Providing Ground Solutions

Mr. James Youngman

41 Howitt Road, Hampstead, London NW3 4LU

Ground Movement Assessment – Revision 1

June, 2017

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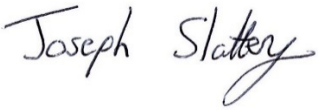
Checked	Joseph Slattery, Principal Engineer *MEng (Hons) BEng CEng MICE FGS RoGEP*			
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1. INTRODUCTION

Card Geotechnics Limited (CGL) has been commissioned by Mr James Youngman to undertake a ground movement assessment for the proposed basement development at No. 41 Howitt Road, Hampstead, London, NW3 4LU.

The London Borough of Camden's guidance document *"CPG4, Basements and Lightwells*[1]*"*, requires a Basement Impact Assessment (BIA) to be undertaken for new basements in the Borough and sets out 5 stages for a BIA to "enable the Borough to assess whether any predicted damage to neighbouring properties and the water environment is acceptable or can be satisfactorily ameliorated by the developer". The five stages are set out below:

1. Screening
2. Scoping
3. Site investigation
4. Impact assessment
5. Review and decision making

A Basement Impact Assessment (BIA) was undertaken by David Dexter Associates (David Dexter) [2] which was subsequently audited by Campbell Reith and Chelmer. This report sets out to address comments 1, 2, 3, 7 & 11 in the Campbell Reith/Chelmer audit[3], see Appendix A, in providing a ground movement assessment to assess the impact on the adjacent party walls from the proposed basement construction, and a qualitative assessment on potential changes in desiccation due to the construction, and impact on trees within close proximity to the property. This report and the ground movement assessment has been undertaken by qualified CGL Senior Engineer, checked by a CGL Principal Engineer and approved by a CGL Director.

This ground movement assessment includes:-

1. A review of the Albury S.I. Limited[4] ground investigation report and data;

[1] Camden Planning Guidance, CPG4, Basements and Lightwells, July 2015.
[2] Proposed basement impact assessment, 41 Howitt Road, June 2015, revision E, David Dexter Associates, June 2015.
[3] Campbell Reith (Graham Kite) / Camden LBC (Gavin Sexton) email dated 21st March 2017
[4] Report on a site investigation at 41 Howitt Road, Hampstead, London, NW3 4LU, (Reference: 14/10166/NAM), Albury S.I. Limited, July 2014.

2. A review of the existing BIA by David Dexter;

3. Analysis of critical sections to assess the potential impact of ground movements associated with the construction of the new basement on neighbouring party wall properties. The analysis has been undertaken using PDISP software to determine short and long term heave/settlement ground movements;

4. A report on the results of the analysis setting out design assumptions, geotechnical parameters and provide conclusions/recommendations regarding the potential impact on neighbouring properties and Damage Category taking into consideration predicted ground movements.

2. SITE LOCATION AND DESCRIPTION

2.1 Site location

The site of the proposed basement development is located at No. 41 Howitt Road, Hampstead, London, NW3 4LU, within the London Borough of Camden (Camden). The Ordnance Survey grid reference for the approximate centre of the site is TQ 26462 77612 (526462E, 177612N).

A site location plan is provided in Figure 1.

2.2 Site description

A site layout plan is provided in Figure 2. The property sits within a rectangular site orientated on a slight north-west/south-east axis. The road slopes gently downwards to the south-west. The property is an early 1900s 3 storey mid terrace house, sharing party walls with Nos. 39 and 43. No. 43 Howitt Road currently has a partial single level basement at the front of the property, which is underpinned to the same level as the proposed basement for No. 41. The rear party wall of Nos. 41/43 and the party wall with No. 39 will require underpinning for the construction of the new basement. There is a small existing single storey basement at No. 41, at the front of the property, which is accessed by steps leading down from the front entrance. Development plan drawing 1308.22.a details a trial pit, trial pit No. 1 which was excavated to investigate the footings for the extension to No. 43 basement in 2011. The trial pit confirmed the basement slab to be 400mm thick. Two further trial pits were excavated in 2016; Trial pit No. 2 excavated at the party wall with No 39 showed the footings to be at 400mm below ground level at No. 41, and 700mm or more below ground level for No. 39 next door. Trial Pit No. 3 proved the footings beneath the front wall to be founded at 700mm below ground level.

There is a conservatory to the rear of the building and the rear garden is predominantly paved, and is approximately 400mm higher than the ground floor level, and ground level to the front of the property.

2.3 Proposed development

It is proposed to deepen and extend the existing basement across the entire footprint of the building and also extend into a short section of the rear garden.

No Ordnance Datum levels have been provided. Therefore, for the purpose of this ground movement analysis, the existing ground level has been taken as 10m above Site Datum Level (SDL). The proposed basement slab level will be at 2.8m bgl (7.2m SDL) with a thickness of 370mm. The foundations to be underpinned are assumed to be at around 1.0m bgl, 9.0m Site Datum Level (SDL). It is assumed no underpinning will be required adjacent to the party wall of No 43 existing basement.

The existing ground floor and basement floor slabs are 400m thick, as detailed on development drawing 138.22.a. Excavation beneath the existing ground floor slab to the new basement formation level at 3.3m bgl (6.7m SDL) will be around 2.9m.

The existing basement slab level at No. 41 is at 2.6m bgl (7.4m SDL) as detailed on development drawing 138.22. A. A nominal depth of excavation of around 300mm beneath the slab will be required to construct the new basement slab, at the formation level of 6.7m SDL.

The proposed development drawings are presented in Appendix B.

2.4 Anticipated ground conditions

Online British Geological Survey (BGS) mapping for the area[5] indicates the site is underlain by the London Clay Formation, approximately 30m thick. The London Clay is a firm to stiff fissured heavily over consolidated clay, occasionally containing sandy horizons, particularly towards the base of the unit. Some Made Ground is also anticipated on site associated with the construction of the current and any past developments.

[5] http://mapapps.bgs.ac.uk/geologyofbritain/home.html

3. GROUND AND GROUNDWATER CONDITIONS

3.1 Summary

A ground investigation was undertaken by Albury S.I. Limited comprising 1 window sampler hole to 4.2m below ground level (bgl) in the rear garden.

Drawing 1308.22.a notes that a hand augered 6.0m deep borehole, BH2, with a standpipe installation was carried out by P.J. Drilling Ltd. In 2016. However, no borehole log or installation details have been provided for this borehole.

The stratigraphy encountered in BH1 at the site is summarised in Table 1 and a conceptual site model is shown in Figure 3.

Table 1. Summary of ground conditions from Soils Ltd ground investigation

Stratum	Depth of stratum surface (m bgl)	Thickness (m)
Dark brown sandy TOPSOIL with roots. [TOSPOIL]	0	0.3
Brown silty sand with occasional pockets of brown clay on crushed brick. [MADE GROUND]	0.3	0.6
Very high/extremely high, very stiff/hard brown silty clay with occasional roots. [LONDON CLAY]	0.9	Not proven. Borehole terminated at 4.2 bgl

3.2 In-situ and laboratory testing

Insitu hand shear vane tests shown on the borehole log recorded undrained shear strength, c_u values in excess of 190kPa; these values are considered to be uncharacteristically high for the London Clay and should be considered with caution. No insitu SPT 'N' or undrained triaxial laboratory tests were carried out to validate the unusually high undrained strength values presented on the log.

3.3 Groundwater

No groundwater was encountered during the investigation. Two groundwater monitoring visits undertaken in July 2015 recorded groundwater at 2.9m bgl. Records of a rising head test undertaken in BH2 are summarised on drawing 1308.22.a which notes that the borehole was dry 1 hour after completion of the standpipe installation. The water level rose to 5.0m bgl after 72 hours, and 3.9m bgl after 120 hours. It should be noted that

isolated perched water may be present within the Made Ground or isolated pockets with the London Clay Formation.

3.4 Geotechnical design parameters

As the strength test results obtained during the Albury ground investigation are considered to be very high and uncharacteristic for London Clay in the region, the geotechnical design parameters for this ground movement assessment have been adopted from a CGL ground investigation undertaken at No. 32 Glenilla Road within 150m of the property. The parameters are presented in Table 2. These values are unfactored (Serviceability Limit State) parameters and are considered to be characteristic and conservative values for the local soils.

Table 2. Geotechnical design parameters

Stratum	**Design Level (m SDL)**	**Bulk Unit Weight γ_b (kN/m^3)**	**Undrained Cohesion c_u (kPa) [c']**	**Friction Angle ϕ' (°)**	**Young's Modulus E_u (MPa) [E']**
Made Ground	10.0	20	30 [0]	24[a,b]	18.6[b] [13.95]
London Clay Formation	9.1	20	40 + 5.17z[c] [5]	21[a]	24 +3.1z[d] [18 + 2.3z][e]

a. BS 8002:2015 Code of practice for Earth retaining structures, British Standards institution.
b. Burland et. al (Eds) (2001) Building response to tunnelling, CIRIA Special Publication 200, CIRIA
c. z = depth below upper surface of the London Clay
d. Based on 600 Cu - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.
e. Based on 0.75Eu - Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.

4. GROUND MOVEMENT ANALYSIS

4.1 Introduction

This section details calculations undertaken to assess ground movements that may occur as a result of the proposed basement excavation and construction.

4.2 Construction sequence

It is understood from the structural drawings provided in Appendix C, that the proposed basement will be constructed using a 'hit and miss' sequence underpinning technique to carry loads from existing party walls. Internal load bearing walls will also be underpinned. Excavation of the basement will be gradual with soil being excavated initially to construct and cast each underpin. The remaining central volume of soil is to be removed once the underpinning is complete around the perimeter.

Based on the current drawings, the underpinning sections will not be less than 1.0m in width and no two adjacent sections are to be excavated simultaneously. Due to the high stiffness of the reinforced concrete underpin walls and early propped construction sequence, long term wall deflection is expected to be very low (i.e. <2mm). This is based on CGL's experience with similar underpinned basement developments in the area.

4.3 Ground movements arising from excavation and construction

The soils at formation level will be subjected to a combination of stress reduction from excavation and subsequent loading from the existing building and the new basement construction. The basement excavation unloading has been determined using the proposed development drawings and the design parameters in Table 2.

Assuming an excavation depth of 2.9m beneath the existing ground floor slab and a unit weight of 20kN/m^3 for the soils to be excavated the unloading due to excavation will be 58kN/m^2. Beneath the existing basement an excavation depth of 300mm will result in an excavation unloading of 6kN/m^2, therefore an excavation of 10kN/m^2 has been allowed for beneath the existing basement, within the in the ground movement analysis.

The imposed building construction loads used in the analysis have been provided by David Dexter as dead and live line loads along the perimeter and internal load bearing walls, as shown on the structural load plan in Appendix C, and have been used to calculate the structural loads across the basement.

Gross and net loads are provided in Table 3. They allow for dead and live loading and for excavation unloading. The concrete internal basement slab, is included as a combined dead and live weight loading of 10kPa.

The magnitude of ground movements have been calculated using OASYS Limited PDISP (**P**ressure **Disp**lacement) analysis software. PDISP assumes that the ground behaves as an elastic material under loading, with movements calculated based on the applied loads and the soil stiffness's (Eu and E') for each stratum input. Ground movements have been estimated for undrained (short term) and drained (long term) conditions.

Table 3. Summary of gross and net loads for the proposed basement

Foundation area[a]	Typical underpin width (m)	Gross Loads based on typical underpin width (kN/m^2)	Excavation Load (kN/m^2)	Net load[b] (kN/m2)
Wall 1	1.5	91.67	-58	33.67
Wall 2	1.5	75.20	-58	17.20
Wall 3a	1.8	0.00	0	0.00
Wall 3b	1.8	74.03	-58	16.03
Wall 4a	1.5	88.83	-58	30.83
Wall 4b	1.5	0.00	0	0.00-
Wall 5	1	105.00	-58	47.00
Wall 6	1	105.00	-58	47.00
Wall 7	1	46.25	-58	-11.75
Wall 8	1	95.00	-58	37.00
Wall 9a	1.2	72.17	-74	-1.83
Wall 9b	1.2	72.17	-74	-1.83
Basement Slab (long term condition only)	0	10	-58	-48.00

a. Foundation areas refer to loading areas as shown on the structural load plan in Appendix C.
b. Positive values (+) indicate stress increase and negative (-) values indicate stress reduction.

The proposed development gives rise to a combination of net loading and unloading of the underlying strata due to the proposed construction. The PDISP analysis was modelled to assess ground movements on a displacement grid at formation level of the basement, at 3.3m bgl (6.7m SDL).

4.3.1 Short term ground movement (during construction)

At formation level the maximum short term ground movement is estimated to be 6mm of heave beneath the rear garden, and 4mm beneath the existing property, reducing to between 1mm to 3mm heave and up to 1mm settlement beneath the property boundary walls and beneath the underpins. Up to 3mm of heave is anticipated beneath the party wall foundation of No. 39, and up to 1mm of heave/settlement is predicted beneath the party wall foundation of No. 43. The estimated undrained displacement (short term) across the basement and beneath the party walls due to unloading by excavation, and structural loading of the existing building is presented as a displacement contour plot in Figure 4.

4.3.2 Long term ground movements (post construction)

At formation level the maximum long term ground movement is estimated to be 10.5mm of heave beneath the rear garden, and 6mm of heave beneath the existing property. Heave of between around 1mm and 6mm is predicted beneath the party walls and underpins of No. 39, up to 1mm of heave for No. 43 over the long term. The estimated drained displacement (long term) across the basement and beneath the party walls due to unloading by excavation, and structural loading of the existing building, is presented as a displacement contour plot in Figure 5.

4.4 Installation related movements

During the construction process for the underpin sections, up to 5mm of settlement may occur at the formation level of the existing foundations. This is based on CGL's experience of similar underpinning works within the London Clay Formation, allowing for good quality workmanship and propping. The effect of the installation movements on the party walls has been assumed to vary by parabolic reduction rather than a linear reduction to give a more conservative estimate of installation movements across the 8.0m width of the foundation of each neighbouring property. These potential movements have been combined with the short term and long term ground movements predicted in the PDISP model.

4.5 Critical sections

Two critical sections were identified through the party walls of the adjacent properties, No. 39 Howitt Road (critical section A), and No. 43 Howitt Road (critical section B). The location of the critical sections are shown on the site layout plan in Figure 2 and on the contour plans in Figure 4 and Figure 5.

Ground movements of the party wall foundations were assessed along displacement lines assuming an existing foundation level of 9.0m SDL (1.0m bgl) at No. 39 Howitt Road, and for the section of the Nos. 41 and 43 party wall, which will need underpinning to the rear of the property.

The results of the assessment and corresponding ground movement profiles have been brought forward into Section 5 of this report where the cumulative impact due to excavation and construction on Nos. 39 and 43 Howitt Road has been assessed.

4.5.1 Critical section A – No. 39 Howitt Road

Ground movements for No. 39 Howitt Road have been taken from a displacement line at 9m SDL through the width of the property (8m wide) adjacent to the proposed basement. Combined vertical displacement across the width of No. 39 Howitt Road is estimated to be approximately 5mm reducing to less than 1mm on the far side of the property foundation.

A plot of combined ground movement profiles along critical section A is provided in Figure 6.

4.5.2 Critical section B – No. 43 Howitt Road

Ground movements for No. 43 Howitt Road have been taken from a displacement line at 9mOD through the width of the property (8m wide) adjacent to the proposed basement. Combined ground movements across the width of No. 43 Howitt Road are estimated to be approximately 2mm, reducing to less than 1mm on the far side of the property foundation.

A plot of combined ground movements along critical section B is provided in Figure 7.

5. BUILDING DAMAGE ASSESSMENT

The calculated ground movement profiles have been used to assess potential 'damage categories' that may apply to the structures at Nos. 39 and 43 Howitt Road due to the proposed basement construction. The methodology proposed by Burland and Wroth[6], and later supplemented by the work of Boscardin and Cording[7], has been used, as described in *CIRIA Special Publication 200*[8] and *CIRIA C760*[9]

General damage categories are summarised in Table 4 below:

Table 4. Classification of damage visible to walls (reproduction of Table 6.4, CIRIA C760

Category	Description
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm).
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very Severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

The above assessment criteria are primarily relevant for assessing masonry structures founded on strip footings. This methodology will be adopted within the damage assessment for Nos. 39 and 43 Howitt Road.

[6] Burland, J.B., and Wroth, C.P. (1974). *Settlement of buildings and associated damage*, State of the art review. Conf on Settlement of Structures, Cambridge, Pentech Press, London, pp611-654

[7] Boscardin, M.D., and Cording, E.G., (1989). *Building response to excavation induced settlement*. J Geotech Eng, ASCE, 115 (1); pp 1-21.

[8] Burland, Standing J.R., and Jardine F.M. (eds) (2001), *Building response to tunnelling, case studies from construction of the Jubilee Line Extension London*, CIRIA Special Publication 200.

[9] CIRIA C760 (2017) *Guidance on embedded retaining wall design*

As set out in Section 4.2 of this report, minimal horizontal deflections of the underpins (<2mm) are expected, assuming good construction practices and control. Therefore, the damage assessment is based primarily on vertical ground movements. Limiting lateral movements have been derived to inform the temporary works design and limit the damage category of the neighbouring properties to within acceptable limits.

5.1 Impact Assessment

The results of the predicted ground movements at No. 41 Howitt Road due to the proposed basement development (short, long term and workmanship) have been compiled to determine the overall critical vertical deflection profiles across the neighbouring properties of Nos. 39 and 43 Howitt Road.

The displacement profiles associated with short and long term heave/settlement due to underpin loading and excavation, and the assumed settlement profile due to underpin workmanship have been combined to determine the deflection ratio for the adjacent properties. The method of deriving these values and establishing an appropriate deflection ratio is illustrated graphically in Figure 6 and Figure 7 for No. 39 Howitt Road and No. 43 Howitt Road respectively. The width of the adjacent properties adjacent to the proposed basement have been taken as approximately 8m.

Based on the calculated maximum deflection ratios, a maximum limiting value for the horizontal deflection of each underpin has been calculated to limit the damage category for the adjacent properties to within Category 1 ('very slight') damage, or Category 2 ('slight') damage. This is also the limit as specified in Camden's basement guidance. The results are summarised in Table 5.

Table 5. Summary of ground movements and corresponding damage category

Party Wall Reference	Horizontal movements[c] (mm)	Maximum deflection (mm)	Horizontal Strain Δ/L[b] (%)	Deflection ratio δ_h/L[a] (%)	Damage category
No. 39 Howitt Road (Section A)	<4.5mm	2.6	0.0563	0.0325	Category 1 ('very slight')
No. 43 Howitt Road (Section B)	<5.5	0.8	0.0688	0.0100	Category 1 ('very slight')
No. 39 Howitt Road (Section A)	<10.0	2.6	0.1250	0.0325	Category 2 ('slight')

Party Wall Reference	Horizontal movements[c] (mm)	Maximum deflection (mm)	Horizontal Strain Δ/L[b] (%)	Deflection ratio δ_h/L[a] (%)	Damage category
No. 43 Howitt Road (Section B)	<10.0	0.8	0.1250	0.0100	Category 2 ('slight')

a. See Figure 6.27 (a) CIRIA C760 (2017) Guidance on embedded retaining wall design. (L = length of adjacent structure in metres, perpendicular to basement; Δ = relative deflection)
b. See Box 6.3 (5) CIRIA C760 (2017) Guidance on embedded retaining wall design. (δh = horizontal movement in metres
c. The movement corresponding to the level of the party wall foundations.

As stated in Section 4.2 of this report long term wall deflection is expected to be very low (i.e. <2mm) however assuming lateral deflection of the underpins is limited to approximately 5mm, the predicted damage category imposed on the neighbouring properties due to the proposed basement development will still be within Category 1 corresponding to 'very slight' damage. The building interaction chart, showing all critical sections, is presented in Figure 8. It is noted that that the building interaction chart is plotted assuming limiting horizontal movement is fully realised.

Good quality workmanship with staged propping of the underpins is essential in controlling horizontal movements and rotation in the short term. It is critical that the basement wall is propped over the long term (i.e. with the basement floor slab) to prevent any long term deflection.

5.2 Monitoring strategy

The results of the ground movement analysis suggest that with good construction control, damage to adjacent boundary walls generated by the assumed construction methods and sequence is likely to not exceed Category 1 ('slight'). A formal monitoring strategy should be implemented on site in order to observe and control ground movements during construction, and in particular movements of the adjacent properties.

The system should operate broadly in accordance with the 'Observational Method' as defined in CIRIA Report 185[10]. Monitoring can be undertaken by installing survey targets to the top of the wall and face of the adjacent buildings. Baseline values should be established prior to commencement of works. Monitoring of these targets should be carried out at regular time intervals and the results should be analysed to determine if unacceptable horizontal translation of the wall or tilt/settlement of the neighbouring walls

[10]Nicholson, D., Tse, Che-Ming., Penny, C., The Observational Method in ground engineering: principles and applications, CIRIA report R185, 1999.

is occurring. Regular monitoring of these targets will allow ground movement trends to be detected early such that mitigation strategies may be implemented if required.

Monitoring data should be checked against predefined trigger limits and reviewed regularly to assess and manage the damage category of the adjacent buildings as construction progresses.

It is recommended that a condition survey is undertaken on all adjacent walls and property facades prior to the works commencing and ideally when monitoring baseline values are established. Existing cracks or structural defects should be carefully recorded, documented and regularly inspected as construction progresses.

6. DESICCATION ASSESSMENT

The Landmark Trees Aboricultural Impact Assessment report[11] assessed that the potential impacts of the proposed basement development at No. 41 Howitt Road were 'all very low in terms of Recommended Protected Area encroachments of the on and off-site trees' and the proposals will not have any significant impact on either the retained trees or wider landscape.

Based on the plasticity data obtained from the Albury S.I. ground investigation, the London Clay beneath the site is classified as clay with a very high plasticity, with Plasticity Limits of 54% at 1.0 bgl and 57% at 3.0m bgl, which indicate a high volume change potential[12]. BRE 412[12] gives an empirical relationship to estimate the onset of significant desiccation. This is reported to occur when the moisture content, w, is 0.4 times the Liquid Limit, w_L i.e. if $w < 0.4w_L$ then the soil is significantly desiccated.

Two Atterberg Limit tests on soil samples obtained from the Albury borehole BH1 recorded Liquid Limits of 83% at 1.0m bgl and 81% at 3.0m bgl. At 1.0m bgl $0.4w_L$ is 33.2% which is higher than the corresponding moisture content, w *of* 27.7%, suggesting, based on the given criteria, that the upper layer is desiccated. At 3.0m bgl desiccation $0.4w_L$ is 32%, approximately equal to the corresponding moisture content, w of 31.5% suggesting no significant desiccation at this depth. It should be noted that the $w < 0.4w_L$ criteria is considered to be a crude method for assessing desiccation as it is based on moisture content which, due to inaccuracies in laboratory testing small changes in moisture content, and does not take into account the decreasing moisture content with depth which typically occurs in overconsolidated soils.

Taking this into consideration, and that there is little variation in the moisture contents (ranging between 26.3% and 33.2% over the 4.2m depth of the borehole), suggesting the clay is slightly desiccated within the top layer and tree root zone. The proposed basement excavation is considered to extend the new foundations to a depth below the zone of shrink/swell influence and impact from any potential desiccation due to nearby trees.

With reference to the Landmark Trees report differential heave/shrinking across the adjacent property foundations will only have the potential to occur at the front of the property where the existing 8.0m high cherry tree root zone falls close to the footprint of

[11] Landmark Trees, Aboricultural impact assessment report, 41 Howitt Road, April 2014
[12] NHBC (2013) *NHBC Standards. Chapter 4.2 Building near trees.*

the party wall with No 39. The root zones of the trees to the rear of the property (mature Ash, Plum and Cotoneaster) do not extend across the party walls of the adjacent buildings and therefore will not impact on the party wall foundations, although the tree root zone of the mature ash tree is shown to extend across the proposed retaining basement wall of No. 41.

The cherry tree at the front of the property is estimated to be approximately 6.0m from No. 39 and No. 41 party wall. According to the NHBC guidance in Chapter 4.2, Building near trees, (chart 1, Appendix 4.2-B for soils with high volume change potential) the minimum depth required for the foundation to be unsusceptible to shrink swell movements due to the cherry tree is 1.0m bgl. Trial Pit TP2 shown on the development drawing 1308.22.a indicates the foundation to No 39 is at '700m or more below ground level' and therefore the foundation depth may be less than the 1.0m depth recommended using the NHBC tables. However, if differential ground movement due to desiccation were an issue, it is likely some cracking would be apparent currently along the front wall of No. 41 where there is a combination of basement underpinned foundations below the desiccated zone, and shallow footings within the slightly desiccated upper layer. No such damage was observed during the David Dexter building survey, and the Basement Impact Assessment records that the external and internal appearance of the wall appeared to be in 'good condition'. Based on these visual observations, and that the upper layer is not anticipated to be significantly desiccated, it is considered that the potential impact of differential shrink/swell ground movement between the basement party wall underpins and existing shallow footings, will be low, and that transitional underpins beneath other wall foundations of No. 39 and No. 41, other than the new basement party walls, would be over cautious.

7. CONCLUSIONS AND RECOMMENDATIONS

The findings of this report are informed by site investigation data and information regarding construction methods, sequence and loading as provided by the Structural Engineer. The analysis is undertaken on the assumption of a good standard of workmanship and propping during basement construction.

The construction of the basements will generate ground movements due to a variety of causes including heave, settlement, and underpin deflection during and after excavation. Calculations indicate that these can be controlled to within 'Category 1 ('slight') damage for the adjacent properties of No. 39 Howitt Road and No. 43 Howitt Road. The above assumes a good standard of workmanship during construction and a limiting horizontal movement to inform the temporary propping design of the underpins.

It is recommended that a condition survey is undertaken and an appropriate monitoring regime is adopted to manage risk and potential damage to the neighbouring structures as construction progresses onsite.

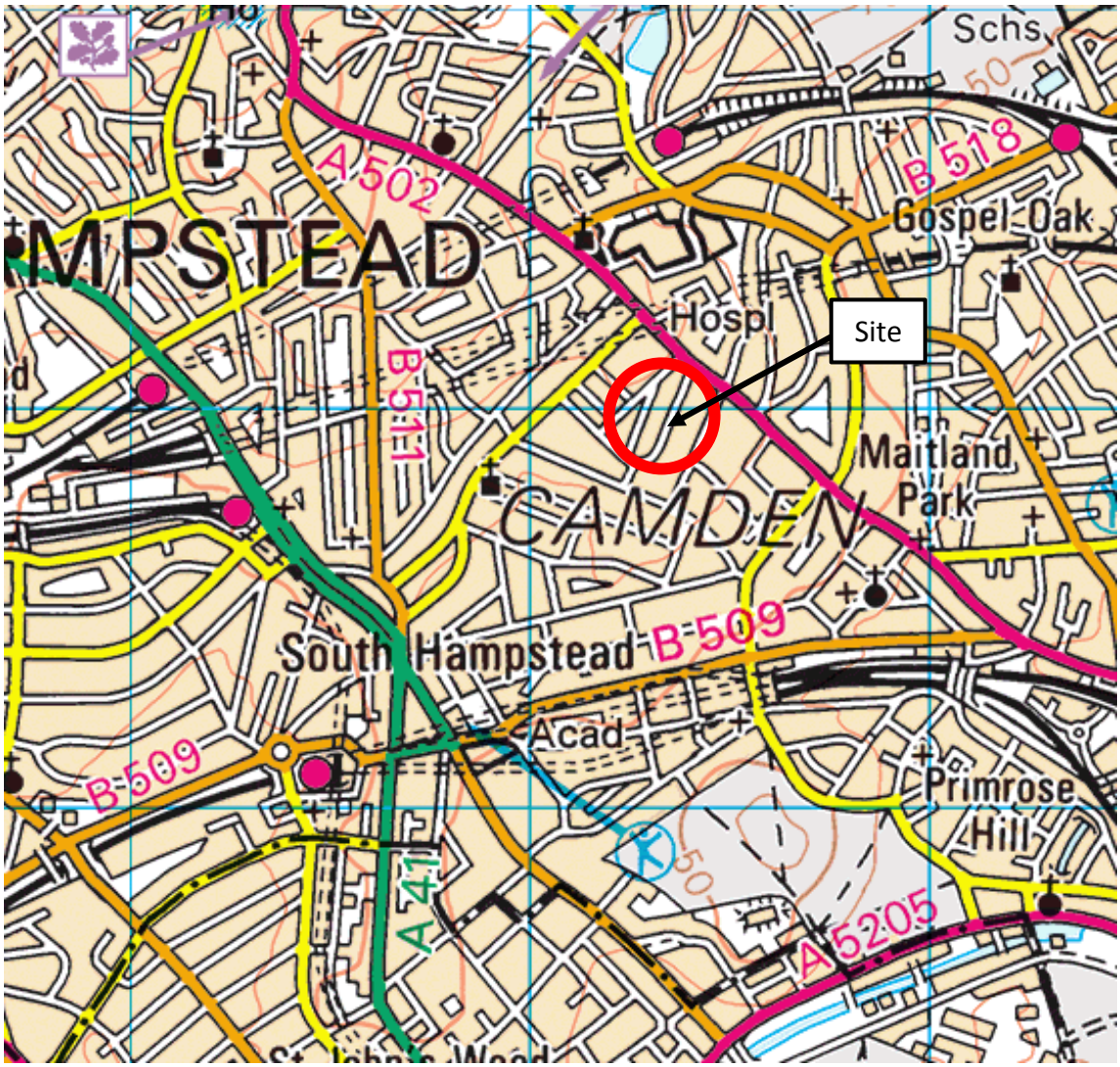
The proposed basement is unlikely to be founded below groundwater level and as such groundwater control is not likely to be required during construction. Any groundwater encountered is likely to be limited and confined to perched pockets within the Made Ground or London Clay Formation and this can be controlled with isolated sump pumping.

Based on an assessment of available information the upper soil layers are considered to be slightly desiccated, however the proposed basement excavation will extend the new foundations to a depth below the zone of shrink/swell influence and therefore impact on the underpinned wall foundations, from potential desiccation due to nearby trees, is considered to be low. Furthermore, no structural damage attributable to differential shrink/swell movement has been observed between existing shallow wall footings and the existing underpinned basement wall of No. 43. Based on these observations and the suggested marginal desiccation, it is considered that the impact of potential differential shrink/swell ground movement between shallow and deeper basement foundations will be low, and that transitional underpinning beneath No. 39 and No. 43 walls, other than the new basement party walls, will not be required.

Notwithstanding this, it is recommended a compressible material is placed behind the retaining basement wall to the rear of the property which falls within the tree root zone of

a neighbouring mature Ash tree, or that the retaining structure be designed to accommodate potential heave forces resulting from shrink/swell movement due to potential desiccation.

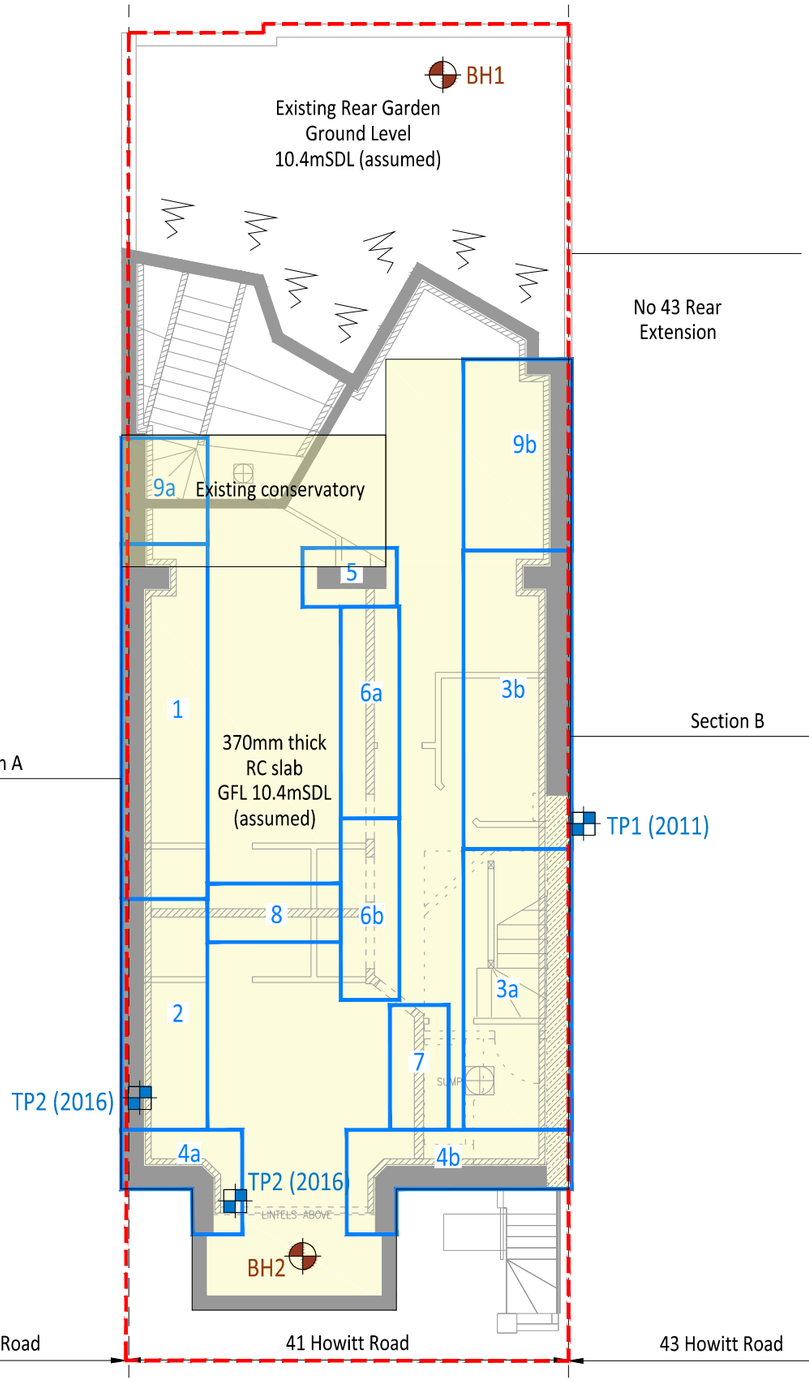
FIGURES



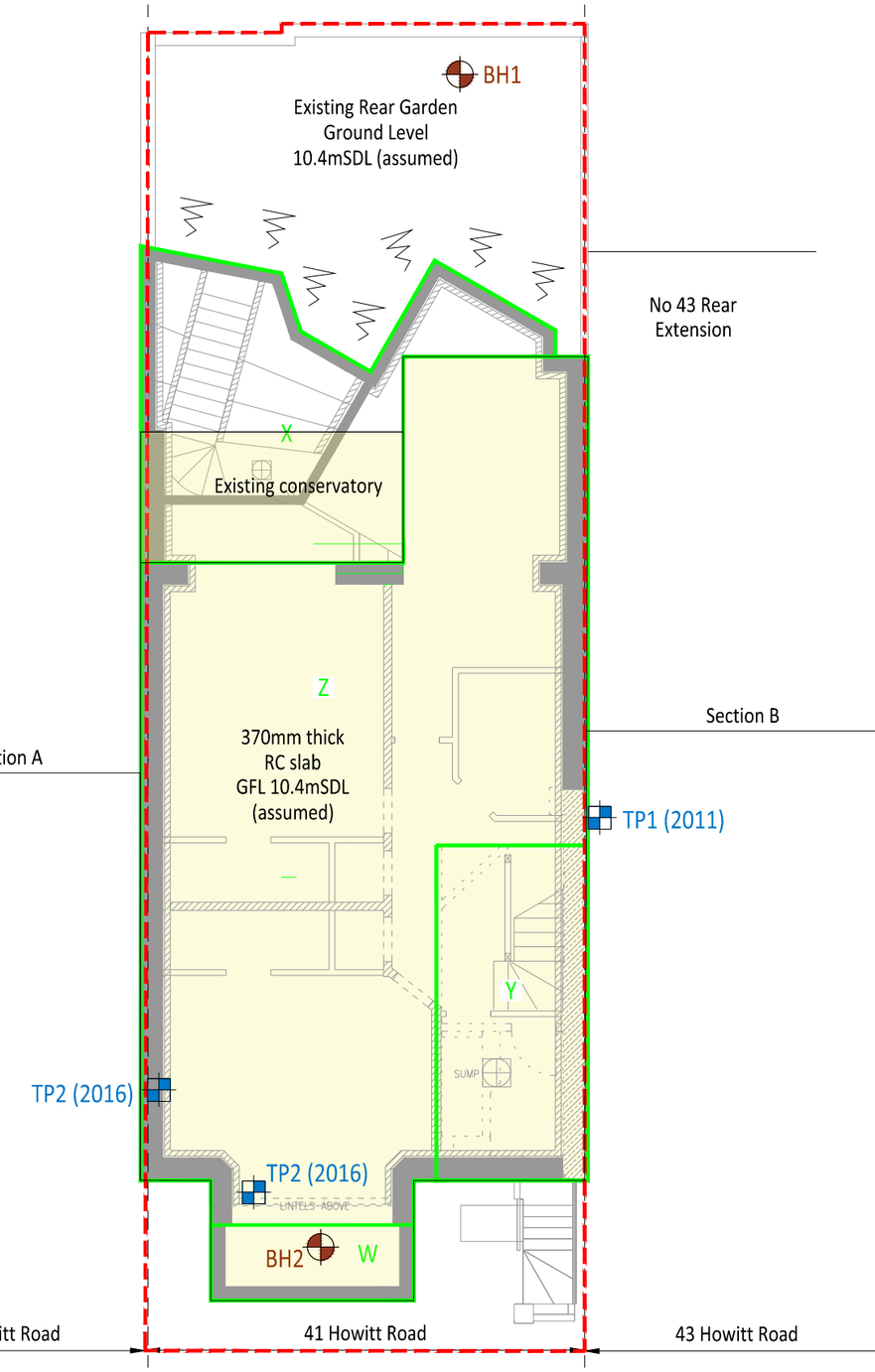
N

Client	Project	Job No
Mr. J. Youngman	**41 Howitt Road, Hampstead, London NW3 4LU**	**CG/28201**
CGL	Title: **Site location plan**	**Figure 1**

Underpin Load Areas 1 to 9b



Excavation areas W, X, Y & Z



KEY

- Site Boundary
- Borehole (BH1) - Albury SI, July 2014
- Borehole (BH2 & rising head test) - PJ Drilling Ltd April 2016
- Hand Dug Trial Pits
- Existing Building Footprint
- Underpin Load Areas
- Excavation Areas

Notes.

1. Ground floor level 10.0m above assumed Site Datum Level (SDL).

Rev	Date	Comments
0	23/05/17	

CGL
Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW
T: 01483 310600

Project: **41 Howitt Road, Hampstead, London, NW3 4LU**

Client: **Mr. J. Youngman**

Drawing title: **Figure 2 - Site Layout and Exploratory Hole Location Plan**

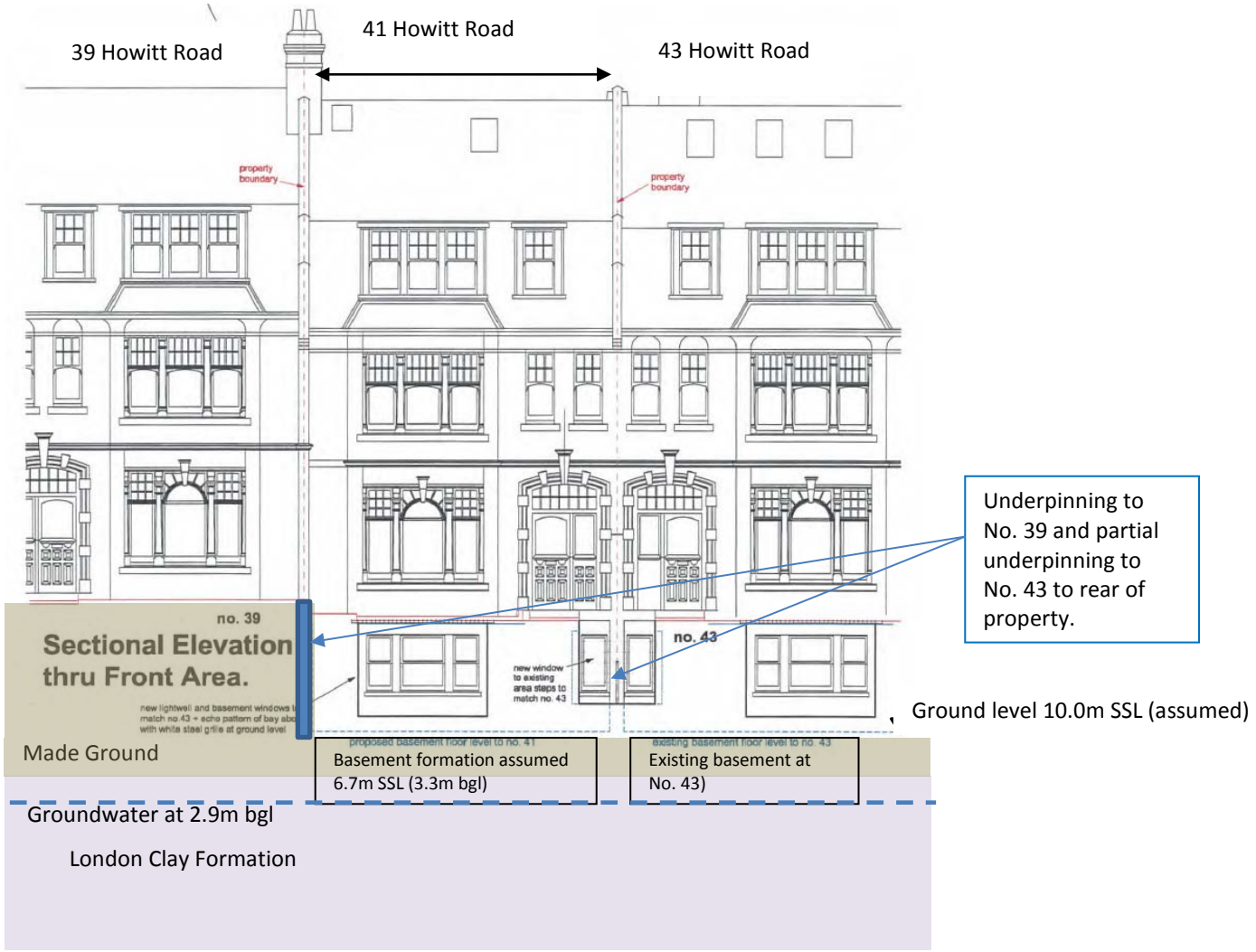
Scale(s): **NTS**

Job No.: **CG/28201**

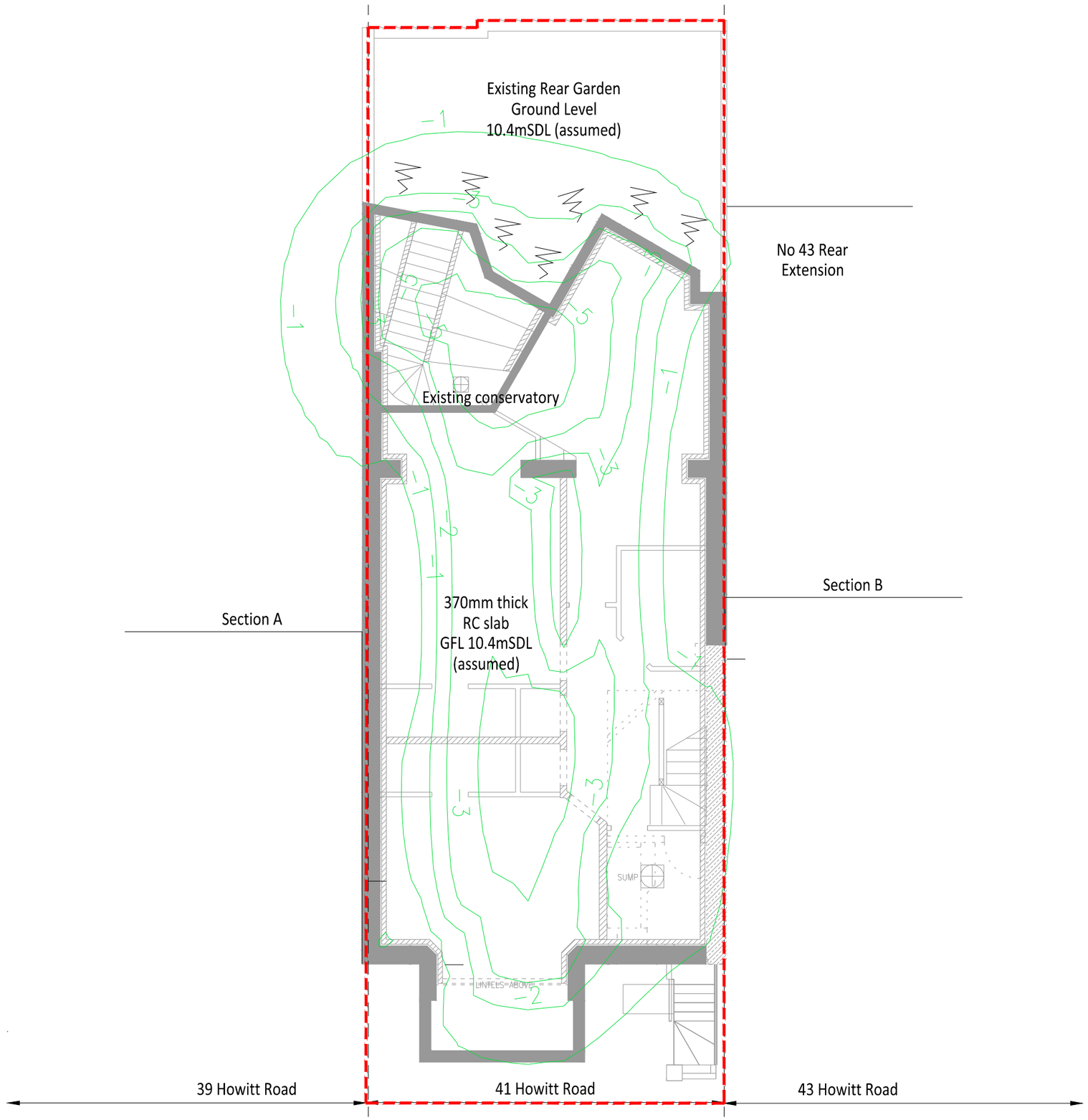
Drawn	TSB	23/05/17
Checked		
Approved		

Dwg No.: **CG/28201-001**

Rev.: **0**



Client	Project	Job No
Mr. J. Youngman	**41 Howitt Road, Hampstead, London NW3 4LU**	**CG/28201**
CGL	Title: **Conceptual site model**	**Figure 3**



KEY

Notes.

1. Negative values indicate heave; positive values indicate settlement.

Rev	Date	Comments
0	18/05/17	

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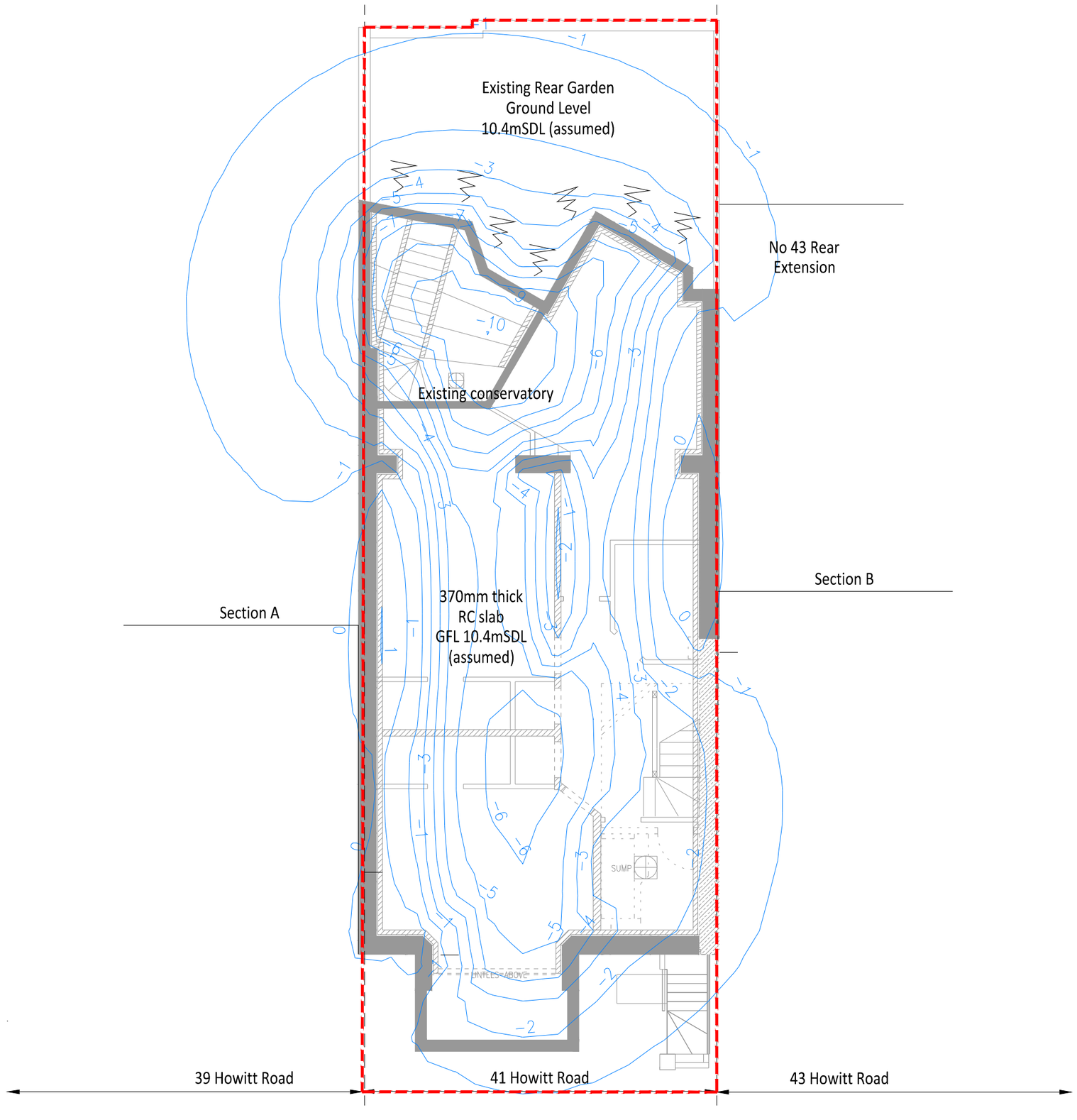
Client
Mr. J. Youngman

Drawing title
Figure 4 - Undrained displacement contours

Scale(s)	Job No.
NTS	**CG/28201**

Drawn	TSB	18/05/17	Dwg No. **CG/28201-002**	Rev. **0**
Checked				
Approved				



KEY

Notes.

1. Negative values indicate heave; positive values indicate settlement.

Rev	Date	Comments
0	18/05/17	

Card Geotechnics Ltd
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Project
41 Howitt Road, Hampstead, London NW3 4LU

Client
Mr. J. Youngman

Drawing title
Figure 5 - Drained displacement contours

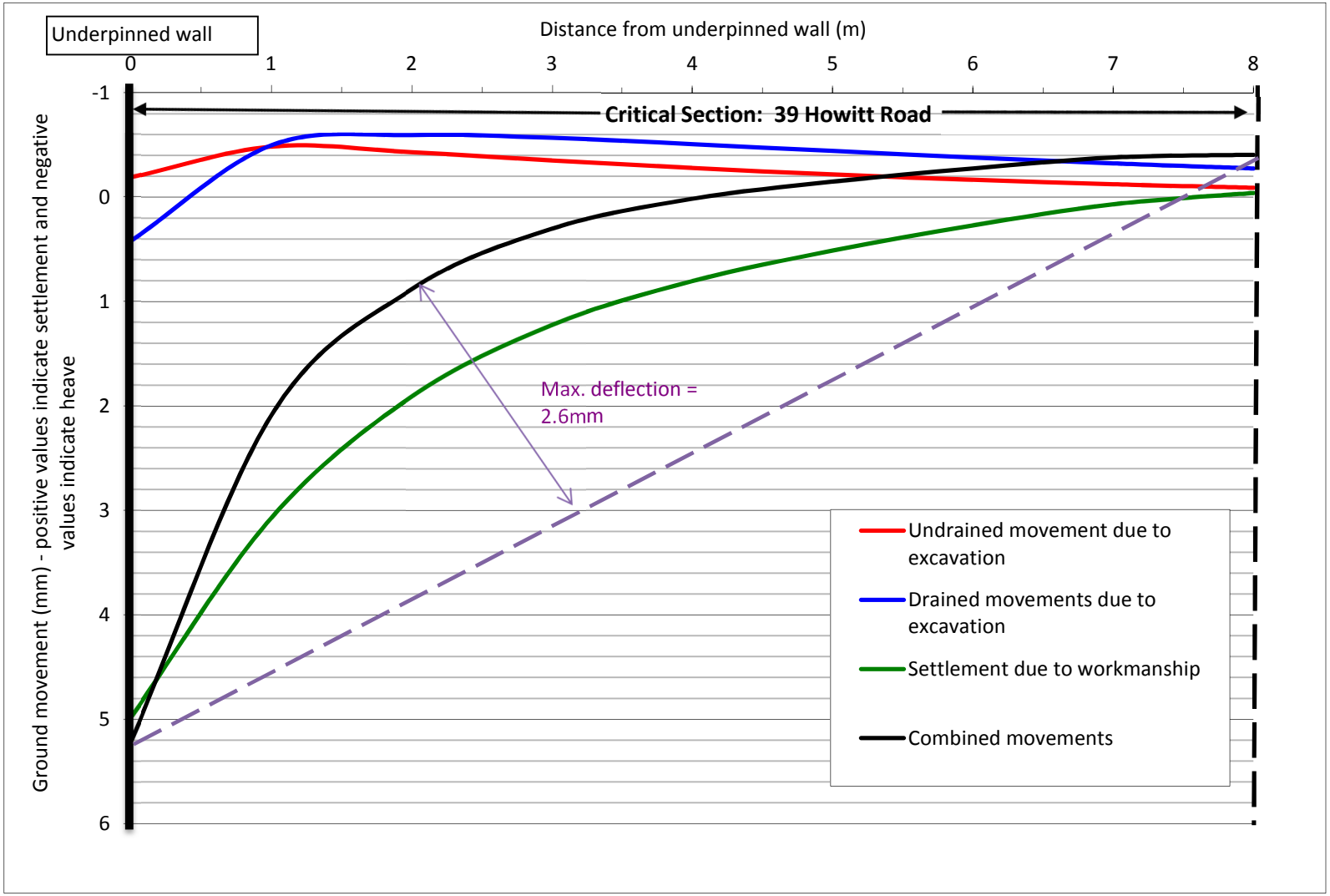
Scale(s)
NTS

Job No.
CG/28201

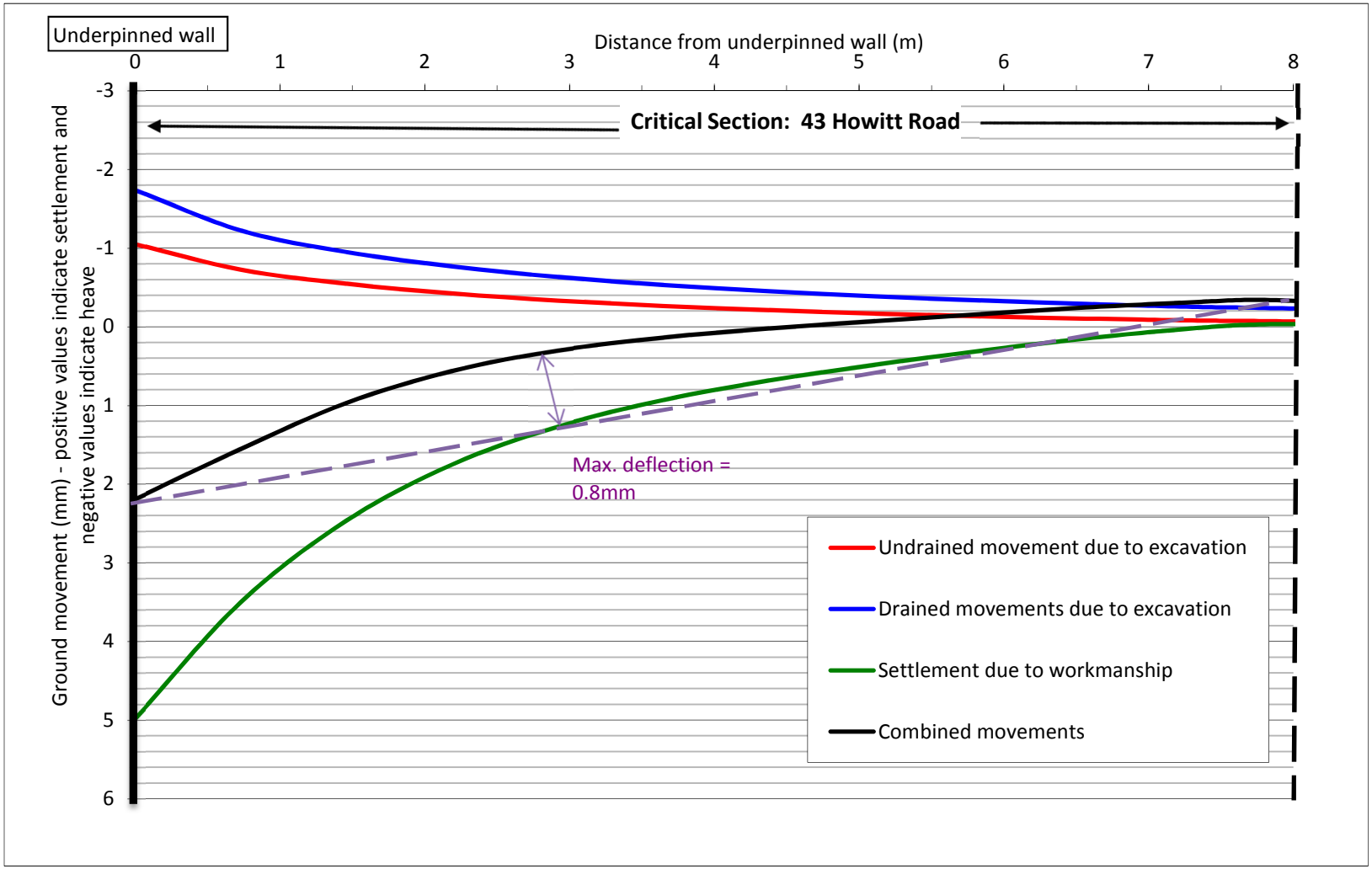
Drawn	TSB	18/05/17
Checked		
Approved		

Dwg No.
CG/28201-003

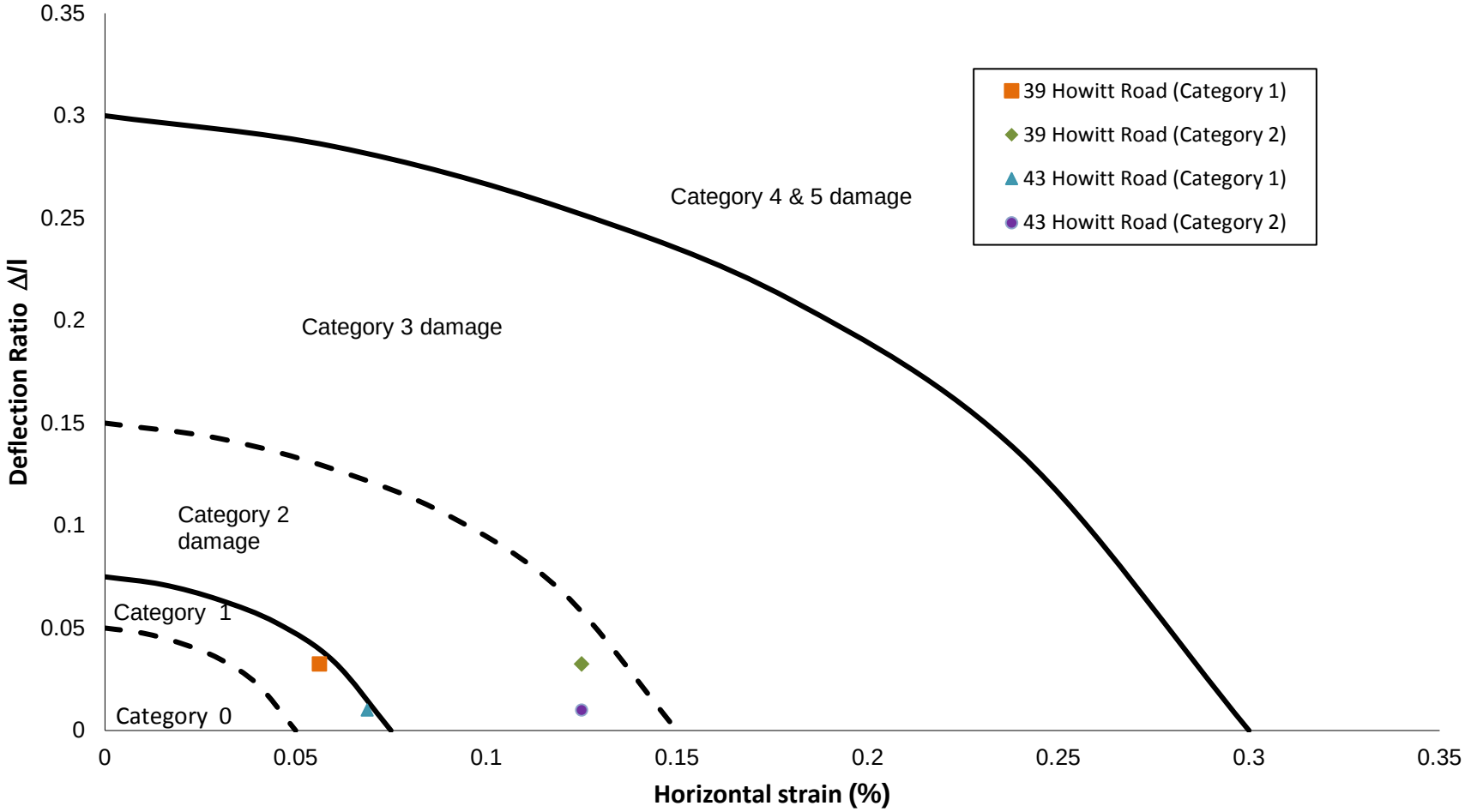
Rev.
0



Client	Project	Job No
Mr. J. Youngman	**41 Howitt Road, Hampstead, London NW3 4LU**	**CG/28201**
CGL	Title **Combined ground movements – No. 39 Howitt Road (section A)**	**Figure 6**



Client	Project	Job No
Mr. J. Youngman	**41 Howitt Road, Hampstead, London NW3 4LU**	**CG/28201**
CGL	Title **Combined ground movements – No. 43 Howitt Road (section B)**	**Figure 7**



Client	Project	Job No
Mr. J. Youngman	**41 Howitt Road, Hampstead, London NW3 4LU**	**CG/28201**
CGL	Title: **Damage Category Plot**	**Figure 8**

APPENDIX A

Campbell Reith/Chelmer BIA audit comments schedule

From: Graham Kite/CRH
To: "Sexton, Gavin" <gavin.sexton@camden.gov.uk>
Cc: Camden Audit/CRH@campbellreith
Date: 21/03/2017 09:01
Subject: 12466-56 41 Howitt Road

Hi Gavin

Please find below brief comments in regards to 41 Howitt Road, after review of the BIA documents and Chelmer's Audit. I have addressed comments in the same order as Chelmer's previous response, in the table below. I have also listed short bullet points for recommended further action and at the end, notes / observations (which formed the basis of our assessment).

I hope this is clear. We are of course happy to discuss this further with you. You can reach me on the number below or 07472 611560.

Regards

Graham Kite

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consulting engineers
Friars Bridge Court,
41-45 Blackfriars Road,
London
SE1 8NZ

Tel +44 (0)20 7340 1700
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Summary (with reference to Table 1 of Comments from Chelmer in response to DDA's Revision E BIA)

Item	Topic	Chelmer's Comments	Campbell Reith's Comments
1	Damage to neighbouring properties	The damage category has not been calculated in accordance with the Burland system; Separate assessments will be required for adjacent properties as foundations at different levels; CPG4 requires mitigation to be proposed where Category 1 damage or greater is predicted.	Agreed - recommendations below. The damage impact assessment predicts Category 2 damage but does not consider the effects of heave, does not consider separate load bearing walls, and is not considered conservative.
2	Land stability assessment	No evidence presented that an appropriately qualified engineer / geologist has assessed the scheme.	Agreed - CGL (Ian Marychurch) specifically limits his comments to the hydrogeology assessment.

3	Extent of underpinning to neighbours	Basement under no 43 is partial so requirement to underpin the remainder of the party wall - the risk to no 43 has not been identified.	Agreed - the use of transition underpins is suggested by DDA but not in sufficient detail (see also temporary and permanent works recommendations below).
4	Known areas of flooding	Specific reference to SFRA required; the site is within a Critical Drainage Area which should be identified and assessed.	Agreed - additionally, consideration of attenuation SUDS in accordance with CPG4 3.51 should be made.
5	Groundwater	Resolved	
6	Groundwater (drainage from rear patio)	Rear patio drainage may discharge to public sewer and impact should be assessed	See 4 - attenuation SUDS should be considered
7	Arboricultural impact assessment	Potential for shrink / swell movements to be generated by tree action	Agreed - soils tested in the SI indicate signs of desiccation and the structure shows sign of historic movements. Risk / impacts should be evaluated (see below)
8	Services survey	Identification of underground infrastructure is required in the land stability screening	Agreed - underground infrastructure should be identified and impacts assessed if within zone of influence
9	Borehole / trial pit	Resolved	
10	Clay cohesion value	Resolved	
11	Risks of groundworks	Resolved	The temporary and permanent works are not presented in sufficient detail to be able to assess if all impacts have been suitably mitigated.
11	Mitigation measures	Mitigation measures for the effects of underpinning cannot be delegated to the Party Wall surveyor; mitigation proposed is generic and does not relate to reducing the potential impacts of the proposed scheme.	Agreed - Category 2 damage is predicted and no mitigation of this is proposed. Further, the damage impact assessment neglects the effects of heave, does not consider individual load bearing walls, and is not considered conservative.
11	Monitoring	Resolved	The structural monitoring proposed will need to be updated to specifically address the scheme's predicted movements, and include suitable trigger values and contingency actions.
12	Retaining wall design	Resolved	
13	Drawings	Resolved	Should be updated once temporary and permanent works, transition underpinning etc have been clarified

14	Previous damage	Resolved	DDA dismiss the previous damage as historic, but this has not been demonstrated considering the potential for desiccated clays and arboricultural effects (see 7)
15	LBC's development policies	Resolved	
16	Construction Measures	Resolved	

Conclusions / Recommendations

The comments of the auditor are generally agreed with, and further assessment is required:

- Temporary and permanent works to be consistently presented, including proposed sequencing, propping, transitional underpinning etc.
- Effects of shrink / swell, removal of the existing trees and consideration of the exiting building damage to be assessed.
- GMA and damage impact assessment to consider the temporary works and the effects of heave, and should be calculated in accordance with the guidance. Mitigation should be proposed where Category 1 or greater damage is predicted. All structures including the highway and utilities to be identified and assessed.
- Appropriate structural monitoring including trigger values and contingency actions should be proposed.
- Appropriate drainage in accordance with CPG4 3.51 to be proposed.
- All assessments to have been demonstrably reviewed and approved by appropriately qualified individuals in accordance with CPG4.

Notes / Observations

1. The BIA has been prepared by DDA with an audit undertaken by Chelmer. The scheme involves an extension of an existing 1-storey basement, to include the full footprint of the building plus a rear extension.

2. The site is part of a terrace of houses. There is an existing basement at 43 Howitt Road. There is no basement at 39.

3. The underlying ground conditions are Made Ground over London Clay. The SI describes roots to 3m and the testing would suggest the clay is desiccated. There are trees at the rear garden boundary.

4. In the description of the existing property, damage is described including cracking and bowing of walls. This damage is not further assessed, but rather is dismissed a historic. There is no consideration of potential movements due to shrink swell of the clay.

5. Temporary works involves underpinning and temporary propping, The BIA and CMA are not consistent in their descriptions, although it is accepted the BIA has been

updated more recently in response to Chelmer comments. The level of detail of sequence and propping we normally ask for has not been presented.

6. The GMA has allowed for the retaining walls to be unpropped cantilevers in the permanent case. However, it has neglected potential heave effects.

7. The GMA predicts Category 2 damage and makes no recommendations for further mitigation, as required by CPG4, Section 3.27. The GMA has not considered individual load bearing walls, and therefore only provides an estimate of general movements. rather than being able to predict damage to particular walls. Without the inclusion of heave effects, the GMA is not considered to account for all potential movements.

8. It is mentioned that transition underpinning may be required to stabilise neighbouring property (no 39). This is not detailed and the BIA states this would be decided under the Party Wall Act.

9. Likewise, a suitable monitoring plan has not been proposed and has been assumed to be be agreed under the Party Wall Act (target positions are mentioned, but should be presented with trigger values and contingency actions).

10. No impact assessment on the highway / pavement has been undertaken.

11. Attenuation SUDS has not been considered. The site is within a Critical Drainage Area,

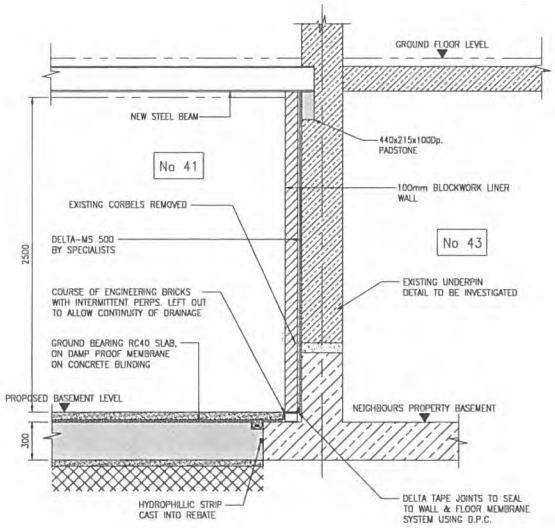
12. It has not been demonstrated that all sections have been reviewed by appropriately qualified individuals.

13. The BIA recommends the following, which would normally be undertaken as part of the BIA:
    - Identification of underground utility infrastructure and tunnels that may be affected.
    - Impact of tree removal to be assessed.
    - Heave assessment, and appropriate temporary and permanent works to be designed to mitigate effects.
    - Drainage proposal to be developed .

-
-

APPENDIX B

Proposed development plans



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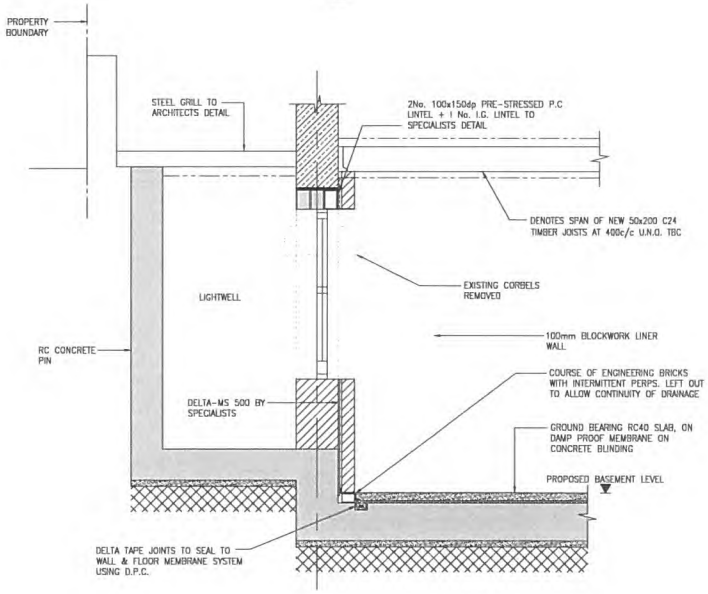
SCALE 1:20



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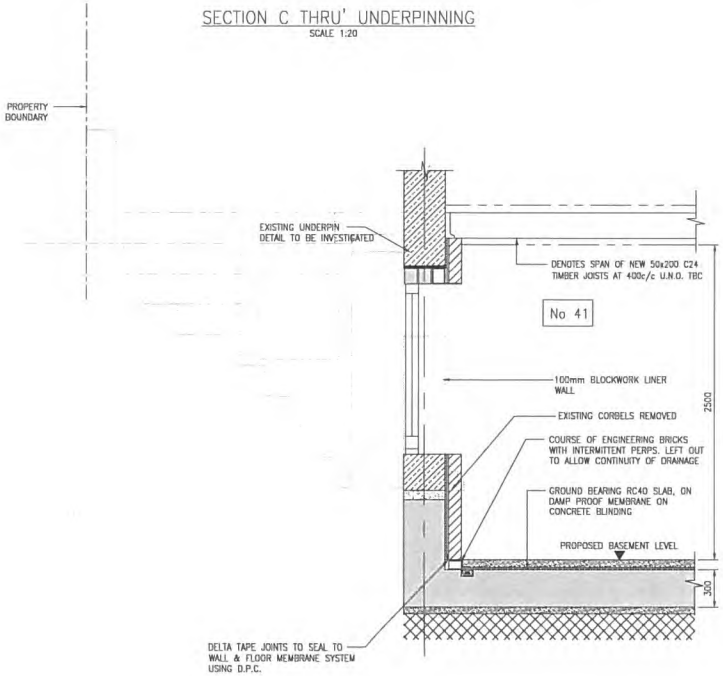

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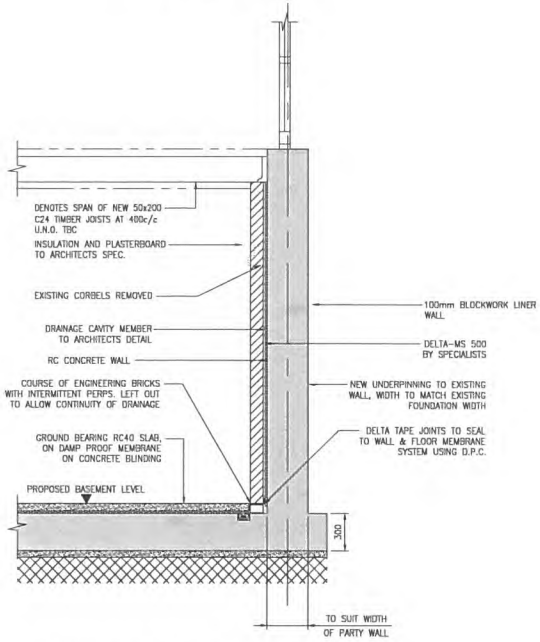

SECTION F THRU' RETAINING WALL
SCALE 1:20

NOTES

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2. DO NOT SCALE FROM THIS DRAWING WORK ONLY TO FIGURED DIMENSIONS.

3. FOR STANDARD NOTES REFER TO DRAWING 1343-000.

ISSUE	REVISION	DATE	INITIAL
P2	FOR COMMENT	20/11/14	MC
P1	FOR COMMENTS	17/10/14	AT

Project
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Client
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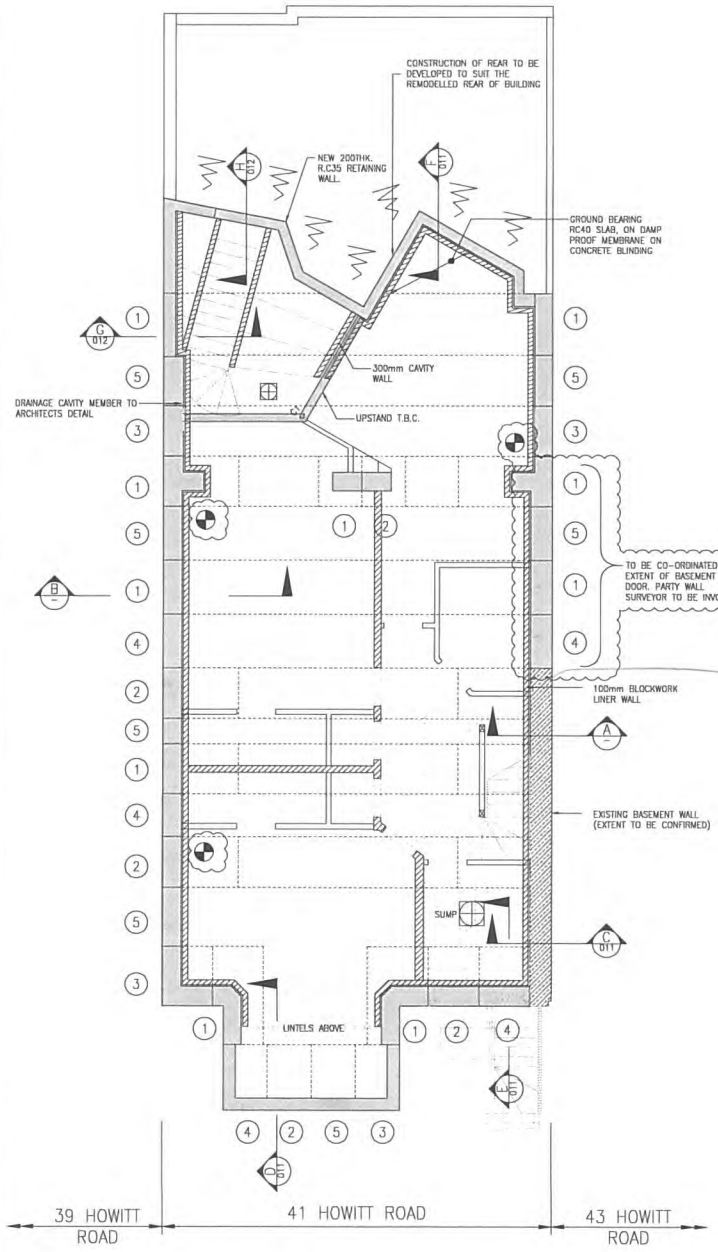
Title
BASEMENT SECTIONS
SHEET 1

STRUCTURAL DRAWING

Designed	RC	Approved	
Drawn	MC	Project Engineer/Director	Date
Scale	AS SHOWN	North	Drawing No: 1343-011 Issue P2
Date	SEPT 14		



BASEMENT PLAN
SCALE 1:50

INDICATIVE CONSTRUCTION SEQUENCE:

- INSERT NEW STEELS AT GROUND LEVEL TO PROVIDE SUPPORT TO WALLS ABOVE
- SPREAD LOAD OF BEAMS ONTO TEMPORARY PROPS (TO BE DEVELOPED BY THE CONTRACTOR)
- COMMENCE UNDERPIN SEQUENCE TO WALLS
- CREATE BASEMENT SLAB
- REMOVE STEEL BEAM TEMPORARY SUPPORT
- CONSTRUCTION OF REAR BUILDING WORKS

NOTE:
CONSTRUCTION SEQUENCE AND DETAILS OF TEMPORARY PROPPING THROUGHOUT TO SUPPORT BUILDING ABOVE IS TO BE DEVELOPED BY CONTRACTOR IN THE TEMPORARY WORKS DESIGN, FOR COMMENT BY DDA DURING THE WORK PLANNING PROCESS, WELL BEFORE CONSTRUCTION COMMENCES

NOTE:
CONTRACTOR TO CHECK UNDERGROUND OBSTRUCTIONS USING APPROPRIATE METHODS PRIOR TO EXCAVATION TAKING PLACE.

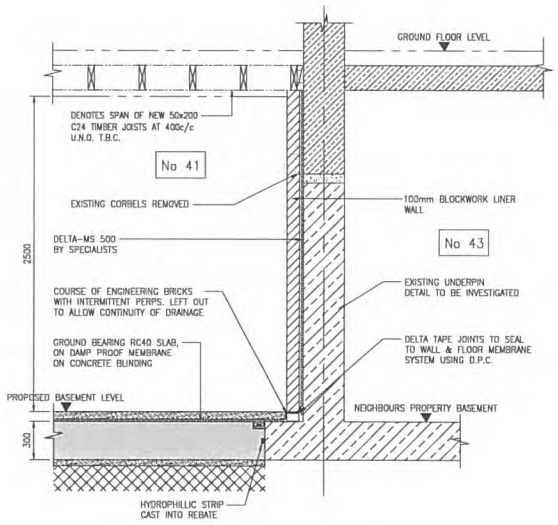
NEW UNDERPINNING TO EXISTING WALLS TO ACCOMMODATE NEW LOW LEVEL BASEMENT.

(1) DENOTES SEQUENCE – REFER TO SPECIFICATION.

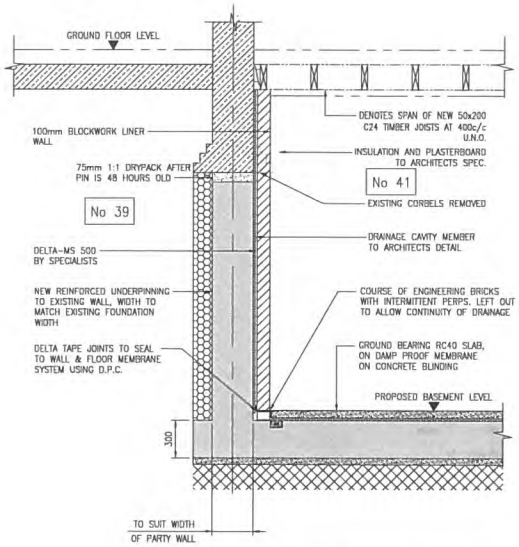
THICKENINGS MAY BE REQUIRED IN BASEMENT SLAB TO SUPPORT LOAD BEARING WALLS

COLUMN SCHEDULE	
MARK	DESCRIPTION
C1	80x80x5.0 SHS

= INDICATES MOVEMENT MONITORING POINTS TO BE SET UP BY CONTRACTOR AND PARTY WALL SURVEYOR. SEE UNDERPINNING NOTES FOR DETAIL



SECTION A THRU' UNDERPINNING
SCALE 1:20



SECTION B THRU' UNDERPINNING
SCALE 1:20

NOTES

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2. DO NOT SCALE FROM THIS DRAWING WORK ONLY TO FIGURED DIMENSIONS.
3. FOR STANDARD NOTES REFER TO DRAWING 1343-000
4. BASEMENT UNDERPINNING CONSTRUCTION METHOD TO BE PROPOSED BY THE CONTRACTOR AND APPROVED BY DDA

ISSUE	REVISION	DATE	INITIAL
P4	REVISED AS CLOUDED	1/08/15	AT
P3	FOR COMMENT	20/11/14	MC
P2	FOR COMMENT	17/10/14	MC
P1	FOR PLANNING	03/09/14	MC

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Title
BASEMENT PLAN AND SECTIONS

STRUCTURAL DRAWING

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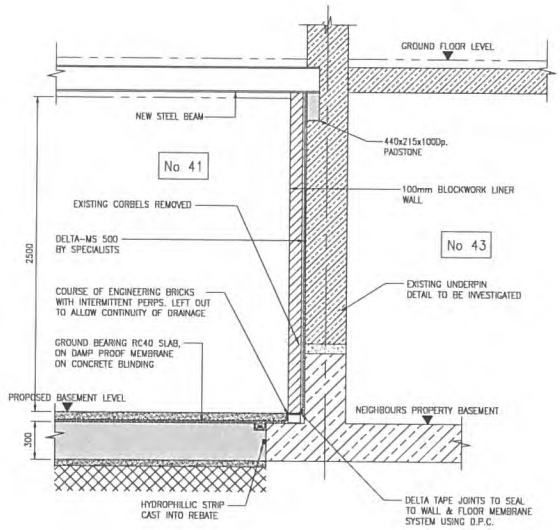
Drawn	MC	Project Engineer/Director	Date
Scale	AS SHOWN	North	Drawing No: 1343-010 Issue P4
Date	SEPT 14		



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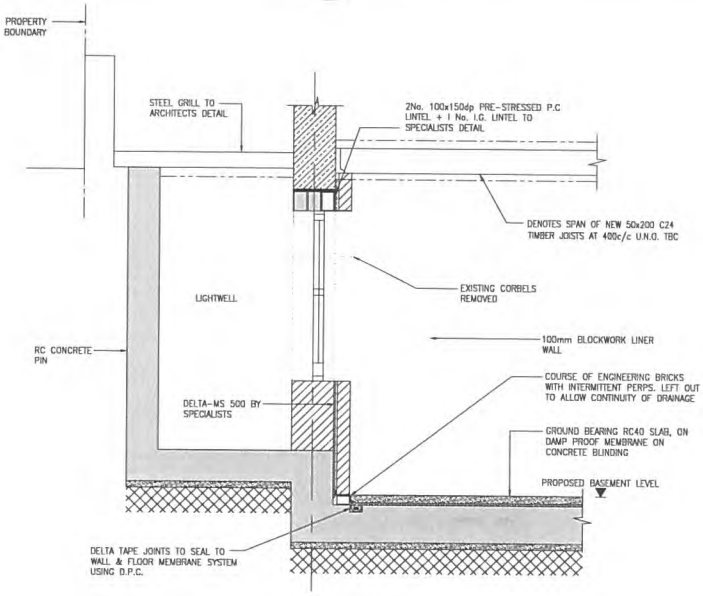

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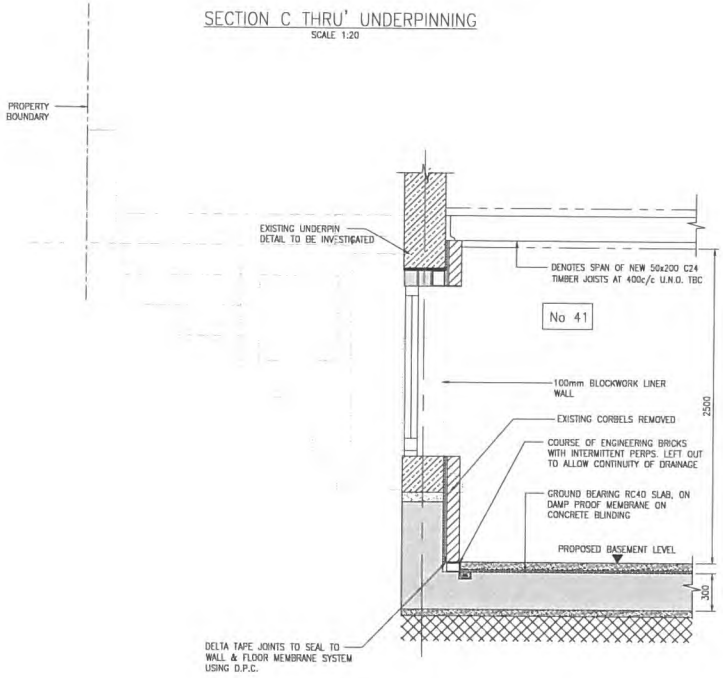

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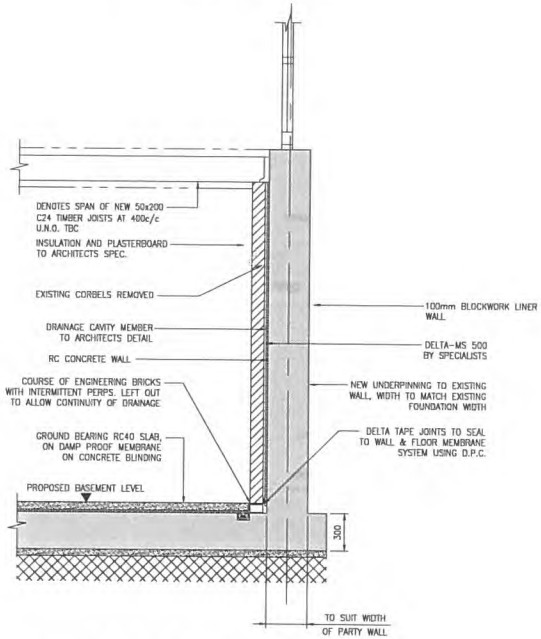

SECTION F THRU' RETAINING WALL
SCALE 1:20

NOTES

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P2	FOR COMMENT	20/11/14	MC
P1	FOR COMMENTS	17/10/14	AT

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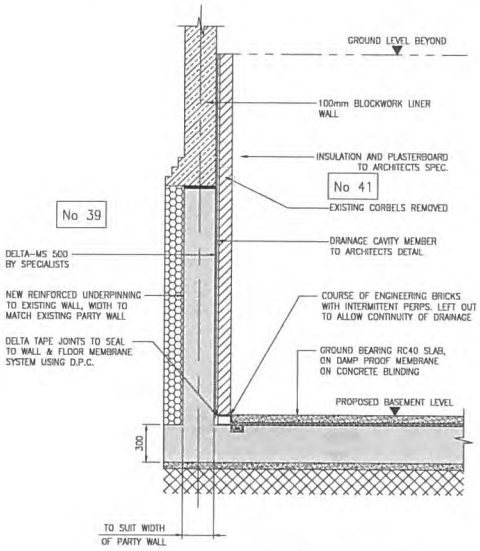
Title
BASEMENT SECTIONS
SHEET 1

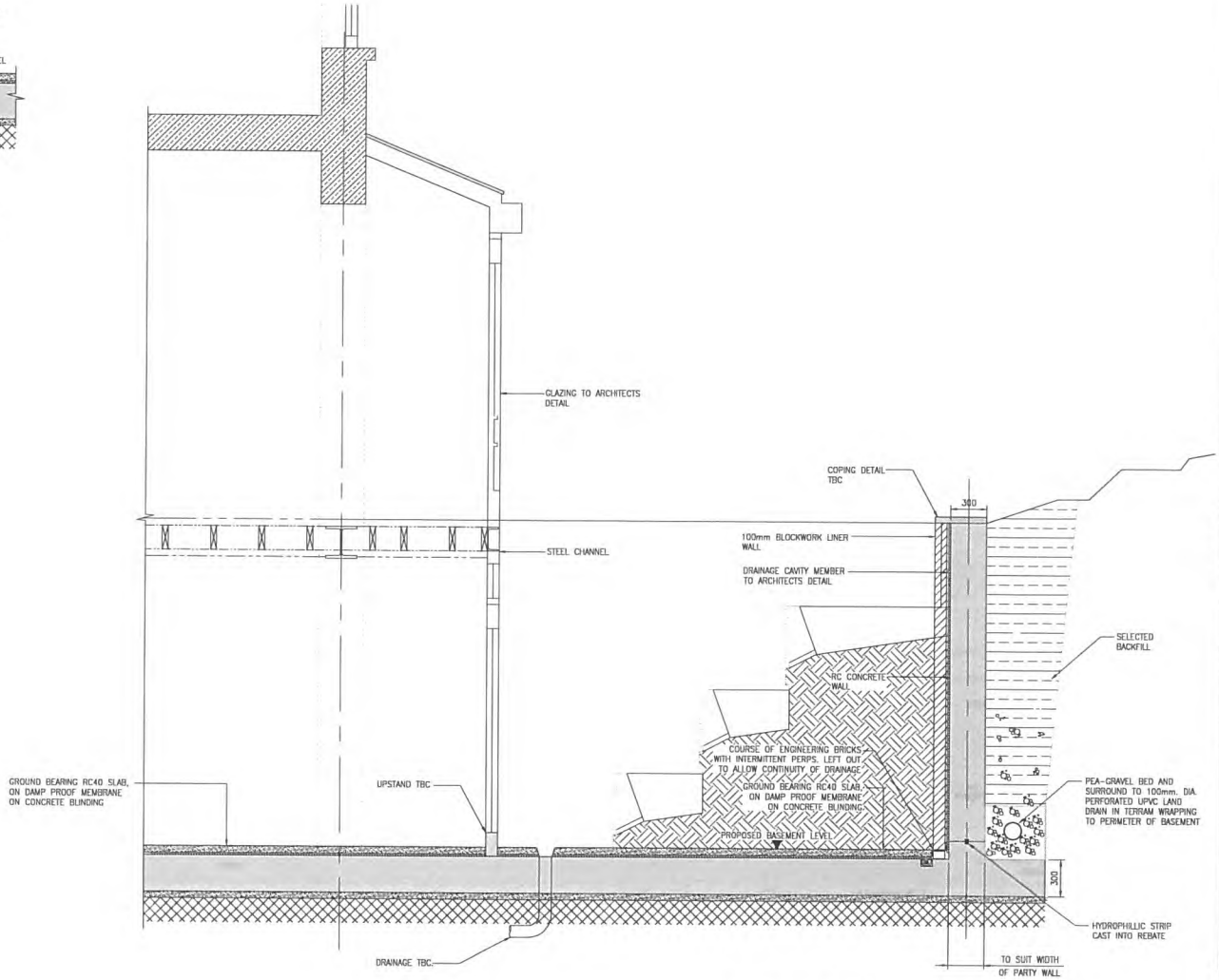
STRUCTURAL DRAWING

Designed	RC	Approved	
Drawn	MC	Project Engineer/Director	Date
Scale	A3 SHOWN	North	Drawing No: 1343-011 Issue: P2
Date	SEPT 14		



SECTION G THRU' UNDERPINNING

SCALE 1:20



SECTION H THRU' UNDERPINNING

SCALE 1:20

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ISSUE	REVISION	DATE	INITIAL
P2	FOR COMMENT	20/11/14	MC
P1	FOR COMMENT	17/10/14	AT

Project

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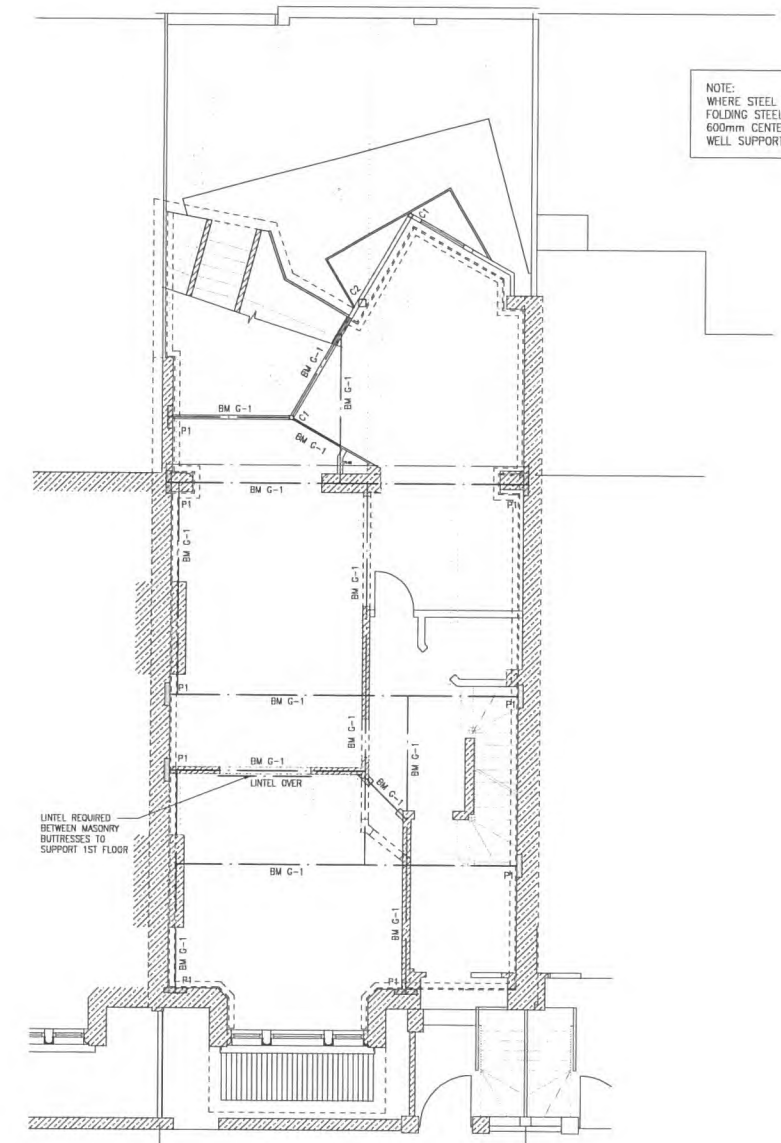
Title

BASEMENT SECTIONS SHEET 2

STRUCTURAL DRAWING

Designed	RC	Approved	
Drawn	MC	Project Engineer/Director	Date
Scale	AS SHOWN	North	Drawing No: 1343-012
Date	SEPT 14		Issue P2

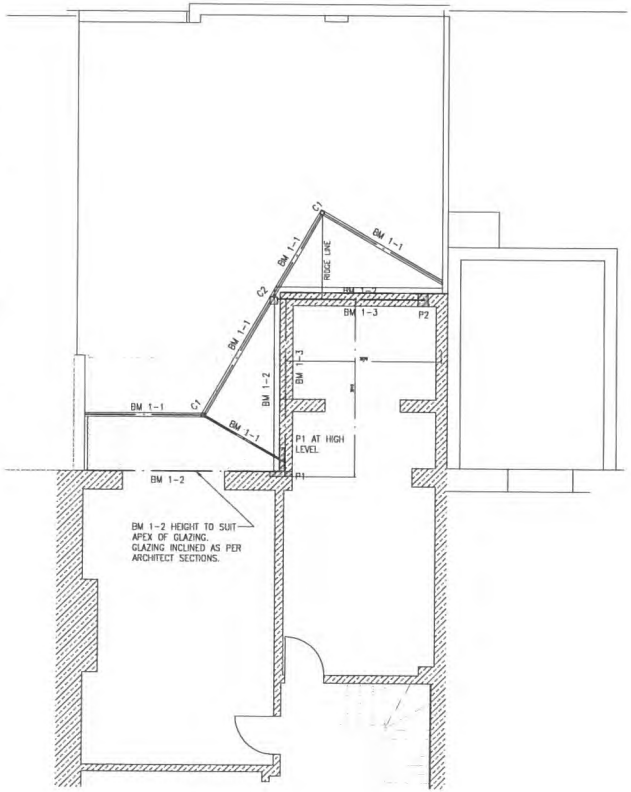


GROUND FLOOR PLAN
SCALE 1:50

NOTE:
WHERE STEEL BEAMS ARE TO SUPPORT EXISTING WALLS, FOLDING STEEL WEDGES SHALL BE PROVIDED AT MAX 600mm CENTERS TO ENSURE THAT THE WALLS ARE WELL SUPPORTED THROUGHOUT.

COLUMN SCHEDULE	
MARK	DESCRIPTION
C1	80x80x5.0 SHS
C2	150x150x5.0 SHS

BEAM SCHEDULE	
MARK	DESCRIPTION
BM 1-1	80x80x5.0 SHS
BM 1-2	100x100x8.0 EA
BM 1-3	STEEL BEAM



LOWER ROOF PLAN
SCALE 1:50

NOTES

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ISSUE	REVISION	DATE	INITIAL
P1	FOR COMMENT	20.11.14	MC

Project
41 HOWITT ROAD

Client
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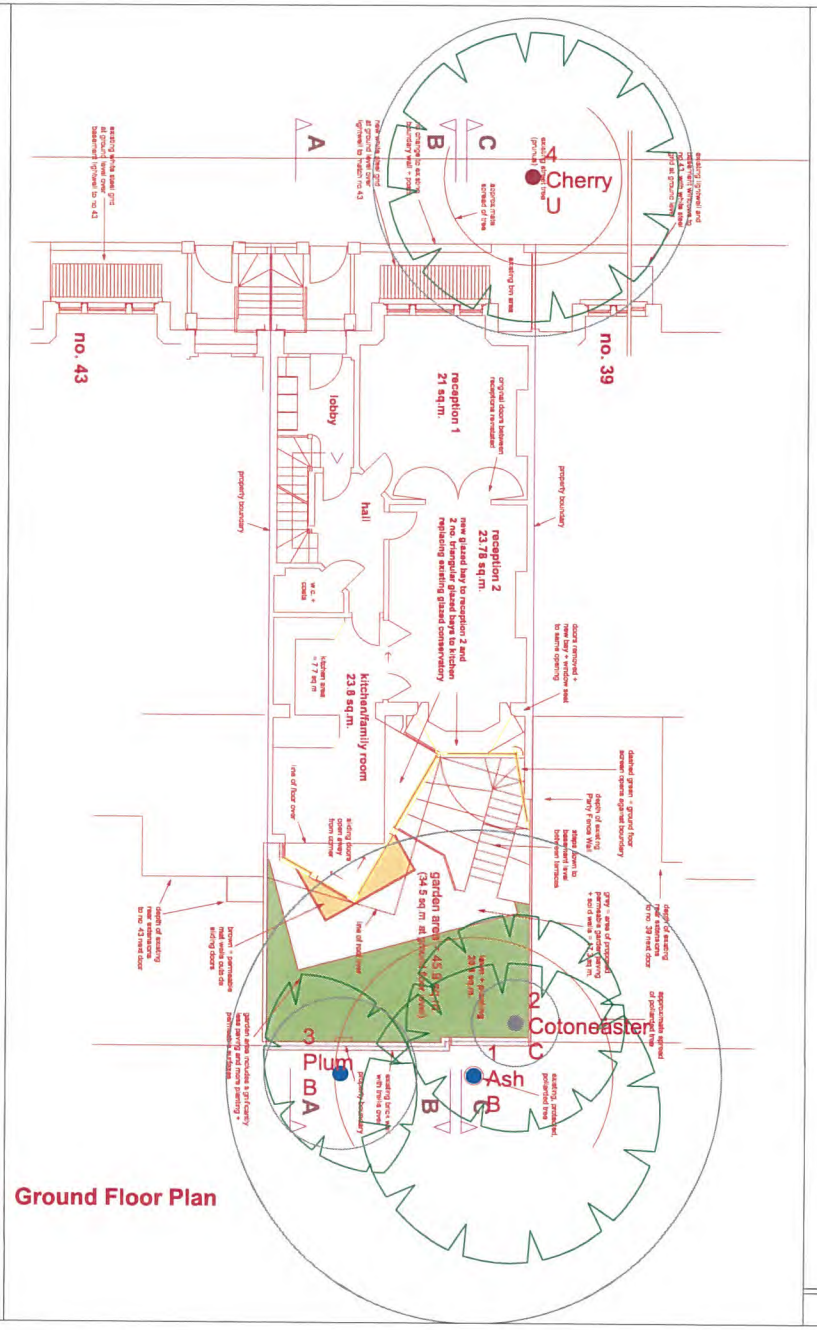
Title
GROUND FLOOR AND PART ROOF PLAN

STRUCTURAL DRAWING

Designed	RC	Approved	
Drawn	MC	Project Engineer/Director	Date
Scale	AS SHOWN	North	Drawing No: 1343-020 Issue: P1
Date	NOV '14		



Ground Floor Plan

NOTE:

This survey is of a preliminary nature. The trees were inspected from the ground only on the basis of the Visual Tree Assessment method. No samples were taken for analysis. No decay detection equipment was employed. The survey does not cover the arrangements that may be required in connection with the laying or removal of underground services.

Branch spread in metres is taken at the four cardinal points to derive an accurate representation of the crown.

Root Protection Areas (RPA) are derived from stem diameter measured at 1.5 m above adjacent ground level (taken on sloping ground on the upslope side of the tree base).

Landmark Trees

20 Broadwick Street, London, W1F 8HT
Tel: 0207 851 4544 Mobile: 07812 989928
e-mail: info@landmarktrees.co.uk Web: www.landmarktrees.co.uk

Site: 41 Howitt Road, London	1-100@A2
Drawing Title: Arboricultural Impact Assessment Plan	April 2014

Key:

- Category A High Quality
- Category B Moderate Quality
- Category C Low Quality
- Category U Trees Unsuitable for Retention

Category — Crown Spread
Root Protection Area — Tree Number, Species, Category
Tree Position Approximate (not shown on original survey)

5m 10m

properties marked with pale blue rectangles show those houses on Howitt Road that already have full or part basement extensions. (there are others outside the limit of this plan.) all houses on this road have original, small basements as shown on existing floor plans.

the pale green rectangle is a "landlocked" site known by residents as the "Secret Garden". the site is heavily overgrown with shrubs and trees and is a great asset for local biodiversity.

41 Howitt Road
London NW3 4LU

Location + Block Plans

1308.10.A

Scale: 1.1250 + 1.200 at A2
1.2500 + 1.400 at A4

Drawn: ef

Date: December 2013

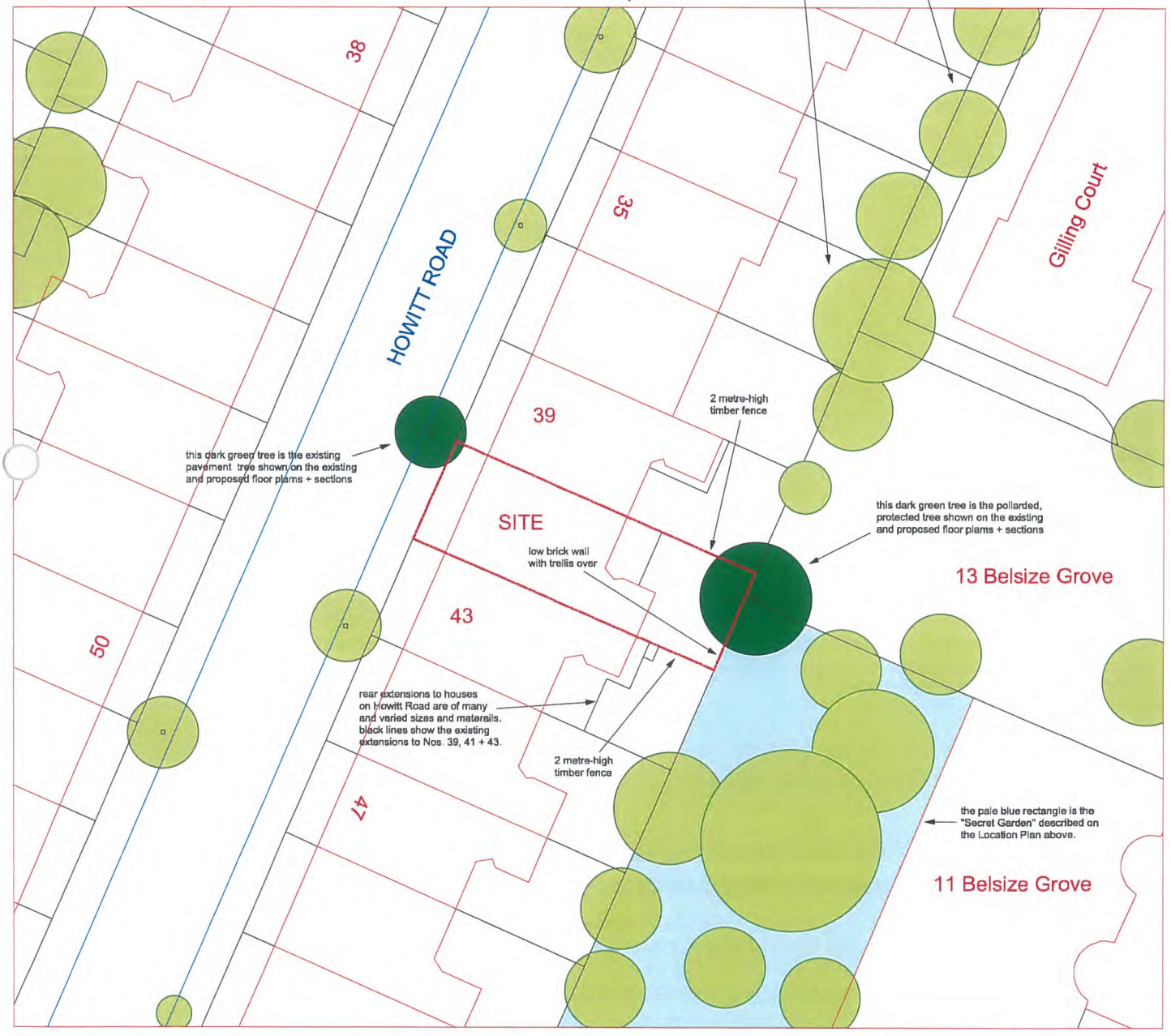
Evan Ferguson Architects
Manor Farm, Helperthorpe
Malton, N.Yorks YO17 8TQ

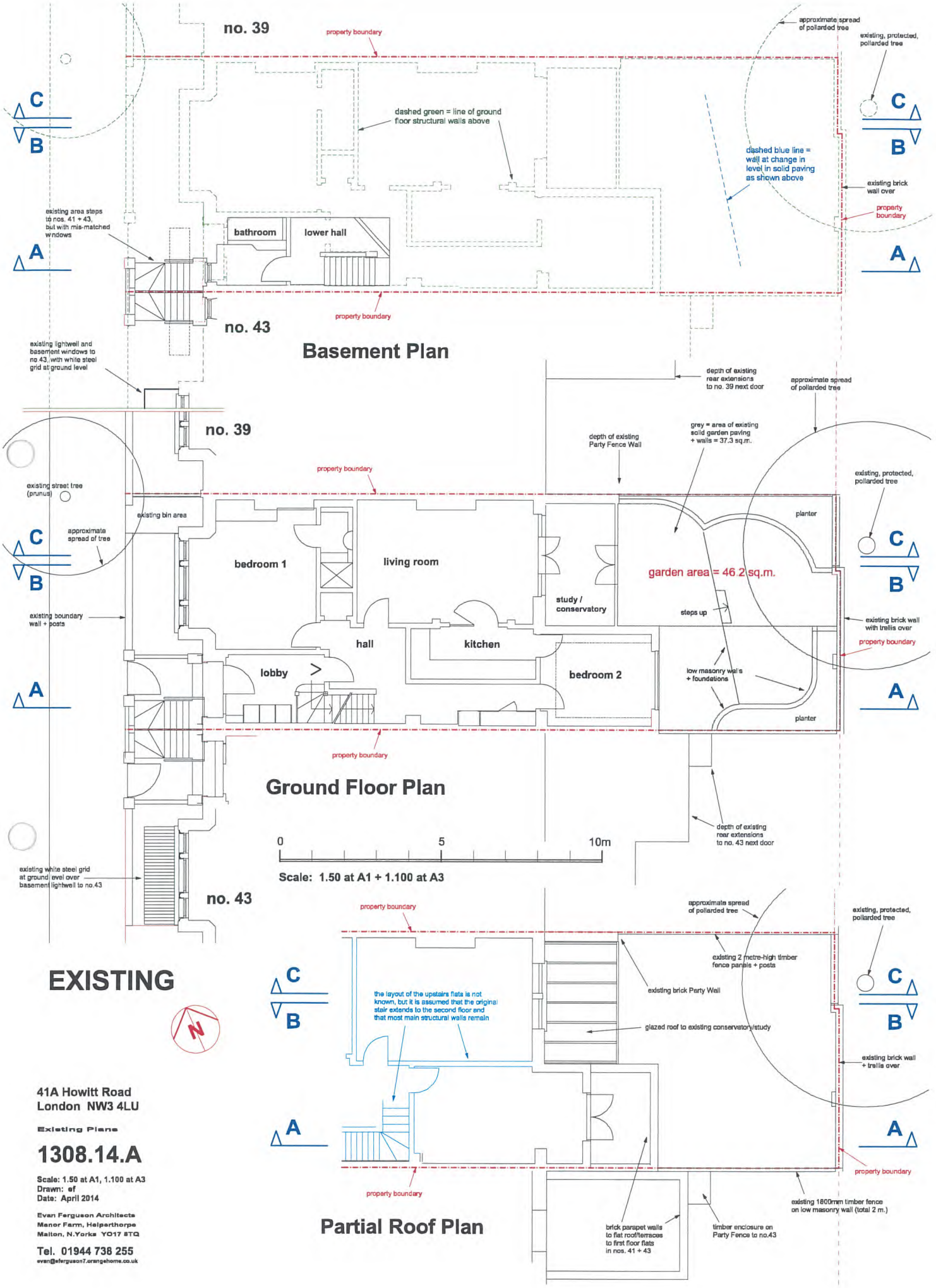
Tel. 01944 738 255
evan@eferguson7.orangehome.co.uk

LOCATION PLAN
1.1250 at A2
1.2500 at A4

BLOCK PLAN
1.200 at A2
1.400 at A4

pale green trees are shown in approximate locations as identified from Google Earth. only those coloured dark green are close enough to this site to require consideration.





EXISTING

N

41A Howitt Road
London NW3 4LU

Existing Plans

1308.14.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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41A Howitt Road
London NW3 4LU

Existing
Sections AA + BB

1308.15.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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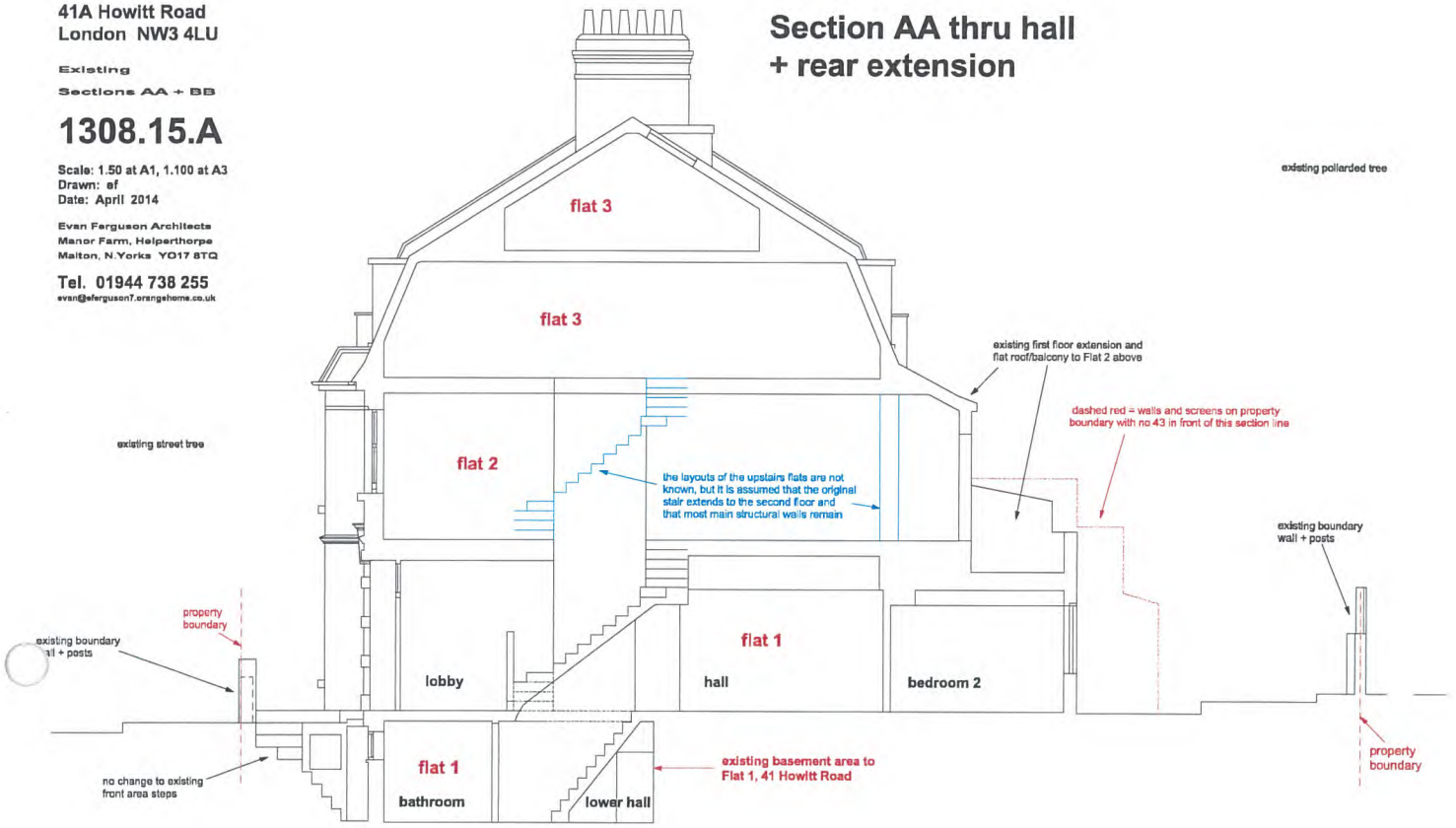
Section AA thru hall + rear extension



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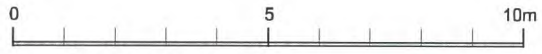
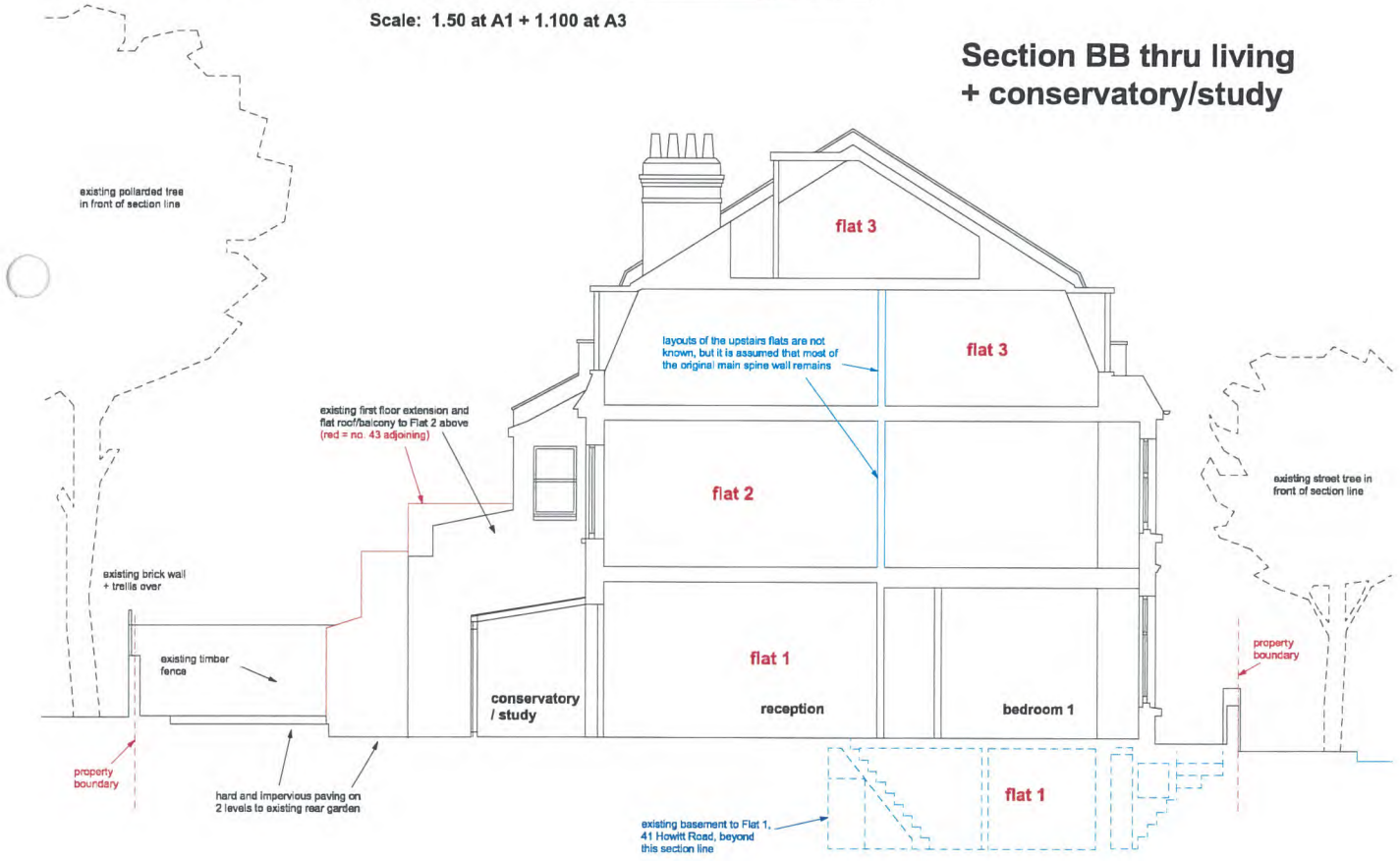


Scale: 1.50 at A1 + 1.100 at A3

Section BB thru living + conservatory/study



41A Howitt Road
London NW3 4LU

Existing Section CC
+ Rear Elevation

1308.16.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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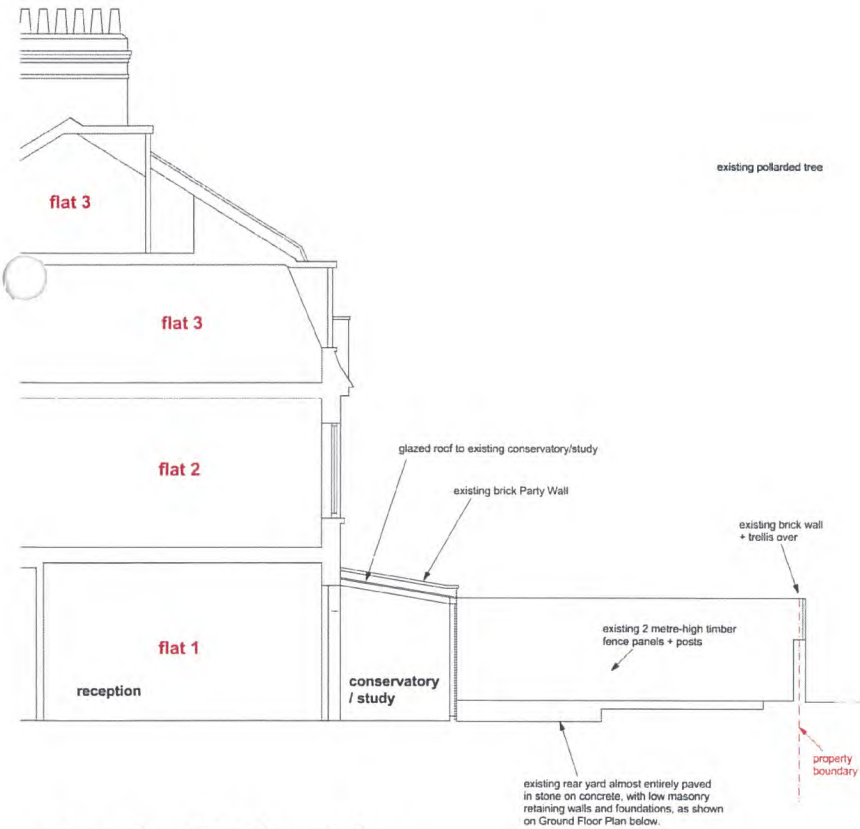
EXISTING

Photo 1: view of existing single storey rear extension to 41A Howitt Road and first floor extension above. rear of no. 43 is to the left.

Garden Elevation



Section CC thru living + conservatory/study

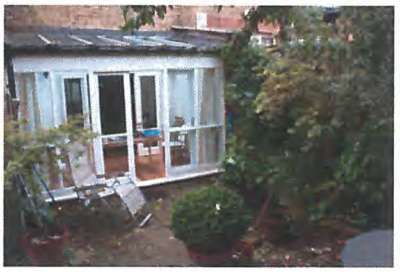


Photo 2: view of the conservatory/study to the rear of 41A Howitt Road, with the existing masonry Party Wall with no. 39 to the right.

Photo 3: view of the rear garden to 41A Howitt Road, showing the impervious stone paving covering most of the existing garden.

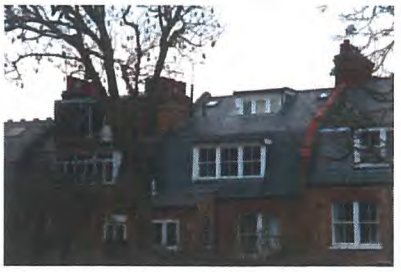


Photo 4: view of the rear of 41 Howitt Road in the centre of this photo, with no. 43 to the left and no. 39 to the right, showing the existing pollarded tree just behind no. 41's garden.

Street Elevation to Howitt Road

41A Howitt Road
London NW3 4LU

Existing Elevation to Howitt Rd. + photos

1308.17.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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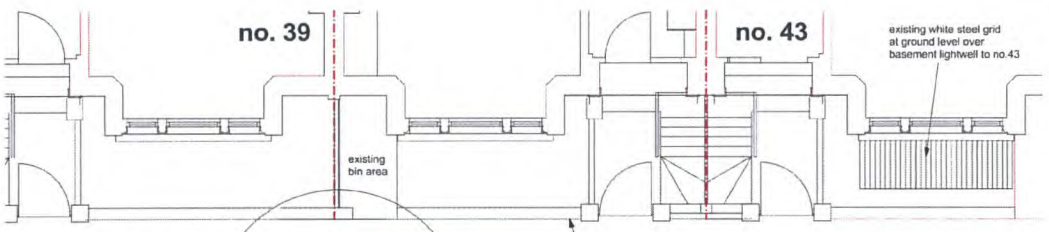
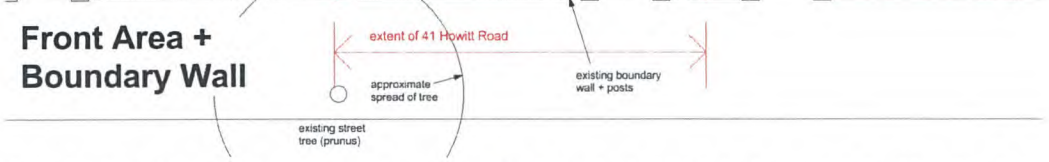
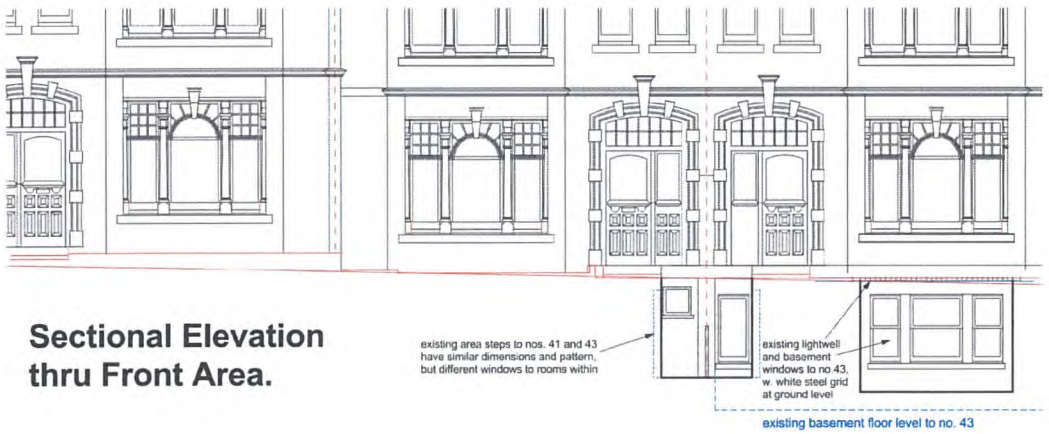
EXISTING



Front Area + Boundary Wall





Sectional Elevation thru Front Area.

Photo 5: view of the front area of no. 43 Howitt Road, showing the white steel grille above an existing lightwell serving basement windows. no. 41 is to the left.

Photo 4: view of entrance doors of 41 (left) + 43 (right) Howitt Road, with original railings to area steps below. apart from the basement window to no. 41, to be enlarged to match that to no. 43, no changes are proposed.

Photographs of Existing Street Elevation

Photo 1: view of 41 Howitt Road in the centre of this photo, with no. 43 to the right and no. 39 behind the street tree to the left

Photo 2: view of the ground floor of 41 Howitt Road. no changes proposed to the boundary wall or to the bin storage area at left.

Photo 3: view of the front area steps and basement windows to nos. 41 (left) and 43 (right) Howitt Road.

41 Howitt Road
London NW3 4LU

Location + Block Plans

1308.10.A

Scale: 1.1250 + 1.200 at A2
1.2500 + 1.400 at A4

Drawn: ef

Date: December 2013

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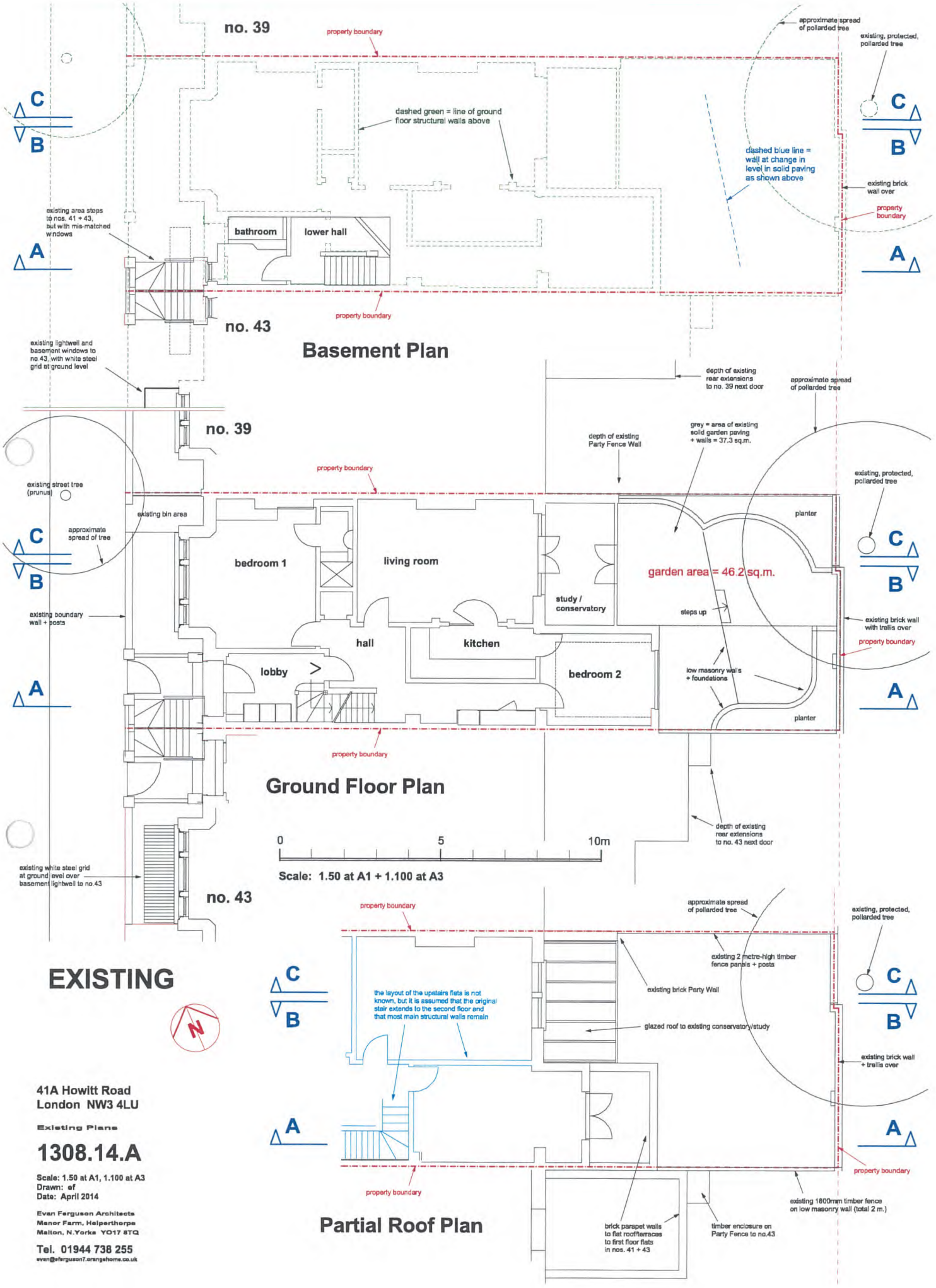
LOCATION PLAN
1.1250 at A2
1.2500 at A4

BLOCK PLAN
1.200 at A2
1.400 at A4

pale green trees are shown in approximate locations as identified from Google Earth. only those coloured dark green are close enough to this site to require consideration.

38
35
39
43
50
47
HOWITT ROAD
Gilling Court
SITE
this dark green tree is the existing pavement tree shown on the existing and proposed floor plans + sections
2 metre-high timber fence
this dark green tree is the pollarded, protected tree shown on the existing and proposed floor plans + sections
low brick wall with trellis over
13 Belsize Grove
rear extensions to houses on Howitt Road are of many and varied sizes and materails. black lines show the existing extensions to Nos. 39, 41 + 43.
2 metre-high timber fence
the pale blue rectangle is the "Secret Garden" described on the Location Plan above.
11 Belsize Grove



41A Howitt Road
London NW3 4LU

Existing Plans

1308.14.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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41A Howitt Road
London NW3 4LU

Existing
Sections AA + BB

1308.15.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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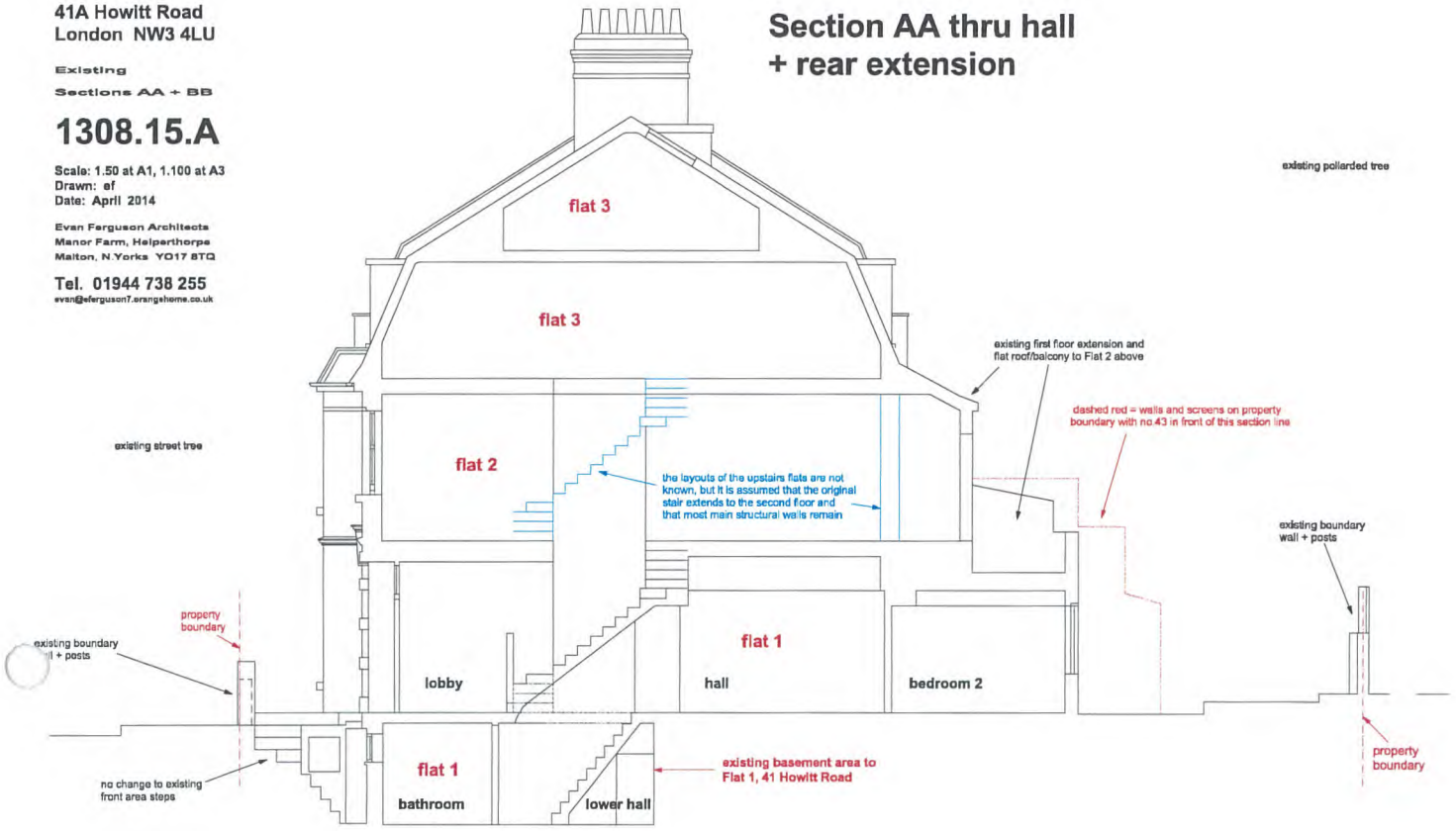
Section AA thru hall + rear extension

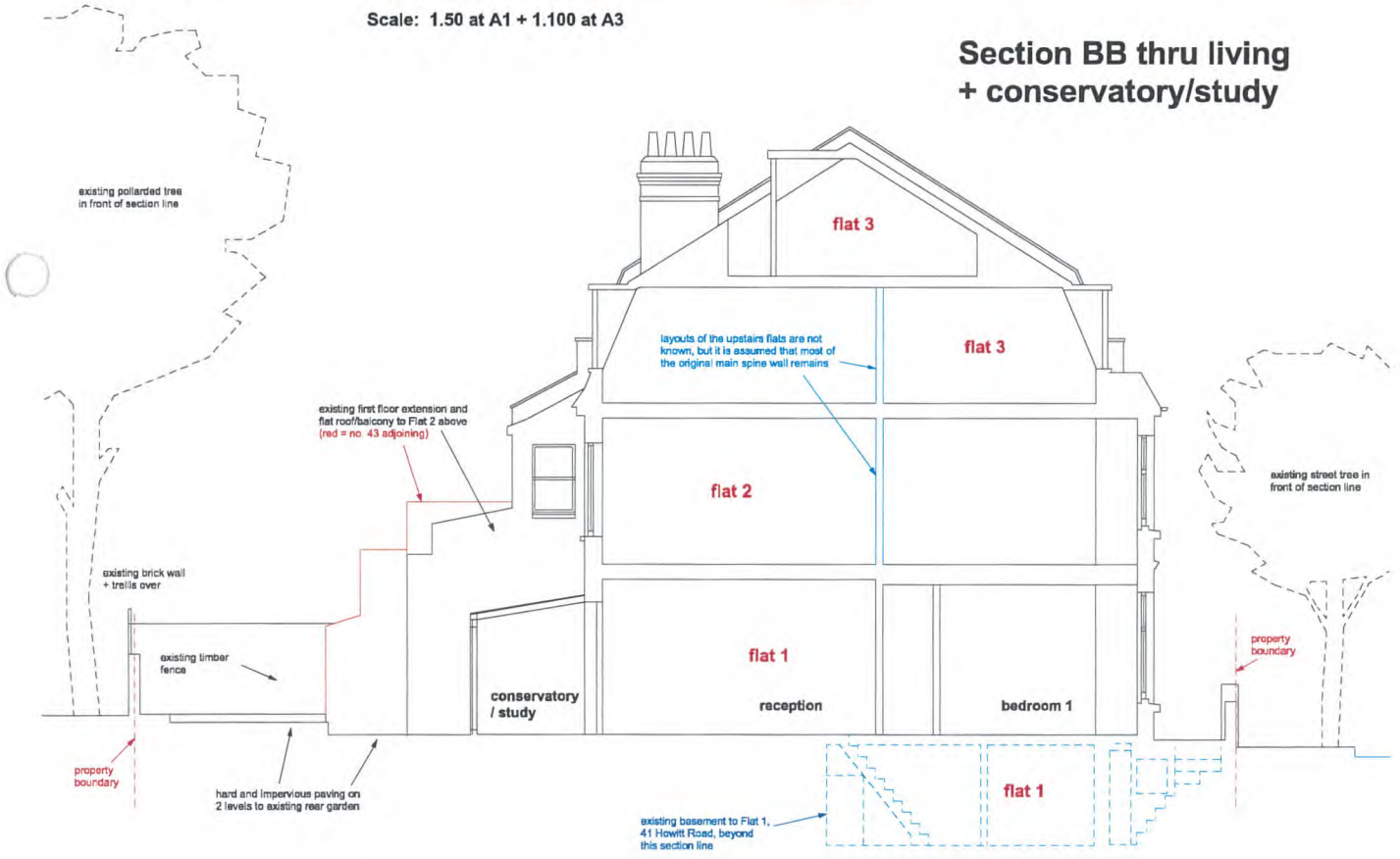


EXISTING

0 5 10m

Scale: 1.50 at A1 + 1.100 at A3

Section BB thru living + conservatory/study



41A Howitt Road
London NW3 4LU

Existing Section CC
+ Rear Elevation

1308.16.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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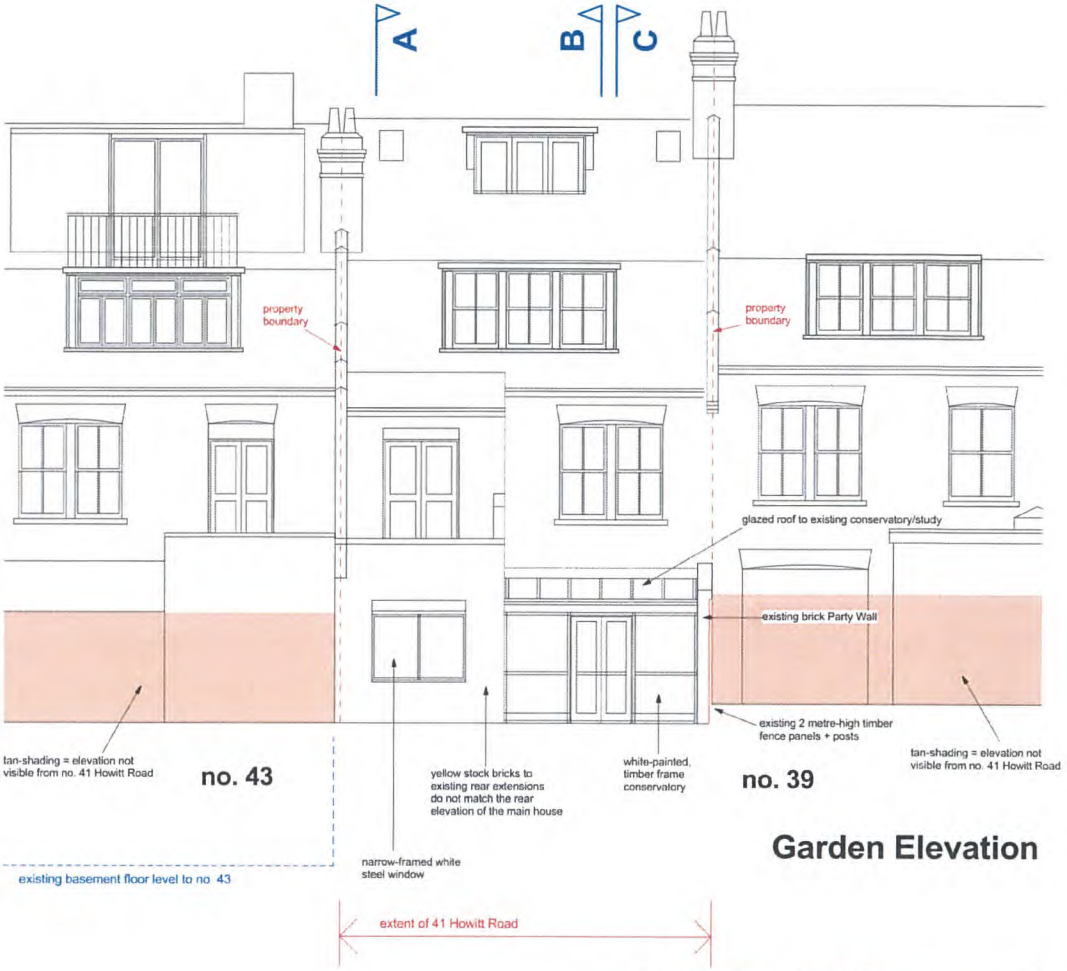
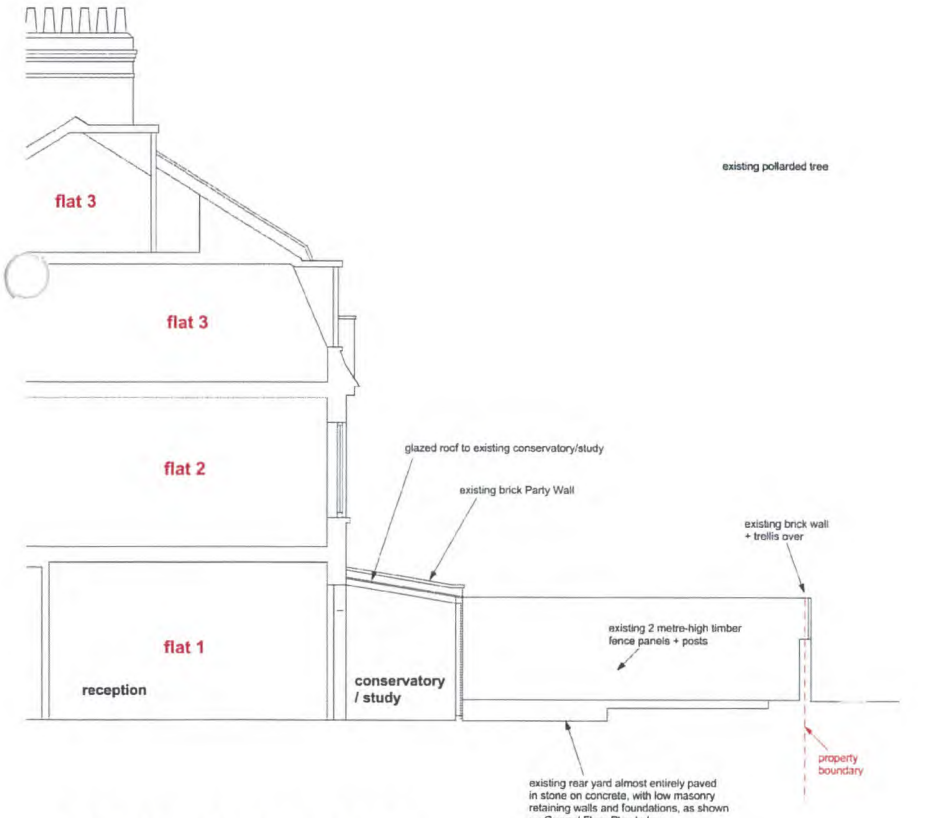


Garden Elevation



Section CC thru living + conservatory/study

Photo 2: view of the conservatory/study to the rear of 41A Howitt Road, with the existing masonry Party Wall with no. 39 to the right.

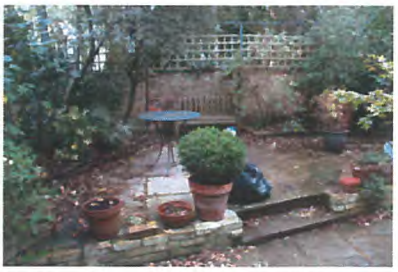


Photo 3: view of the rear garden to 41A Howitt Road, showing the impervious stone paving covering most of the existing garden.

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Street Elevation to Howitt Road

41A Howitt Road
London NW3 4LU

Existing Elevation to Howitt Rd. + photos

1308.17.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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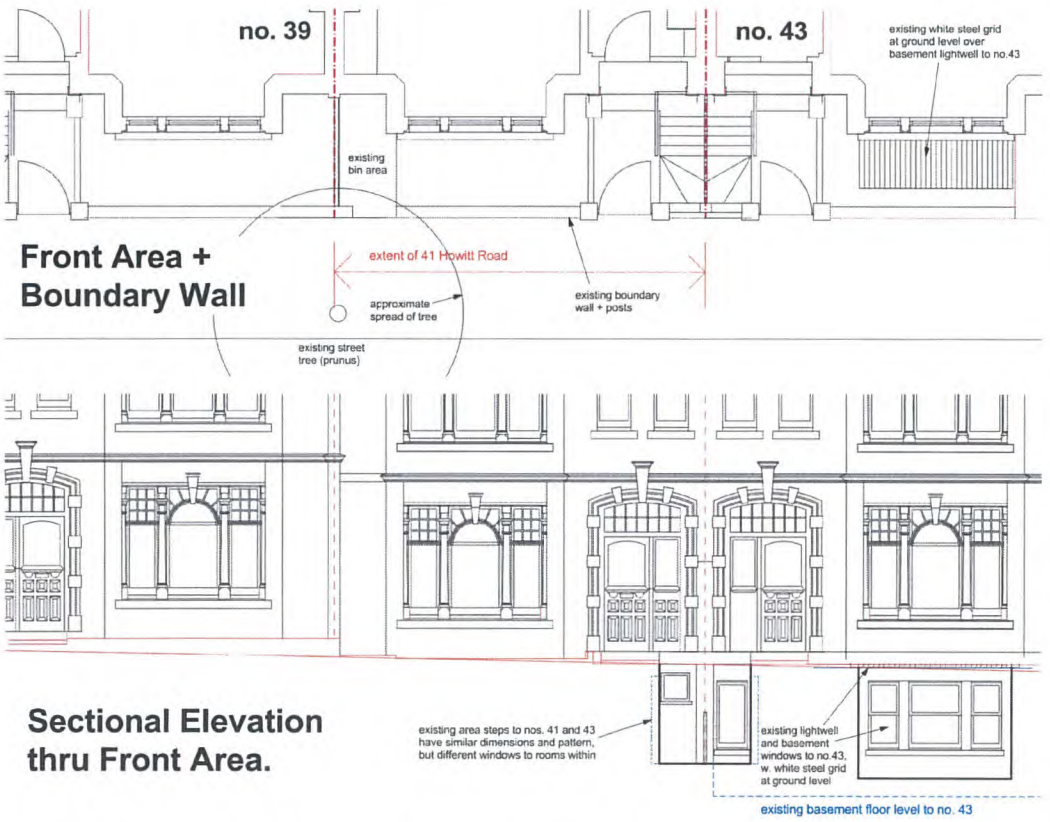
EXISTING



Front Area + Boundary Wall

Sectional Elevation thru Front Area.

Photo 5: view of the front area of no. 43 Howitt Road, showing the white steel grille above an existing lightwell serving basement windows. no. 41 is to the left.

Photo 4: view of entrance doors of 41 (left) + 43 (right) Howitt Road, with original railings to area steps below. apart from the basement window to no. 41, to be enlarged to match that to no. 43, no changes are proposed.

Photographs of Existing Street Elevation

Photo 1: view of 41 Howitt Road in the centre of this photo, with no. 43 to the right and no. 39 behind the street tree to the left

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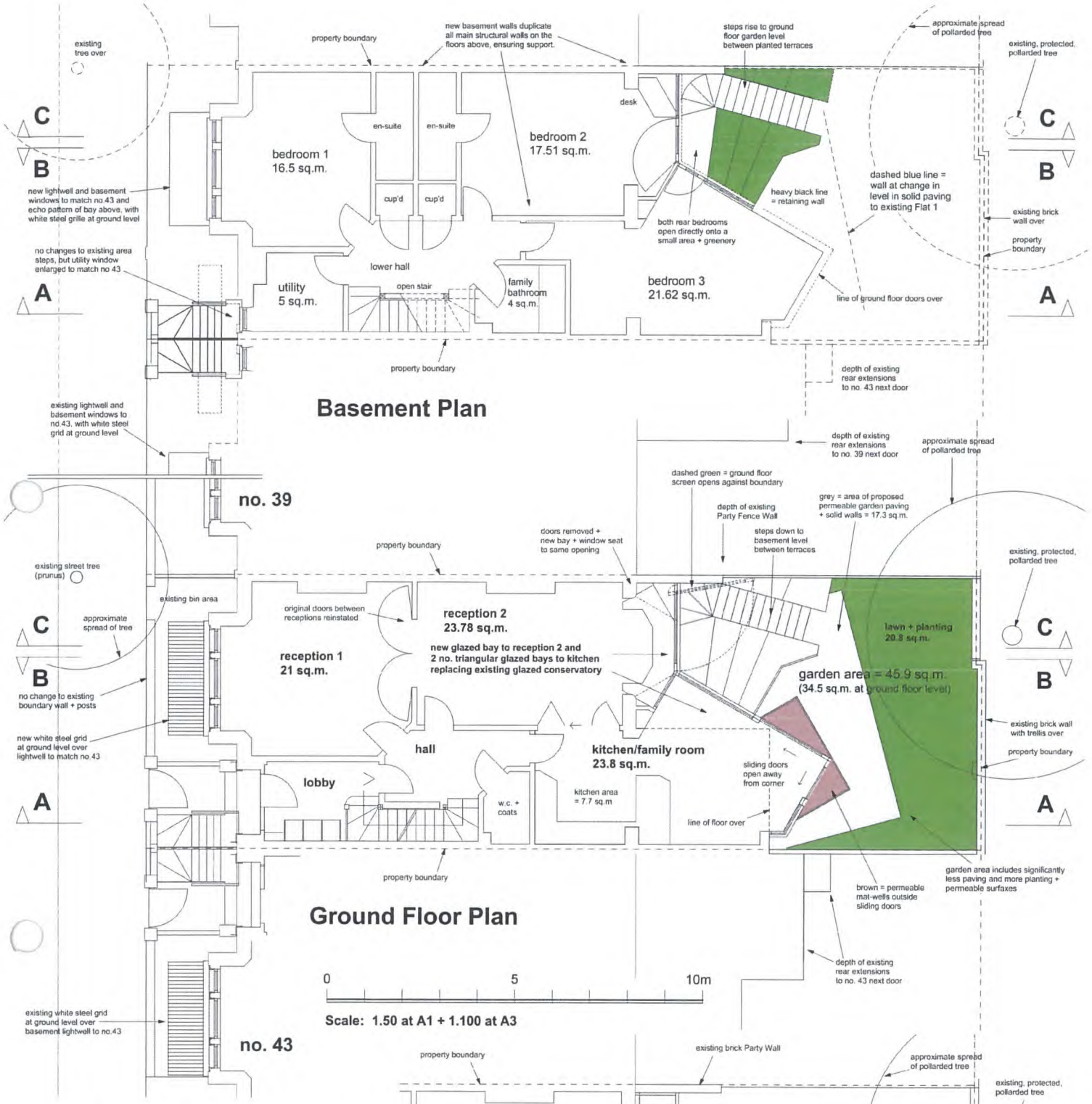

41A Howitt Road
London NW3 4LU

Proposed Plans

1308.18.B

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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41A Howitt Road
London NW3 4LU

Existing
Sections AA + BB

1308.19.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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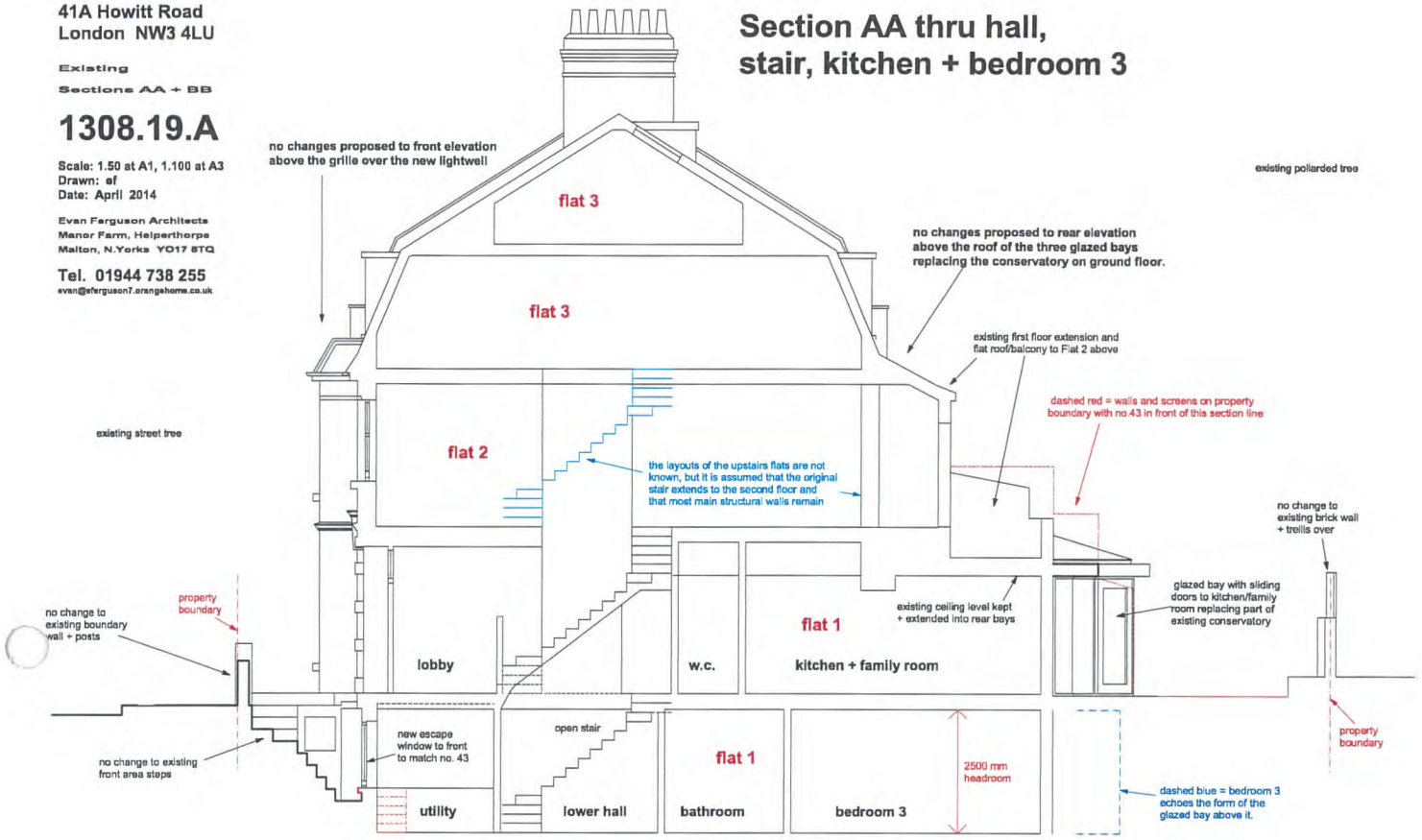
Section AA thru hall, stair, kitchen + bedroom 3

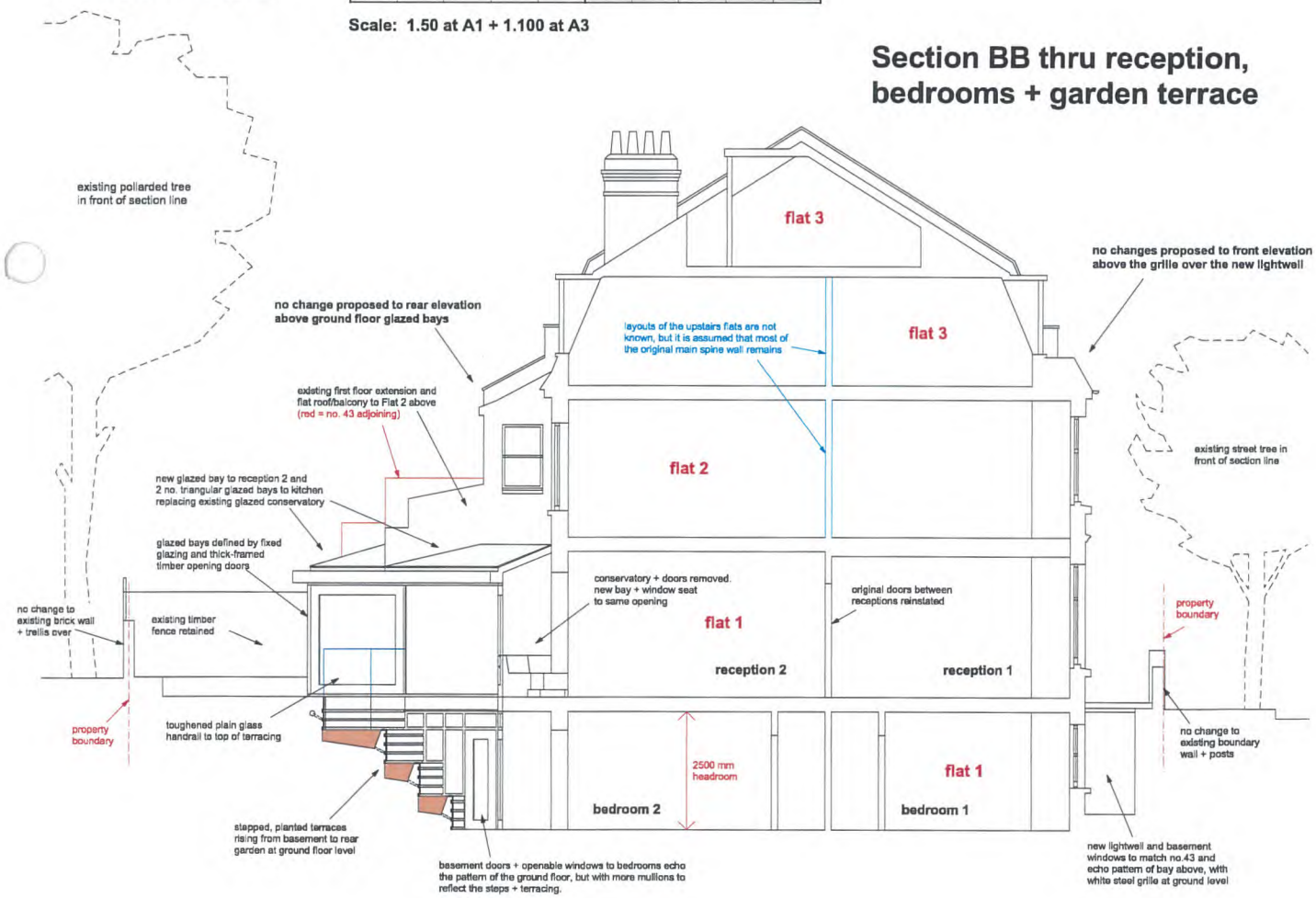


PROPOSED

0 5 10m

Scale: 1.50 at A1 + 1.100 at A3

Section BB thru reception, bedrooms + garden terrace



41A Howitt Road
London NW3 4LU

Proposed Section CC
+ Rear Elevation

1308.20.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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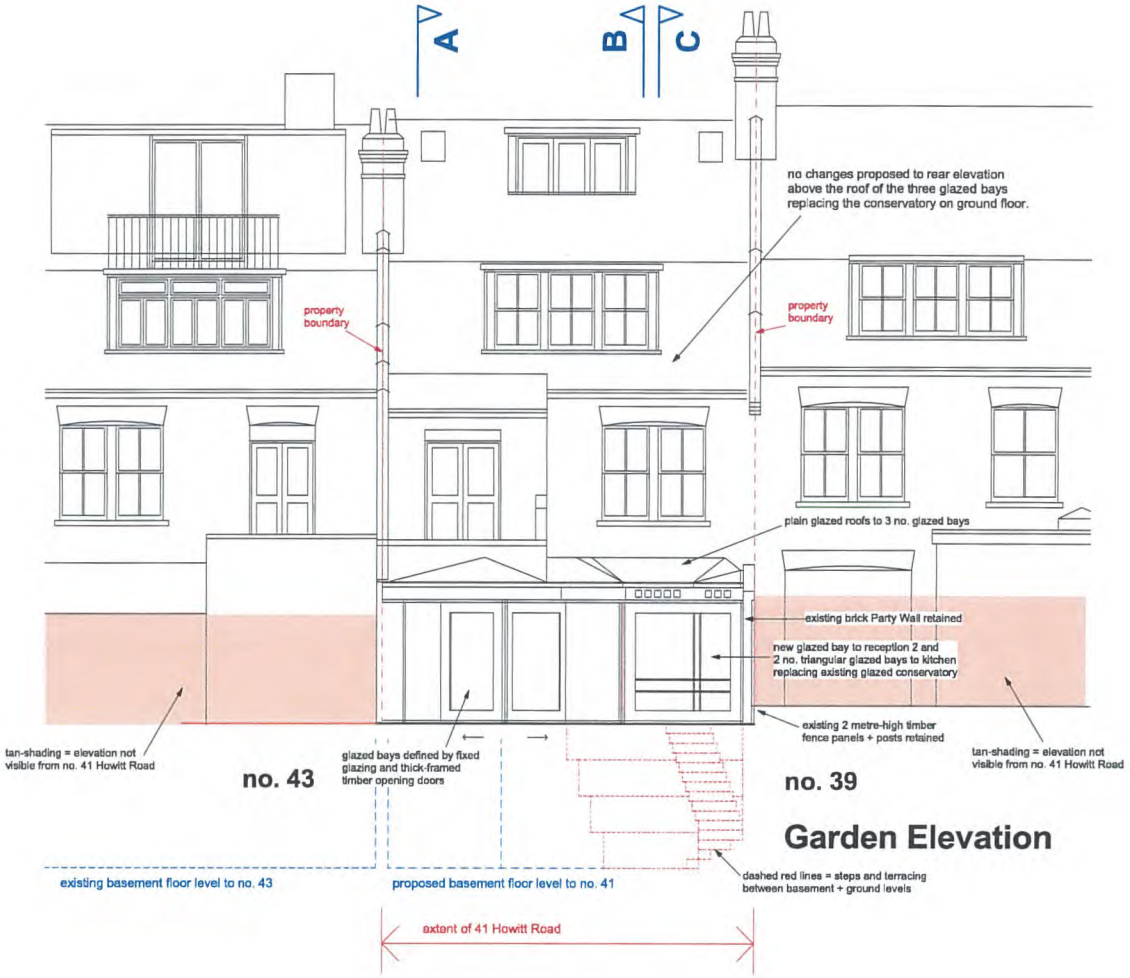
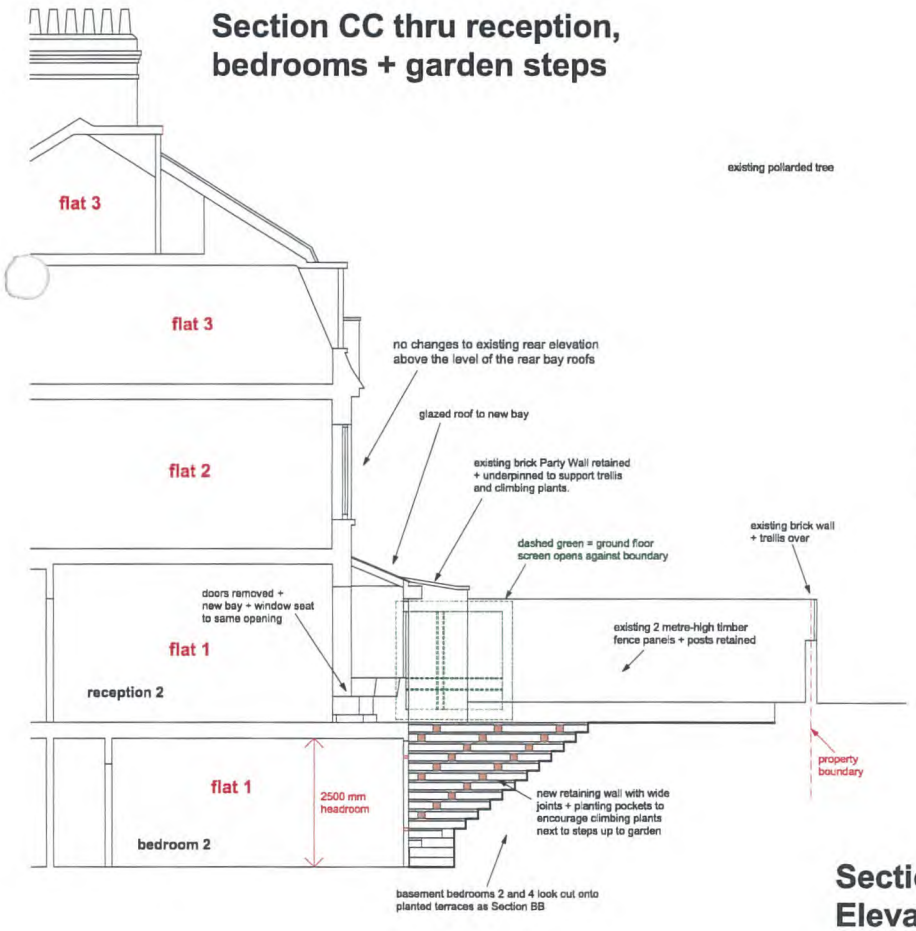
PROPOSED

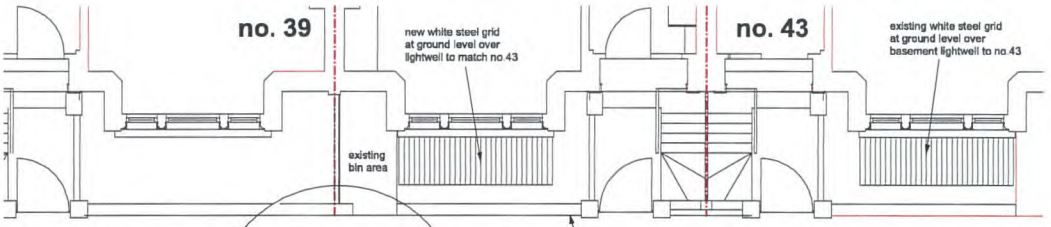


Section CC thru reception, bedrooms + garden steps

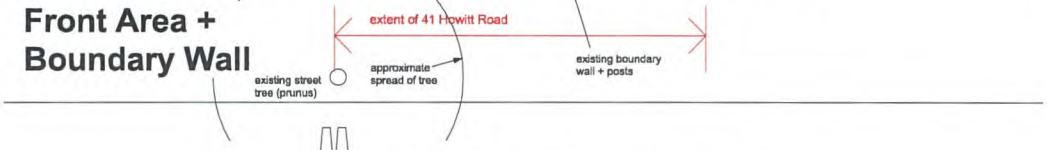


Sectional Elevation

Street Elevation to Howitt Road



Front Area + Boundary Wall



Sectional Elevation thru Front Area.

41A Howitt Road
London NW3 4LU

Proposed Elevation to Howitt Road

1308.21.A

Scale: 1.50 at A1, 1.100 at A3
Drawn: ef
Date: April 2014

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PROPOSED

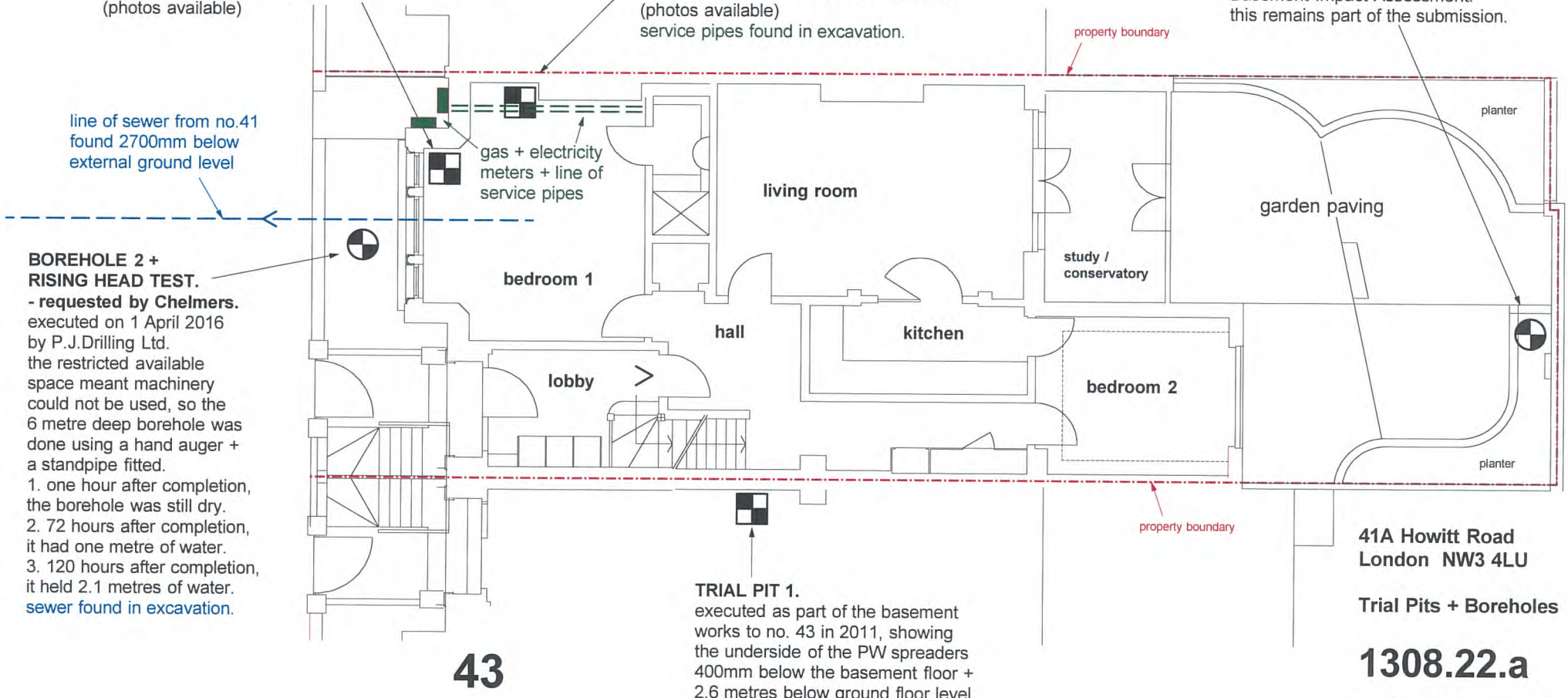
TRIAL PIT 3.
dug on 1 March 2016, showing the underside of the PW spreaders 700mm below ground floor level to no. 41 with four spreader courses extending 150mm from face of bwk. under spreaders is compacted hardcore. (photos available)

TRIAL PIT 2. - requested by Chelmers.
dug on 29 February 2016, showing the underside of the PW spreaders 400mm below the ground floor level to no. 41 and 700mm or more below the ground floor level of no. 39 next door. under spreaders is compacted hardcore. (photos available)
service pipes found in excavation.

BOREHOLE 1.
executed in July 2014 by Albury SI and submitted as part of the original Basement Impact Assessment.
this remains part of the submission.

line of sewer from no.41 found 2700mm below external ground level

BOREHOLE 2 + RISING HEAD TEST.
- requested by Chelmers.
executed on 1 April 2016 by P.J.Drilling Ltd.
the restricted available space meant machinery could not be used, so the 6 metre deep borehole was done using a hand auger + a standpipe fitted.
1. one hour after completion, the borehole was still dry.
2. 72 hours after completion, it had one metre of water.
3. 120 hours after completion, it held 2.1 metres of water.
sewer found in excavation.



TRIAL PIT 1.
executed as part of the basement works to no. 43 in 2011, showing the underside of the PW spreaders 400mm below the basement floor + 2.6 metres below ground floor level (to both nos. 43 and 41).
info. on p.11 of the PW Award.

Ground Floor Plan

0 5

Scale: 1.50 at A2 + 1.100 at A4

41A Howitt Road
London NW3 4LU

Trial Pits + Boreholes

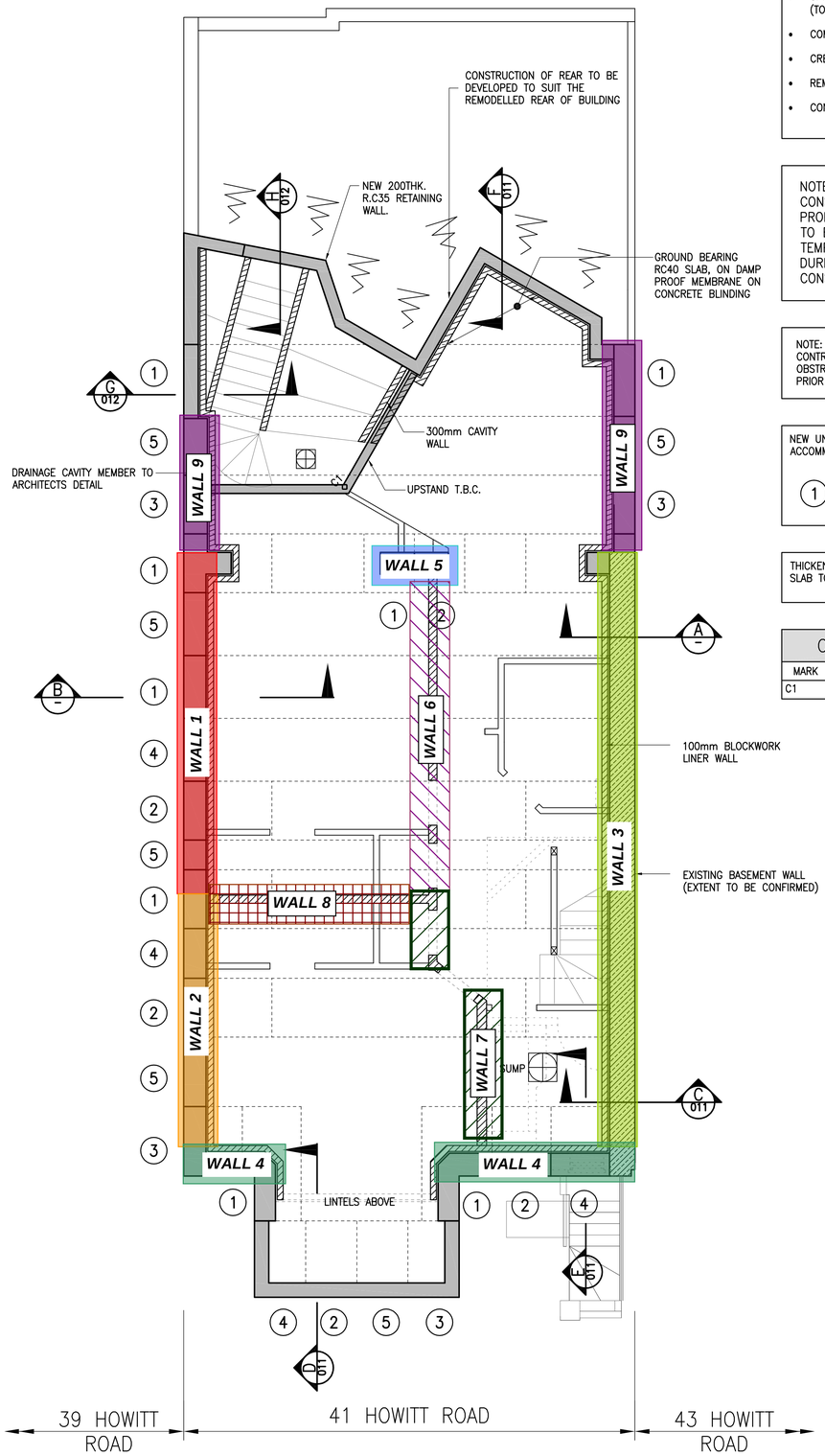
1308.22.a

Scale: 1.50 at A2, 1.100 at A4
Drawn: ef
Date: April 2016

Evan Ferguson, Architect
Manor Farm, Helperthorpe
Malton, N.Yorks YO17 8TQ
Tel. 01944 738 255
e-mail: efarchitect@hotmail.com

APPENDIX C

Structural load plans



BASEMENT PLAN
SCALE 1:50

INDICATIVE CONSTRUCTION SEQUENCE:

- INSERT NEW STEELS AT GROUND LEVEL TO PROVIDE SUPPORT TO WALLS ABOVE
- SPREAD LOAD OF BEAMS ONTO TEMPORARY PROPS (TO BE DEVELOPED BY THE CONTRACTOR)
- COMMENCE UNDERPIN SEQUENCE TO WALLS
- CREATE BASEMENT SLAB
- REMOVE STEEL BEAM TEMPORARY SUPPORT
- CONSTRUCTION OF REAR BUILDING WORKS

NOTE:
CONSTRUCTION SEQUENCE AND DETAILS OF TEMPORARY PROPPING THROUGHOUT TO SUPPORT BUILDING ABOVE IS TO BE DEVELOPED BY CONTRACTOR IN THERE TEMPORARY WORKS DESIGN, FOR COMMENT BY DDA DURING THE WORK PLANNING PROCESS, WELL BEFORE CONSTRUCTION COMMENCES

NOTE:
CONTRACTOR TO CHECK UNDERGROUND OBSTRUCTIONS USING APPROPRIATE METHODS PRIOR TO EXCAVATION TAKING PLACE.

NEW UNDERPINNING TO EXISTING WALLS TO ACCOMMODATE NEW LOW LEVEL BASEMENT.

(1) DENOTES SEQUENCE – REFER TO SPECIFICATION.

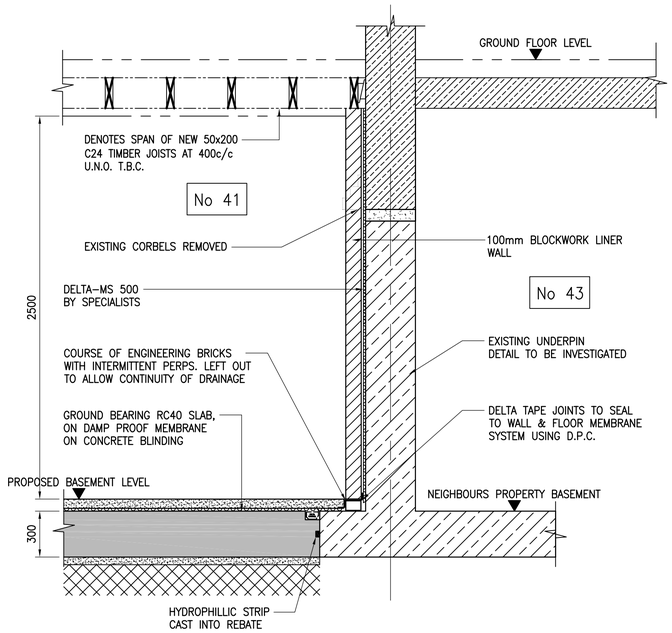
THICKENINGS MAY BE REQUIRED IN BASEMENT SLAB TO SUPPORT LOAD BEARING WALLS

COLUMN SCHEDULE

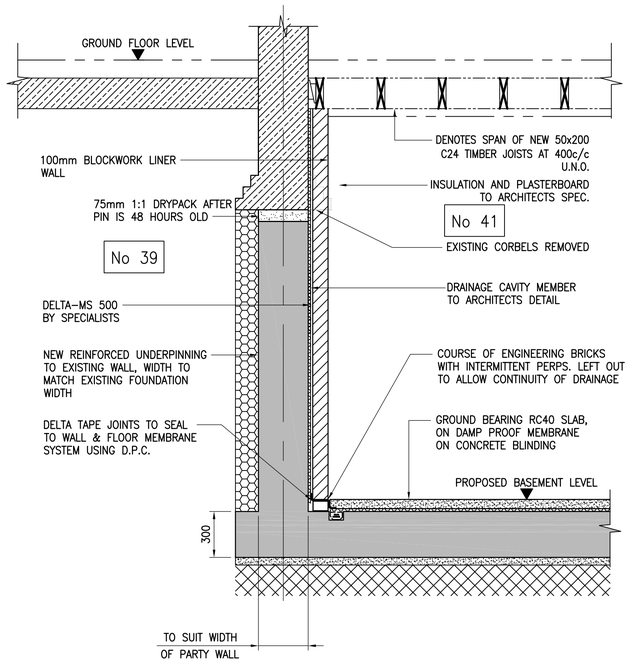
MARK	DESCRIPTION
C1	80x80x5.0 SHS

WORKING LOADS

WALL 1 -	DL - 103.4kN/m LL - 34.1kN/m
WALL 2-	DL - 98.7kN/m LL - 14.1kN/m
WALL 3 -	DL - 102.9kN/m LL - 30.35kN/m
WALL 4 -	DL - 102.9kN/m LL - 30.35kN/m
WALL 5 -	DL - 49kN LL - 56kN
WALL 6 -	DL - 49kN/m LL - 56kN/m
WALL 7 -	DL - 35kN/m LL - 11.25kN/m
WALL 8 -	DL - 45kN/m LL - 50kN/m
WALL 9 -	DL - 75.4kN/m LL - 11.2kN/m



SECTION A THRU' UNDERPINNING
SCALE 1:20



SECTION B THRU' UNDERPINNING
SCALE 1:20

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICE ENGINEERS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE FROM THIS DRAWING WORK ONLY TO FIGURED DIMENSIONS.
3. FOR STANDARD NOTES REFER TO DRAWING 1343-000.

ISSUE	REVISION	DATE	INITIAL
P3	FOR COMMENT	20/11/14	MC
P2	FOR COMMENT	17/10/14	MC
P1	FOR PLANNING	03/09/14	MC

Project
41 HOWITT ROAD

Client
MR JAMES YOUNGMAN

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Title
BASEMENT
PLAN AND SECTIONS

STRUCTURAL DRAWING

Designed	RC	Approved	
Drawn	MC	Project Engineer/DIrector	Date
Scale	AS SHOWN	North	Drawing No: 1343-010 / Issue: P3
Date	SEPT 14		