ground Floor)
Drawing 1079 101 A (Existing Roof Plan)
Drawing 1079 200 A (Existing Section AA)
Drawing 1079 300 A (Existing Front Elevation)
Drawing 1079 301 A (Existing Rear Elevation)
Drawing 1079 302 A (Existing Side Elevation)
Drawing 1079 102 A (Proposed Lower Ground Floor)
Drawing 1079 103 A (Proposed Roof Plan)
Drawing 1079 201 A (Proposed Section AA)
Drawing 1079 202 A (Proposed Section BB)
Drawing 1079 203 A (Proposed Section CC)
Drawing 1079 303 A (Proposed Front Elevation)
Drawing 1079 304 A (Proposed Rear Elevation)
Drawing 1079 305 A (Proposed Side Elevation)

Packmanlucas Structural Designers

Report 5682-11-170509 Prelim Calcs
Drawing 5682-SK-01-P2 Foundation GA
Drawing 5682-SK-02-P2 Ground Floor GA
Drawing 5682-SK-03-P2 First Floor GA

2.0 PROPERTY AND AREA DETAILS

2.1 The property is located in the centre of King Henry's Road, bordering a railway to the north. Primrose Hill Park is located roughly 250m to the south of the site. The site occupies approximately 0.03 ha and is centred on Ordnance Survey National Grid Reference 527774, 184252.

Figure 1. Extract of Site Location Plan from Groundsure Report (Groundsure GS-3776156)

2.2 The site comprises 34 King Henry's Road, London NW3 3RP which is a four-storey, including a lower ground floor, semi-detached, residential property with associated rear garden and front lightwell in the centre of King Henry's Road. The property is adjoined by No. 32 King Henry's Road (No. 32) to the east and neighbours No. 36 King Henry's Road (No. 36) to the west. The rear garden of the site backs directly onto a major railway line linked to Euston Station to the South East.

2.3 A site inspection (walk-over survey) was undertaken on 10th November 2016 by James Blyth 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. The lower ground floor basement was being used as a separate apartment to the property above.

2.4 The existing property at No. 34 has a lower ground floor that is founded at approximately 2.5 m below existing ground at street level (bgl), which consists of one large room and four smaller rooms. The proposed development involves the extension of the lower ground floor south, into the area of the front garden towards King Henry's Road and will extend across the width of No. 34. The existing lower ground internal floor level of the property is proposed to be lowered by 0.4 m to 0.6 m. An extension is also proposed into the rear garden; the existing rear garden level is approximately at the same level as the existing lower ground floor, 2.4 m bgl. Existing and proposed plans are presented in Appendix B.

2.5 The proposed basement will involve excavation in the front garden to approximately 3.3 m bgl, as detailed in Drawing 1079-D-201 Rev.A and assuming a slab thickness of 0.6 m. It is understood that the basement will be formed by reinforced concrete (RC) underpinning and RC retaining walls. Trench fill foundations are also proposed in areas to lower the existing foundations of the lower ground floor. Excavation for the underpins and trench fill foundations is anticipated to a depth of 1.3m below existing lower ground floor level (equivalent to approximately 3.7m bgl).

2.6 A search has been made of planning applications on the London Borough of Camden's 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 one relevant application (2013/5264/P) for a similar extension into the front garden at No. 32. The proposed drawings identify the original lower ground floor and the proposed extension as being founded at a similar level as the existing No. 34, approximately 2.4 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 that King Henry's Road and the current property were developed prior to 1871, at which time the railway line to Euston was also present. The Belsize Park region to the north-west was undeveloped until roughly 1894. The historic maps identify very few new developments in the area since 1894.

3.2 Topography

3.2.1 The BGS Onshore GeoIndex indicates that the site is on relatively flat ground at approximately 39 mOD. The ground level along King Henry's Road rises to 45 mOD approximately 175 m to the west, creating a slope of <2° and stays at 39 mOD to the junction of Ainger Road and King Henry's Road approximately 100 m to the east. Levels of higher ground, 65 mOD and 55 mOD exist approximately 340 m to the south-southwest and 380 m to the northwest respectively, creating a maximum slope of <4°.

3.2.2 The rear garden at No. 34 King Henry's Road is indicated to be approximately 2.4 m lower than the street level at the front, and is at the floor level of the existing lower ground floor. However, as stated above there are no significant slopes indicated in the area and the lower ground level along the rear gardens may be associated with historic cuttings for the railway line that runs adjacent to the rear garden.

3.3 Hydrological Setting (Rivers and Watercourses)

3.3.1 The site lies approximately 4.5 km to the northwest of the River Thames. The nearest surface water feature, identified in the Groundsure Report, is Regents Canal which is roughly 670 m southeast of the site. The BGS Onshore GeoIndex identifies the nearest well as being located approximately 600 m to the south-southwest of the property.

3.3.2 The book 'The Lost Rivers of London' (Barton, 1992) does not identify any lost rivers within the immediate vicinity of the site. The nearest underground stream is the Tyburn approximately 650 m to the west which flowed from Belsize Park through Regent's Park then along Marlybone Lane towards St James Park before entering the River Thames. The Tyburn is identified on the Groundsure report as a culvert approximately 600 m to the west of the site. Two maps of the tributaries of the Thames and showing the approximate location of No. 31 St Mark's Crescent are presented in Figure 2 and Figure 3.

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

- There are no surface water features within 500 m of the site.
- There are no surface water abstraction licences within 700 m of the site.
- There are no flood defences, no area benefitting from flood defences, and no flood storage areas within 4 km of the site.

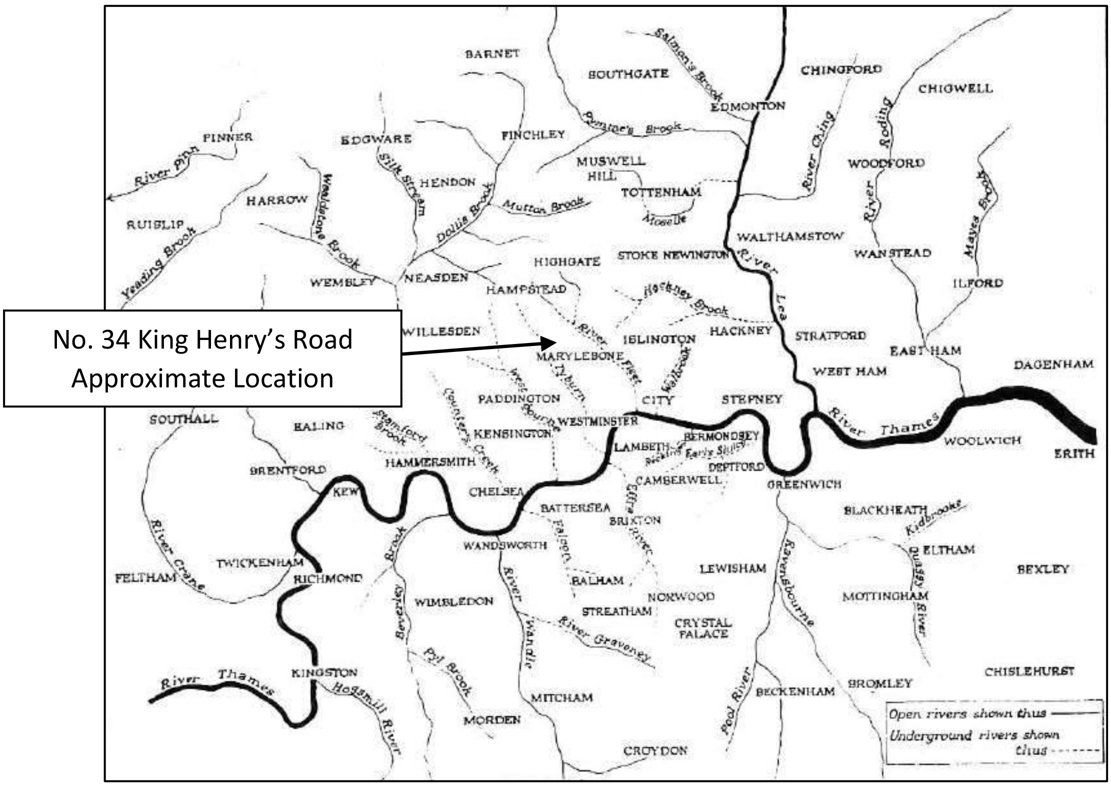

Figure 2. Tributaries of the Thames from Kingston to Erith identified in 'The Lost Rivers of London' (Barton, 1992)

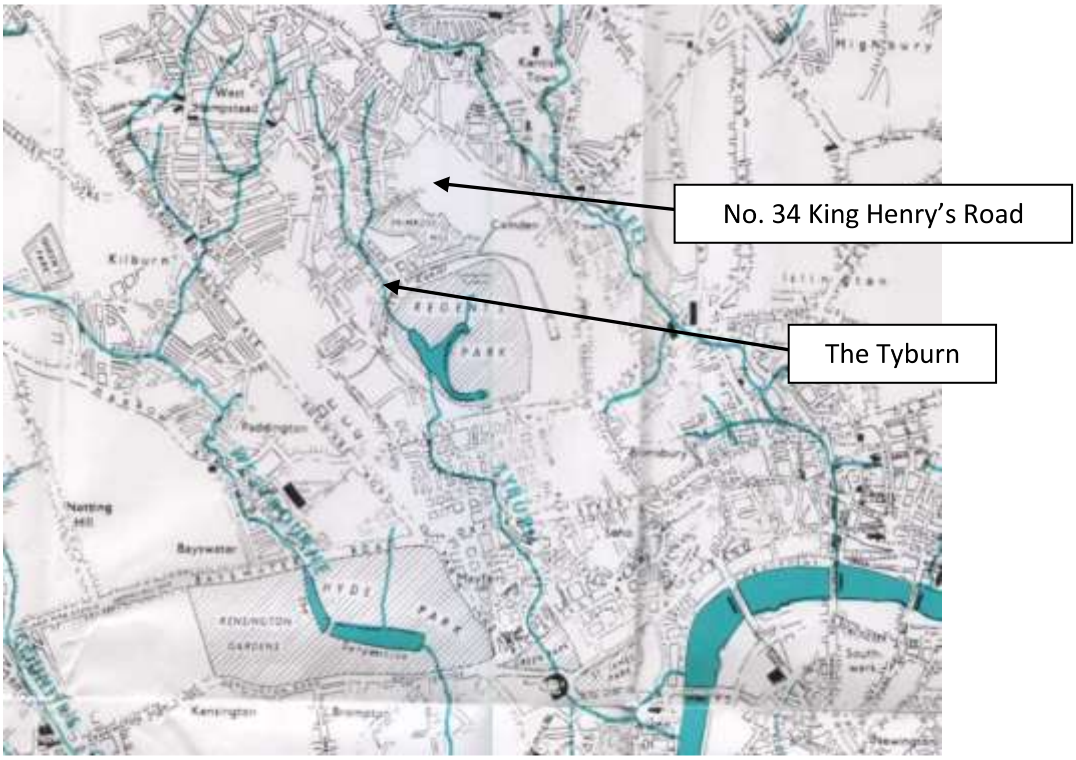

Figure 3. Location of the Tyburn relative to 34 King Henry's Road (Extract from map posted on londonbygaslight.wordpress.com)

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. The EA website also shows that the property does not fall within an area at risk of reservoir flooding.

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 is identified as being at very low risk with no flood risk areas nearby.

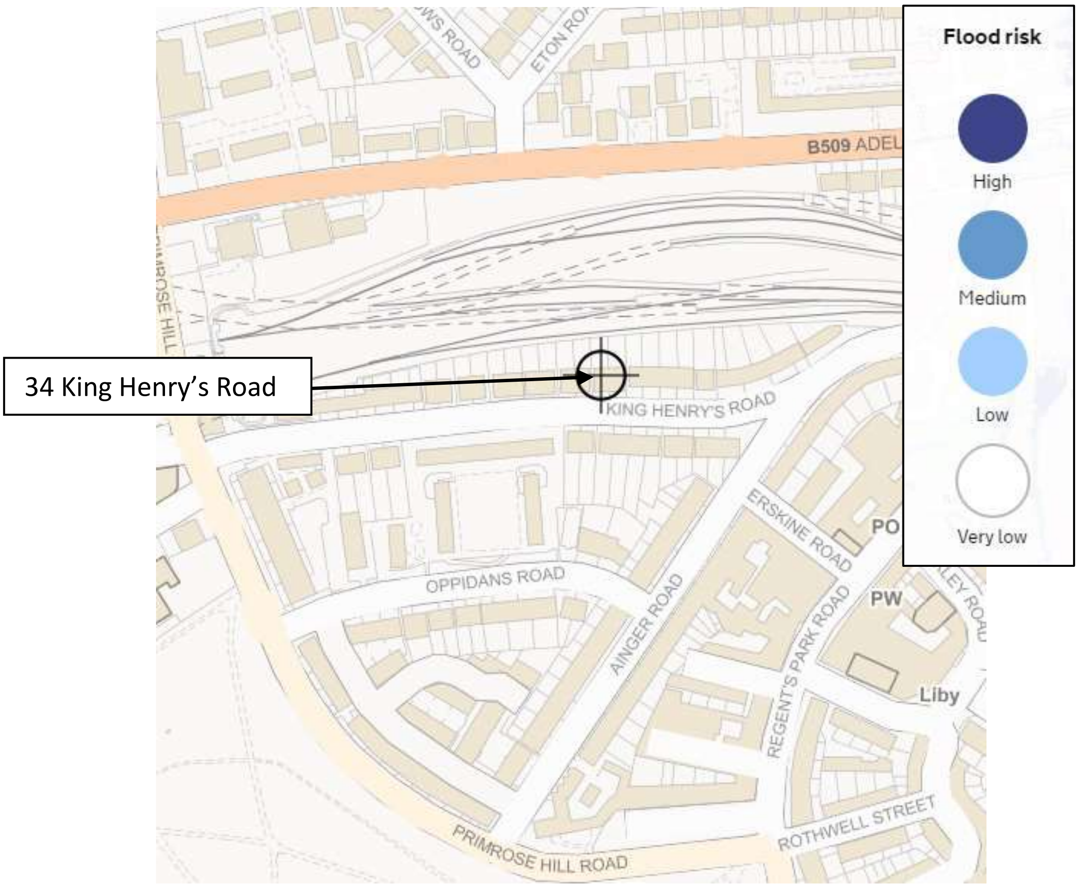

Figure 4. Flood Risk from Surface Water (Contains public sector information licensed under the Open Government Licence v3.0)

3.4.3 Figure 15 'Surface Water Flood Risk Potential' from the Camden Geological, Hydrogeological and Hydrological Study (GHHS) by Arup (2010) shows historic flooding close to the proposed development but the 'Floods in Camden' report by the London Borough of Camden (2003) does not indicate that either of the 1975 or 2002 floods affected King Henry's Road and indicates that only the adjoining Gloucester Avenue was affected by the 1975 flood event and Primrose Hill Road was affected by the 1975 and 2002 floods. Figure 5 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.

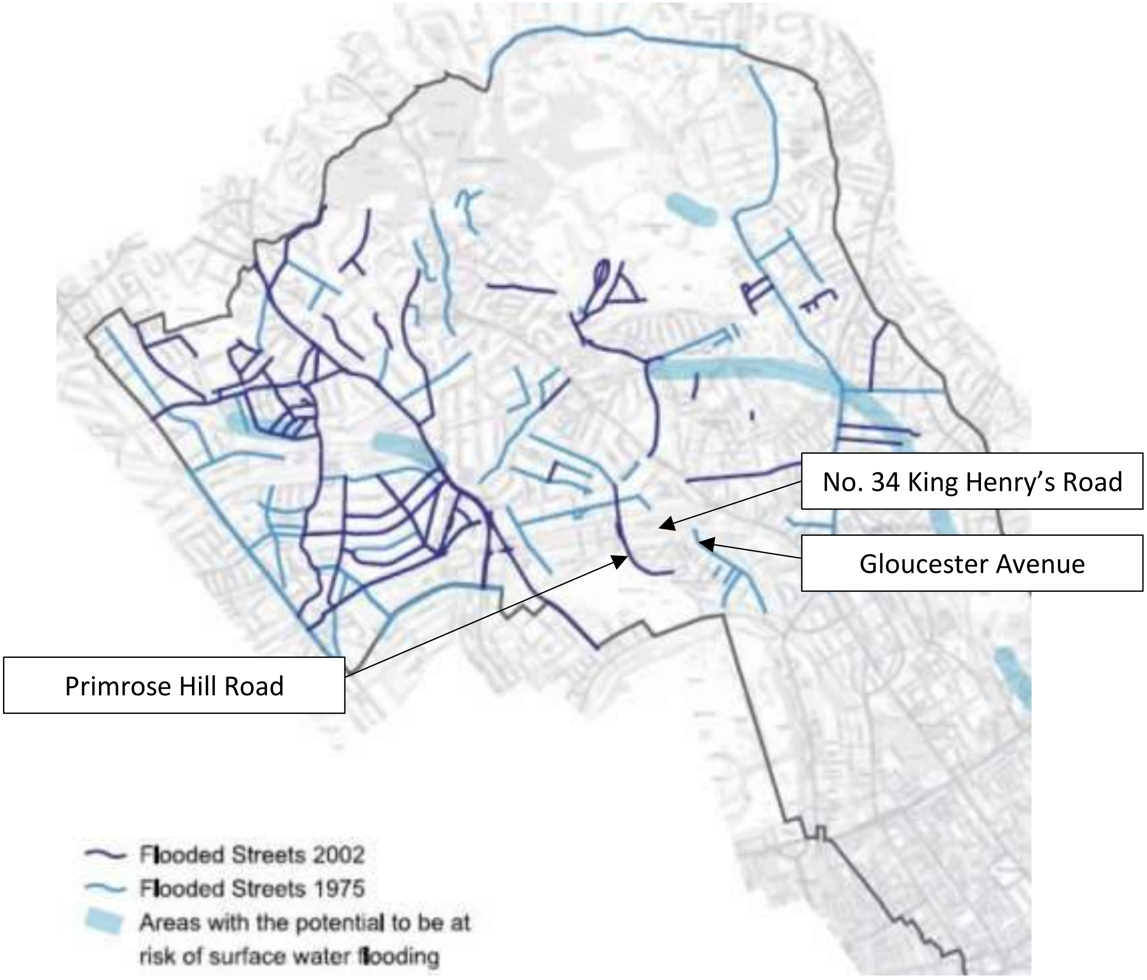

Figure 5. Extract from Figure 15 of the Camden GHHS (Arup, 2010)

3.4.4 Figure 5a of the London Borough of Camden Strategic Flood Risk Assessment (SFRA) by URS (2014) indicates the site is located in an area where there are no external sewer flooding records but there have been eight properties affected by internal sewer flooding. Extracts from Figures 5a and 5b of the SFRA is displayed in Figure 6 below.

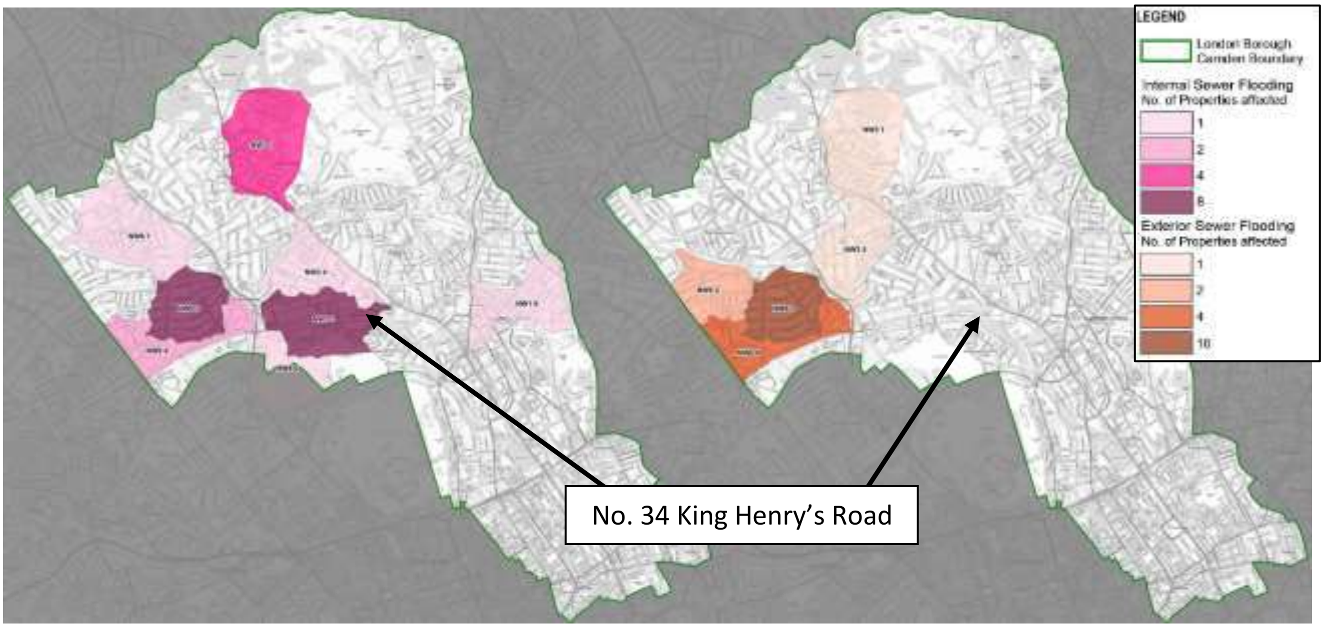

Figure 6. Extracts from Figures 5a and 5b of the SFRA (URS, 2014)

3.4.5 Figure 6 of the SFRA shows that the site is located in a Critical Drainage Area (CDA), along with the majority of the borough. A CDA is defined as *"A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure."* It is not located within the Primrose Hill Local Flood Risk Zone (LFRZ). An extract of Figure 6 is displayed in Figure 7 below.

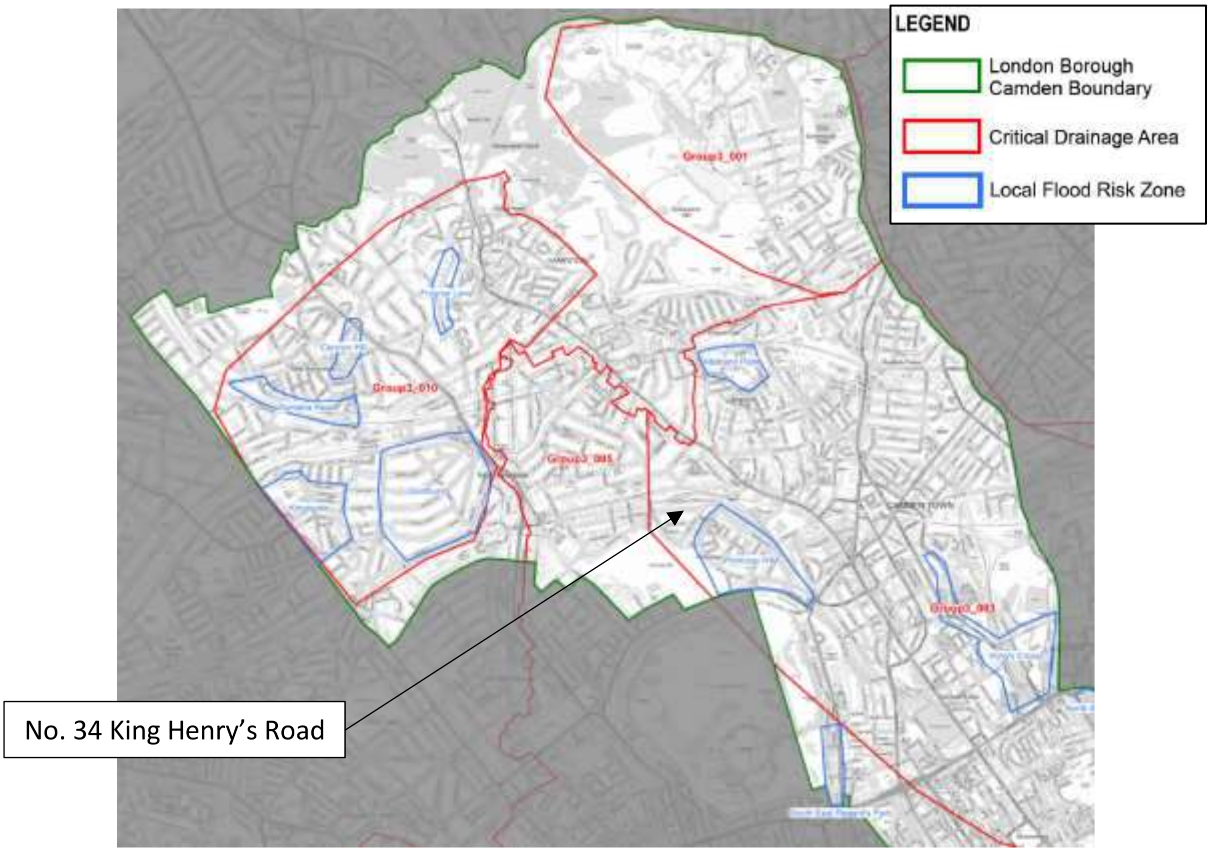

Figure 7. Extract from Figures 6 of the SFRA (URS, 2014)

3.5 <u>Geological Setting (Ground Conditions)</u>

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 8 below. The BGS indicates the same geology is encountered for over a 1 km radius to the site. The Claygate Member and Bagshot Formation are present 1.3 km north-west of the site.

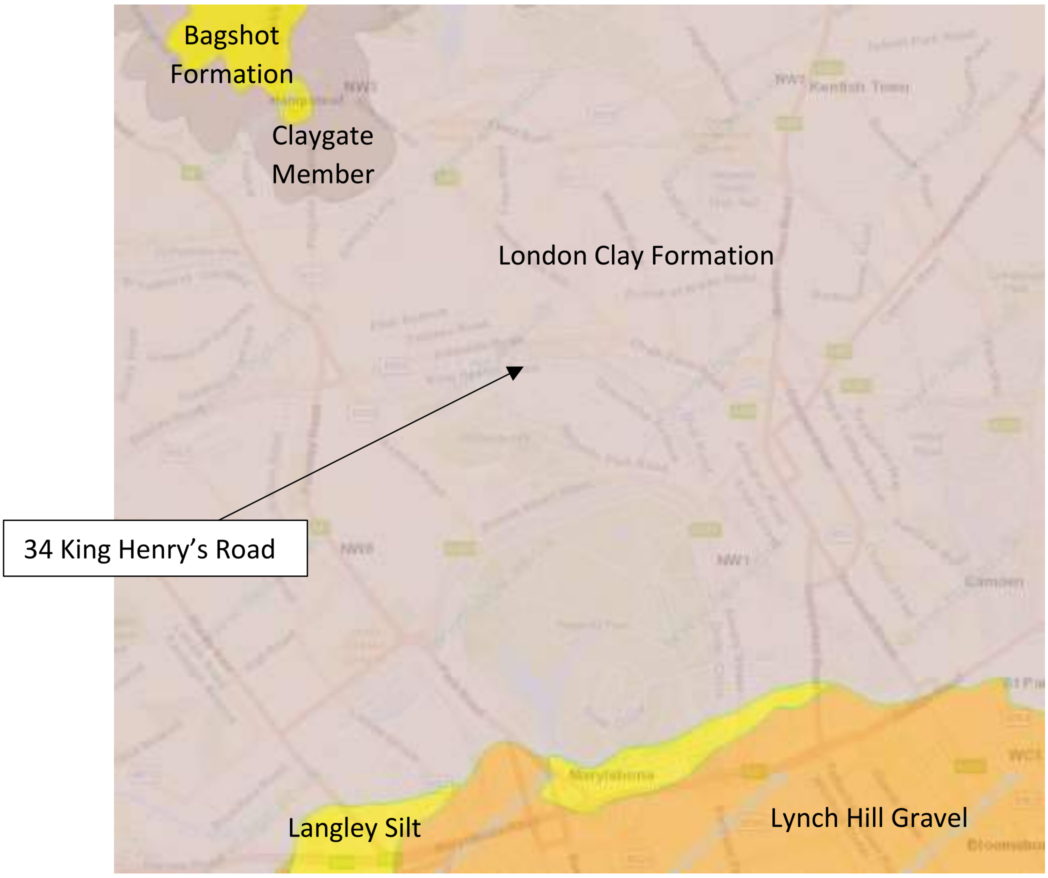

Figure 8. Site BGS Geological Plan (Contains British Geological Survey materials © NERC 2016. Base mapping is provided by ESRI)

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 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 9 below. The borehole logs are presented in Appendix D.

3.5.4 Four BGS boreholes were reviewed, with the deepest borehole extending to 121.9 m bgl. The boreholes typically showed Made Ground, comprising of a clay with brick and concrete fragments over the London Clay Formation. The London Clay Formation is broken down into weathered and the un-weathered material. The weathered London Clay Formation consists of an orange and brown clay with occasional fine sand lenses which makes way to the un-weathered London Clay which comprises of a grey laminated fissured clay. The London Clay was only penetrated in the eastern reviewed borehole which found it be underlain by the Lambeth Group at a depth of 60.4 m bgl. This in turn was underlain by Thanet Sands at a depth of 70.0 m bgl before making way to Chalk bedrock at 71.0 m bgl, the Chalk was not penetrated at the final borehole depth of 121.9 m bgl. Groundwater levels recorded in the boreholes are detailed in Section 3.6.3.

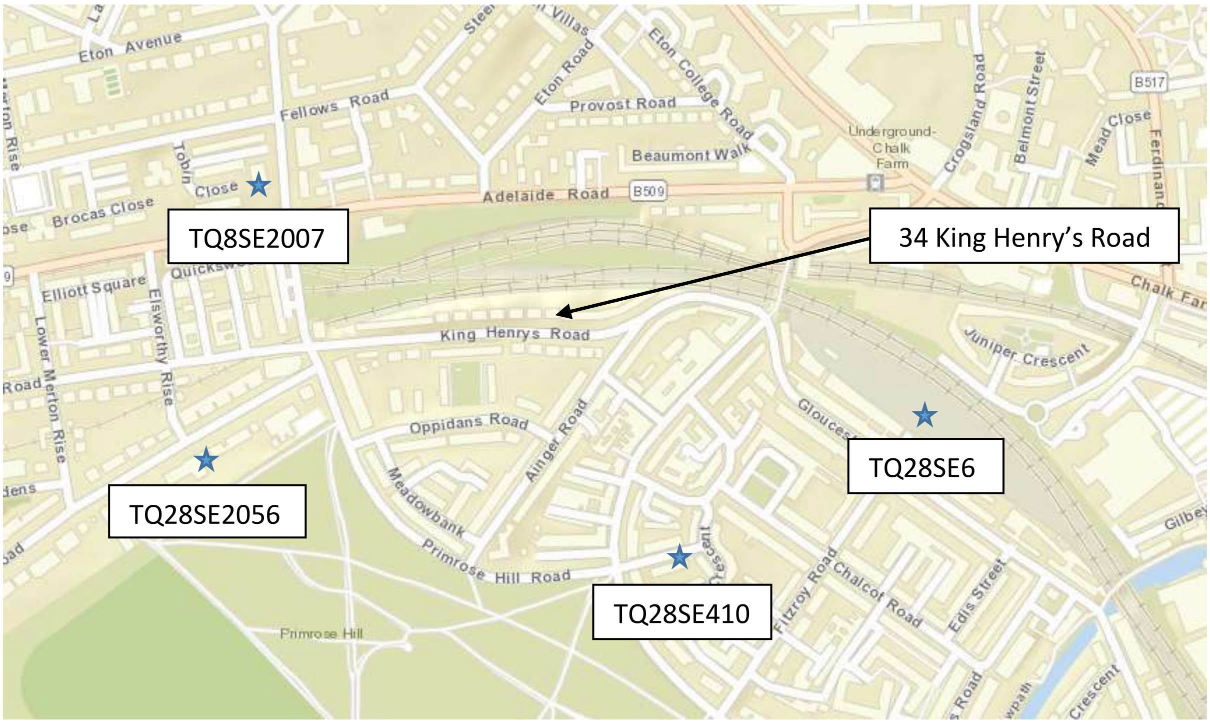

Figure 9. BGS Borehole Locations (Contains British Geological Survey materials © NERC 2016. Base mapping is provided by ESRI)

3.5.5 The ground Investigation completed by Chelmer (2016) comprised a single C.F.A. borehole (BH1) to 8.10 m bgl within the front garden of No. 34 and two hand excavated trial pits (TP1 & TP2) to examine the current properties foundations. The ground investigation indicated that the London Clay Formation was present beneath Made Ground at 2.0 m bgl. The London Clay Formation consisted of a stiff fissured brown silty CLAY. The base of the London Clay Formation was not proven at the maximum drilling depth of 8.10m bgl. Table 1 below presents a summary of the ground conditions encountered and the borehole 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	2.0	MADE GROUND: Brown sandy gravelly CLAY with occasional brick fragments, becoming more clayey with depth.
2.0	8.10+	LONDON CLAY FORMATION: Stiff fissured brown silty CLAY

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. This is defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

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

- There are no groundwater abstraction licences are within 500 m of the site.
- The site is not within a Source Protection Zones (SPZs), the nearest identified is the outer catchment 56 m southwest of the site.
- The BGS has classified the site as being not prone to groundwater flooding based on rock type.

3.6.3 Groundwater information recovered from the BGS boreholes near the site (Figure 9) are detailed in Table 2 below.

Table 2: Summary of Groundwater Records from BGS Boreholes		
Location	Date	Groundwater Standing Level (m bgl [m AOD])
TQ28SE6	1849	*Standing – 45.7 [15.2]*
TQ28SE410	March 1950	*Seepage – 31.4 [7.3]* *Standing – 34.1 [4.6]*
TQ28SE2012	November 1962	*No Data*
TQ28SE2056	February 1990	*Groundwater not encountered during drilling*

3.6.4 No groundwater was observed during the drilling process of the ground investigation performed by Chelmer (2016), where BH1 was drilled to 8.10m depth and a monitoring standpipe was installed to 8.0 m bgl. Two return monitoring visits have been completed on 28th October and

10th November 2016, the groundwater was recorded at depths of 6.29 m and 5.16 m bgl respectively.

3.6.5 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'*. As presented in Figure 4e of the SFRA the nearest recorded groundwater flooding incident was approximately 180 m to the south of the site. An extract of Figure 4e of the SFRA is displayed in Figure 10 below.

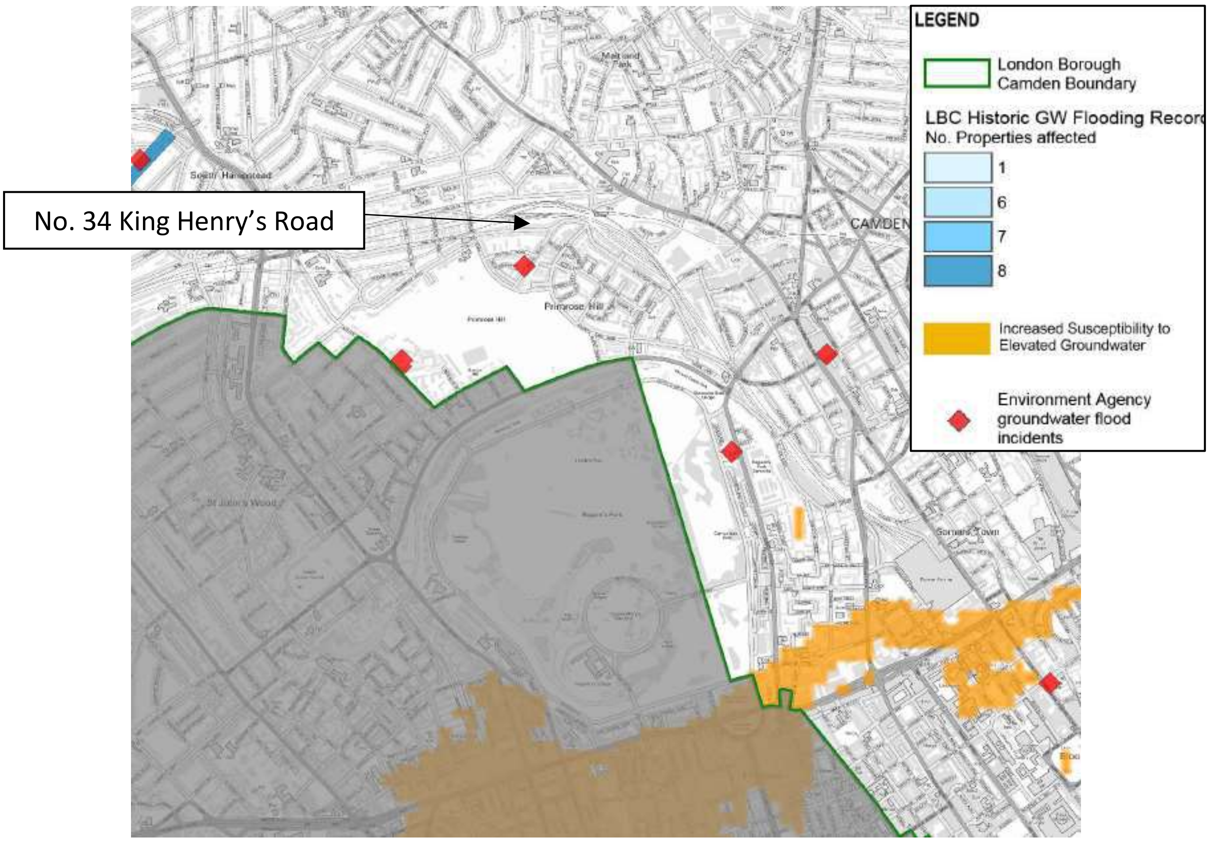

Figure 10. Extract from Figure 4e of the SFRA (URS, 2014)

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 October 2016 (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 a maximum 3.3 m bgl.
- The site is located on relatively flat ground at 39 mOD, with slopes in the surrounding area <4°. The rear garden at No. 34 King Henry's Road is indicated to be approximately 2.4 m lower than the street level at the front, and is at the floor level of the existing lower ground floor.
- There are no surface water bodies within 500 m of the site.
- 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 (2.0 m thick), stiff fissured brown silty clay of the London Clay Formation to the base of a borehole drilled to 8.10 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 borehole (BH1) to 8.10m bgl, however, during the two monitoring visits groundwater was recorded at depths of between 5.16m and 6.29m 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), where BH1 was drilled to 8.10 m bgl and a monitoring standpipe was installed to 8.00 m bgl. Two return monitoring visits have also been completed on 28th October and 10th November 2016, the groundwater was recorded at depths of 6.29 m and 5.16 m bgl respectively.

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 lowered lower ground floor level will be founded within the London Clay Formation. The monitoring performed in the on-site borehole (BH1) indicated groundwater level was approximately 1.9 m below the founding level of the proposed basement. 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 even if the groundwater level rises above the proposed founding level. 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 the lack of surface water features near the site 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 development will extend into the front and rear gardens, which may result in an increased area of hardstanding that will require mitigation. Potential mitigation options include implementing one of the following Sustainable Drainage Systems (SuDS), which must be designed formally to avoid any increase in the discharge of surface water to the mains drainage system. Any SuDS design should take account of groundwater conditions at the site. Potentially suitable SuDS systems include:

- Ensuring paved areas are permeable by using gravel, permeable paving etc.;
- Directing some roof water to a rain garden;
- Provision of other temporary intervention storage, such as rainwater harvesting.

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 relatively flat ground at 39 mOD, with slopes in the surrounding area <4°. The rear garden at No. 34 King Henry's Road is indicated to be approximately 2.4 m lower than the street level at the front, and is at the floor level of the existing lower ground floor. However the lower ground level along the rear gardens may be associated with historic cuttings for the railway line that runs adjacent to the rear garden. 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 Some ground movement is inevitable when basements are constructed. When underpinning methods are used the magnitude of the movements in the ground being supported by the new basement walls is dependent primarily on:

- the geology;
- the adequacy of temporary support to both the underpinning excavations and the partially complete underpins prior to installation of full permanent support; and
- the quality of workmanship when constructing the permanent structure.

4.4.5 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.

4.4.6 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.

4.4.7 Soil parameters, including the bearing capacity of the London Clay Formation, will be detailed in the Chelmer Geotechnical Interpretative Report, currently being prepared.

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 1079-D-102-A provided by Sketch London Architects, and is presented in Figure 11 below. The proposed basement is approximately 20.0 m long by 9.5 m wide with excavation generally extending to a depth of approximately 3.3 m below existing ground level (bgl). The basement is understood to be constructed by RC underpins, RC retaining walls and RC foundations, as detailed in Section 2.5.

5.1.3 The excavation depths for the basement have been modelled using Drawing 5682-SK-01-P1 provided by Packmanlucas Structural Designers to estimate the gross pressure reductions (unloading) across the development. Figure 12 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 underpins, 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).

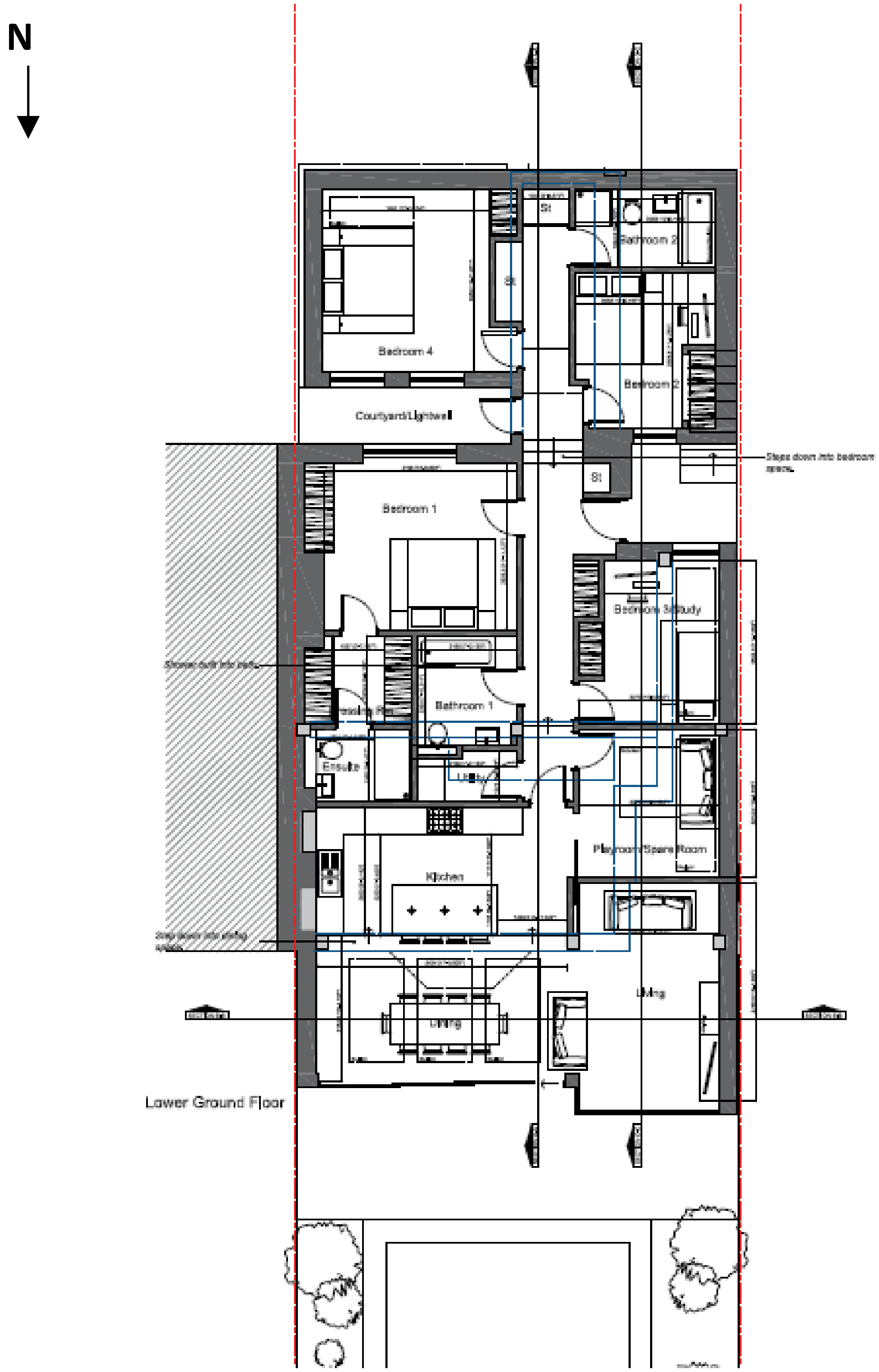

Figure 11. Layout of the proposed basement foundation plan (Drawing 1079-D-102-A)

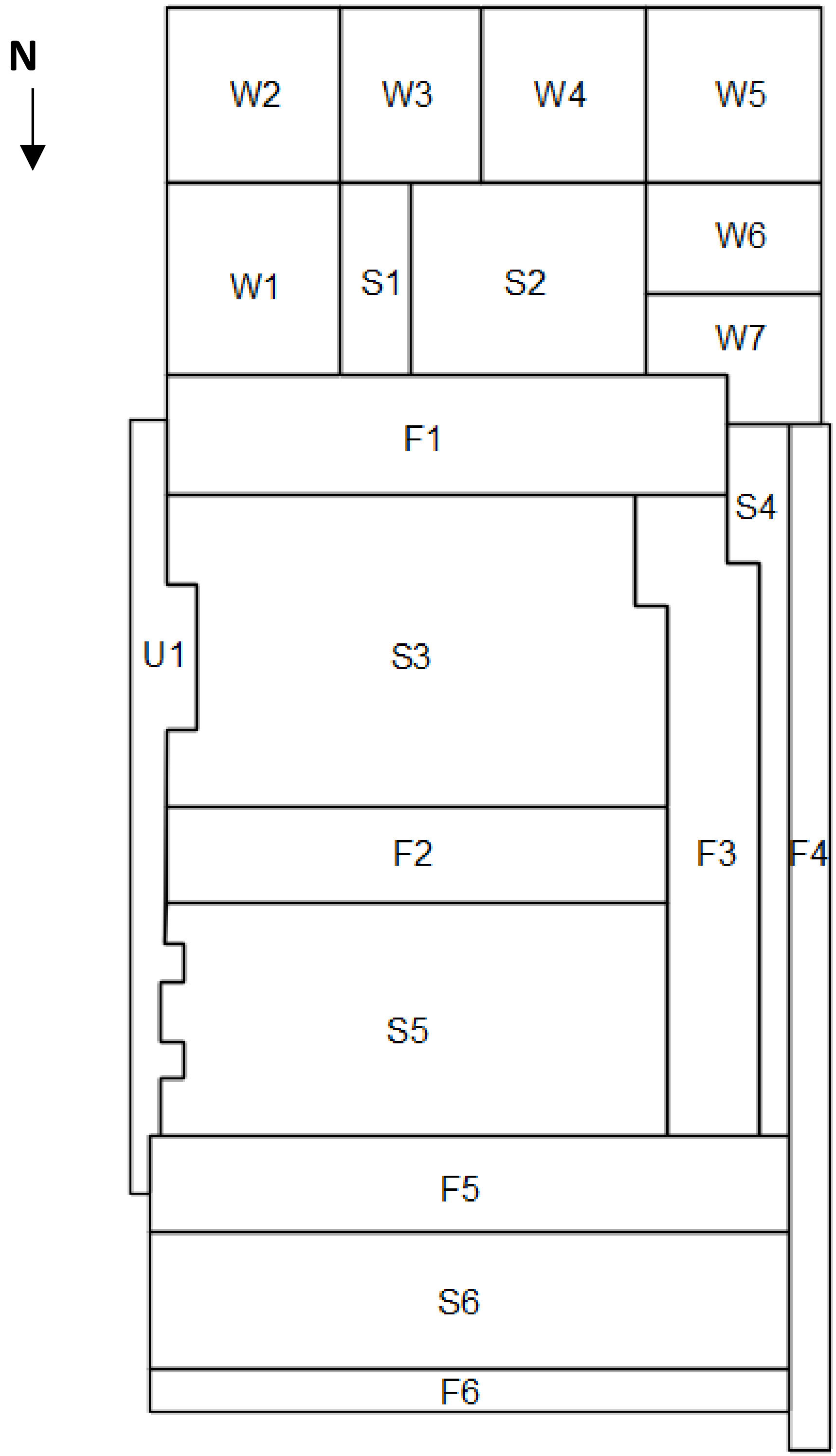

Figure 12. Detail of geometry introduced to PDISP
[U/W = Underpinning/retaining wall excavation and loads, F = Trench fill foundations, Slab = Bulk excavation and slab loads]

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 both the Chelmer (2016) 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 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	3.3	28.5	17.1
	10.0	55.0	33.0

Undrained Young's Modulus, $E_u = 500 * C_u$
Drained Young's Modulus, $E' = 0.6 * E_u$

Where no C_u data are available:
Undrained Shear Strength, C_u assumed as $C_u = 80 + 7.5z$ kPa
where z = depth below the highest founding level (m).

Global Poissons ratio of 0.5 have been adopted for the London Clay Formation over their modelled thicknesses

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 underpins and retaining 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 – Short-term (undrained) conditions
- Stage 4 – Construction of the basement slab – 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 13, 14, 15, and 16 respectively.

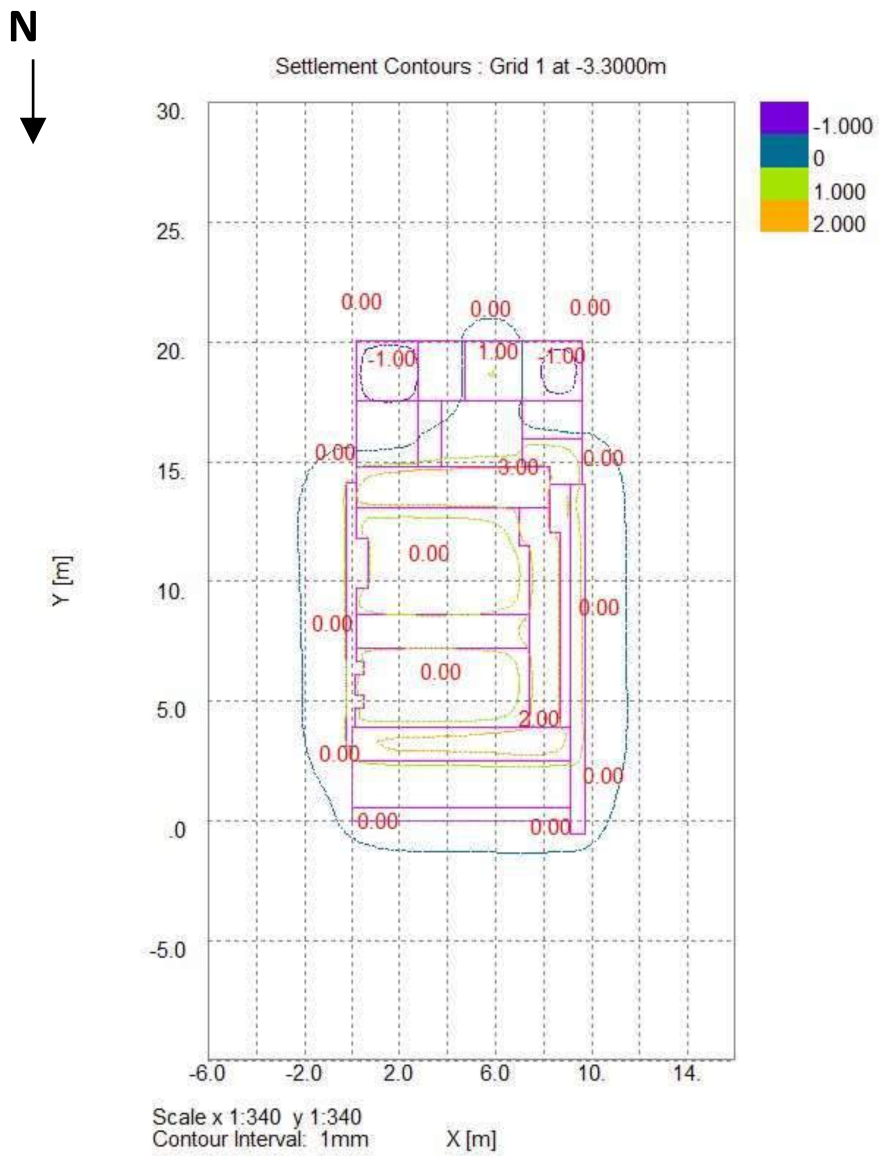

Figure 13. Stage 1 – Construction of underpins and retaining walls – Short-term (undrained) condition (1.0 mm settlement contours)

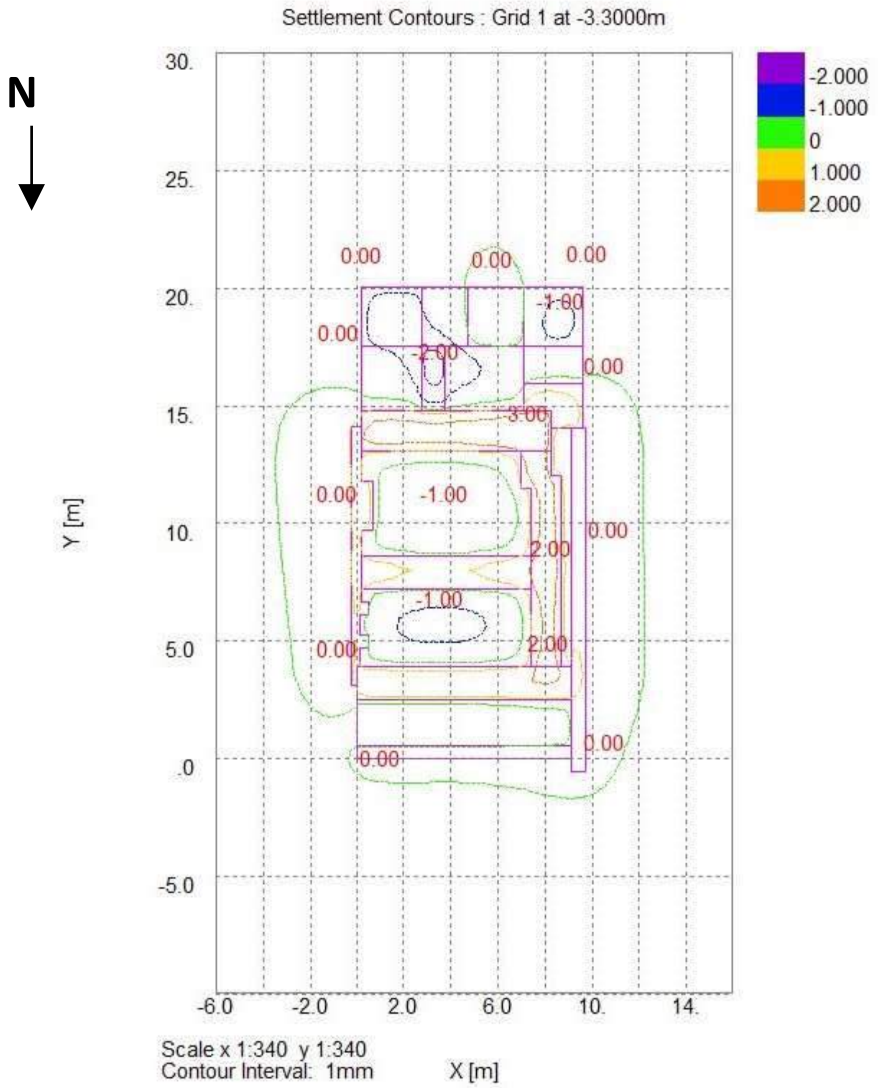

Figure 14. Stage 2 – Bulk excavation of central area to basement formation level and construction of internal columns – Short-term (undrained) conditions (1.0 mm settlement contours)

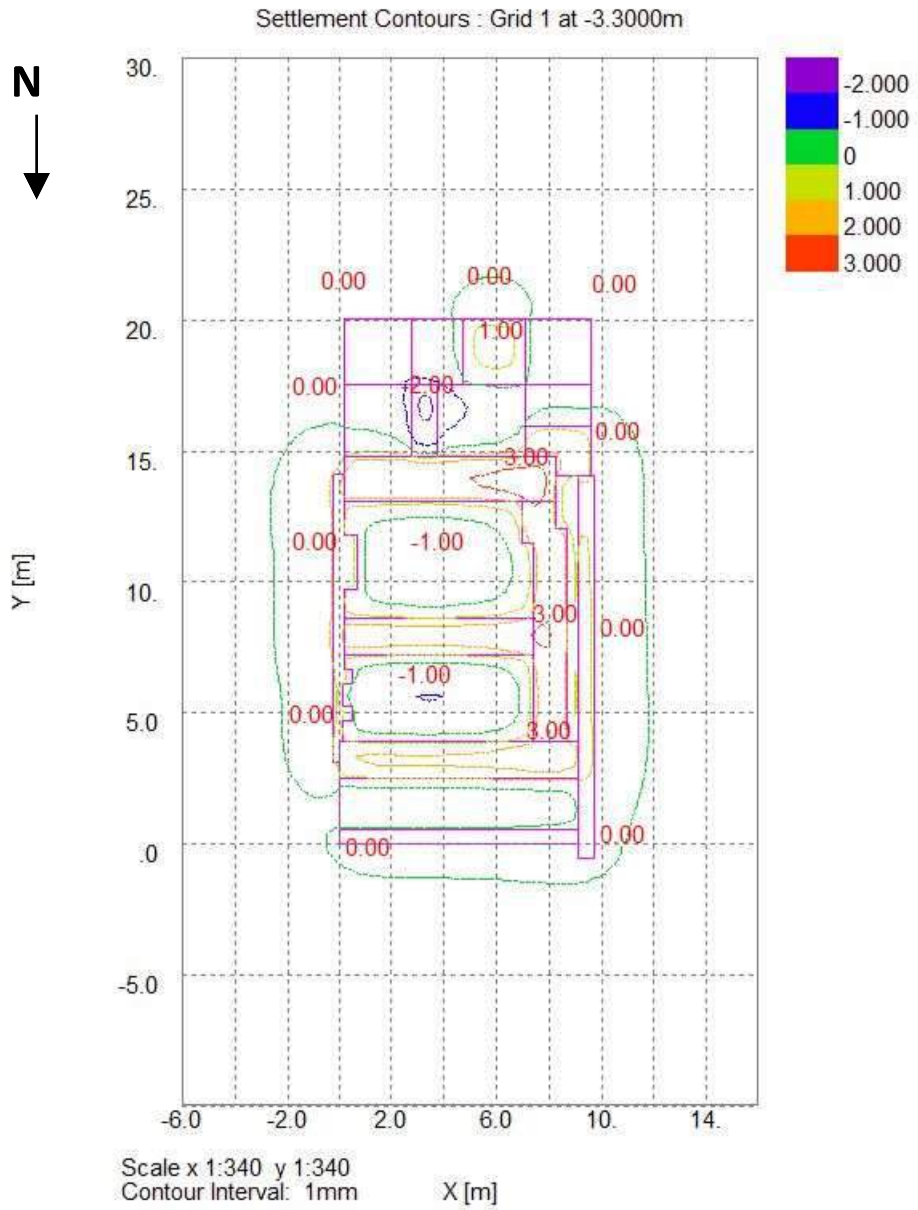

Figure 15. Stage 3 – Construction of the basement slab – Short term (undrained) conditions (1.0 mm settlement contours)

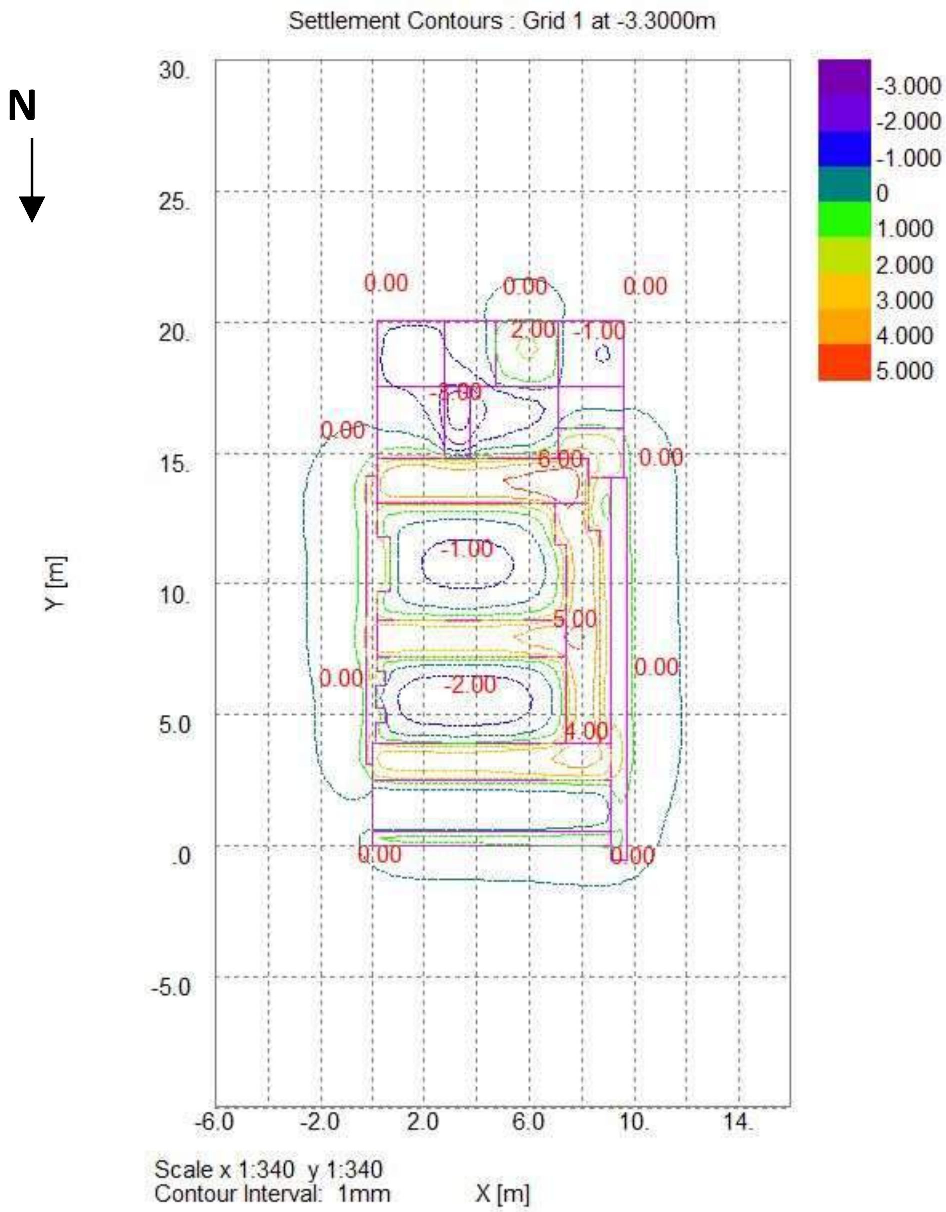

Figure 16. Stage 4 – Construction of the basement slab – Long term (drained) conditions (1.0 mm settlement contours)

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 wall is predicted to undergo movements ranging from 1.0 mm heave to 3.0 mm settlement. The basement slab is predicted to undergo slightly greater displacements, from 6.0 mm settlement to 3.0 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)***
Northern perimeter of basement	No movements	No movements	No movements	0.0 – 1.0 mm Settlement
Eastern perimeter of basement (Party wall with No 32)	0.0 – 1.0 mm Heave	0.0 – 1.0 mm Heave	0.0 – 1.0 mm Settlement	0.0 – 3.0 mm Settlement
Southern perimeter of basement	1.0mm Settlement to 1.0 mm Heave	1.0mm Settlement to 1.0 mm Heave	0.0 – 1.0 mm Settlement	2.0mm Settlement to 1.0 mm Heave
Western perimeter of basement	0.0 – 1.0 mm Heave	0.0 – 1.0 mm Heave	0.0 – 2.0 mm Settlement	0.0 – 2.0 mm Settlement
Basement Slab	- - -	3.0 mm Settlement to 2.0 mm Heave	3.0 mm Settlement to 2.0 mm Heave	6.0 mm Settlement to 3.0 mm 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.

6.0 DAMAGE CATEGORY ASSESSMENT

6.1 When underpinning it is inevitable that the ground will be un-supported or only partially supported for a short period during excavation of each pin, even when support is installed sequentially as the excavation progresses. This means that the behaviour of the ground will depend on the quality of workmanship and suitability of the methods used, so rigorous calculations of predicted ground movements are not practical. However, provided that the temporary support follows best practice, then extensive past experience has shown that the bulk movements of the ground alongside underpins for a single storey basement (of nominal depth 3.5m) should not exceed 5 mm horizontally. This figure should be adjusted pro-rata for shallower or deeper basements.

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 From a search of the Camden's Borough Council planning website a similar extension into the front garden at No. 32 was proposed. The proposed drawings identify the original lower ground floor and the proposed extension at No. 32 as being founded at a similar level as the existing No. 34, approximately 2.4 m bgl. No evidence has been found for a modern basement below No.36 and therefore it is assumed to have an identical lower ground floor level as No.34.

6.4 The uniform founding level for the proposed basement means that the potentially critical locations will be determined by the displacements predicted by the PDISP analyses and the geometries of the adjacent buildings. For these damage category assessments we are interested in the ground movements at the foundation level of the neighbouring buildings, so it is the depth of the proposed excavation below foundation level of the neighbouring properties that must be considered.

6.5 The worst case scenarios for potential damage will be the front wall of No's. 32 and 34 King Henry's Road. These walls are considered to have a higher potential for damage in comparison to other walls that make up the same structures due to the increased settlements predicted along them by PDISP, their geometries and proximities to the proposed excavation. The approximate distances and geometries are presented in Figure 17 below.

6.6 The lateral extent of ground movements caused by relaxation of the ground alongside the basement excavation depends in part on whether the excavated soils are granular (mainly sands and gravels) or cohesive (clay). The ground investigation indicated that the excavation will be in cohesive soils. Therefore, published data for ground movements associated with the construction of retaining walls in cohesive soils have been used for the damage category assessments.

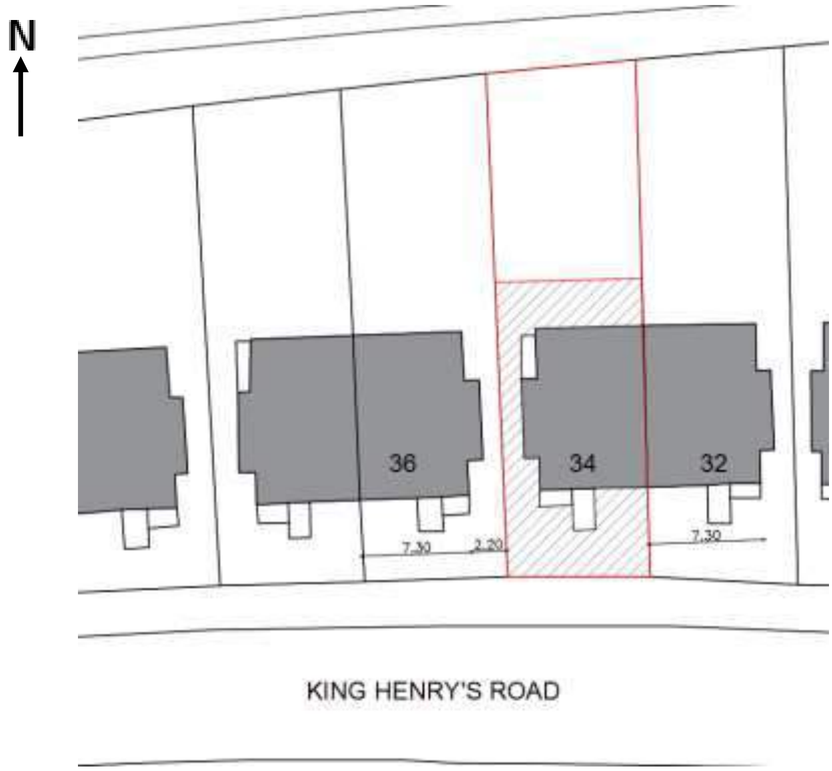

Figure 17. Approximate widths of affected walls of adjoining structures

6.7 The damage category assessments undertaken consider the following:

- ground movements arising from the vertical stress changes, as assessed by the PDISP analyses;
- ground movements alongside the proposed underpins and retaining walls caused by relaxation of the ground in response to the excavations.

Some ground movement is inevitable when basements are constructed. Ground movements associated with the construction of retaining walls in clay soils have been shown to extend to a distance up to 4 times the depth of the excavation, as detailed in Table 2.4 of CIRIA C580 (Gaba et al, 2003).

6.8 For worst case 'low support stiffness' walls (which is appropriate to the underpinning construction method) the estimated vertical ground movements resulting from the excavation in front of the proposed basement wall would be as defined in Table 2.4 of CIRIA C580. This predicts a settlement 0.35% of the maximum excavation depth. Therefore, for a 1.3 m excavation (the approximate excavation depth for each assessed case) the total settlements immediately alongside the proposed basement walls due to the excavation of the soil would be 4.6 mm.

Front wall of No. 32:

6.9 The relevant geometries are as follows:

Depth of foundations = 0.4 m (As assessed by TP2A)
Depth of excavation = 1.3 – 0.4 = 0.9 m
Width of zone of affected ground = 0.9 x 4 = 3.6 m

Width (L) of No. 32 = 7.30 m (scaled from drawings)
Height of No. 32 (H) = 12.6 m (estimated to eaves level) + 0.4 m (footing depth) = 13.0 m
Hence L/H = 0.6

6.10 The predicted 5 mm maximum horizontal displacement (see Section 6.1) decreases pro-rata to 1.3 mm when the depth of excavation is taken into account. Thus, the horizontal strain beneath the front walls would, theoretically, be in the order of $\varepsilon_h = 3.6 \times 10^{-4}$ (0.036%).

6.11 The maximum settlement produced by the PDISP analysis beneath the location where the front wall No. 32 is closest to the proposed basement was in Stage 4 where 3.0 mm settlement was predicted. This must be added to the settlement profile presented in Figure 2.11(b) of CIRIA Report C580 for a worst case (low stiffness ground support) scenario.

6.12 The total predicted settlement (due to excavation) of 4.6 mm (see Section 6.8) is reduced to 3.2 mm when the assumed depth to No. 32's foundations are taken into account. The total combined settlement of 6.2 mm, 3.2 mm predicted by the CIRIA methods plus the maximum 3.0 mm predicted by PDISP, is detailed as the point immediately alongside the proposed basement (0 m) in Figure 18 below. Figure 18 presents the settlement curve from the basement wall to the maximum distance of affected ground, 3.6 m (see Section 6.9).

6.13 The deflection at No. 32 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 2.12 of CIRIA C580). The settlement is convex and gives a maximum vertical deflection, Δ = 2.0 mm as displayed in Figure 18 below, which represents a deflection ratio $\Delta/L = 5.56 \times 10^{-4}$ (0.056%).

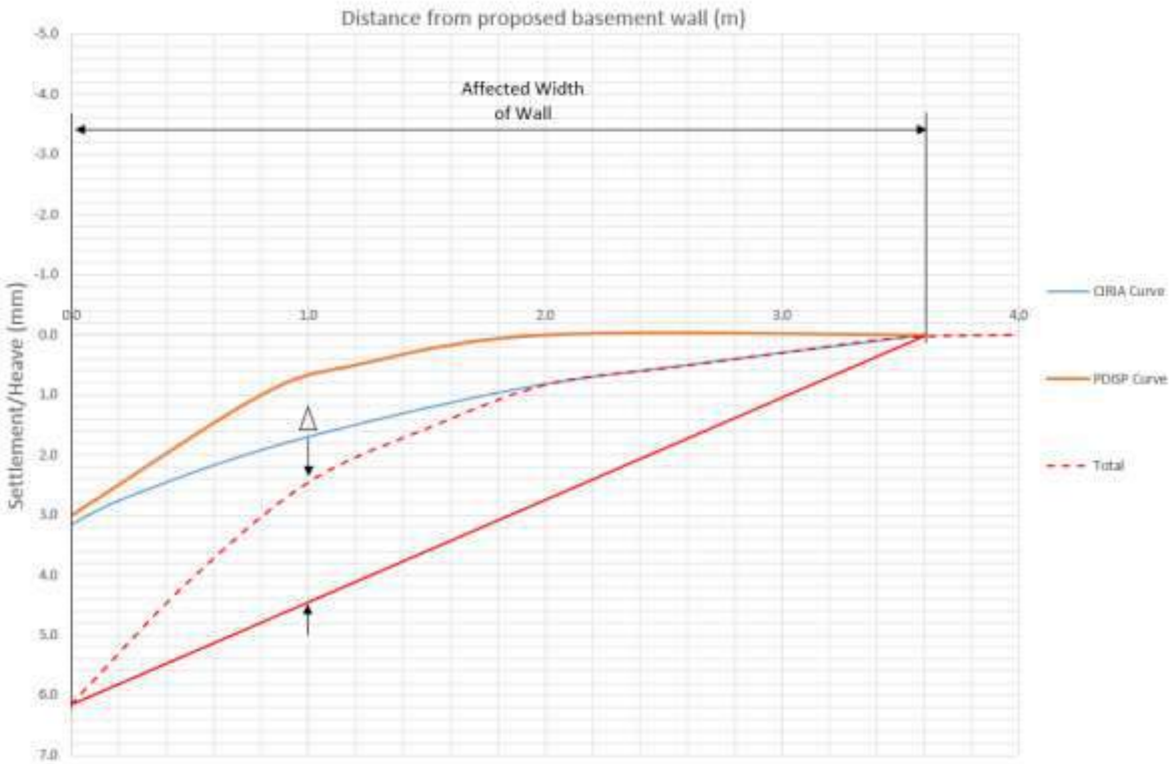

Figure 18. Combined displacements for No. 32 front wall due to excavation of proposed basement

6.14 Using the damage category ratings and graphs given in CIRIA SP200, for L/H = 0.5 (The closest to the L/H of 0.6 defined in Section 6.9), these deformations plot on the boundary between damage categories 'Slight' (Burland Category 2) and 'Very Slight' (Burland Category 1) as illustrated in Figure 19 below.

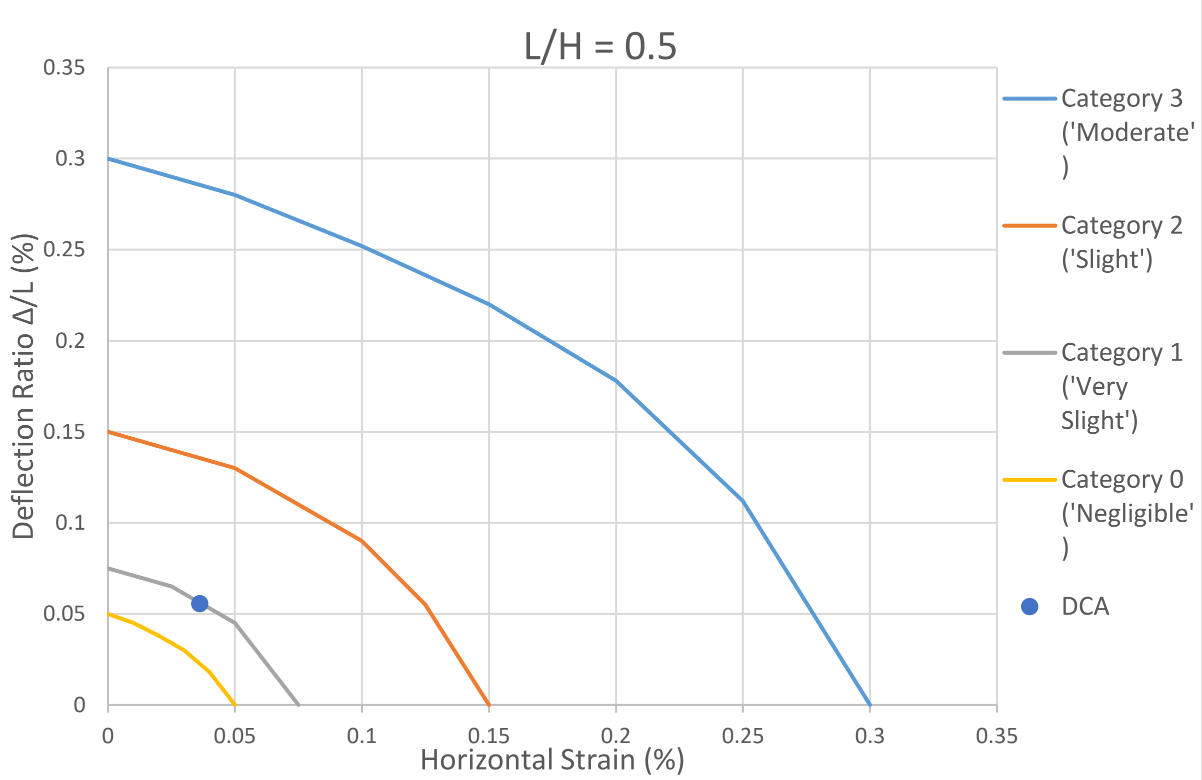

Figure 19: Damage category assessment for No. 32 front wall

<u>Front wall of No. 36:</u>

6.15 The relevant geometries are as follows:

Depth of foundations = 0.4 m (Assumed the same as assessed by TP2A)
Depth of excavation = 1.3 – 0.4 = 0.9 m
Width of zone of affected ground = 0.9 x 4 = 3.6 m
Distance from basement = 2.2 m

Width (L) of No. 36 = 7.30 m (scaled from drawings)
Height of No. 36 (H) = 12.6 m (estimated to eaves level) + 0.4 m (footing depth) = 13.0 m
Hence L/H = 0.6

6.16 The predicted 5 mm maximum horizontal displacement (see Section 6.1) decreases pro-rata to 1.3 mm when the depth of excavation is taken into account. Thus, the horizontal strain beneath the front walls would, theoretically, be in the order of $\varepsilon_h = 3.6 \times 10^{-4}$ (0.036%).

6.17 The maximum settlement produced by the PDISP analysis beneath the location where the front wall No. 36 is closest to the proposed basement was in Stage 4 where 2.0 mm settlement was predicted. This must be added to the settlement profile presented in Figure 2.11(b) of CIRIA Report C580 for a worst case (low stiffness ground support) scenario.

6.18 The total predicted settlement (due to excavation) of 4.5 mm (see Section 6.8) is reduced to 3.2 mm when the assumed depth to No. 36's foundations are taken into account. The total combined settlement of 5.2 mm, 3.2 mm predicted by the CIRIA methods plus the maximum 2.0 mm predicted by PDISP, is detailed as the point immediately alongside the proposed basement (0 m) in Figure 20 below. Figure 20 presents the settlement curve from the basement wall to the maximum distance of affected ground, 3.6 m (see Section 6.15).

6.19 The deflection at No. 36 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 2.12 of CIRIA C580). The settlement is convex and gives a maximum vertical deflection, Δ = 0.0 mm as displayed in Figure 20 below, which represents a deflection ratio Δ/L = 0.00 (0.00%).

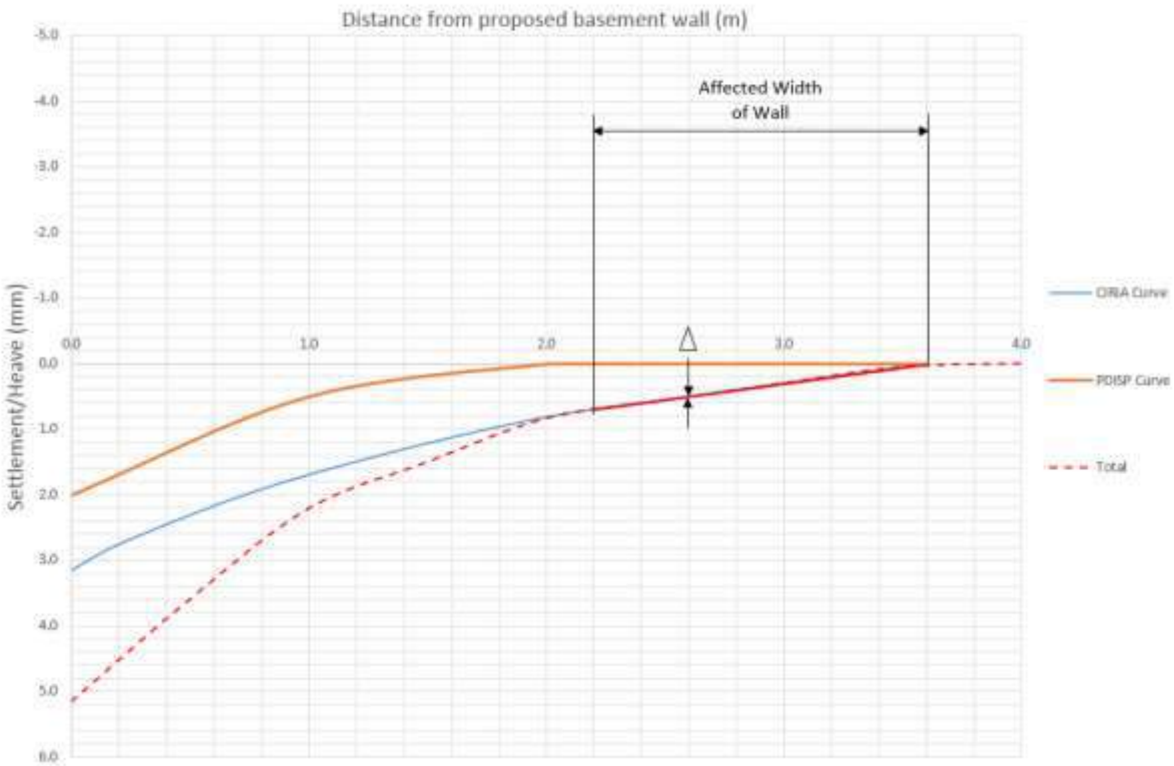

Figure 20. Combined displacements for No. 36 front wall due to excavation of proposed basement

6.20 Using the damage category ratings and graphs given in CIRIA SP200, for L/H = 0.5 (The closest to the L/H of 0.6 defined in Section 6.15), these deformations represent a damage category of 'Negligible' (Burland Category 0), as illustrated in Figure 21 below.

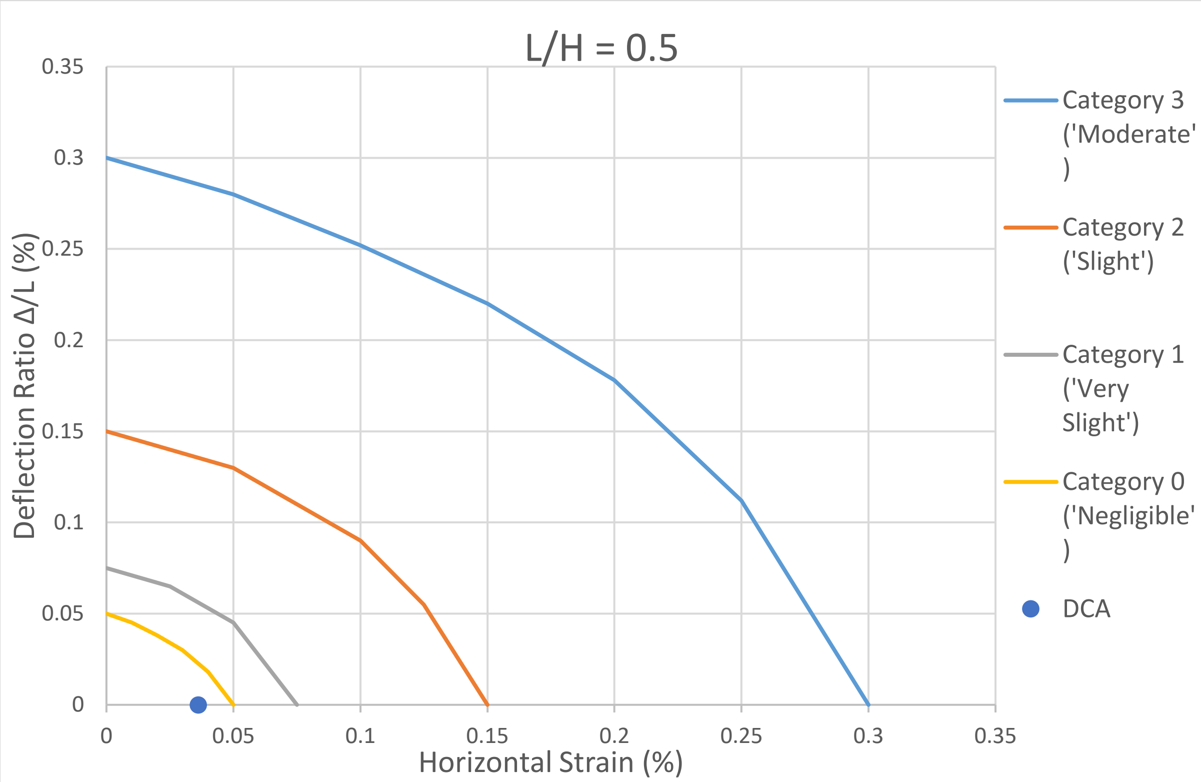

Figure 21: Damage category assessment for No. 36 front wall

6.21 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.

6.22 Due to the geometry and distance from the proposed basement excavations the proposed basement is assumed to have lower potential to cause damage to other neighbouring structures. Therefore, other structures have not been assessed in detail, and the damage category assessment to all other surrounding developments is assumed to be Category 0 'Negligible' or Category 1 'Very Slight'.

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 the lack of surface water features near the site can lead to the conclusion that conventional measures of managing surface water run-off (including Sustainable Drainage Systems (SuDS), if appropriate) 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. monitoring performed in the on-site borehole (BH1) indicated groundwater level was approximately 1.9 m below the founding level of the proposed basement. 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 even if the groundwater level rises above the proposed founding level. Therefore, there would be no significant impact on neighbouring properties.

7.4 The standpipe installed in BH1 on site should be maintained so that further monitoring readings can be taken during the detailed design and prior to the start of construction.

7.5 The site is located on relatively flat ground at 39 mOD, with slopes in the surrounding area <4°. The rear garden at No. 34 King Henry's Road is indicated to be approximately 2.4 m lower than the street level at the front, and is at the floor level of the existing lower ground floor. However the lower ground level along the rear gardens may be associated with historic cuttings for the railway line that runs adjacent to the rear garden. 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 13 – 16.

7.7 A Damage Category Assessment (DCA) was undertaken for the worst case scenario in the adjoining properties, 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 case, the front wall of No. 32 plotted on the boundary between Burland Category 2 'Slight' and Burland Category 1 'Very Slight' (as given in CIRIA SP200, Table 3.1) and the front wall of No 36 fell within Burland Category 0 'Negligible'. The damage category results have been plotted graphically in Figure 19 and 21 above.

7.9 No further damage category assessments have been carried out as No's. 32 and 36 King Henry's Road are considered the worst cases scenario and therefore all other structures will be classified as Category 0 'Negligible' or Category 1 'Very Slight'.

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

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APPENDIX A

SCREENING ASSESSMENT

Subterranean (groundwater) flow screening chart	
1. a) Is the site located directly above an aquifer?	No. The site is located above the 'Unproductive' aquifer of the London Clay Formation.
b) Will the proposed basement extend beneath the water table surface?	No. The monitoring performed in the on-site borehole (BH1) recorded groundwater approximately 1.9m below founding level. However monitoring should be undertaken up to construction. Due to the anticipated very low permeability of the London Clay Formation and low topographical relief the proposed basement is not anticipated to have any impact (see Section 4.2).
2. Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No. No surface water features were identified within 500m of the site.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No. The site is approximately 1.6 km south of Hampstead Heath.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes. The proposed development will extend into both front and rear gardens. Due to the very low risk of surface water flooding conventional measures of managing surface water run-off should be sufficient.
5. 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.
6. 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?	No. As detailed in Question 2 above, there are no surface water features within 500 m of the site.

Slope stability screening chart	
1. Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approx. 1 in 8)	The rear garden at No. 34 King Henry's Road is indicated to be approximately 2.4 m lower than the street level at the front, which may be associated with historic cuttings for the railway line that runs adjacent to the rear garden. Therefore slope stability will be highly unlikely to cause any problems with the proposed basement.
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 is 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 site is located on relatively flat ground at 39 mOD, with slopes in the surrounding area <4°.
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approx. 1 in 8)	No. As above.
5. Is the London Clay the shallowest strata at the site?	Yes. The London Clay Formation is encountered immediately beneath the Made Ground.
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?	A tree is present along the boundary with No. 32 King Henry's Road (on No.32's property). The status of this tree is unknown, however, any tree protection guidance should be followed.
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?	No. No surface water features were identified within 500m of the site.
9. Is the site within an area of previously worked ground?	Made Ground was recorded to a maximum depth of 2.0m bgl. The Groundsure report indicates potentially infilled features 11 m to the north of the site, associated with the railway tunnel, however no previously worked ground 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 the 'Unproductive' aquifer of the London Clay Formation.
11. Is the site within 50 m of the Hampstead Heath Ponds	No. The site is approximately 1.6 km south of Hampstead Heath.
12. Is the site within 5 m of a highway or pedestrian right of way?	Yes. The site fronts directly onto King Henry's Road. Ensure adequate temporary and permanent support and use of best practice underpinning.

13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No. The proposed extensions to lower ground floor level will be at a similar or the same level as the current lower ground floor. A Damage Category Assessment has been carried out to assess the potential damage to neighbouring properties (see Section 6.0).
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No. From the Groundsure report the nearest tunnel is 13 m to the north of the site.

Surface flow and flooding screening chart	
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No. The site is approximately 1.6 km south of Hampstead Heath.
2. 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?	Yes. The proposed development will extend into both front and rear gardens, increasing the amount of hardstanding. Mitigation measures have been proposed (see Section 4.3).
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes. As above.
4. 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?	Yes. The decrease in permeable area will increase surface inflows, however the existing ground is expected to have low permeability.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	Yes. As above.
6. 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	No. Surface water flood risk is very low and the groundwater monitoring indicates the basement will be above the static water level.

water level of nearby surface water feature?	

APPENDIX B

NOTES

These drawings are for planning purposes only and not for construction.

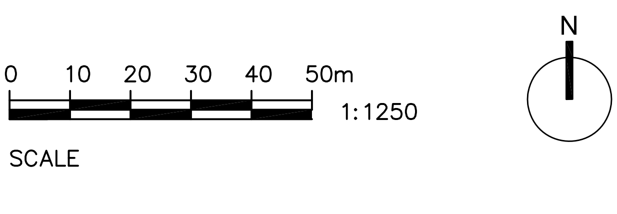
Drawing Title:	LOCATION PLAN
Scale	1:1250 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	000	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



NOTES

These drawings are for planning purposes only and not for construction.

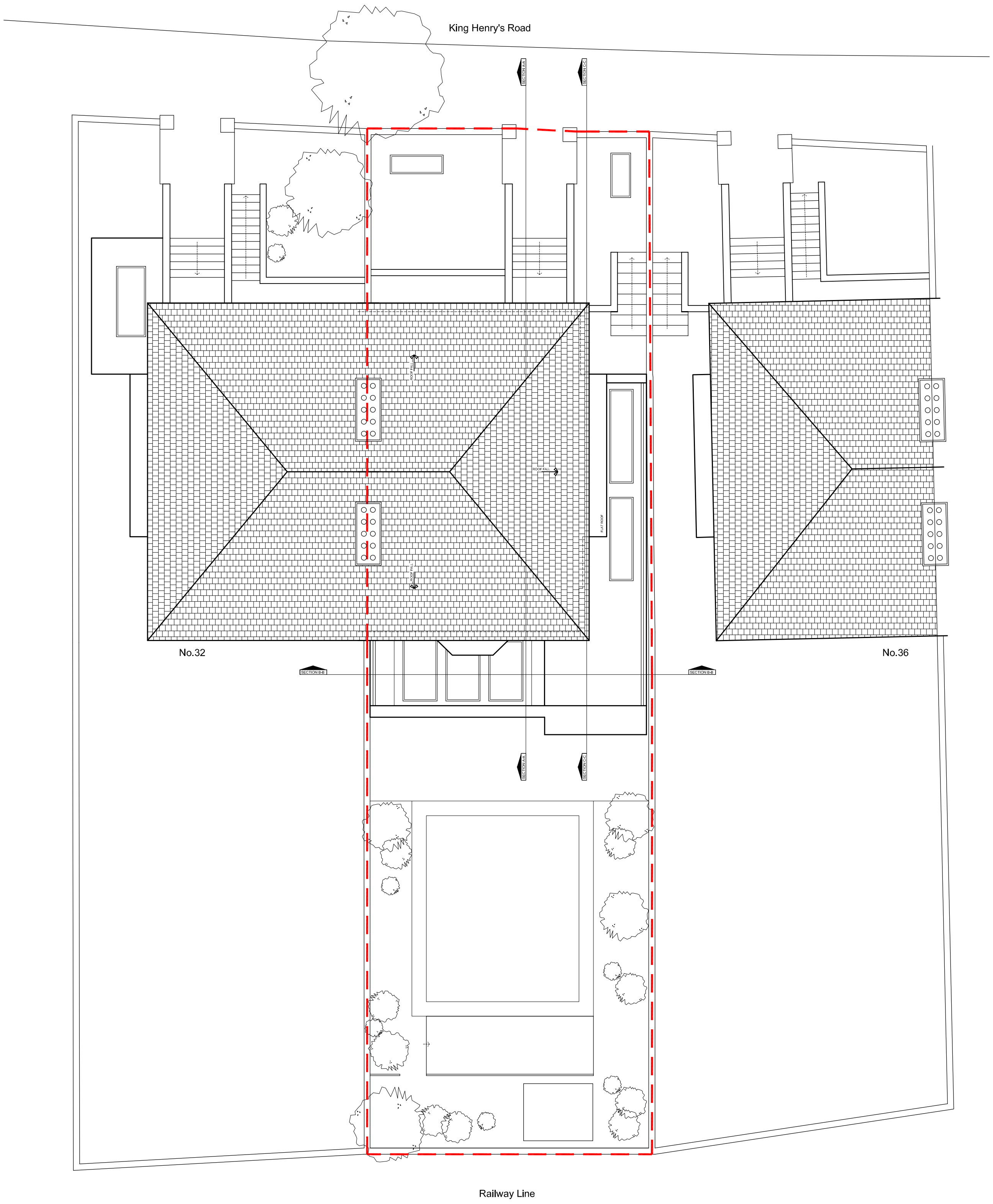
Drawing Title:	SITE PLAN
Scale	1:200 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

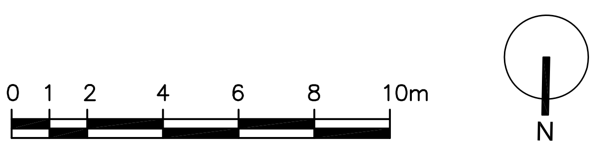
Job No:	Type:	Dwg No:	Revision:
1079	D	001	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017





NOTES

These drawings are for planning purposes only and not for construction.

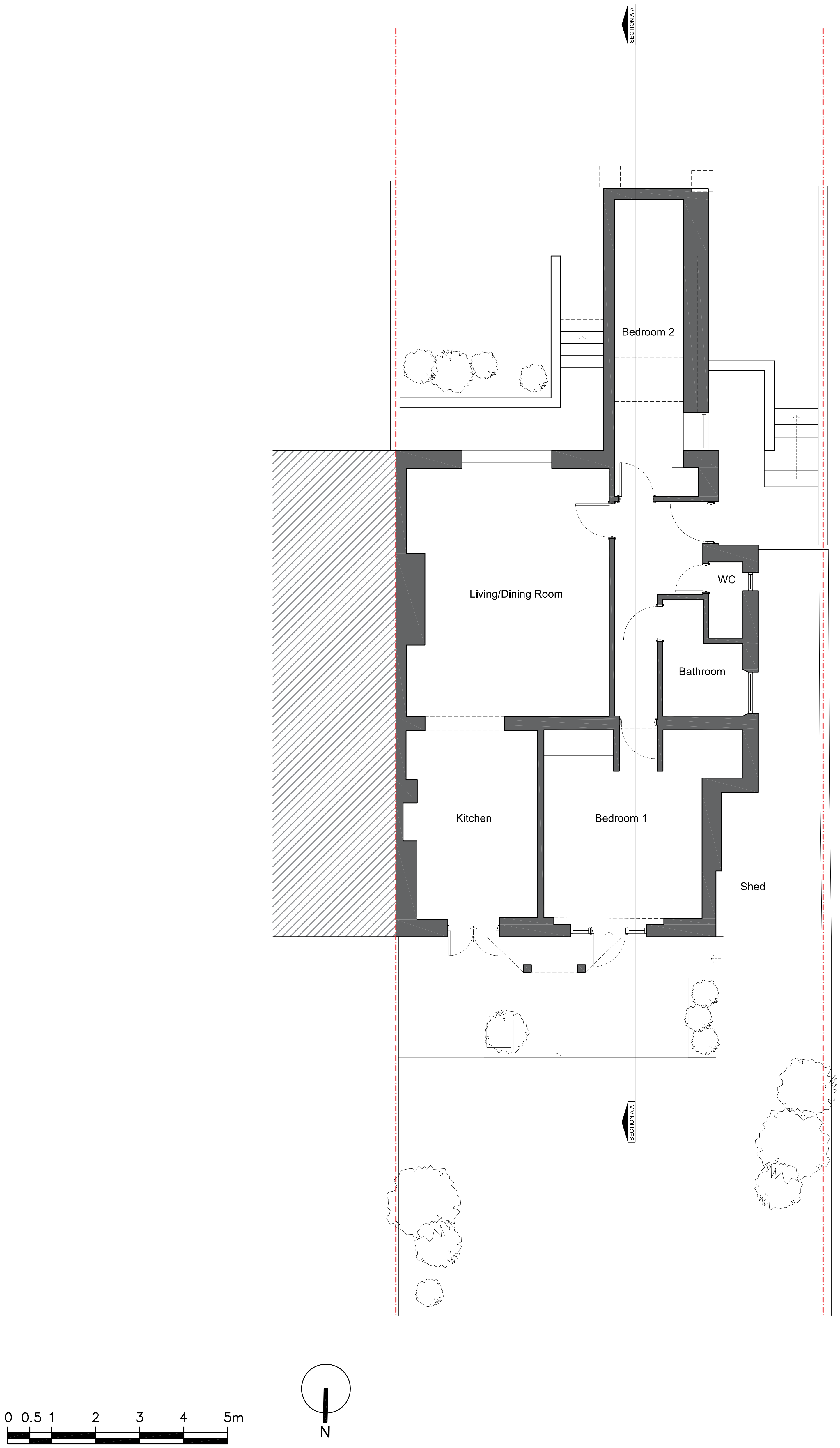
Drawing Title:	EXISTING LOWER GROUND FLOOR
Scale	1:100 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	100	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



NOTES

These drawings are for planning purposes only and not for construction.

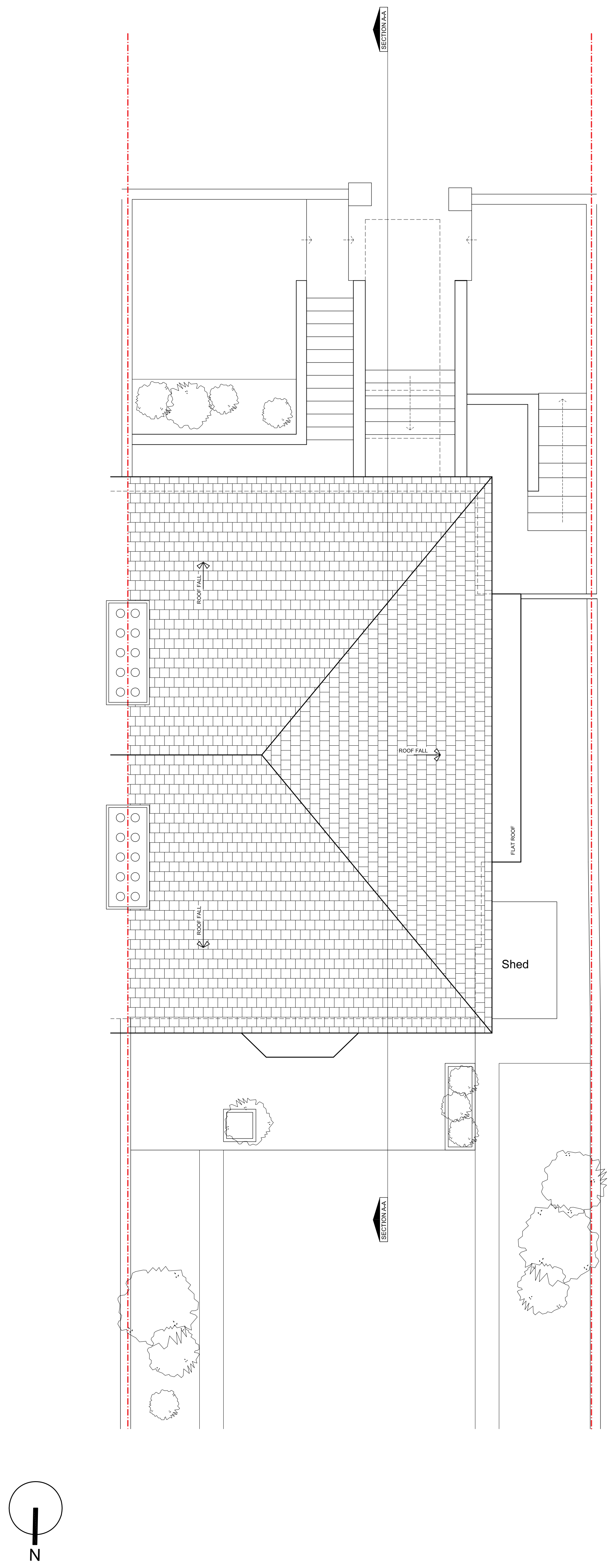
Drawing Title:	EXISTING ROOF PLAN
Scale	1:100 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	101	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



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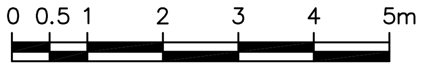


Drawing Title:	
EXISTING SECTION AA	
Scale: 1:100 @ A3	Date: FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING

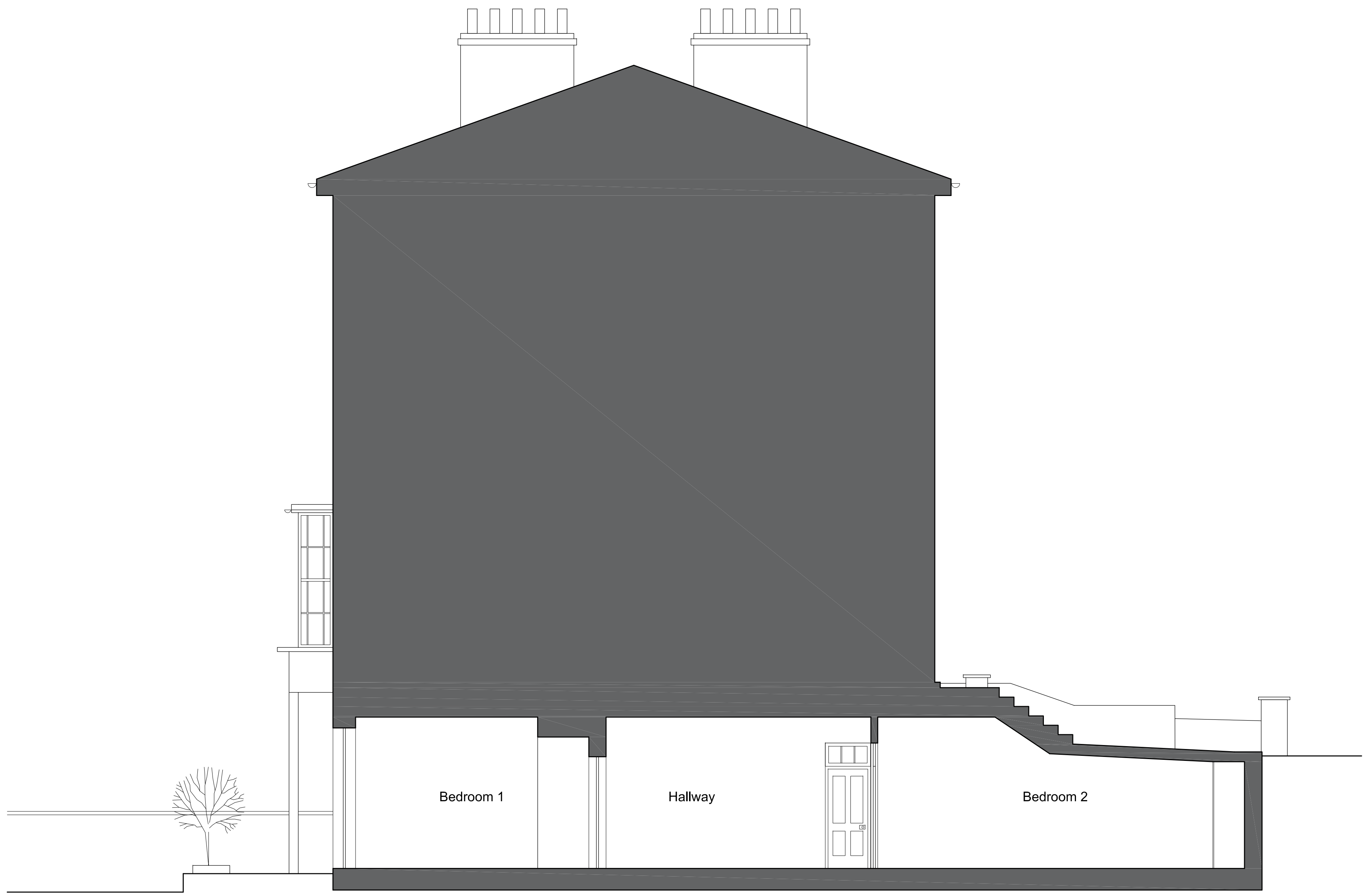
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	200	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Existing Section AA

NOTES

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0 0.5 1 2 3 4 5m

Drawing Title:	EXISTING FRONT ELEVATION
Scale	1:100 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	300	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017

Existing Front Elevation

NOTES
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Existing Rear Elevation

Drawing Title:	EXISTING REAR ELEVATION
Scale	1:100 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	301	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
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NOTES
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0 0.5 1 2 3 4 5m

Drawing Title: EXISTING SIDE ELEVATION			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

Client Ref:

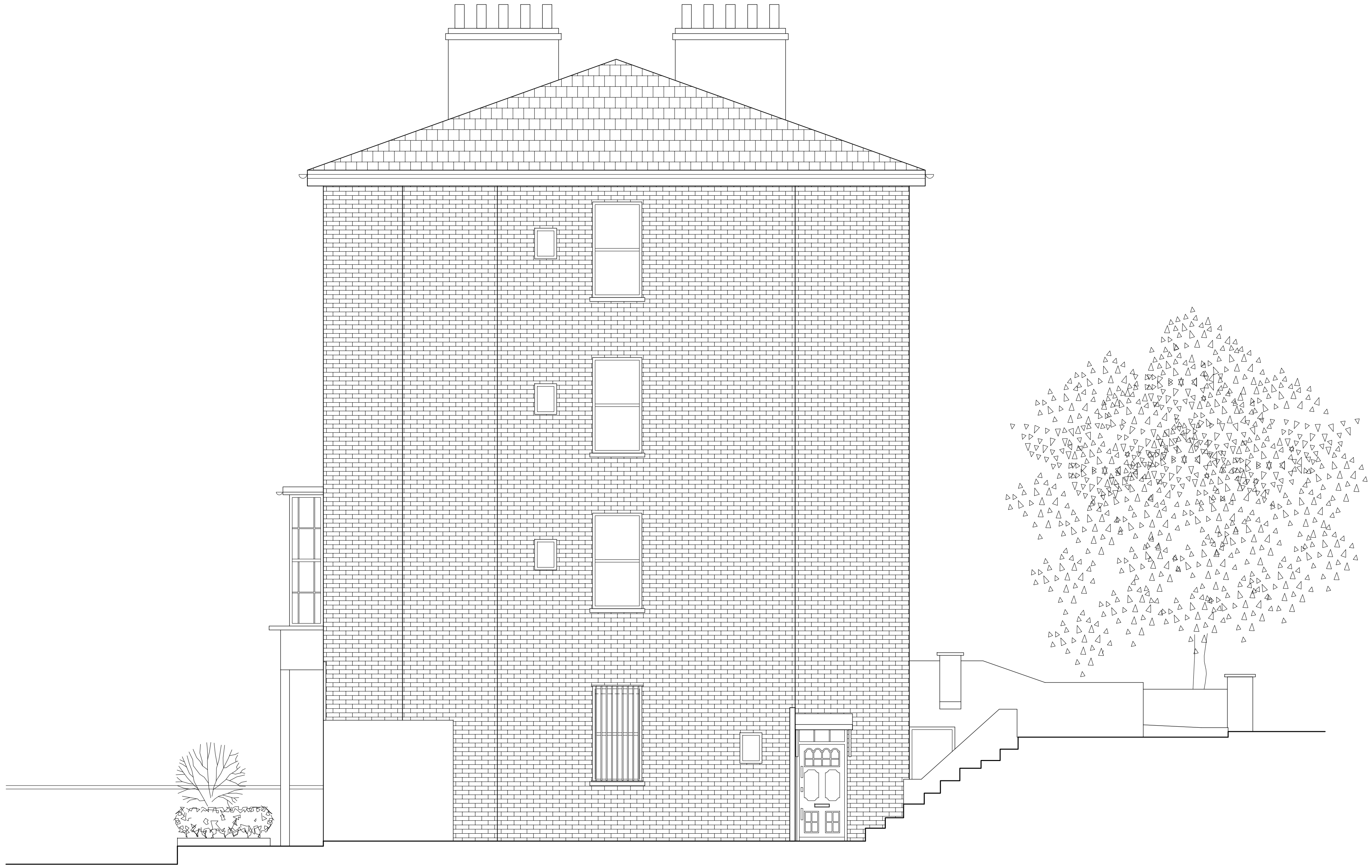
Project: 34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	302	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Existing Side Elevation

NOTES

These drawings are for planning purposes only and not for construction.

Drawing Title:			
PROPOSED LOWER GROUND FLOOR			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

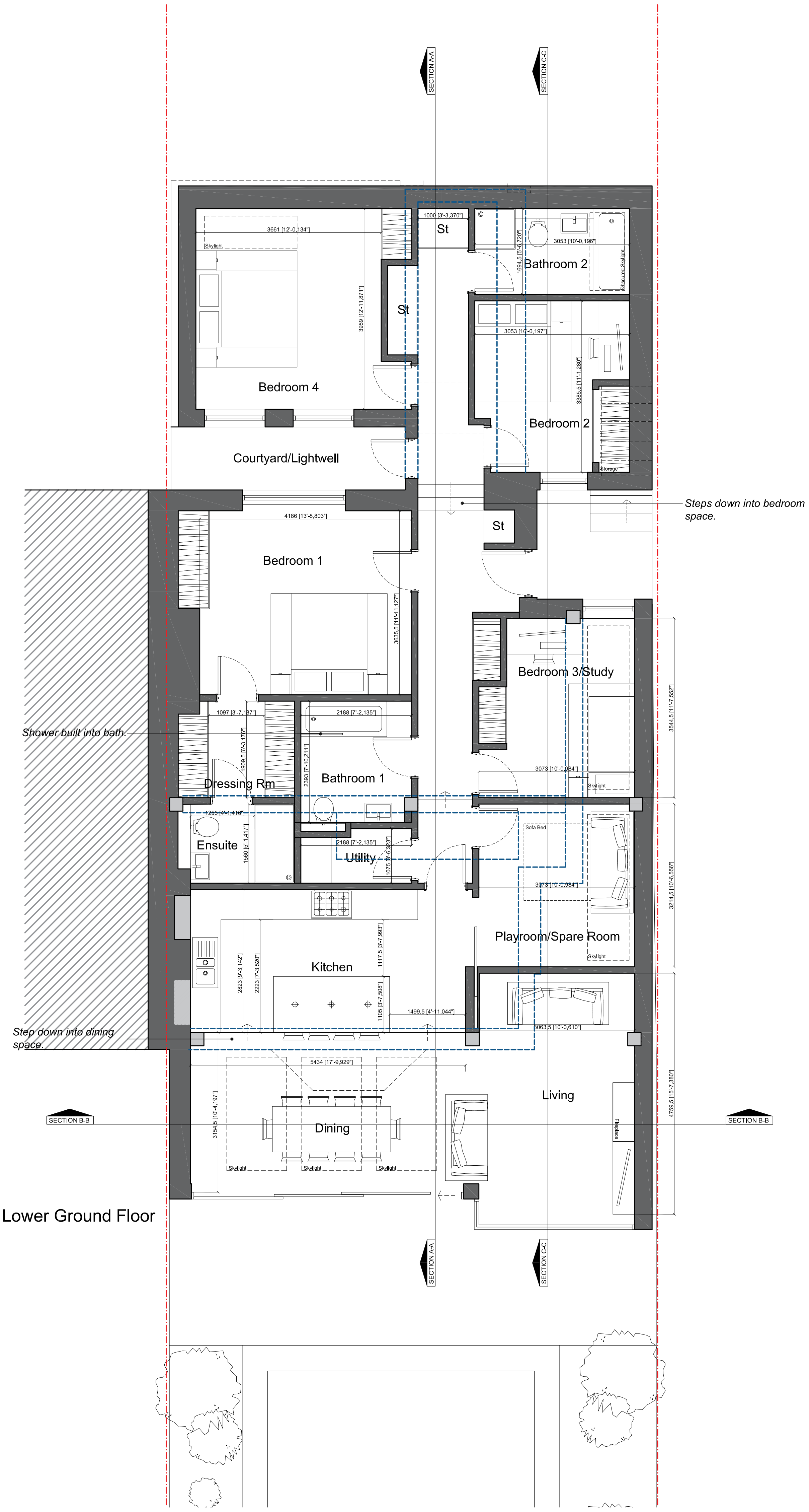
Client Ref:

Project: 34A KING HENRYS ROAD

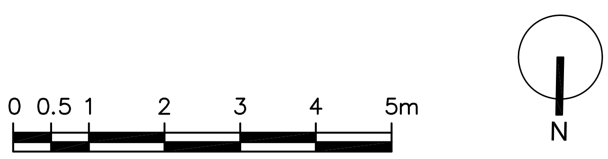
Job No:	Type:	Dwg No:	Revision:
1079	D	102	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue: Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Lower Ground Floor



NOTES

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Drawing Title: PROPOSED ROOF PLAN			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

Client Ref:

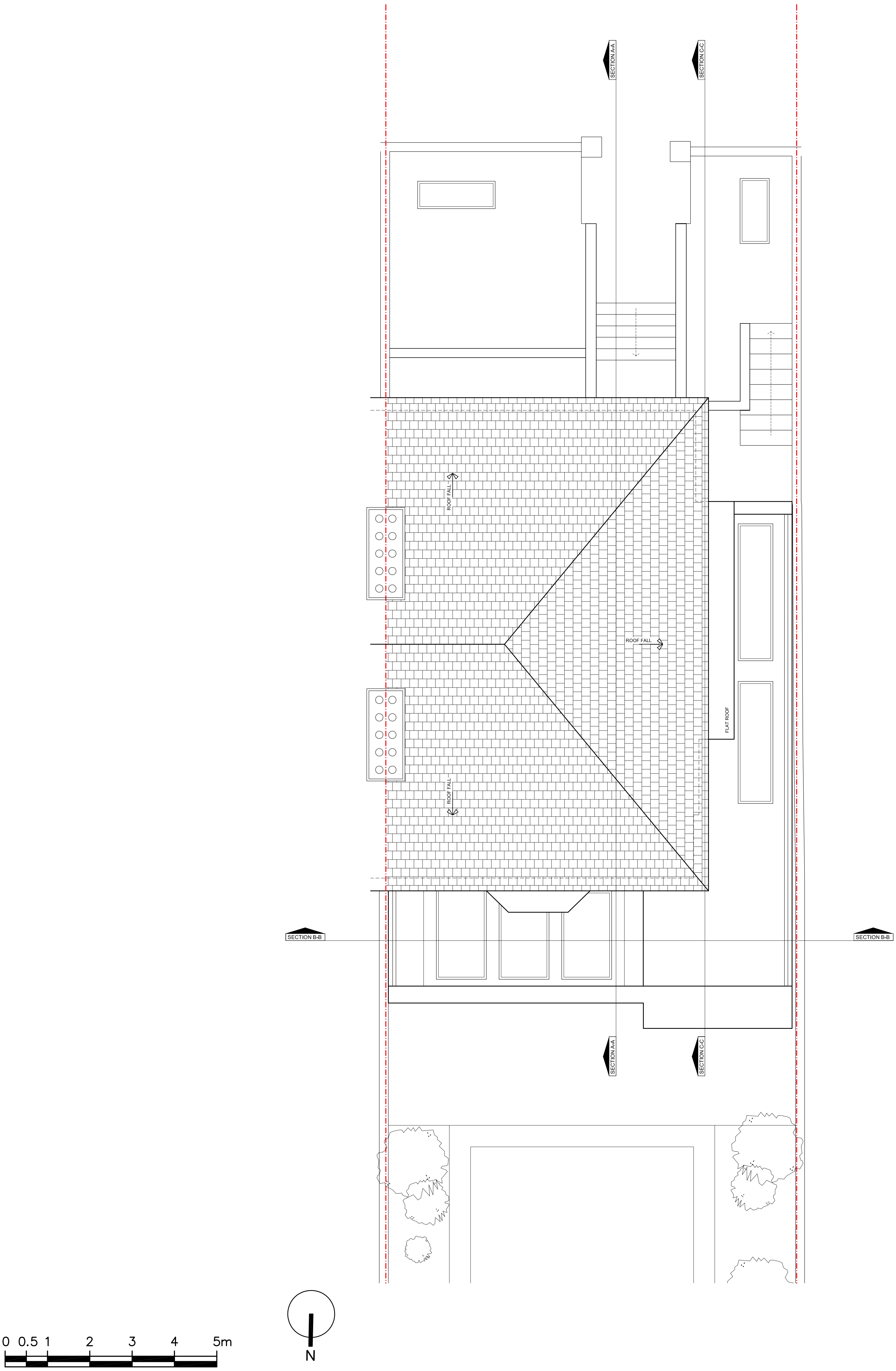
Project: 34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	103	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



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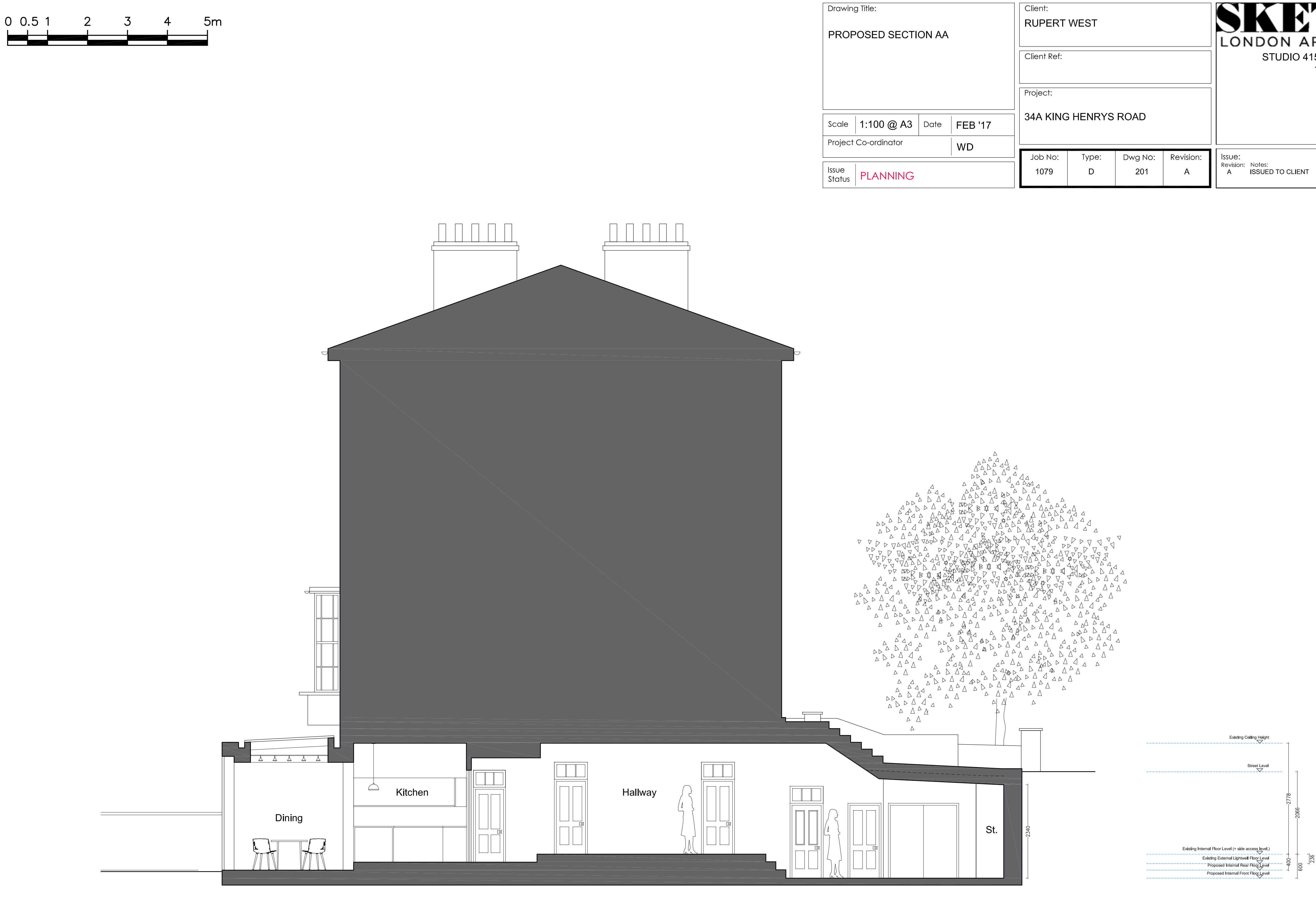
Drawing Title: PROPOSED SECTION AA			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST			
Client Ref:			
Project: 34A KING HENRYS ROAD			
Job No:	Type:	Dwg No:	Revision:
1079	D	201	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Proposed Section AA

NOTES
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Proposed Section BB

Drawing Title: PROPOSED SECTION BB			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

Client Ref:

Project: 34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	202	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017

NOTES

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0 0.5 1 2 3 4 5m

Drawing Title: PROPOSED SECTION CC			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

Client Ref:

Project: 34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	203	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017

Proposed Section CC

NOTES
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0 0.5 1 2 3 4 5m

Drawing Title:
PROPOSED FRONT ELEVATION

Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client:
RUPERT WEST

Client Ref:

Project:
34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	303	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017

Proposed Front Elevation

NOTES

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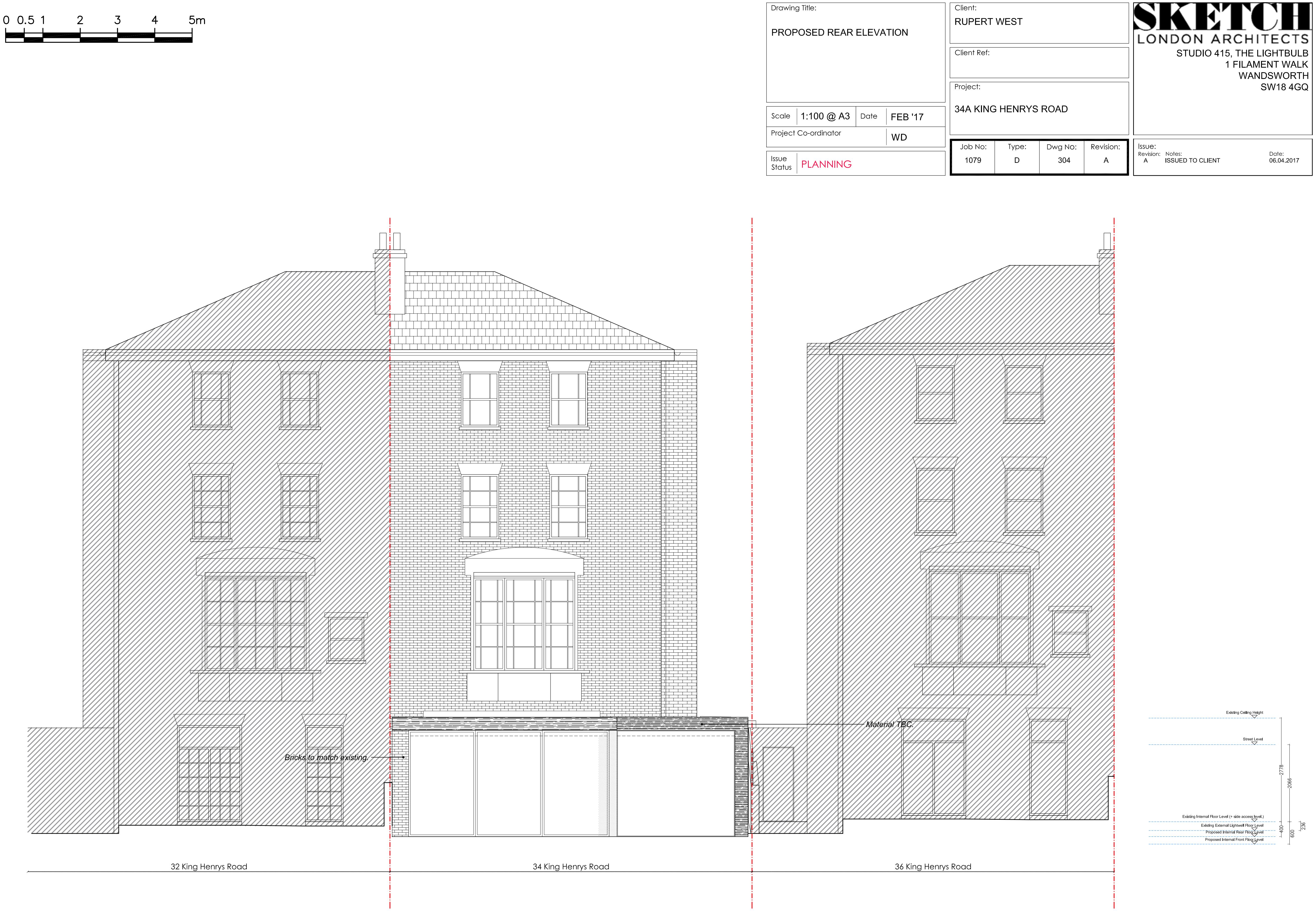
Drawing Title:	PROPOSED REAR ELEVATION
Scale	1:100 @ A3
Date	FEB '17
Project Co-ordinator	WD
Issue Status	PLANNING
Client:	RUPERT WEST
Client Ref:	
Project:	34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	304	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Proposed Rear Elevation

NOTES

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0 0.5 1 2 3 4 5m

Drawing Title: PROPOSED SIDE ELEVATION			
Scale	1:100 @ A3	Date	FEB '17
Project Co-ordinator			WD
Issue Status	PLANNING		

Client: RUPERT WEST

Client Ref:

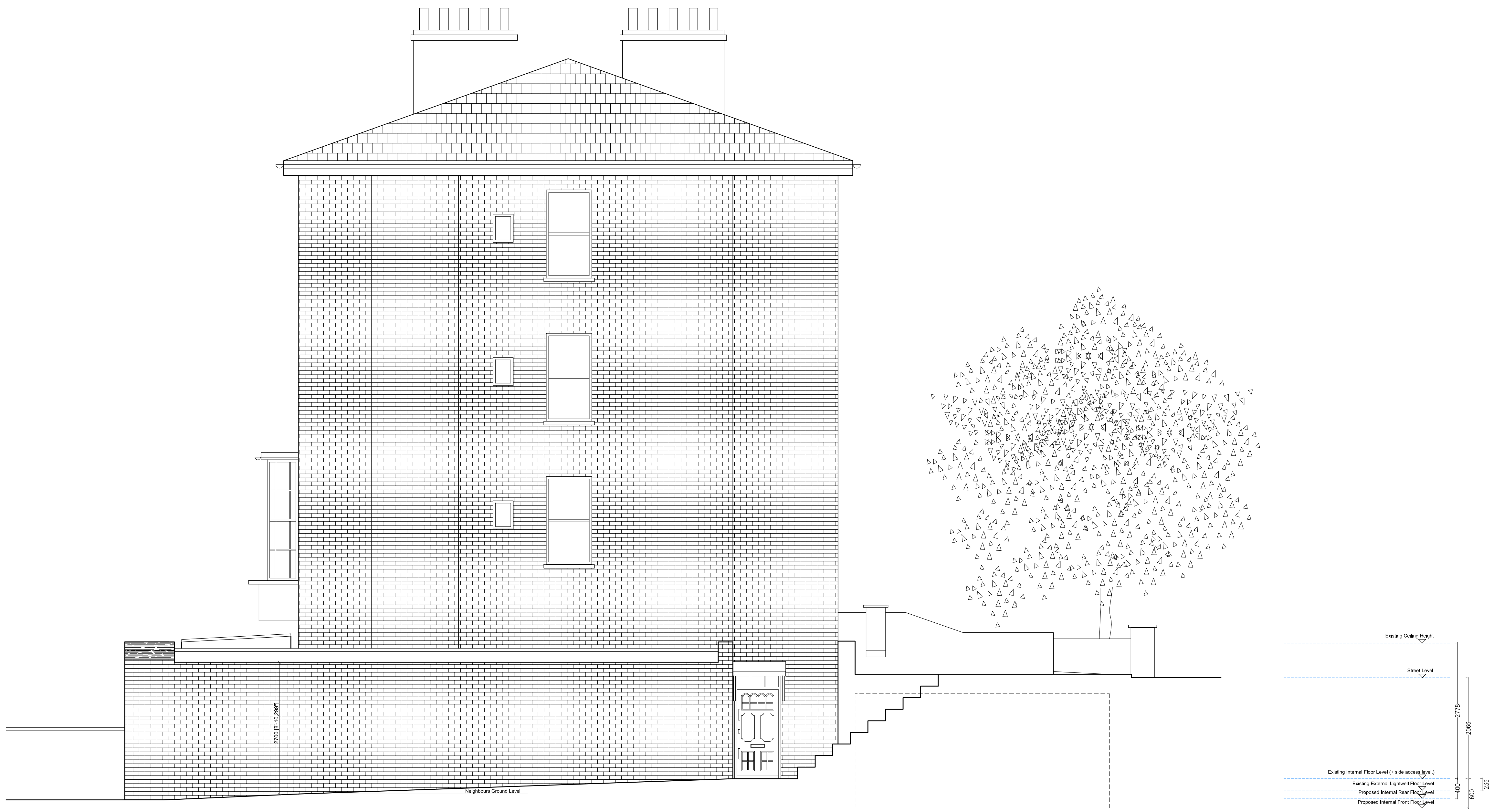
Project: 34A KING HENRYS ROAD

Job No:	Type:	Dwg No:	Revision:
1079	D	305	A

SKETCH
LONDON ARCHITECTS
STUDIO 415, THE LIGHTBULB
1 FILAMENT WALK
WANDSWORTH
SW18 4GQ

Issue:

Revision:	Notes:	Date:
A	ISSUED TO CLIENT	06.04.2017



Proposed Side Elevation

packmanlucas	Project: 34A King Henrys Road		Job Ref.: 5682
	Section: Loadings		Sheet No./Rev: 1
	Originator: YM	Date: May-17	Chk'd By: BB

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Roof

Pitched roof

		DL		LL	
Slates, timber battens and felt	=	0.55	kN/m^2		
Timber joist and Insulation	=	0.20	kN/m^2		
Ceiling, Services & Finishes	=	0.15	kN/m^2		
SUM	**=**	**0.90**	**kN/m^2**	**0.60**	**kN/m^2**

Floor

Floor

		DL		LL	
Timber Joists	=	0.15	kN/m^2		
18mm Ply	=	0.13	kN/m^2		
Finishes (say, 20mm tiles future allowance)	=	0.36	kN/m^2		
Ceiling, Services & Finishes	=	0.15	kN/m^2		
SUM	**=**	**0.79**	**kN/m^2**	**1.50**	**kN/m^2**

Floor

Floor

		DL		LL	
200mm RC slab	=	4.80	kN/m^2		
75mm Lytag lightweight screed	=	1.35	kN/m^2		
Finishes	=	0.42	kN/m^2		
Ceiling Finishes, Services & Insulation	=	0.30	kN/m^2		
SUM	**=**	**6.87**	**kN/m^2**	**1.50**	**kN/m^2**

Beam and Block Floor

		DL		LL	
Beam & Block	=	2.60	kN/m^2		
75mm screed	=	1.80	kN/m^2		
Finishes	=	0.20	kN/m^2		
SUM	**=**	**4.60**	**kN/m^2**	**1.50**	**kN/m^2**

Wall: Solid Masonry Wall = 4.50 kN/m^2 External Wall

Internal Wall Stud load Bearing

		DL		
Wall Finishes (E.F)	=	0.10	kN/m^2	
Plasterboard on Stud Partition	=	0.35	kN/m^2	
Services & Insulation	=	0.05	kN/m^2	
SUM	**=**	**0.50**	**kN/m^2**	Internal load beriang wall

External Enclosed Areas:	Cat. A (NA to EN1-1)	=	**2.50**	kN/m^3
Internal Partitions:	cl. 6.3.1.2 (8) (EN1-1)	=	**0.80**	kN/m^2
Roof's with no Access:	Cat. H (NA to EN1-1)	=	**0.60**	kN/m^2
Garage :	Cat. F (NA to EN1-1)	=	**2.50**	kN/m^2
External Paved Areas:	Cat. F (NA to EN1-1)	=	**2.50**	kN/m^3
Internal Handrail Loads:	Cat. A (i) (NA to EN1-1)	=	**0.36**	kN/m run
Snow Load:	Sb	=		kN/m^2
Wind Load:	Windward Roof Load	=		kPa

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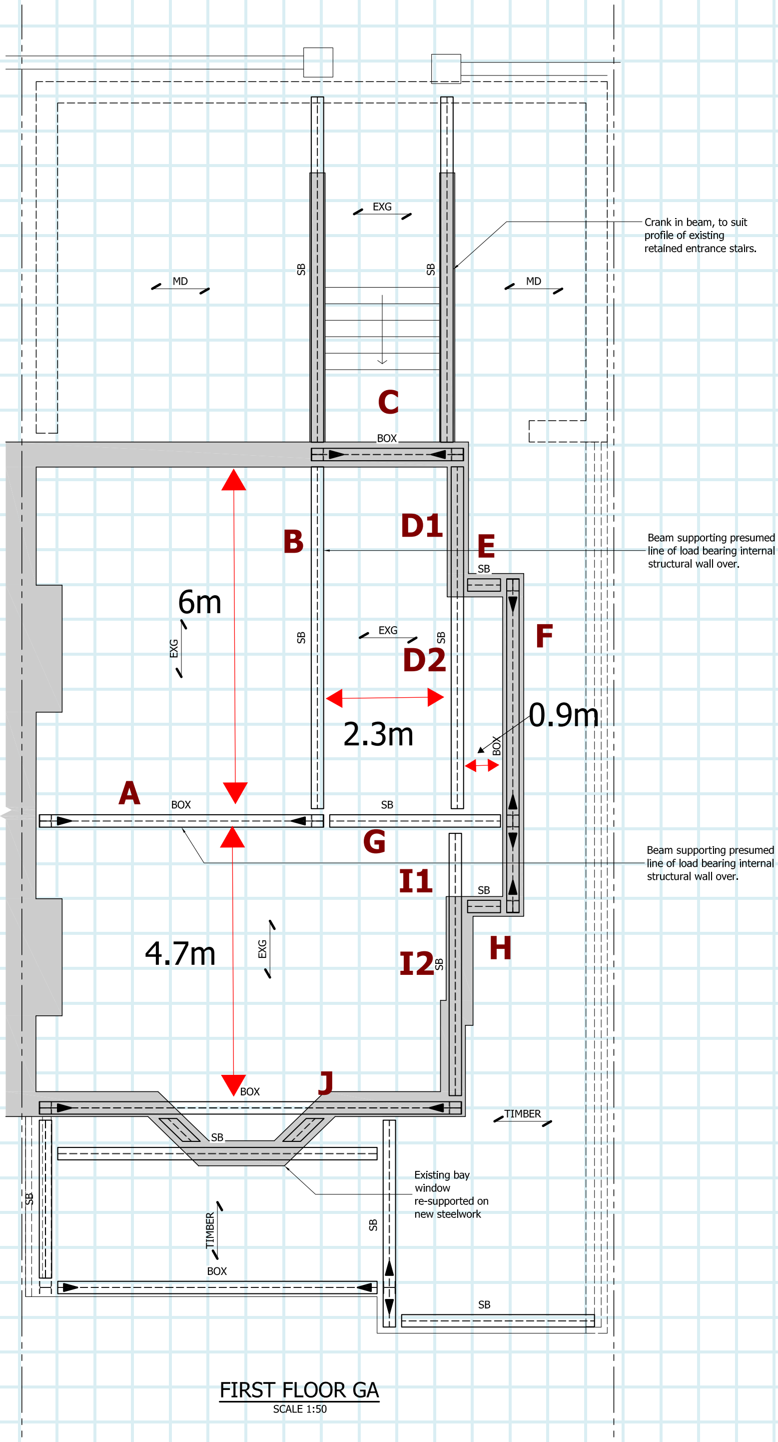
Project	Job Ref.
34A King Henrys Road	5682

Section	Sheet No./Rev
Loading second an third floor	

Originator	Date	Chk'd By
YM		



External Wall= 4.5kN/m2*3m=13.5 kN/m

Internal Wall= 0.5kN/m2*3m=1.5 kN/m

Loading at A: 2 Floor

DL=(6/2+4.7/2)*0.79+IntW=5.72 -> 11.45
LL=(6/2+4.7/2)*1.5=8.1 -> 16.2

Loading at B:

DL=(2.3/2)*0.79+IntW= 2.41 -> 4.82
LL=(2.3/2)*1.5=1.73 -> 3.46

Loading at C,E,H:

DL=WALL= 13.5 -> 27

Loading at D1:

DL=(2.3/2)*0.79+ExtW= 14.41 -> 28.82
LL=(2.3/2)*1.5=1.73 -> 3.46

Loading at D2:

DL=(2.3/2)*0.79=0.91 ->1.82
LL=(2.3/2)*1.5=1.73 ->3.46

Loading at F:

DL=(0.9/2)*0.79+ExtW=13.86 ->27.71
LL=(0.9/2)*1.5=0.68 -> 1.36

Loading at G:

DL=(4.7/2)*0.79=1.86 -> 3.72
LL=(4.7/2)*1.5=3.53 -> 7.06

Loading at I1:

DL=(0.9/2)*0.79=0.36 -> 0.72
LL=(0.9/2)*1.5=0.68 -> 1.36

Loading at I2:

DL=ExtW=13.5 -> 27

Loading at J:

DL=(4.7/2)*0.79+ExtW=15.36->30.71
LL=(4.7/2)*1.5= 3.53 ->7.06

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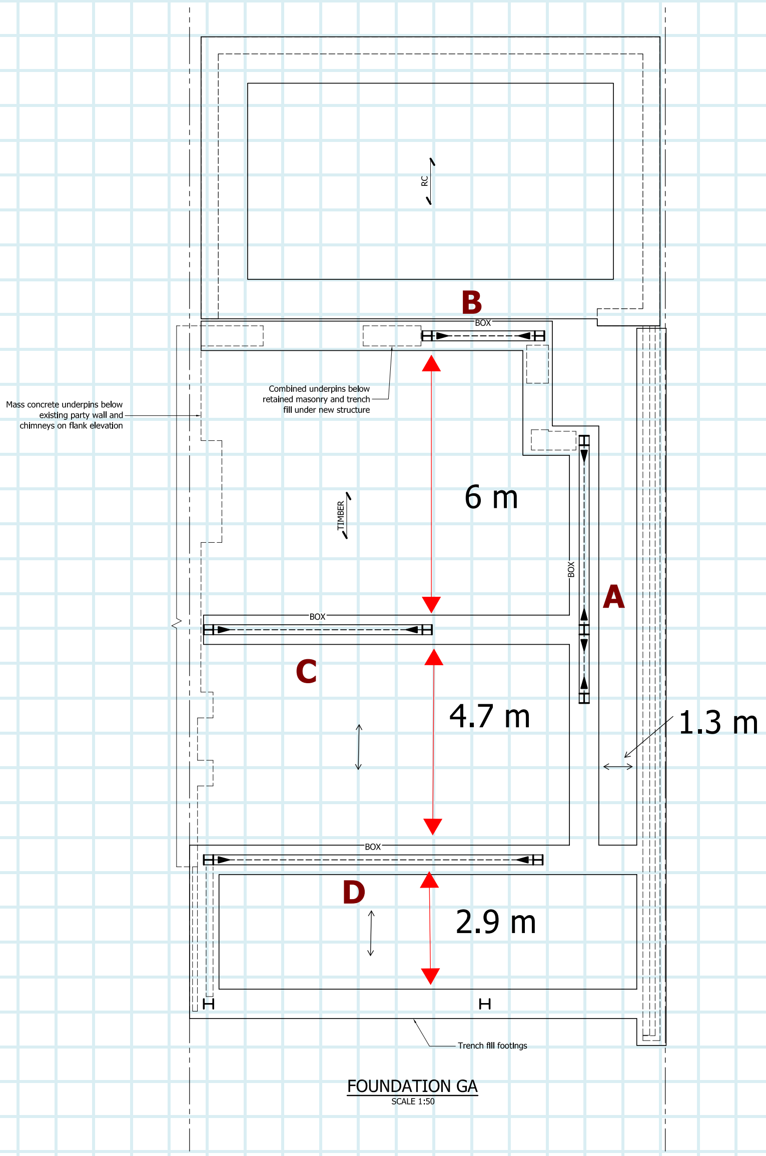
Project	Job Ref.
34A King Henrys Road	5682
Section	**Sheet No./Rev**

Originator	Date	Chk'd By
YM		



Loading just from GF to be added to the reaction taken by Robot Model

Loading at A

DL=(1.3/2)*4.60+IntW=4.49
LL=(1.3/2)*1.5=0.975

Loading at B:

DL=(6/2)*4.60+IntW=15.3
LL=(6/2)*1.5=4.5

Loading at C:

DL=(6/2+4.7/2)*4.60+IntW=26.11
LL=(6/2+4.7/2)*1.5=8.03

Loading at D:

DL=(2.9/2+4.7/2)*4.60+IntW=18.98
LL=(2.9/2+4.7/2)*1.5=5.7

Internal Wall= 0.5kN/m2*3m=1.5 kN/m

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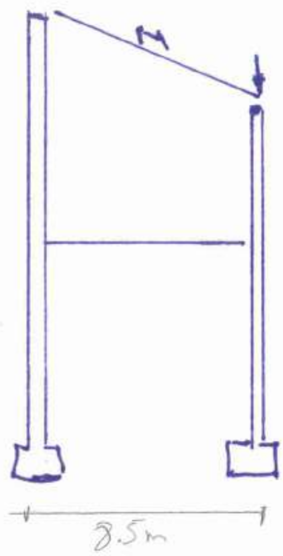
* ROOF LOADING.



DL = 8.5/2 • 0.9 = 3.83 kN/m

LL = 8.5/2 • 0.6 = 2.55 kN/m

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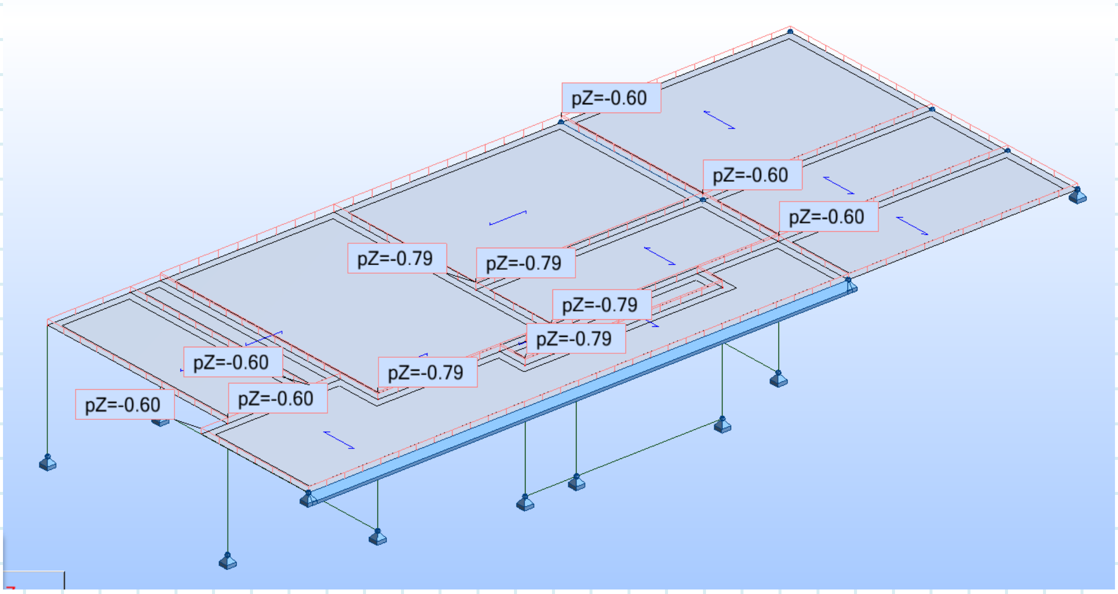
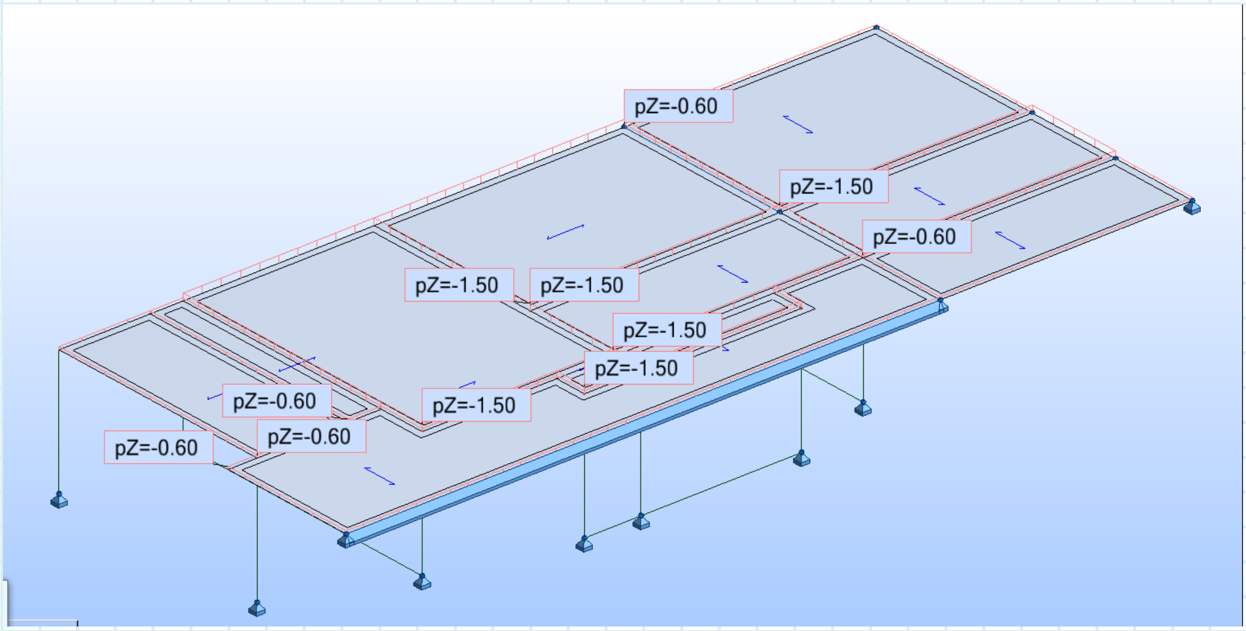
	Section		Sheet No./Rev
	Originator YM	Date	Chk'd By

Robot model: it has been done a robot model of the first floor, it has been applied the loading from above (second and third floor), as well as the loading from roof and first floor.

Area loading at first floor, DL



Area loading at first floor, LL



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	Section:	Sheet No./Rev:
	Originator: YM · Date:	Chk'd By:

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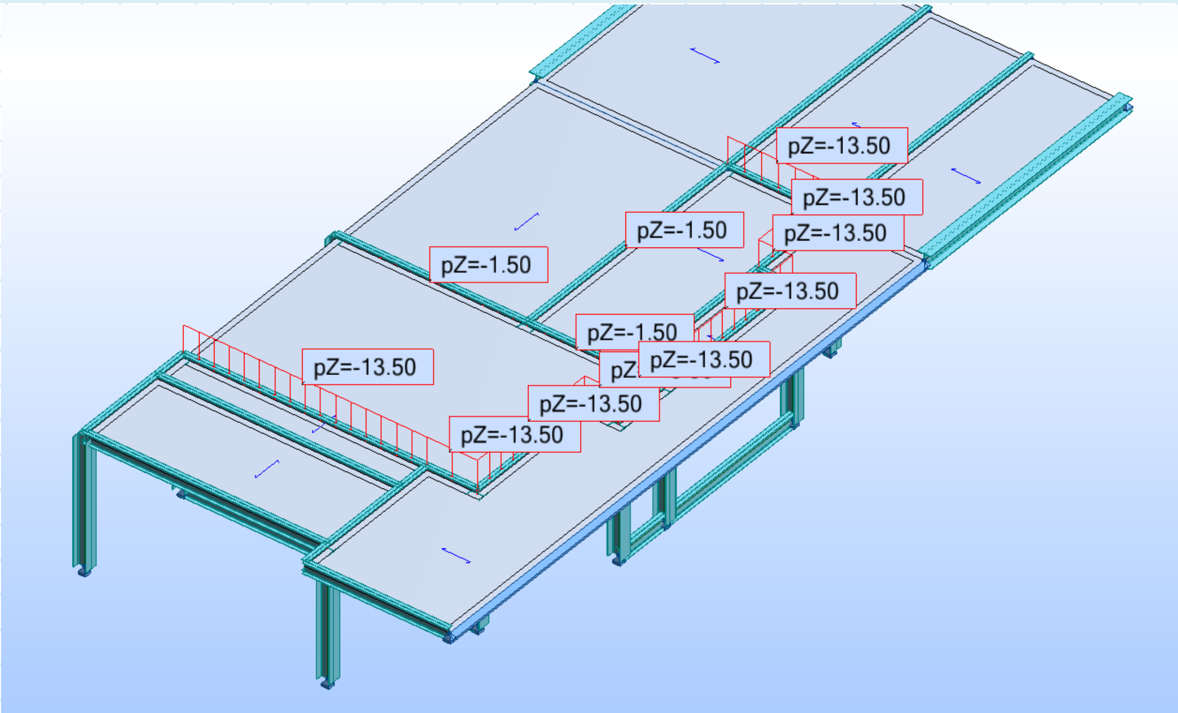
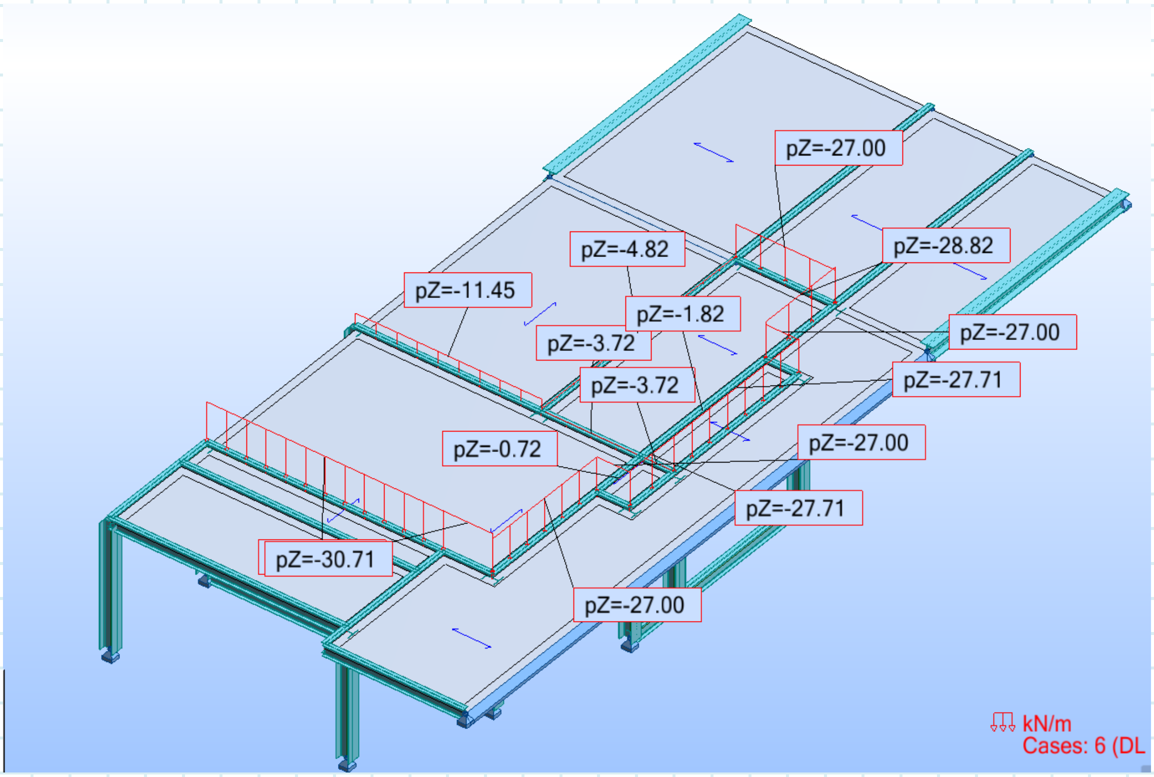
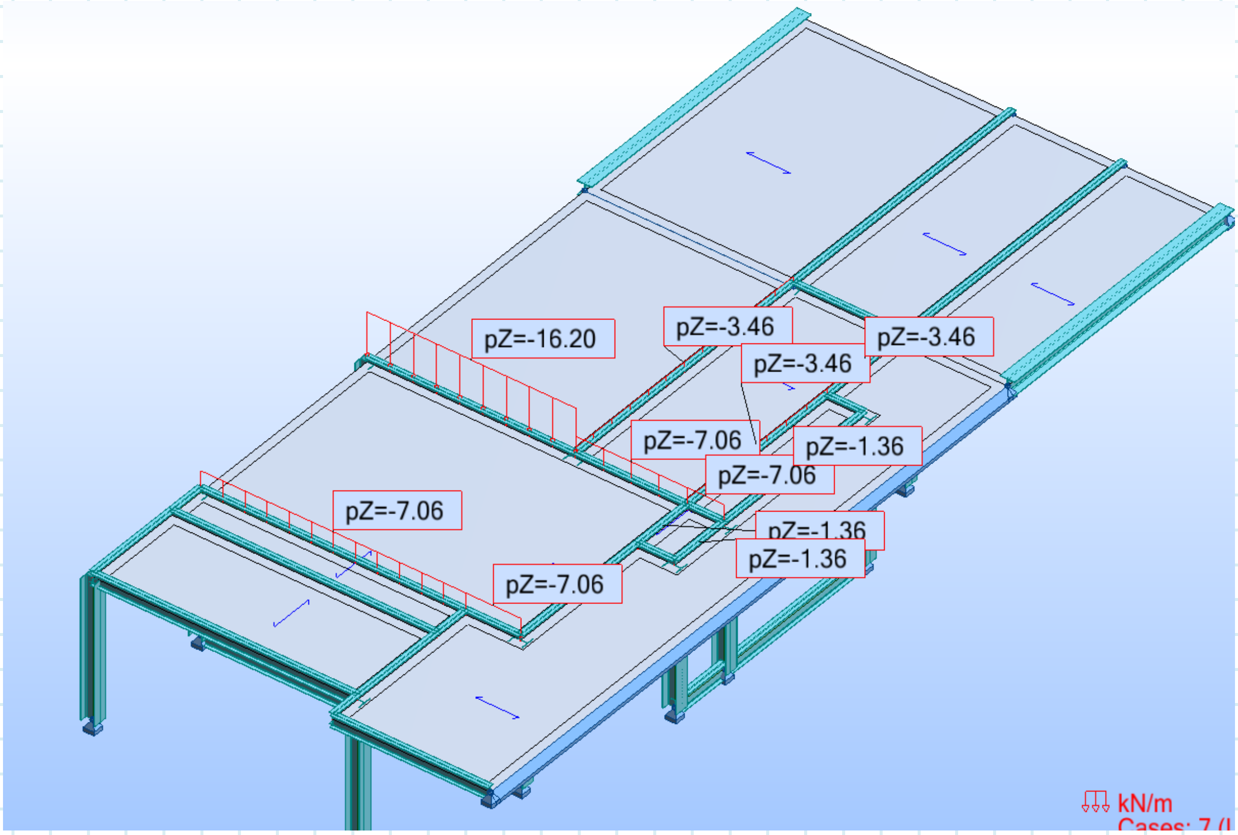
Wall loading at first floor



Loading from floors above, DL



Loading from floors above, LL



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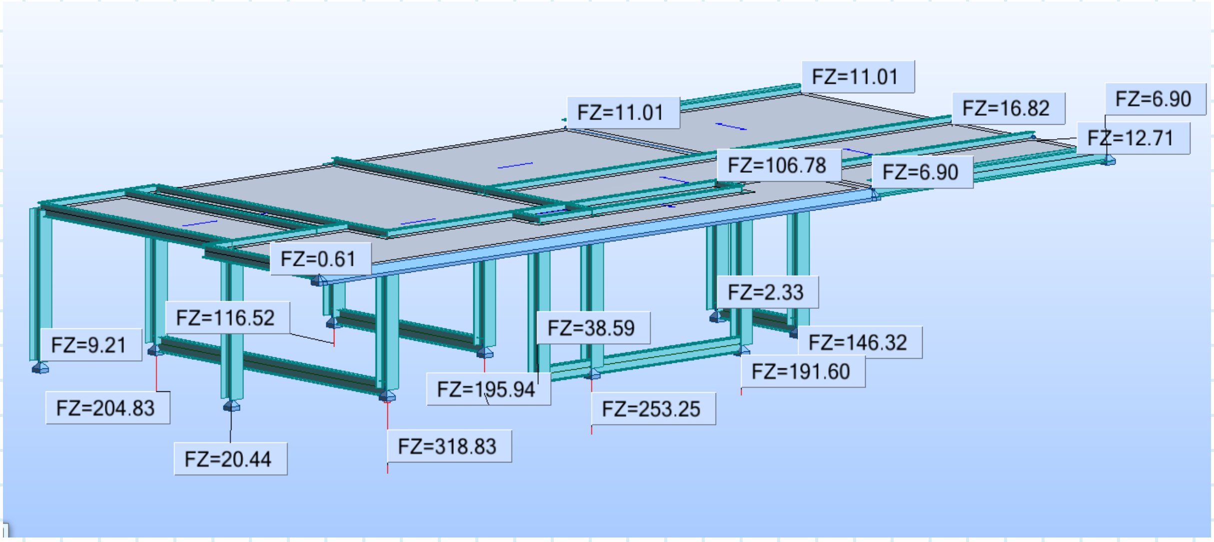
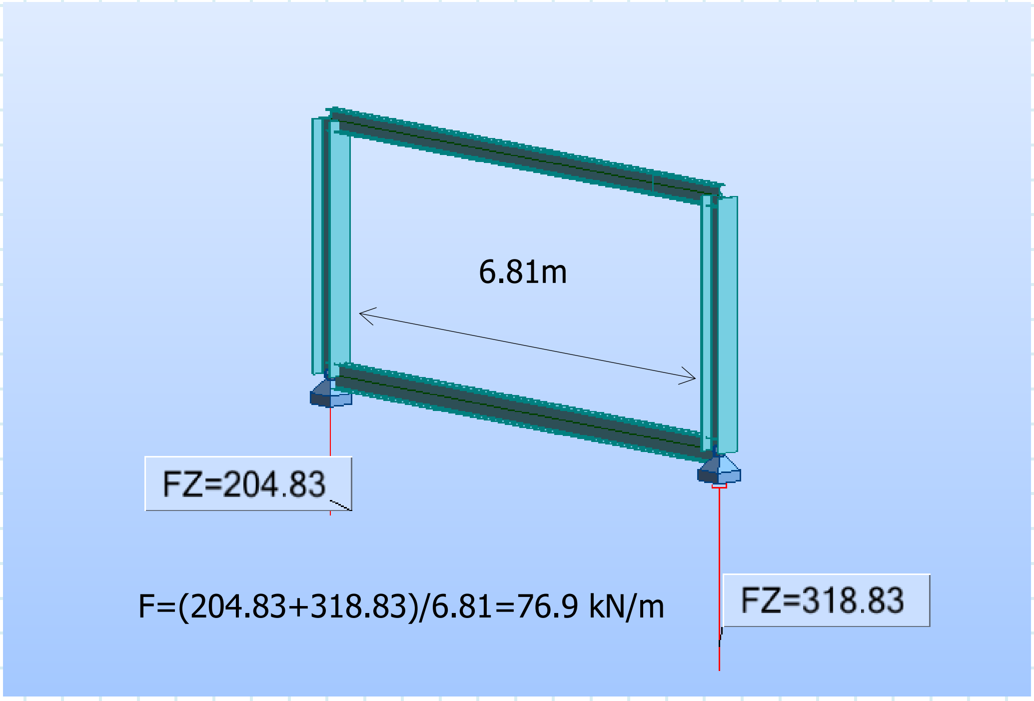
	Originator: YM / Date:	Chk'd By:

REACTION AT GF LEVEL, SLS



BOX FRAME D



F=(204.83+318.83)/6.81=76.9 kN/m

BOX FRAME D (AT GF LEVEL)

SLS = (204.83 + 319.83)/6.81 = 76.9 kN/m

TOTAL LOADING = 76.9 kN/m + 18.98 + 5.7 = 101.56 kN/m

ABP = 95 kPa $\sigma = \frac{F}{A}$

$\frac{101.56 + 25 \cdot 1 \cdot a \cdot 0.6}{a} = \sigma$; a = 1 ; σ = 116.56 kPa NO!

a = 1.2 ; σ = 99.63 kPa NO

a = 1.4 ; σ = 87.54 kPa OK!

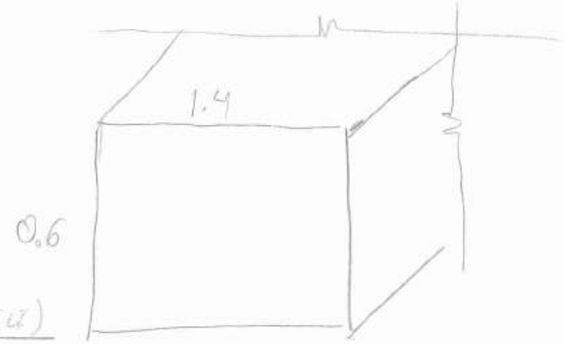
a = 1.35 ; σ = 90.23 kPa OK

(Refer to tedds calculation)

Tedd split the loading in permanent and variable loading.

→ DL = 18.97 + (166.07 + 269.32)/6.81 = 82.90 kN/m

→ LL = 5.7 + (38.76 + 49.51)/6.81 = 18.66



BOX FRAME C (AT GF LEVEL)

Tedd loading

DL = 26.11 + (51.57 + 97.07)/4.44 = 59.58 kN/m

LL = 8.03 + (64.95 + 98.87)/4.44 = 44.93 kN/m

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Project		Job Ref.
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Section: FOUNDATION		Sheet No./Rev
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✗ BOX FRAME A

$DL = 4.49 + (35.60 + 210.29 + 161.98)/5.25 = 82.18$ KN/m

$LL = 0.975 + (2.99 + 42.97 + 29.72)/5.25 = 15.39$ KN/m

$\frac{(82.18 + 15.39) + 25 \cdot 1 \cdot a \cdot 0.6}{a} = \sigma$

$a = 1.3$; $\sigma = 90.05$ KPa

✗ BOX FRAME B

$DL = 18.98 + (81.30 + 127.07)/2.37 = 106.89$ KN/m

$LL = 5.7 + (25.48 + 19.25)/2.37 = 24.57$ KN/m

$\frac{(106.89 + 24.57) + 25 \cdot 1 \cdot a \cdot 0.6}{a} = \sigma$

$a = 1.3$; $\sigma = 116.12$

$a = 1.5$ $\sigma = 102.64$

$a = 1.65$ $\sigma = 94.62$

$a = 1.700$ $\sigma = 92.33$

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FOUNDATION UNDER EXTERNAL WALL

→ DL = 4.39·3.2m + (1.8/2)·4.60 = 18.19 KN/m

LL = (1.8/2)·1.5 = 1.35 KN/m

$$\frac{(18.19 + 1.35) + 25 \cdot 0.6 \cdot a}{a} = \sigma$$

a = 0.5 , σ = 54.08 KPa

FOUNDATION FRONT ELEVATION

DL = 13.97 + (2.9/2)·4.6 + 1.5 = 22.14

LL = 6.47 + (2.9/2)·1.5 = 8.64

$$\frac{(22.14 + 8.64) + 25 \cdot 0.6 \cdot 0.5}{0.5} = \sigma$$

a = 0.5 → σ = 79.06 KPa

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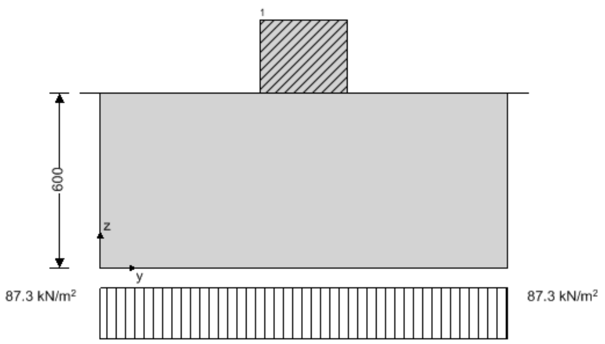
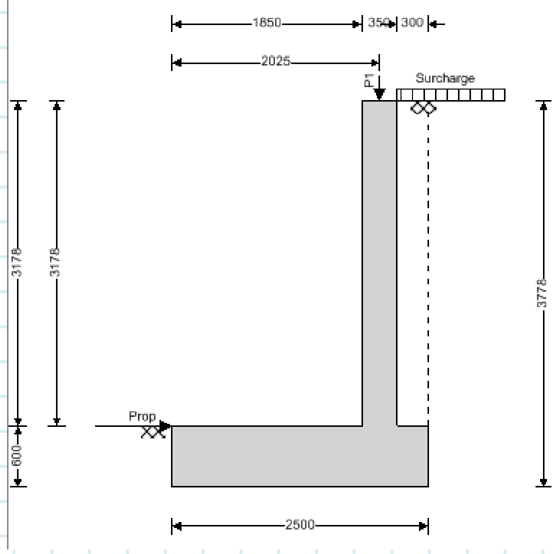
Strip foundation details - considering a one metre strip

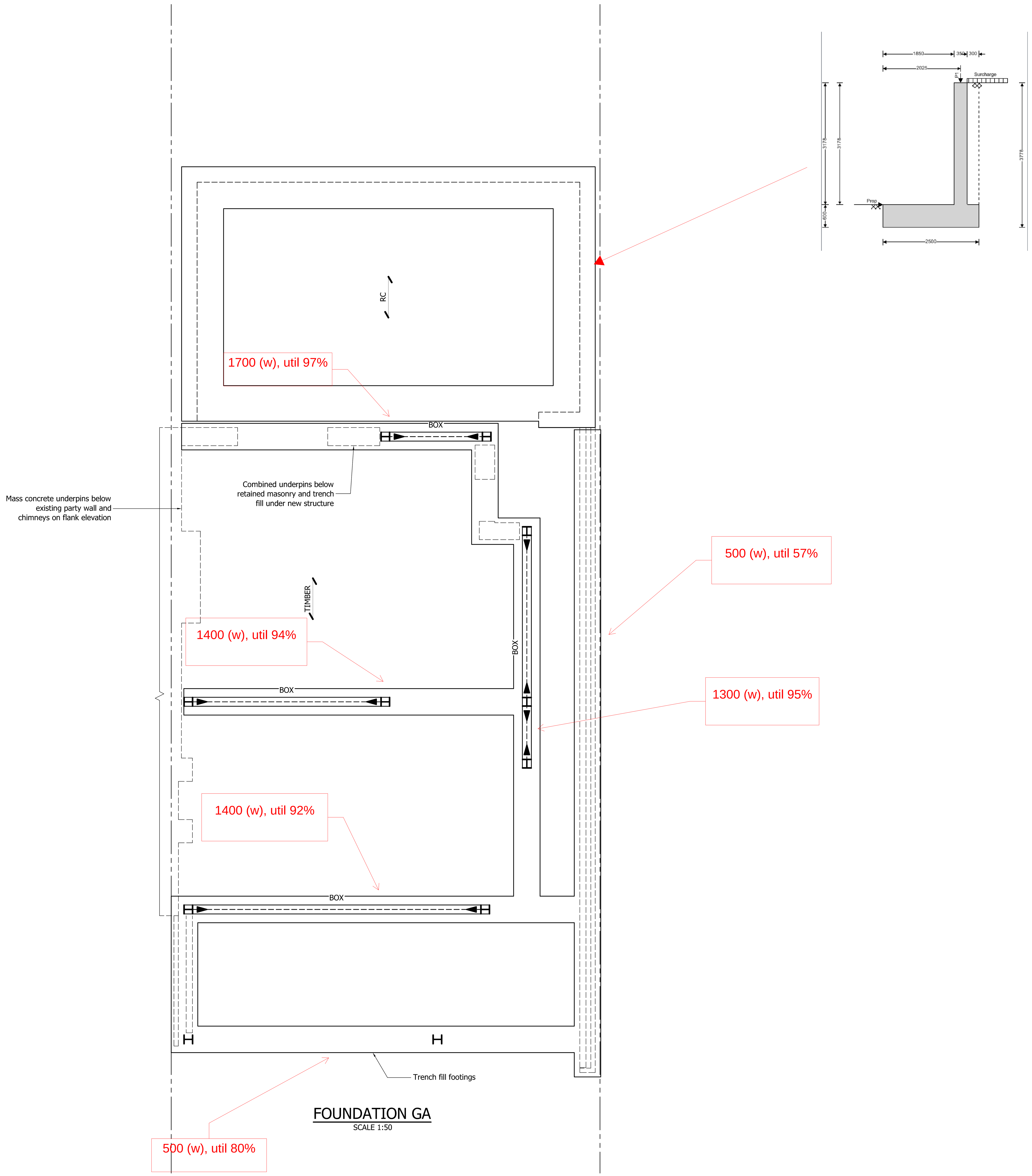
Length of foundation	L_x = **1000** mm
Width of foundation	L_y = **1400** mm
Foundation area	$A = L_x \times L_y$ = **1.400** m²
Depth of foundation	h = **600** mm
Depth of soil over foundation	h_{soil} = **0** mm
Level of water	h_{water} = **0** mm
Density of water	γ_{water} = **9.8** kN/m³
Density of concrete	γ_{conc} = **24.5** kN/m³





Retaining wall
ABP=95 KPa

DO NOT SCALE



FOUNDATION GA
SCALE 1:50

REV	DATE	DESCRIPTION	DRAWN	CHKD
P1	05.05.17	WIP Issue	BB	BB

REVISIONS

The contractor is to verify all dimensions on site before commencing work. All errors and omissions are to be reported to the Engineer. This drawing is to be read in conjunction with all relevant Architects, Services Engineers and Engineers drawings and specifications.

Project
34A King Henrys Road
London

Title
Foundation GA

Client
Ms. E. Wynd
Mr. R. West

Scale	Drawn	Date	Checked
1:50 @ A1	BB	May-17	BB

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Revision P1

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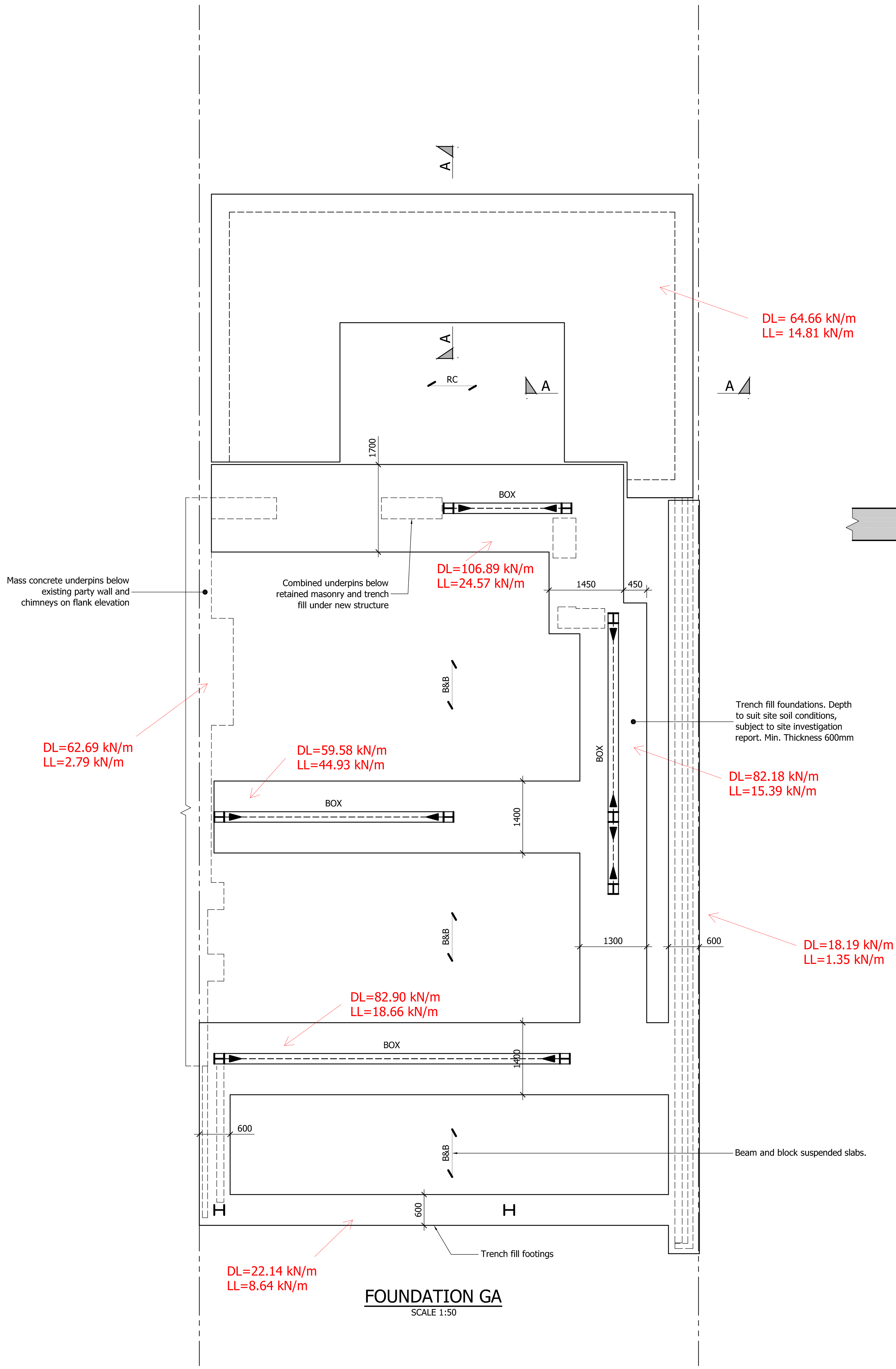
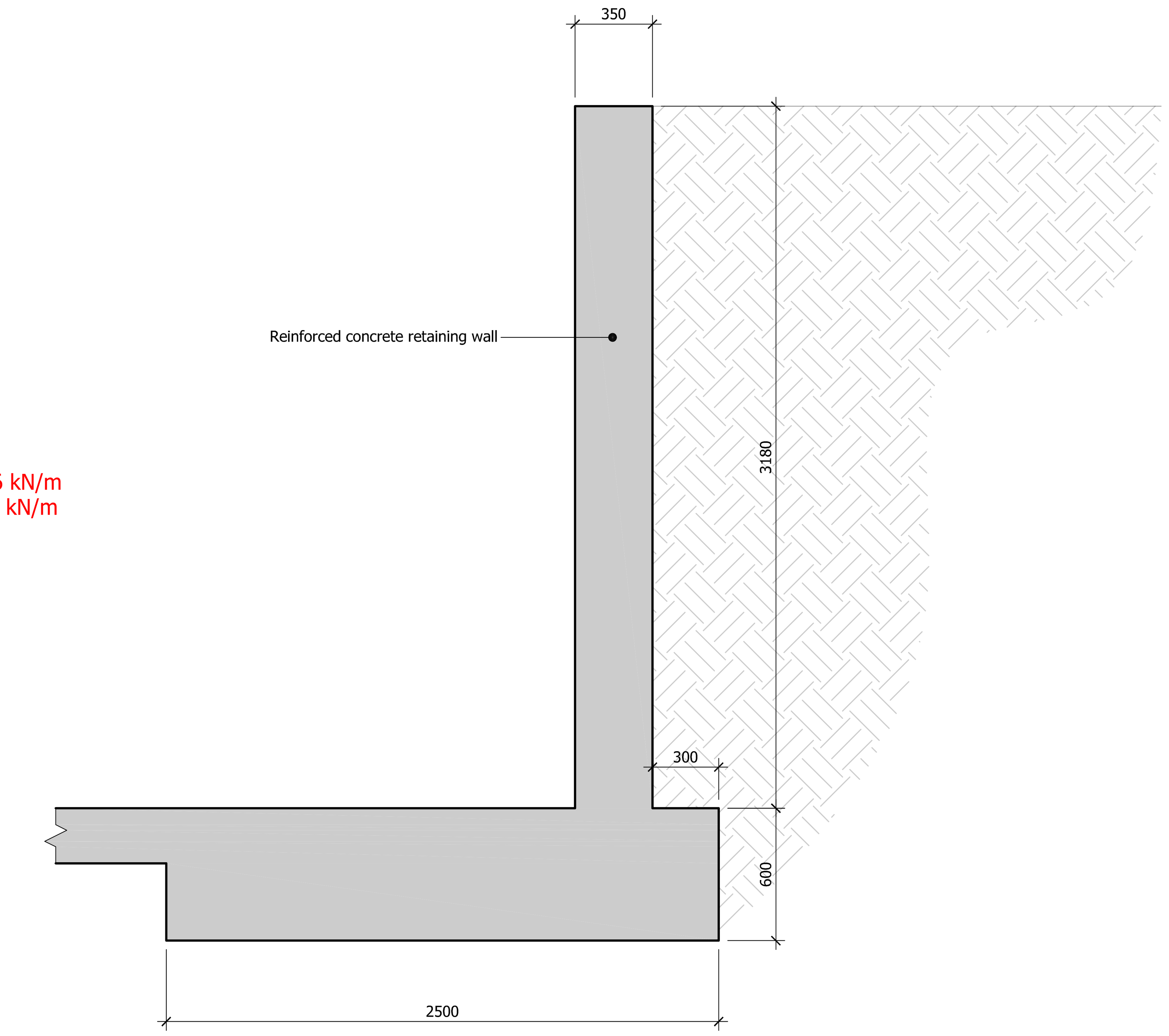
A1

DO NOT SCALE



FOUNDATION GA
SCALE 1:50



SECTION A-A
SCALE 1:20

REV	DATE	DESCRIPTION	DRAWN	CHKD
P2	09.05.17	ISSUED FOR APPROVAL	BB	BB
P1	05.05.17	WIP ISSUE	BB	BB

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Mr. R. West

Scale	Drawn	Date	Checked
1:50 @ A1	BB	May-17	BB

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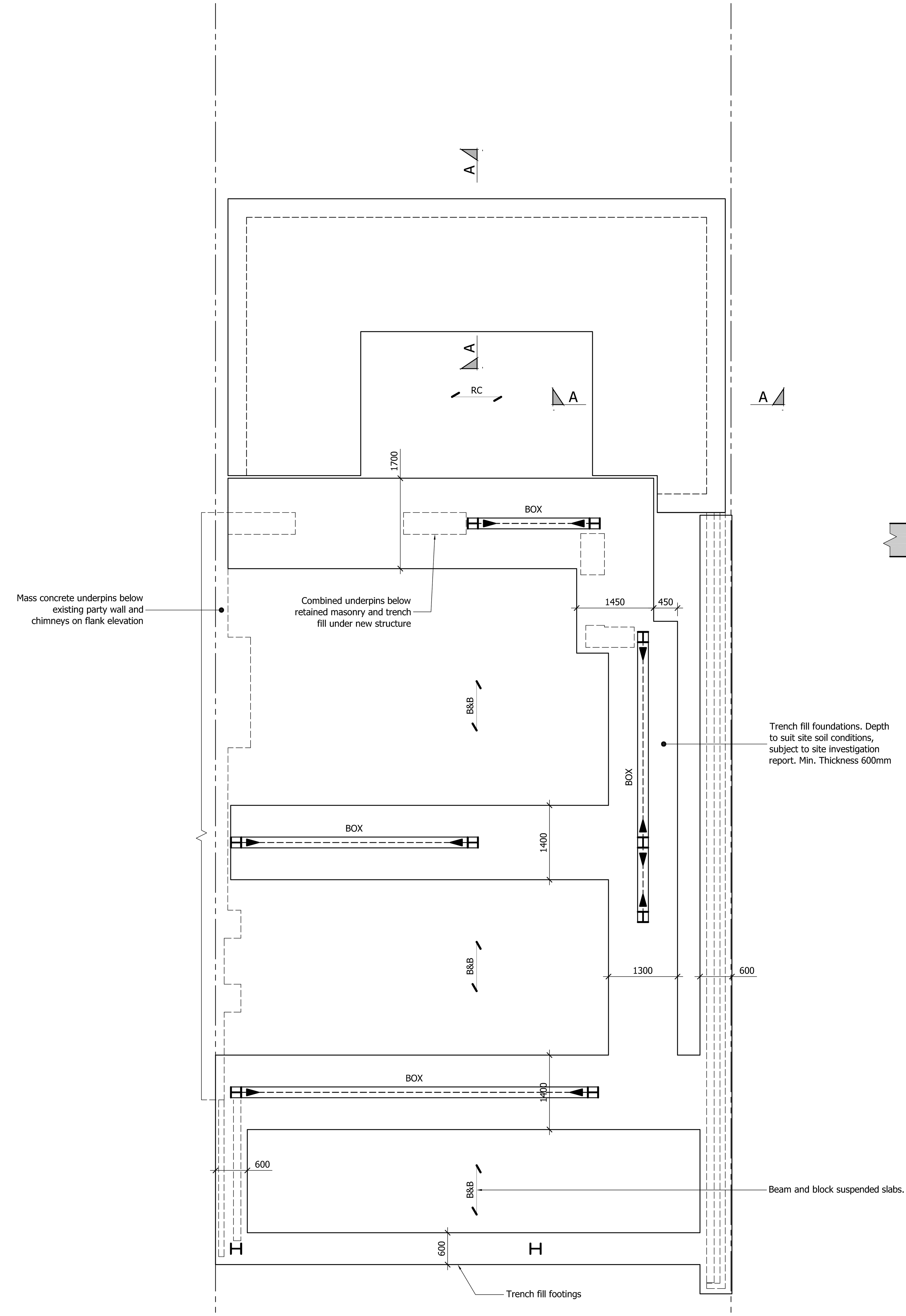
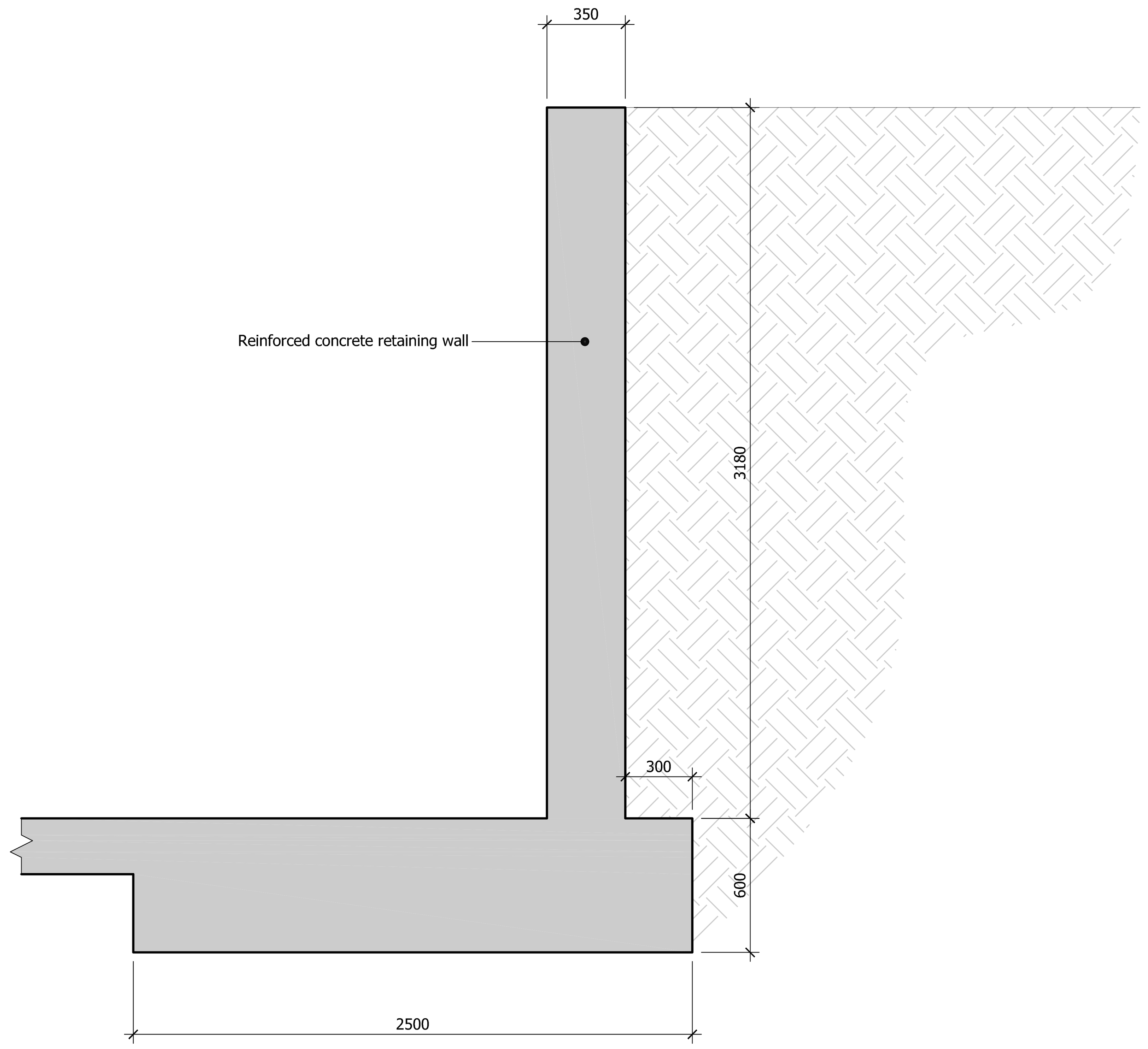
A1

DO NOT SCALE



FOUNDATION GA

SCALE 1:50



SECTION A-A

SCALE 1:20

REV	DATE	DESCRIPTION	DRAWN	CHKD
P2	09.05.17	ISSUED FOR APPROVAL	BB	BB
P1	05.05.17	WIP ISSUE	BB	BB

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Project
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Title
Foundation GA

Client
Ms. E. Wynd
Mr. R. West

Scale	Drawn	Date	Checked
1:50 @ A1	BB	May-17	BB

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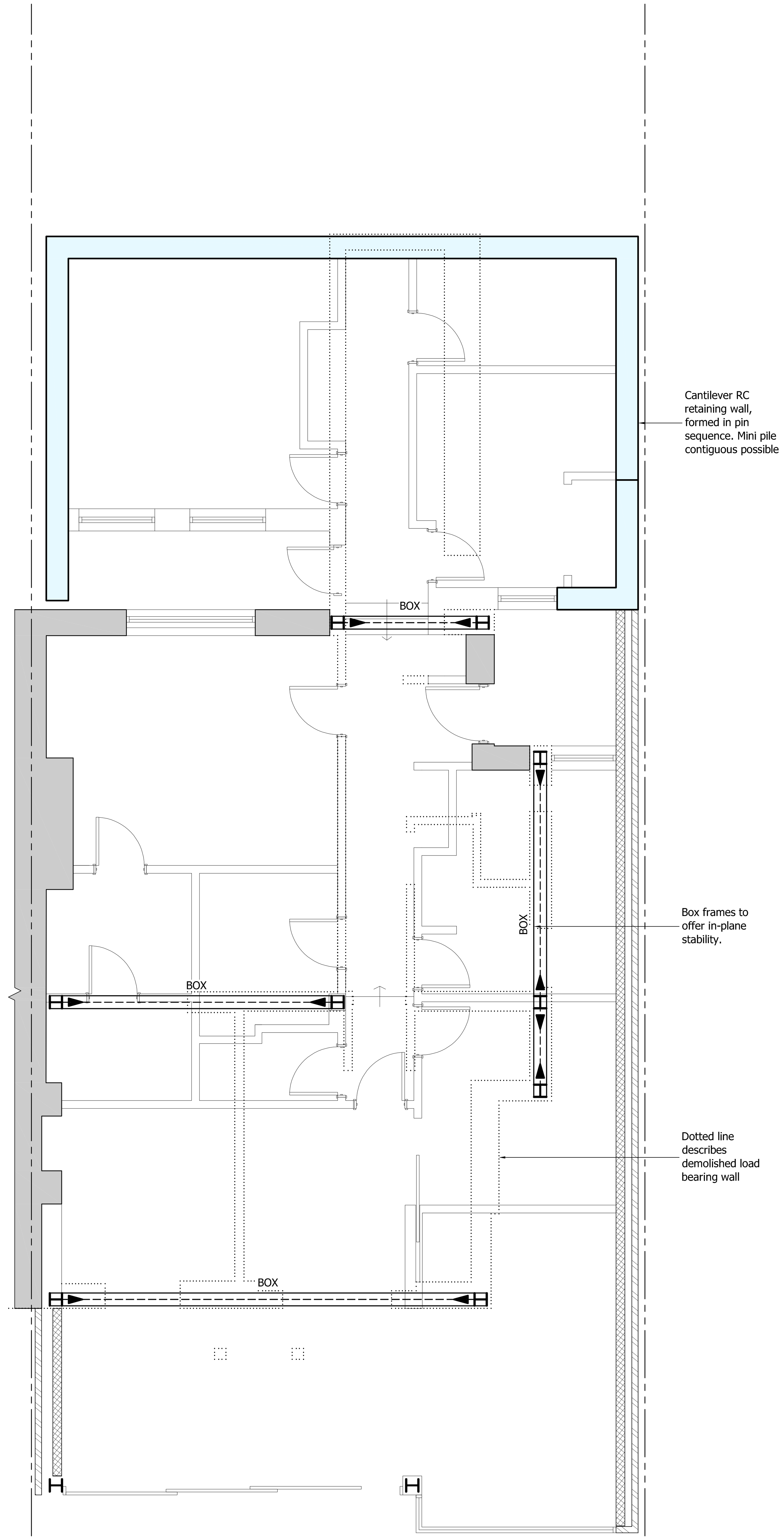
A1

DO NOT SCALE



GROUND FLOOR GA
SCALE 1:50

REV	DATE	DESCRIPTION	DRAWN	CHKD
P2	09.05.17	ISSUED FOR APPROVAL	BB	BB
P1	05.05.17	WIP ISSUE	BB	BB

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Project
34A King Henrys Road
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Title
Ground Floor GA

Client
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Scale	Drawn	Date	Checked
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A1

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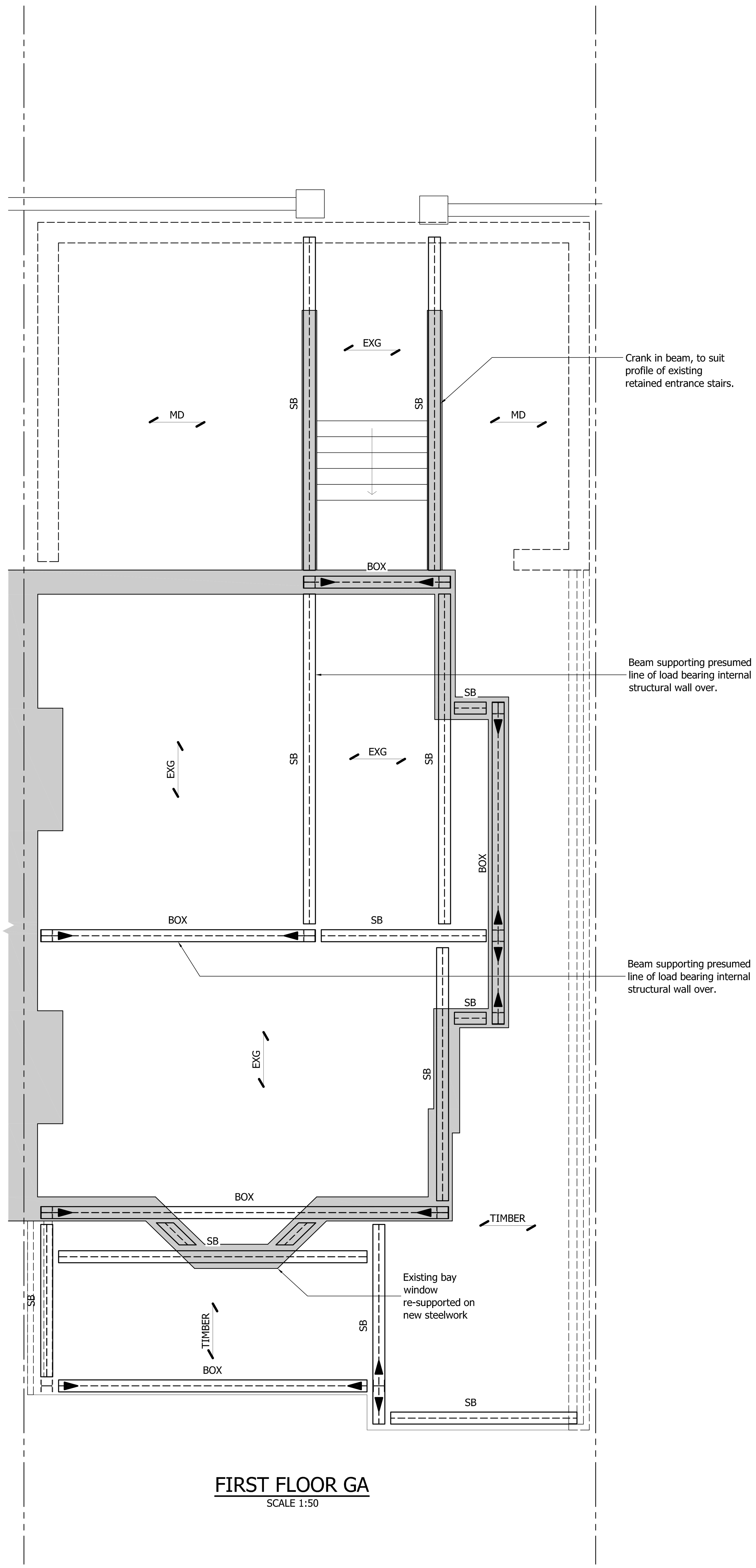

FIRST FLOOR GA
SCALE 1:50

REV	DATE	DESCRIPTION	DRAWN	CHKD
P2	09.05.17	ISSUED FOR APPROVAL	BB	BB
P1	05.05.17	WIP ISSUE	BB	BB

REVISIONS

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Project
34A King Henrys Road
London

Title
First Floor GA

Client
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Mr. R. West

Scale	Drawn	Date	Checked
1:50 @ A1	BB	May-17	BB

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Revision
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A1

APPENDIX C

Left: Front view No. 34 King Henry's Road

Right: View of steps down to entrance of No. 34A King Henry's Road

Left: View of front door to No. 34A King Henry's Road

Right: View of right hand light well of No. 34 King Henry's Road