CampbellReith
consulting engineers

Flat A, 13 Crossfield Road, London, NW6 4NS

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-54
Revision: D2

August 2017

Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
F:+44 (0)20 7340 1777
E:london@campbellreith.com
W:www.campbellreith.com

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Project Partner	E M Brown, BSc MSc CGeol FGS
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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for Flat A, 13 Crossfield Road, London, NW6 3EP (planning reference 2016/6426/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment (BIA) for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The BIA has been carried out by Stephen Buss Environmental Consulting Ltd. The authors' qualifications are in accordance with CPG4 requirements.

1.5. The proposal includes constructing a single floor basement beneath the footprint of the building and a small part of the rear garden, which is currently paved. It is proposed to construct the basement by way of sequential underpinning to the existing lower ground floor flat and CFA piling to the garden.

1.6. Outline structural calculations for the basement retaining wall, basement slab and foundations have been provided by Robert Savage & Associates (RSA) and are accepted. Temporary and permanent works details have been presented, including propping and sequencing. Dimensioned drawings have been presented to provide clarity on the proposed development

1.7. A quantitative Ground Movement Assessment and Damage Impact Assessment were conducted by Chelmer Consultancy Services. A Damage Category Assessment indicates damage to fall between Burland Category 1 (Very Slight) and Category 0 (Negligible) for Nos. 11 and 12 Crossfield Road. The GMA should be revised to also consider 37 Adamson Road.

1.8. A Monitoring Method Statement is proposed by RSA for structures within the zone of influence. The monitoring strategy should include trigger levels linked to the GMA and appropriate contingency measures.

1.9. A Surface Water Flow Assessment was completed by RSA and includes an evaluation of surface water flow and appropriate mitigation measures to offset the effects of basement construction.

1.10. It is accepted that the surrounding slopes to the development are stable and that there are no groundwater considerations regarding the proposed development.

1.11. Queries and requests for clarification are discussed in Section 4 and summarised in Appendix 2. Until the additional information is presented, the BIA does not meet the criteria of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 3 March 2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Flat A, 13 Crossfield Road, London, NW6 3EP (2016/6426/P).

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as *"Excavation of basement, erection of single storey rear conservatory and replacement of side windows to lower ground floor flat."*

2.6. The Audit Instruction also confirmed that the basement proposal does not involve a listed building nor does the site neighbour any listed buildings.

2.7. CampbellReith accessed LBC's Planning Portal on 7 March 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) dated January 2017 (First Draft) by Stephen Buss Environmental Consulting Ltd.
- Design and Access Statement dated November 2016 by Robert Savage & Associates.
- Planning Application Drawings by Robert Savage & Associates consisting of:

    Existing Plans, Elevations and Sections (October 2016).

    Proposed Plans, Elevations and Sections (October 2016).

2.8. Additional information was presented following the initial BIA Audit by CampbellReith including:

- Ground Movement Assessment (Ref GMA/9216) dated July 2017 by Chelmer Consultancy Services.
- Underpinning Calculations and Monitoring Method Statement dated 10 May 2017 by Robert Savage & Associates Ltd.
- Surface Water Flow dated 24 July 2017 by Robert Savage & Associates Ltd.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Section 1.4.
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA and Appendix A.
Are suitable plan/maps included?	Yes	BIA and Appendix A (Appendix C).
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	BIA and Appendix A (Appendix C).
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Appendix A, Section 7.1.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 3.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 4.
Is a conceptual model presented?	Yes	BIA Section 2 and 5.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Appendix A, Section 7.2.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 5.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	N/A	No issues carried forward to scoping.
Is factual ground investigation data provided?	Yes	BIA Appendix A.
Is monitoring data presented?	Yes	BIA Section 2 and Appendix A, although further groundwater monitoring recommended.
Is the ground investigation informed by a desk study?	Yes	BIA Appendix A Section 3.
Has a site walkover been undertaken?	Yes	BIA Appendix A Section 3.2.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Section 2.4.
Is a geotechnical interpretation presented?	Yes	BIA Section 2 and Appendix A Section 6.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Calculation Sheet provided by Robert Savage & Associates.
Are reports on other investigations required by screening and scoping presented?	Yes	Ground Investigation presented in BIA Appendix A. Groundwater Impact Assessment presented in BIA Section 5.
Are the baseline conditions described, based on the GSD?	Yes	BIA.
Do the base line conditions consider adjacent or nearby basements?	Yes	BIA.
Is an Impact Assessment provided?	Yes	Ground Movement Assessment performed by Chelmer, although requires consideration of 37 Adamson Road.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Sections 7 and 8.
Has the need for monitoring during construction been considered?	Yes	BIA Section 7.5.
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	GMA to consider 37 Adamson Road.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	GMA to consider 37 Adamson Road.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Although GMA to consider 37 Adamson Road.
Are non-technical summaries provided?	No	Although conclusions are presented in BIA Section 6.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Stephen Buss Environmental Consulting Ltd and the individuals concerned in its production have suitable qualifications as per the requirements of CPG4.

4.2. The existing property comprises 13A Crossfield Road which is the lower ground floor flat of a four-storey end-terrace house. Plans for the new basement development involve constructing a single floor basement beneath the footprint of the building and a small part of the rear garden, which is currently paved. The formation level of the basement (54m AOD) is expected to be 4m below the elevation of Crossfield Road (58m AOD). It is noted that groundwater levels on site were measured at 55.9m AOD, or about 1.9m above basement formation level.

4.3. The BIA and Ground Investigation Report has identified that on site ground conditions comprise a variable depth of Topsoil and Made Ground (1.00m to 2.70m thick) underlain by Head Deposits (0.20 to 0.90m thick) and London Clay from 1.20 to 3.60m bgl. The proposed basement will therefore be founded in London Clay.

4.4. It is accepted that no known ponds, springlines or wells are in close vicinity to the site and that the site is not located within the catchment area of the Hampstead Heath pond chain. An assessment of adjacent property foundation / basement depths in comparison with the groundwater level has been presented. The proposed basement will be predominantly within the London Clay, which is classified as Unproductive Strata. It is accepted that the site will not impact upon the wider hydrogeological environment.

4.5. It is proposed to create a new basement by way of sequential underpinning to the existing lower ground floor flat and CFA piling to the garden. Following the initial audit, information was requested on the depth, width, bay sequence and type (mass or reinforced concrete) of underpinning. This information was subsequently provided by Robert Savage & Associates (RSA) and Chelmer Consultancy Services.

4.6. Outline structural calculations for the basement retaining walls, basement slab and foundations have been presented by RSA, including soil properties and assumed water levels, as requested to demonstrate the viability of the proposals. An indicative assessment of the likely heave forces is presented Appendix A of the BIA. The potential long term effect of this heave was considered in the basement slab design.

4.7. Both the temporary and permanent construction works have been considered in the structural calculations, with surface and groundwater control methodologies considered based on likely groundwater volume and flow rates expected. The contractor should confirm groundwater conditions prior to starting works.

4.8. A quantitative Ground Movement Assessment (GMA) has been completed by Chelmer Consultancy Services based on the recommendations of CIRIA C580 that considers Nos. 11 and 12 Crossfield Road. The soil and groundwater parameters, and proposed construction methodology is based on that proposed in the BIA and additional documentation. The GMA considered the construction of underpins and contiguous piled walls, excavation to formation level, and heave/settlement. A Damage Category Assessment indicates damage to fall between Burland Category 1 (Very Slight) and Category 0 (Negligible), as per CIRIA C580 for Nos. 11 and 12 Crossfield Road.

4.9. Although it is stated that the GMA considers the worst case sections, and therefore has not been undertaken for other neighbouring properties, it is noted that the geometry and proximity of 37 Adamson Road may make it susceptible to ground movements and corresponding damage impacts. Whilst the PDISP analysis may indicate minimal settlements, retaining wall installation and excavation effects have not been presented. Consequently, the GMA and damage impact assessment should be updated to include 37 Adamson Road.

4.10. A Monitoring Method Statement is proposed by RSA, although it is not accepted. A programme of monitoring the adjoining structures should be established before the work starts, which may include condition surveys, and this should be incorporated in the BIA. The monitoring strategy should include trigger levels linked to the GMA and appropriate contingency measures.

4.11. It is accepted that the proposal will not alter the existing proportion of hard surfaces and paved areas, and hence, the quantity of local rainfall entering the existing sewer system. However, the site is within a Critical Drainage Area. In accordance with CPG4, Section 3.51, consideration of attenuation SUDS to reduce surface water discharge flow rates to sewers should be presented. A Surface Water Flow Assessment was completed by RSA and includes an evaluation of surface water flow and appropriate mitigation measures to offset the effects of basement construction.

4.12. It is accepted that there are no slope stability concerns regarding the proposed development.

4.13. No known tunnels or railway lines are located within the vicinity of the site. The BIA should identify any utility infrastructure within the zone of influence of the development and assess damage impacts, if applicable.

4.14. It is acknowledged that no trees will be removed due to the proposed development.

5.0 CONCLUSIONS

5.1. The BIA was undertaken by Stephen Buss Environmental Consulting Ltd. The authors' qualifications are in accordance with CPG4 requirements.

5.2. The proposal includes constructing a single floor basement beneath the footprint of the building and a small part of the rear garden by way of sequential underpinning and CFA piling to the garden. Temporary and permanent works details have been presented, including propping and sequencing.

5.3. Outline structural calculations for the basement retaining wall, basement slab and foundations have been provided and are accepted.

5.4. Dimensioned drawings have been presented by Robert Savage & Associates to provide clarity on the proposed development.

5.5. The Damage Category Assessment indicates damage to fall between Burland Category 1 (Very Slight) and Category 0 (Negligible) for Nos. 11 and 12 Crossfield Road. The GMA should be revised to also consider 37 Adamson Road.

5.6. The absence of utility infrastructure within the development's zone of influence has been confirmed in a statement from RSA.

5.7. A Monitoring Method Statement is proposed by RSA for structures within the zone of influence. The monitoring strategy should include trigger levels linked to the GMA and appropriate contingency measures.

5.8. A Surface Water Flow Assessment was completed by RSA and includes an evaluation of surface water flow and appropriate mitigation measures to offset the effects of basement construction.

5.9. It is accepted that the surrounding slopes to the development are stable.

5.10. It is accepted that the development will not impact on the wider hydrogeological environment.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Ziffo, E	Flat 3, 12 Crossfield Road, London, NW3 4NS	20.02.17	Stability concerns.	See response in Section 4.6, 4.8 to 4.9.
Cooke, D	Flat 1, 12 Crossfield Road, London, NW3 4NS	22.02.17	Flooding and general groundwater concerns.	See response in Section 4.7 and 4.10.
Pomeroy, G	12a Crossfield Road, London, NW3 4NS	22.02.17	General stability, surface water and flooding concerns.	See response in Section 4.6 to 4.10.

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA format	Works programme not provided. Outline duration to be provided.	Closed – Duration of works estimated in RSA Ltd letter dated 10th May 2017.	May 2017
2	Stability	Underpinning depth, width, bay sequence and type requested for all areas. Dimensioned drawings required to provide clarity on the proposed development.	Closed – Structural drawings presented by RSA. Further information provided in GMA report by Chelmer.	August 2017
3	Stability	Outline structural calculations for the basement retaining wall, basement slab and foundations are required to demonstrate the viability of the proposals, including soil properties and assumed water levels. Geotechnical parameters as per GSD Appendix G3 to be provided.	Closed – Calculation sheet with assumptions provided by RSA.	May 2017
4	Stability	Indicative temporary works propping scheme to be provided. Groundwater control measures to be provided.	Closed – Calculation sheet as above. Surface water flow and control measures provided by RSA.	May 2017
5	Stability	Ground Movement Assessment and Structural Impact Assessment to be presented and justified. Appropriate mitigation measures to be considered, as required.	Open – GMA report by Chelmer to consider 37 Adamson Road.	
6	Stability	The presence of utility infrastructure within the zone of influence should be confirmed. Damage impact should be assessed, if applicable.	Closed – Statement provided.	August 2017
7	Stability	Movement Monitoring Strategy is requested, to consider the existing and neighbouring properties.	Open – Monitoring strategy to include trigger levels linked to the GMA with appropriate contingency measures.	
8	Surface Water Flow	Consideration of attenuation SUDS to be presented as per CPG4 3.51.	Closed – Surface water flow provided by RSA.	August 2017

Appendix 3: Supplementary Supporting Documents

Ground Movement Assessment (Ref GMA/9216) dated July 2017 by Chelmer Consultancy Services.

Underpinning Calculations and Monitoring Method Statement
dated 10 May 2017 by Robert Savage & Associates Ltd.

Surface Water Flow dated 24 July 2017 by Robert Savage & Associates Ltd.

Statement on Utilities Services dated 27 July 2017 by Robert Savage & Associates Ltd.

Ground Movement Assessment

Site	13a Crossfield Road London NW3 4NT
Client	Walter C. Ladwig III
Date	July 2017
Our Ref	GMA/9216

Chelmer Site Investigation Laboratories Ltd
Unit 15 East Hanningfield Industrial Estate, Old Church Road, East Hanningfield, Essex CM3 8AB
Essex: 01245 400930 | London: 0203 6409136 | info@siteinvestigations.co.uk | www.siteinvestigations.com

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.

CONTENTS

1.0 INTRODUCTION

1.1 The excavation and construction of a single storey basement extension to extend beneath the full length of the existing building footprint and into the rear garden of 13A Crossfield Road, London NW3 4NT has been proposed. The site is located in the London Borough of Camden. This report is for planning and scheme development purposes and is not a design document.

1.2 This ground movement assessment (GMA) has been prepared by Chelmer Site Investigations Laboratories Limited (Chelmer) acting on behalf of Walter C. Ladwig III.

1.3 A GMA, including damage category assessment (DCA), has been prepared using results from a site specific ground investigation undertaken by Soil Consultants Ltd (2017). This report presents the analyses undertaken and a damage category assessment.

1.4 The site is located at 13A Crossfield Road, London NW3 4NT (No. 13A), approximate Ordnance Survey grid reference (OSNGR) 526880E, 184550N. The site location plan is displayed in Figure 1 below. The site currently comprises the lower ground floor of an end-terraced, four-storey property. The property is adjoined by No. 12 Crossfield Road (No. 12) to the north and has No. 37 Adamson Road (No. 37) adjacent to the south. The British Geological Survey (BGS) GeoIndex indicates the site is on a north-northwest to south-southeast slope, with a slope angle of less than <3°.

Figure 1. Site location Plan (Contains British Geological Survey materials © NERC 2016. Base mapping is provided by ESRI)

1.5 At this stage it is understood that a basement will be constructed beneath the full footprint of the existing property and into a small part of the rear garden. The basement perimeter walls will comprise reinforced concrete (RC) underpinning beneath the existing structure and contiguous piled walls around the proposed area beneath the rear garden.

1.6 The assessment does not however, include a full basement impact assessment (BIA) and the study does not address the context of the proposed basement construction, any implications that the basement may have on groundwater and surface water regimes within the site and its environs and conversely how the wider site conditions may in turn impact the basement.

1.7 The following drawings and documents have been referred to in preparing this report. Drawings which were irrelevant to the basement have been ignored.

Robert Savage & Architects

Drawing 10591/TP/04A (Proposed Elevation & Section A-A)

Drawing 10591/TP/03 (Existing Elevation & Section A-A)

Drawing 10591/SD/01 (Structural Details)

Drawing 10591/TP/01 (Existing Plan, Block Plan & Location Plan @ 1:1250)

2.0 GROUND MOVEMENT ASSESSMENT

2.1 *Basement Geometry and Stresses*

2.1.1 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.

2.1.2 The layout of the basement used within the analysis is based on Drawing 10581/SD/01 provided by Robert Savage & Associates, and is presented in Figure 3 below. The proposed basement excavation and extension covers an area approximately 18.0 m long by 7.0 m wide with excavation generally extending to a depth of approximately 3.0 m below existing lower ground floor level (blgl) (as scaled from Drawings 10581/SD/01 and 10591/TP/04A). The basement is understood to be constructed by RC underpins and contiguous piled walls as detailed in Section 1.5.

2.1.3 The excavation depths for the basement have been modelled using information provided by Robert Savage & Associates to estimate the gross pressure reductions (unloading) across the development. Figure 3 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, retaining walls and piled walls, excavation of central area from existing ground level, and construction of the concrete slab.

2.1.4 The table in Appendix A 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 2.3.1 below for details).

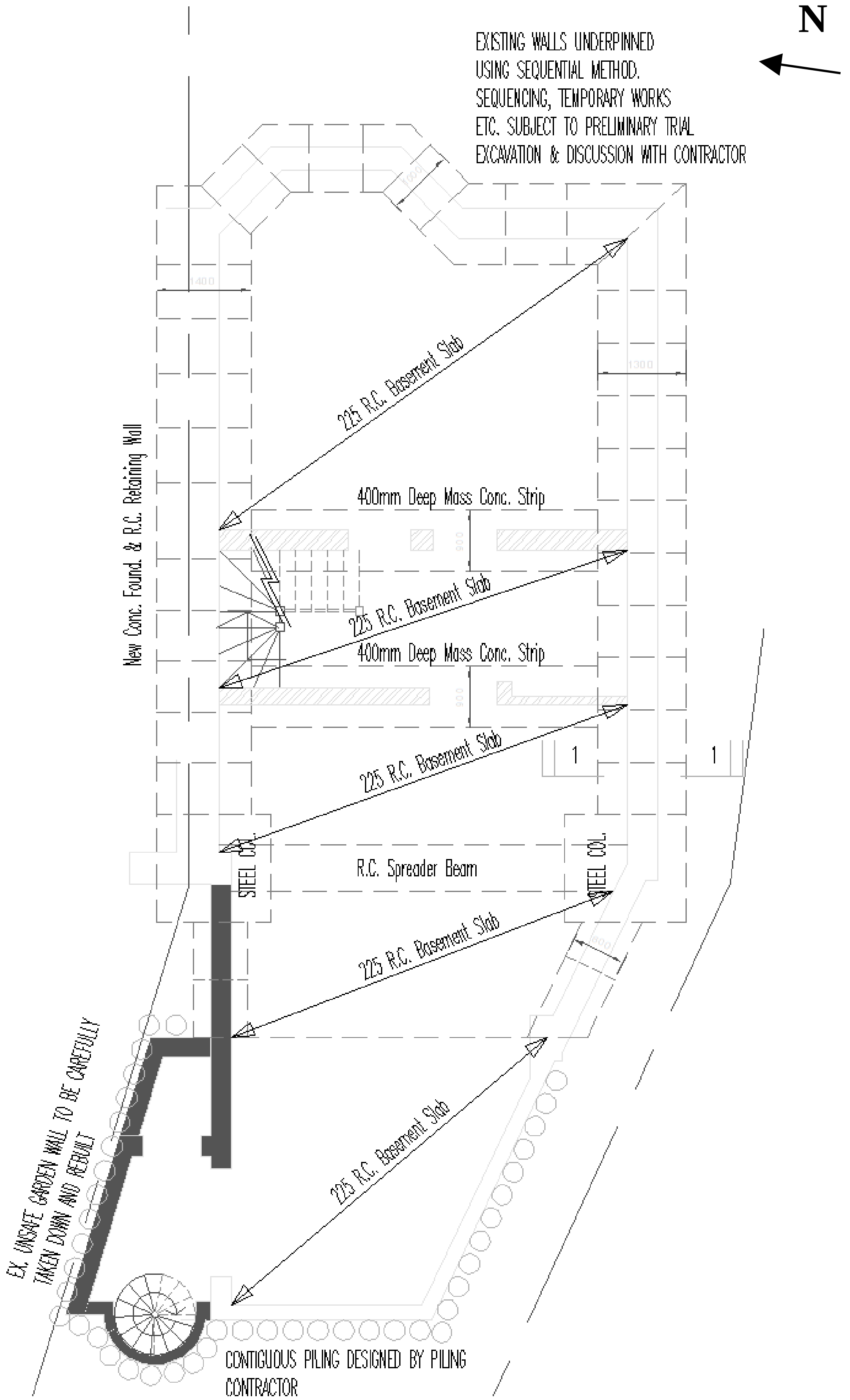

Figure 2. Layout of the proposed basement plan (Extract from Drawing 10581/SD/01)

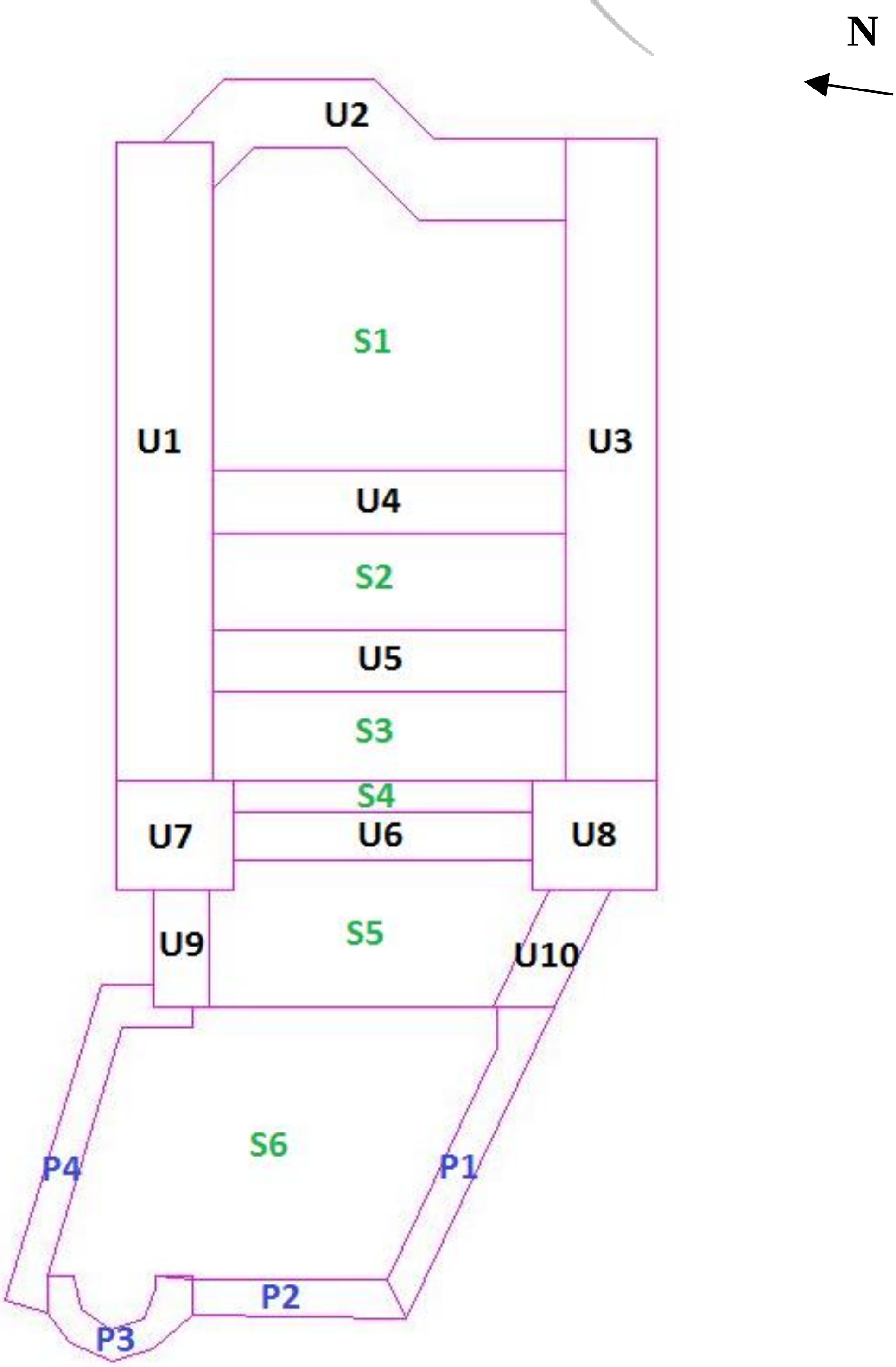

Figure 3. Detail of geometry introduced to PDISP
[U = Underpinning/retaining wall and strip foundation excavation and loads, P – Pile wall loads, S = Bulk excavation and slab loads]

2.2 *Ground Conditions*

2.2.1 The ground profile was based on the Soil Consultants Ltd (2017) ground investigation, which comprised two dynamic sampler boreholes (WS1 and WS2). WS1 was undertaken in the rear garden and advanced to 10.0 m blgl and WS2 was undertaken in the front garden and was advanced to 6.0 m depth. The front garden is indicated as being approximately 1.0 m higher than the rear garden and lower ground floor level in Drawing 10591/TP/04A; therefore, WS2 was advanced to 5.0 m blgl. The boreholes encountered 1.0 m (WS1) and 2.7 m (WS2) of Made Ground overlying clayey gravel / gravelly clay Head Deposits to depths of 1.2 m (WS1) and 3.6 m (WS2). The London Clay Formation was encountered beneath the Head Deposits to the boreholes maximum drilled depths. Full details of the ground conditions encountered are displayed in the Site Investigation Report by Soil Consultants Ltd (2017).

2.2.2 Public domain geological information on the site from the British Geological Survey (BGS) Geology of Britain Viewer indicates that the underlying geology at this site is the London Clay Formation with no overlying superficial deposits recorded.

2.2.3 No groundwater was noted during the intrusive site investigation within WS1 to 10.0 m depth during drilling but a seepage was recorded in WS2 at 3.0 m depth (2.0 m blgl). Groundwater monitoring visits were undertaken on 5th and 19th February 2017 and groundwater levels were recorded at depths of 7.35 m and 0.68 m blgl in WS1, and 1.42 m and 1.13 m blgl in WS2. The significant rise in WS1 was reported by Soil Consultants Ltd (2017) to be potential water infiltration from the shallow soils into the borehole. Due to the lack of long-term accurate groundwater readings the basement should be designed to accommodate a conservative uplift pressure of 30 kPa, which is likely to represent the worst credible scenario, in addition to the swelling displacements/pressures from the excavation and construction of the basement discussed below.

2.2.4 The short-term and long-term geotechnical properties used in the analysis are summarised in Table 1 below. These were based on both the ground investigation vy Soil Consultants Ltd (2017), and on data from previous Chelmer projects in similar ground conditions. All Made Ground and Head Deposits will be excavated and therefore only the change in vertical pressure, due to their excavation, is required for the PDISP analyses. Geotechnical parameters for the Made Ground and Head Deposits are therefore not used in the analysis.

Table 1 - Soil parameters for PDISP analyses			
Strata	**Depth** (m blgl)	**Short-term, undrained Young's Modulus, E_u** (MPa)	**Long-term, drained Young's Modulus, E'** (MPa)
London Clay Formation	3.0 10.0 15.0	23.0 67.0 98.0	13.8 40.2 59.1

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, Cu has been estimated by extrapolation of previous data.

A global Poissons ratio of 0.5 has been adopted for the London Clay Formation over its modelled thickness.

2.3 PDISP Analyses:

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

2.3.2 The results of the analyses for Stages 1, 2, 3 and 4 are presented as contour plots on Figures 4, 5, 6, and 7 respectively.

N

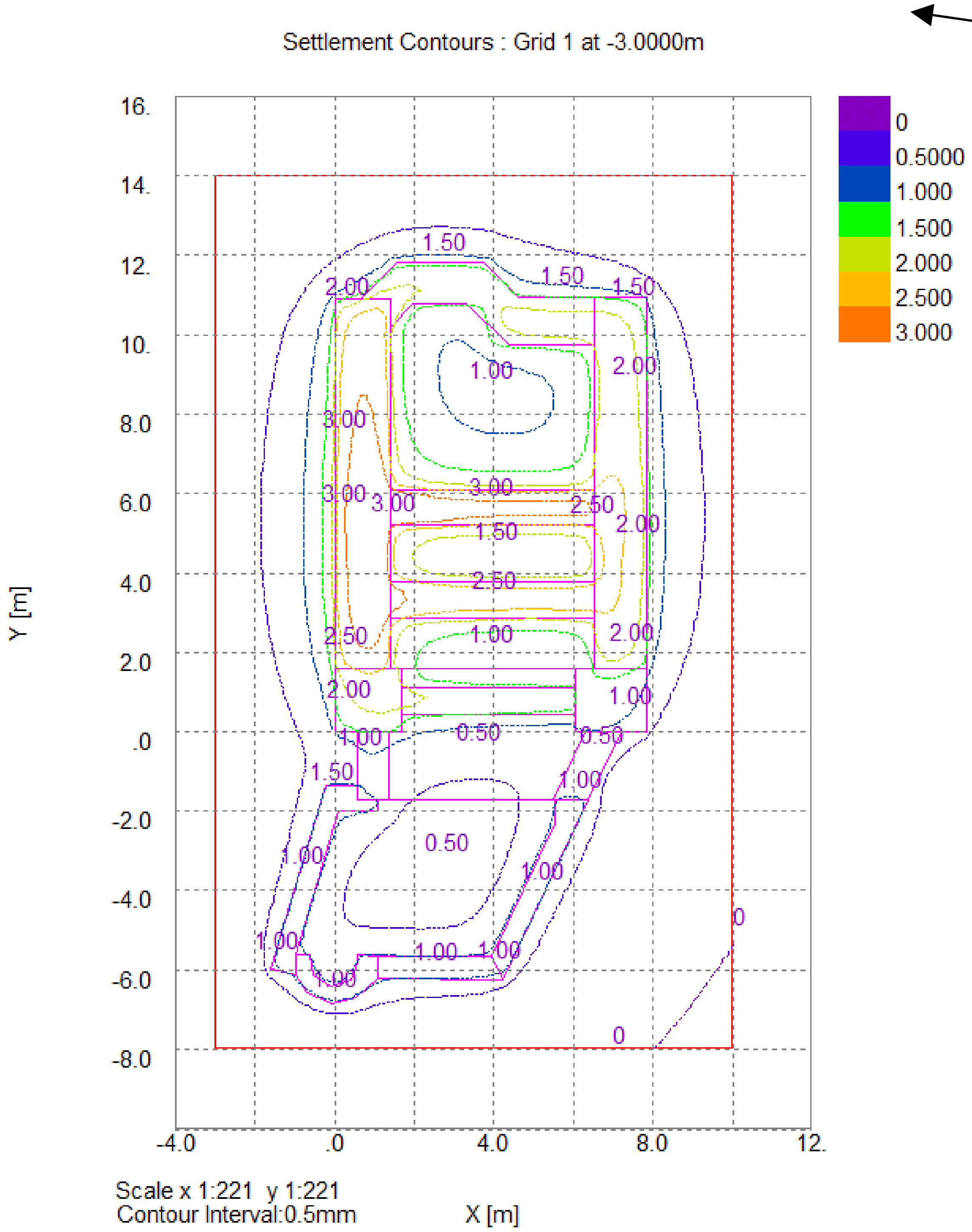

Figure 4. Stage 1 – Construction of underpins and piled walls – Short-term (undrained) condition (0.5mm settlement contours)

N

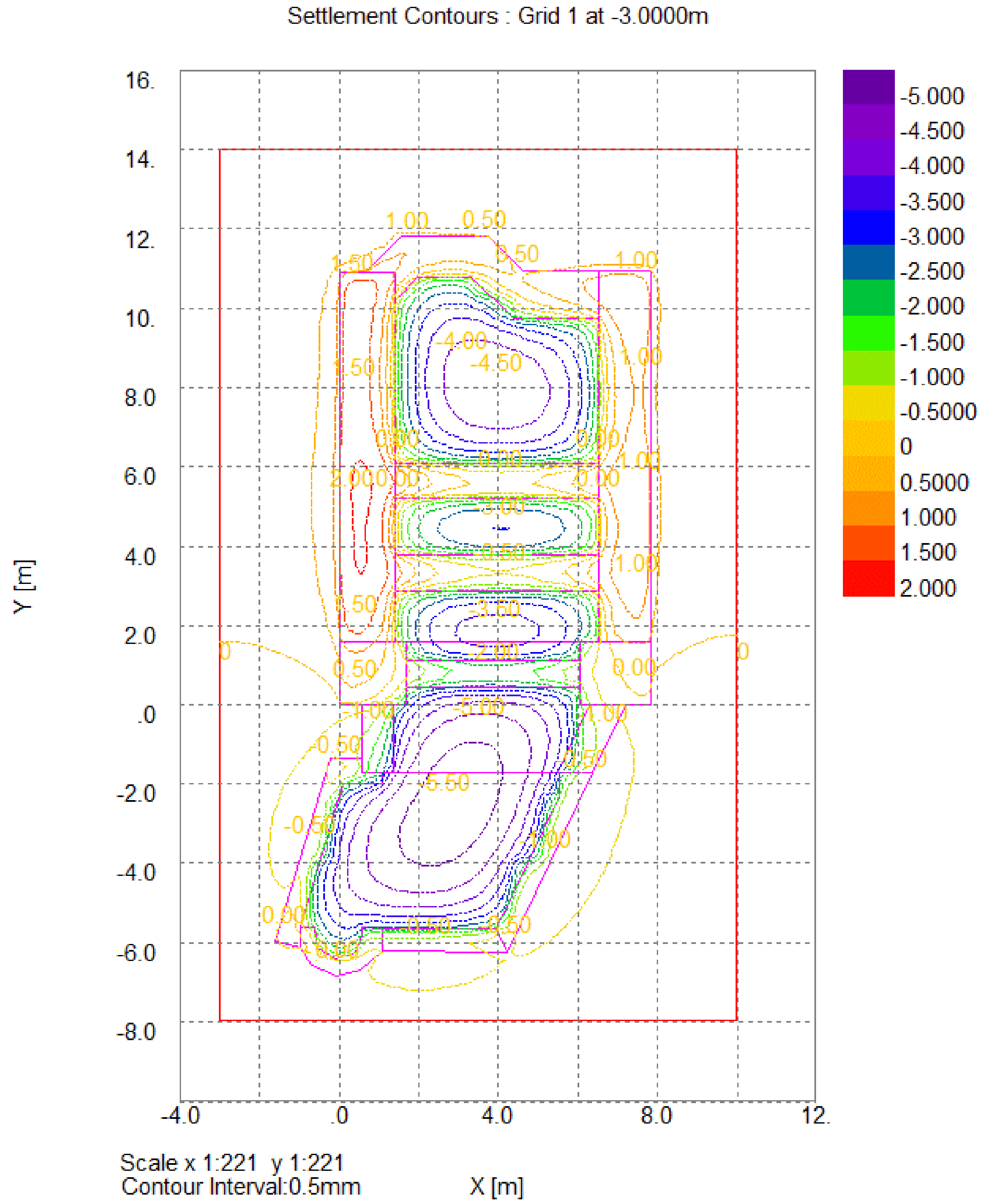

Figure 5. Stage 2 – Bulk excavation of central area to basement formation level – Short-term (undrained) condition
(0.5 mm settlement contours)

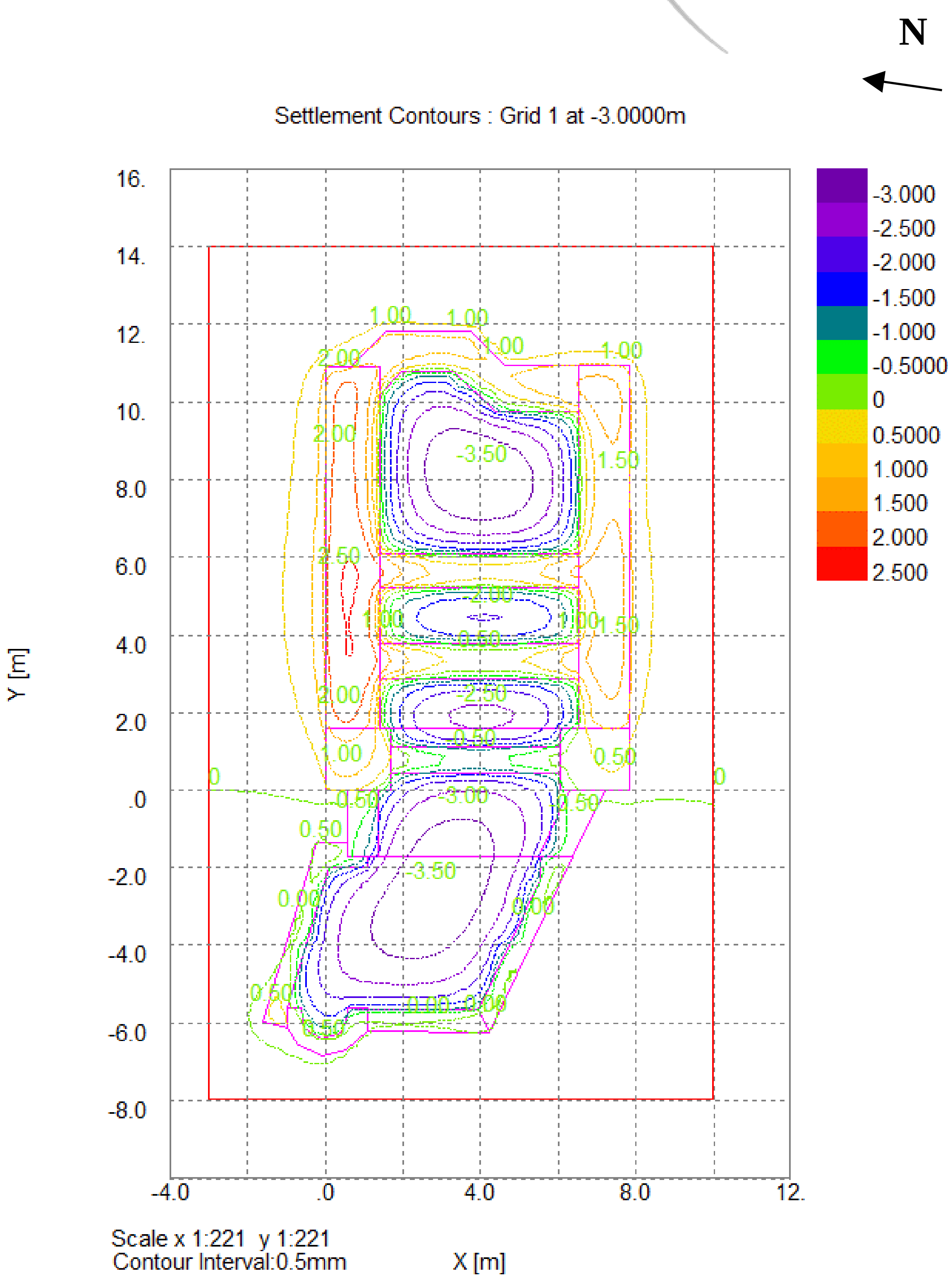

Figure 6. Stage 3 – Construction of the basement slab – Short-term (undrained) conditions (0.5mm settlement contours)

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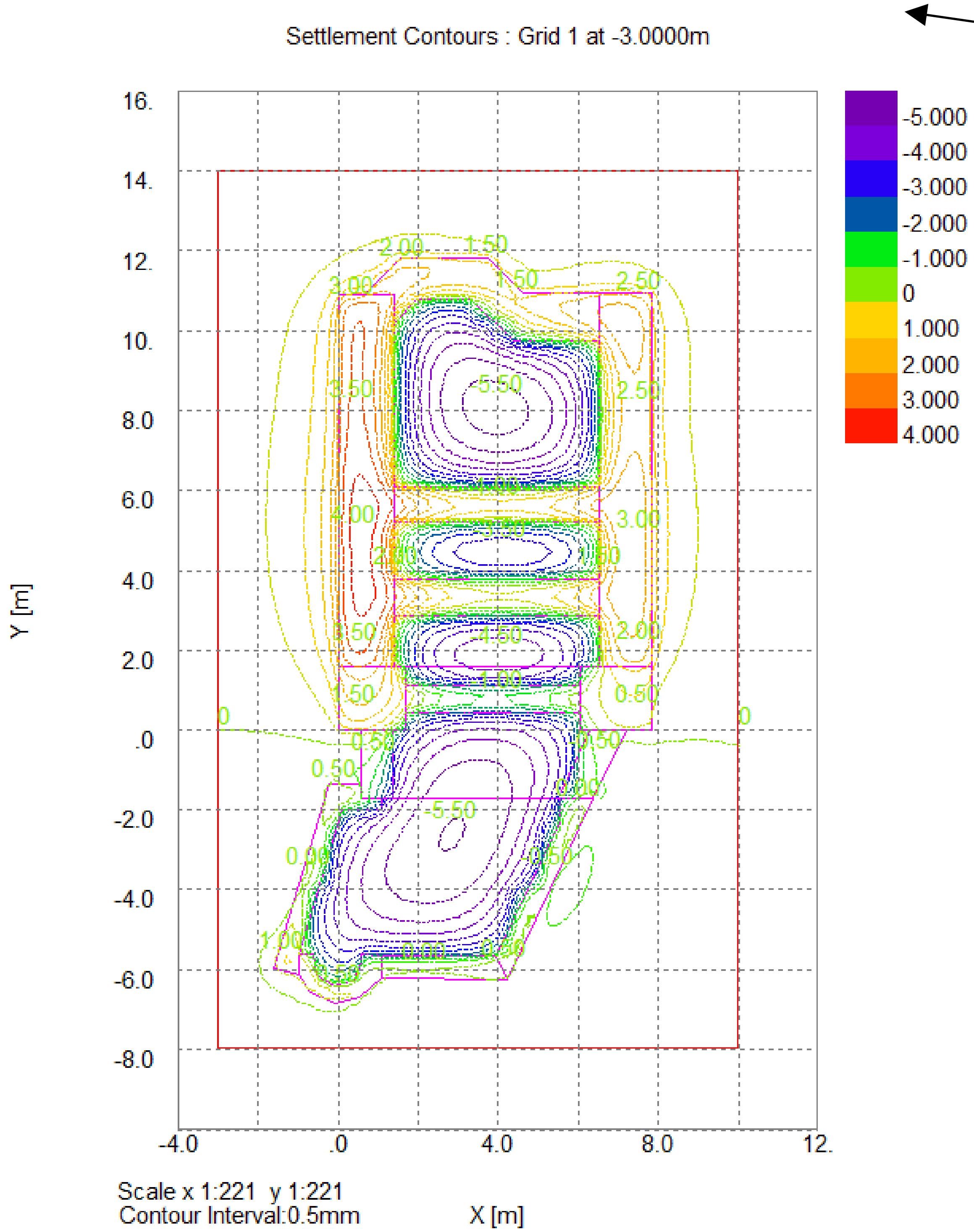


Figure 7. Stage 4 – Construction of the basement slab – Long-term (drained) conditions (0.5 mm settlement contours)

2.4 <u>Heave/Settlement Analysis</u>

2.4.1 Excavation of the basement and construction of the underpins and piled walls 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 anticipated 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.

2.4.2 The ranges of predicted short-term and long-term movements for each of the main sections of the proposed basement are presented in Table 2 below. These analyses indicate that the perimeter walls are predicted to undergo movements ranging from 4.0 mm settlement to 1.0 mm heave. The basement slab is predicted to undergo displacements, between 3.0 mm settlement and 5.5 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 2: 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)*
Underpins along north boundary wall	1.0 – 3.0 mm Settlement	1.0 mm Heave to 2.0 mm Settlement	0.0 – 3.5 mm Settlement	0.0 – 4.0 mm Settlement
Underpins along east boundary wall	1.5 – 2.0 mm Settlement	0.5 – 1.5 mm Settlement	1.0 – 2.0 mm Settlement	1.5 – 2.5 mm Settlement
Underpins along south boundary wall	1.0 – 2.0 mm Settlement	1.0 mm Heave to 1.0 mm Settlement	0.0 – 1.5 mm Settlement	0.0 – 3.0 mm Settlement
Basement slab beneath existing building	1.0 – 3.0 mm Settlement	0.0 – 4.5 mm Heave	3.5 mm Heave to 1.0 mm Settlement	5.5 mm Heave to 2.0 mm Settlement
Pile along north boundary wall	1.0 – 1.5 mm Settlement	0.0 – 0.5 mm Heave	0.5 mm Heave to 0.5 mm Settlement	0.5 mm Heave to 1.0 mm Settlement
Piles along west boundary wall	1.0 mm Settlement	0.0 – 0.5 mm Heave	0.5 mm Heave to 0.5 mm Settlement	0.5 mm Heave to 1.0 mm Settlement
Piles along south boundary wall	1.0 mm Settlement	0.0 – 1.0 mm Heave	0.5 mm Heave to 0.5 mm Settlement	0.0 – 1.0 mm Heave
Basement slab beneath existing rear garden	0.5 mm Settlement	1.0 – 5.5 mm Heave	0.5 – 3.5 mm Heave	0.5 – 5.5 mm Heave

2.4.3 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.

2.5 Bored Pile Retaining Walls

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

2.5.2 For 'Moderate support stiffness' walls designed and constructed in accordance with best practice the estimated ground surface movements resulting from installing a contiguous bored pile wall to approximately 9.0 m bgl for the 3.0 m basement excavation would be as given in Table 5 (conservatively interpolated between CIRIA guidance for high and low stiffness support). The pile depth has been estimated because, under standard UK practice, the design analyses for bearing piles are undertaken by the piling contractor.

Table 5: Potential approximate movements of ground surface immediately alongside the bored pile wall on northern and southern perimeters

Moderate support stiffness – 9.0 m deep wall / 3.0 m depth of excavation		
Ground surface movements due to:	***Horizontal movement***	***Vertical movement***
Bored pile wall installation:	0.04% of wall depth = 3.6 mm	0.04% of wall depth = 3.6 mm
Excavation in front of wall:	0.30% of excavation depth = 9.0 mm	0.25% of excavation depth = 7.5 mm
Totals:	**12.6 mm**	**11.1 mm**

2.6 Underpinning

2.6.1 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 3.5 m) should not exceed 5 mm horizontally. This figure should be adjusted pro-rata for shallower or deeper basements.

2.6.2 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 the maximum 3.0 m excavation the total settlements immediately alongside the proposed basement walls due to the excavation of the soil would be 10.5 mm.

2.7 *Excavations*

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

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

3.0 DAMAGE CATEGORY ASSESSMENT

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

3.2 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). A table displaying the classification of visible damage to walls and the relevant damage categories used in this assessment is provided in Appendix B.

3.3 The London Borough of Camden's planning website displays no evidence of modern basement excavations beneath neighbouring properties. The terraced houses to the north are believed to have lower ground floors founded at the same depth as No. 13A and No. 37 Adamson Road to the south also has a lower ground floor; as no information on this is available it is also assumed to be founded at the same level as No. 13A.

3.4 The uniform founding level beneath 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 adjoining or 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.

3.5 The geometries and distances relevant to the damage category assessments are presented in Figure 8 below. The worst-case scenario is considered to be the front wall of No. 12 due to the higher settlements predicted by PDISP in this location than the rear wall. No. 37 Adamson Road is approximately 1.5 m away from No. 13A, where PDISP predicts settlements of less than 0.5 mm. Therefore, due to the lower displacements and distance from the proposed basement No. 37 is considered a lower risk than No. 12 and will not be assessed in detail.

Figure 8. Approximate widths of affected walls of adjacent structures (Not To Scale)

3.6 The damage category assessments undertaken will consider the following:

- ground movements arising from the vertical stress changes, as assessed by the PDISP analyses;
- ground movements alongside the proposed underpins and pile 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).

Front wall of No. 12:

3.7 The relevant geometries are as follows:

Relative depth of foundations = 0.5 m (estimated)
Depth of excavation = 3.0 – 0.5 = 2.5 m
Width of zone of affected ground = 2.5 x 4 = 10.0 m

Width of No. 12's front wall = 7.0 m (assumed the same as No. 13A) therefore the front wall of No. 11 will also be affected;
Affected width (L) = 10.0 m
Height of buildings affected (H) = 13.0 m (assumed the same as No. 13A) + 0.5 m (footing depth) = 13.5 m
Hence L/H = 0.7

3.8 The predicted 5 mm maximum horizontal displacement (see Section 2.6.1) decreases pro-rata to 3.6 mm when the depth of excavation is taken into account. Thus, the horizontal strain beneath the front wall would, theoretically, be in the order of $\varepsilon_h = 3.6 \times 10^{-4}$ (0.036%).

3.9 The maximum settlement produced by the PDISP analysis beneath the location where the proposed development meets the front wall of the adjoining No. 12 was in Stage 4 where almost 3.5 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, which is appropriate to the underpinning construction method.

3.10 The total predicted settlement (due to excavation) of 10.5 mm (see Section 2.6.2) is reduced to 8.8 mm when the assumed depth to the adjacent buildings footings are taken into account. The total combined settlement of 12.3 mm, 8.8 mm predicted by the CIRIA methods plus the 3.5 mm predicted by PDISP, is detailed as the point immediately alongside the proposed basement (0 m) in Figure 9 below. Figure 9 presents the settlement curve from the basement wall to the maximum distance of affected ground, 10.0 m (see Section 3.7).

3.11 The deflection along the front walls of the No. 12 and 11 is calculated as the difference between the tangent of the relevant width of the affected wall (10.0 m) and the total predicted ground surface movements curve (from Figure 2.11(b) of CIRIA C580). For the low stiffness ground support case, settlement is convex and gives a maximum vertical deflection, $\Delta = 4.0$ mm as displayed in Figure 9 below, which represents a deflection ratio $\Delta/L = 4.0 \times 10^{-4}$ (0.040%).

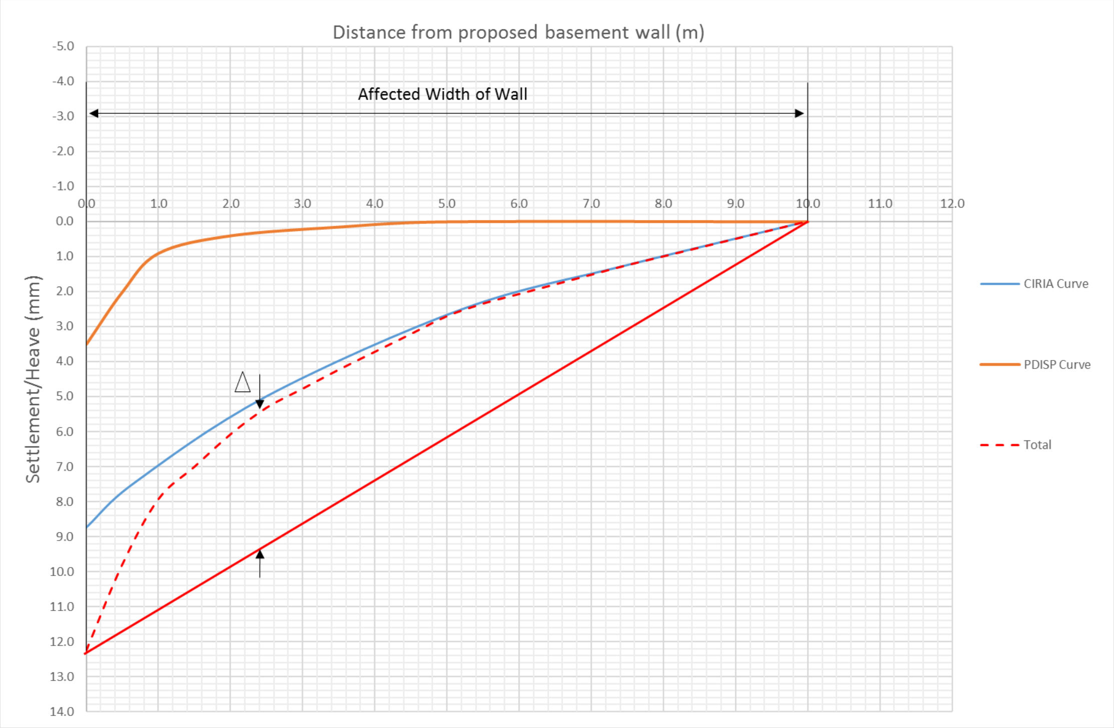


Figure 9. Combined displacements for the front walls of No. 12 and 11 due to excavation of proposed basement

3.12 Using the damage category ratings and graphs given in CIRIA SP200, for L/H = 1.0 (conservative for the 0.7 defined in Section 3.7), these deformations represent a damage category of 'very slight' (Burland Category 1), as illustrated in Figure 10 below.

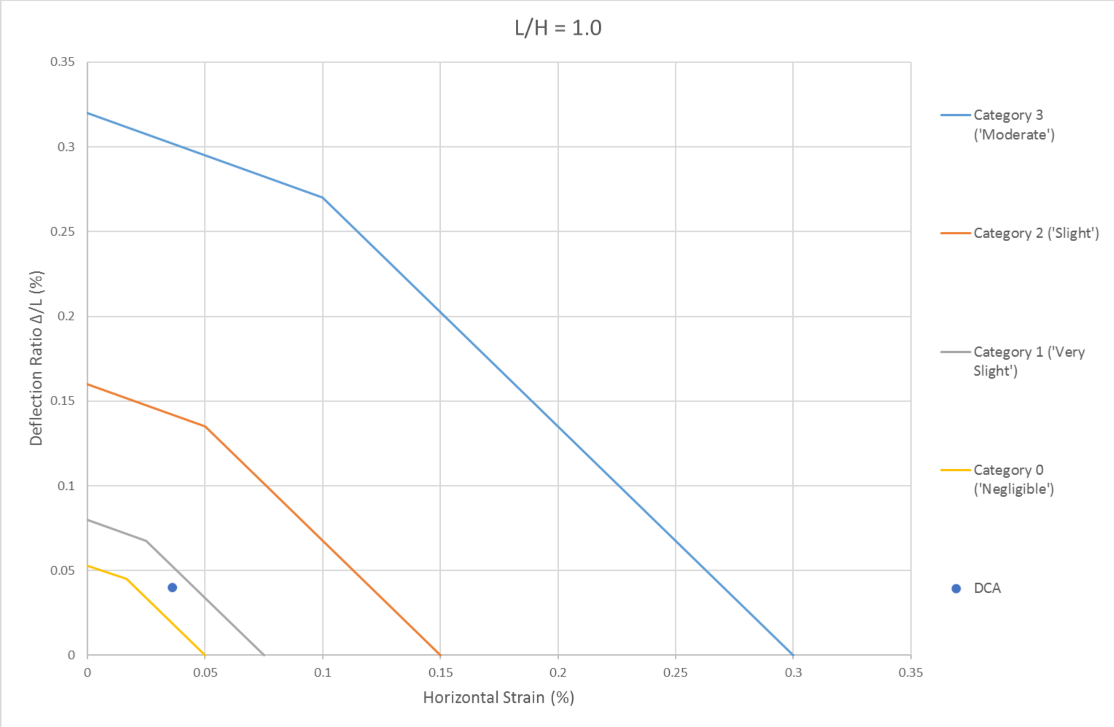


Figure 10: DCA for the front walls of No. 12 and 11

3.14 Use of best practice construction methods will be essential to ensure that the ground movements are kept in line with the above predictions.

3.15 No long term groundwater monitoring data is available and therefore there is a risk that levels higher than the proposed basement foundation level may be experienced. Care should be taken to ensure that any seepages from the exposed clay are collected and removed efficiently, and that water is not allowed to pond on the exposed clay in the excavation at the toe of the underpins.

4.0 SUMMARY

4.1 This summary considers only the primary findings of this assessment; the whole report should be read to obtain a full understanding of the matters considered.

4.2 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 4 – 7.

4.3 A damage category assessment 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 release, as predicted by CIRIA C580, Figure 2.11.

4.4 In the assessed case, the front walls of the adjoining No.'s 12 and 11 Crossfield Road fell within Burland Category 1 'very slight' (as given in CIRIA SP200, Table 3.1). The damage category result has been plotted graphically in Figure 10.

4.5 No further damage category assessments have been carried out as other structures in the vicinity are further away and/or in areas with less predicted ground movements and therefore considered lower risk. Therefore, all other walls are considered to be classified as Category 1 'very slight' or Category 0 'negligible'.

4.7 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.

References

Burland J.B., et al (2001). Building response to tunnelling. Case studies from the Jubilee line Extension, London. CIRIA Special Publication 200.

Gaba A.R., et al (2003). Embedded retaining walls – guidance for economic design. CIRIA Report C580.

Soil Consultants Ltd (2017). Site Investigation Report: 13A Crossfield Road, Hampstead, London NW3 4NT. Report Ref: 10047/BM/OT (Rev 0)

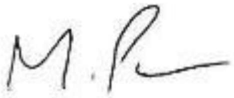
End of report

Report prepared by:

Joel Slater BEng(Hons)

Senior Geotechnical Engineer

Report reviewed by:



CEng FICE CGeol FGS
CSci CEnv C.WEM FCIWEM

UK Registered Ground Engineering Advisor

APPENDIX A

Table 1: Coordinates and net bearing pressure for PDISP			
ZONE	Net change in vertical pressure (kPa)		
#	Stage 1	Stage 2	Stages 3 and 4
U1	46.00	46.00	49.30
U2	33.00	33.00	36.30
U3	34.00	34.00	37.30
U4	52.00	52.00	55.30
U5	41.00	41.00	44.30
U6	33.00	33.00	36.30
U7	28.00	28.00	31.30
U8	12.00	12.00	15.30
U9	6.00	6.00	9.30
U10	6.00	6.00	9.30
P1a	18.00	18.00	18.00
P2a	18.00	18.00	18.00
P3a	18.00	18.00	18.00
P4a	18.00	18.00	18.00
S1	0.00	-57.00	-47.00
S2	0.00	-57.00	-47.00
S3	0.00	-57.00	-47.00
S4	0.00	-57.00	-47.00
S5	0.00	-57.00	-37.00
S6	0.00	-57.00	-37.00
P1b	12.00	12.00	12.00
P2b	12.00	12.00	12.00
P3b	12.00	12.00	12.00
P4b	12.00	12.00	12.00
P1c	12.00	12.00	12.00
P2c	12.00	12.00	12.00
P3c	12.00	12.00	12.00
P4c	12.00	12.00	12.00
P1d	12.00	12.00	12.00
P2d	12.00	12.00	12.00
P3d	12.00	12.00	12.00
P4d	12.00	12.00	12.00

APPENDIX B

Classification of visible damage to walls (after Burland et al, 1977, Boscardin and Cording, 1989; and Burland, 2001)

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
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. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 but also depends on number of cracks	> 0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

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Robert Savage & Associates Ltd.

architects designers structural engineers

11 Eton Garages • Lancaster Grove • London NW3 4PE
Telephone +44 (0)20 7433 3561 • Facsimile +44 (0)20 7433 3716 • E-mail r.savage@virgin.net

Charlotte Meynell
Regeneration and Planning
London Borough of Camden
2nd Floor
5 Pancras Square
London N1C 4AG

10TH May 2017

Dear Charlotte,

Please find attached structural drawing SD01, Calculations for the underpinning and the Monitoring Method Statement.

It is anticipated the duration of the works will be 9 months.

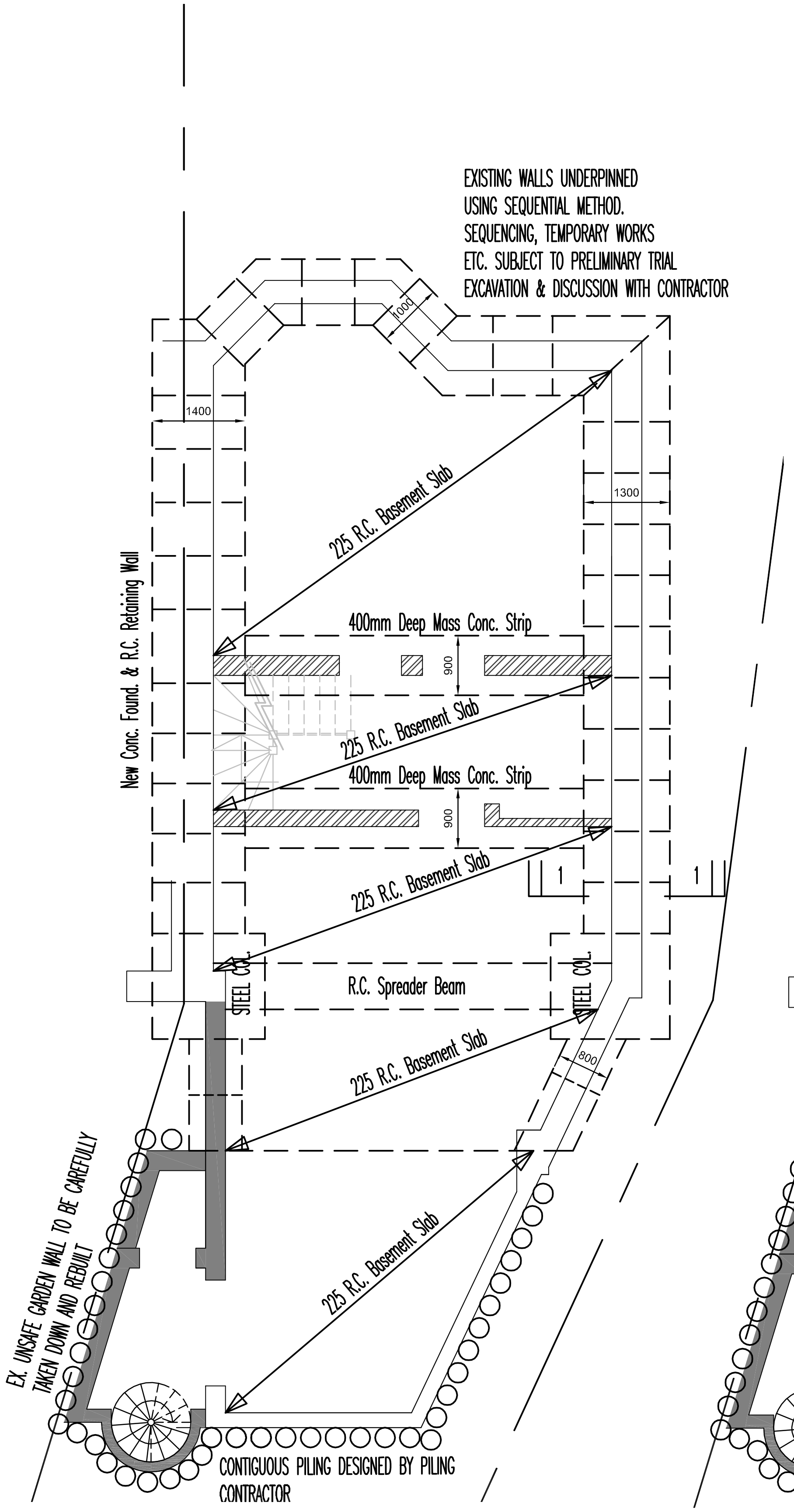
The results of the monitoring will be assessed against the Burland protocol for site progress and subsequently take any mitigating action required.

The trial borehole indicates some seepage of water subsequent to drilling a dry hole. It is suspected this may be due to perched water in the upper permeable strata. Control of any ingress of water into the excavations will be dealt with by piping to pre-determined sumps and pumped away.
A trial excavation will be carried out inside the existing building to finally assess the strategy for temporary works and de-watering as site conditions indicate.

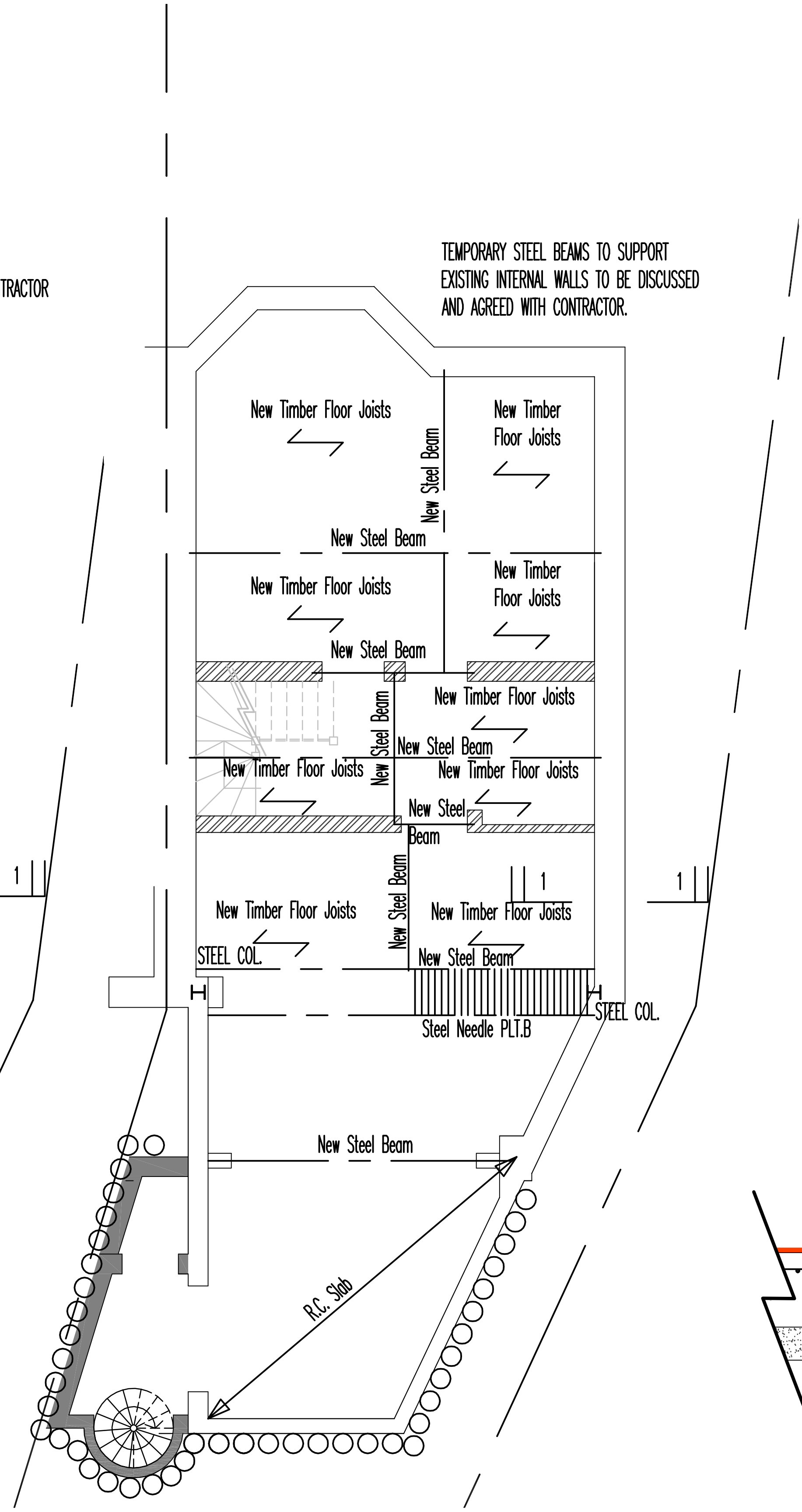
Please do not hesitate to contact us if any further information is required.

Kind regards,

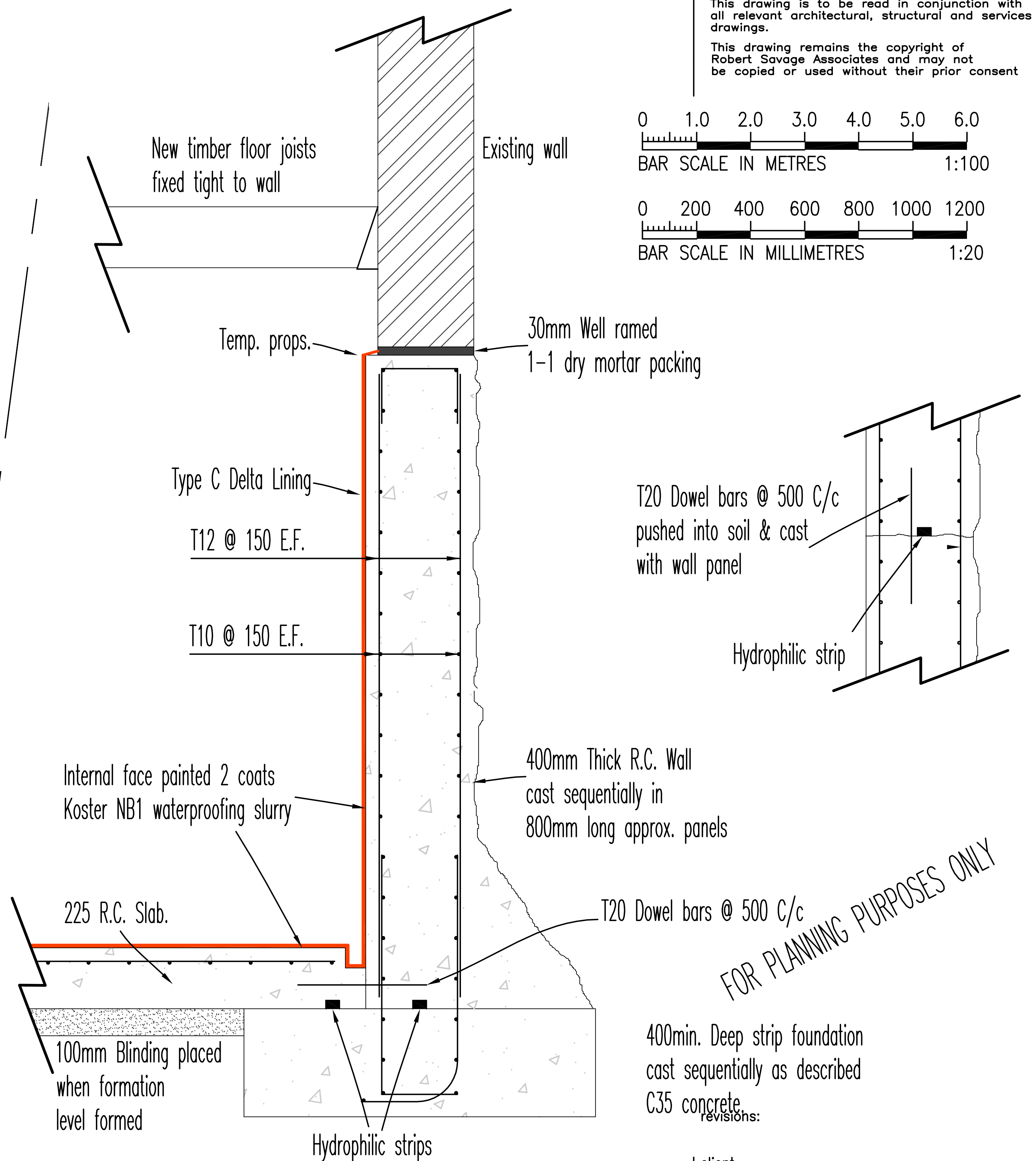
Jeff Savage



BASEMENT PLAN WITH BASEMENT STRUCTURE



BASEMENT PLAN WITH GROUND FLOOR STRUCTURE



DETAIL 1-1

notes

Any discrepancies in dimensions or detail to be reported to the architect immediately.
This drawing is to be read in conjunction with all relevant architectural, structural and services drawings.

0 1.0 2.0 3.0 4.0 5.0 6.0
BAR SCALE IN METRES 1:100
0 200 400 600 800 1000 1200
BAR SCALE IN MILLIMETRES 1:20

revisions:

client

Walter & Jennifer Ladwig

project

13A Crossfield Road
London NW3 4NS

title

Structural Details

scale	date	drg. no.
1:100 & 1:20	May 2017	10591/SD/01

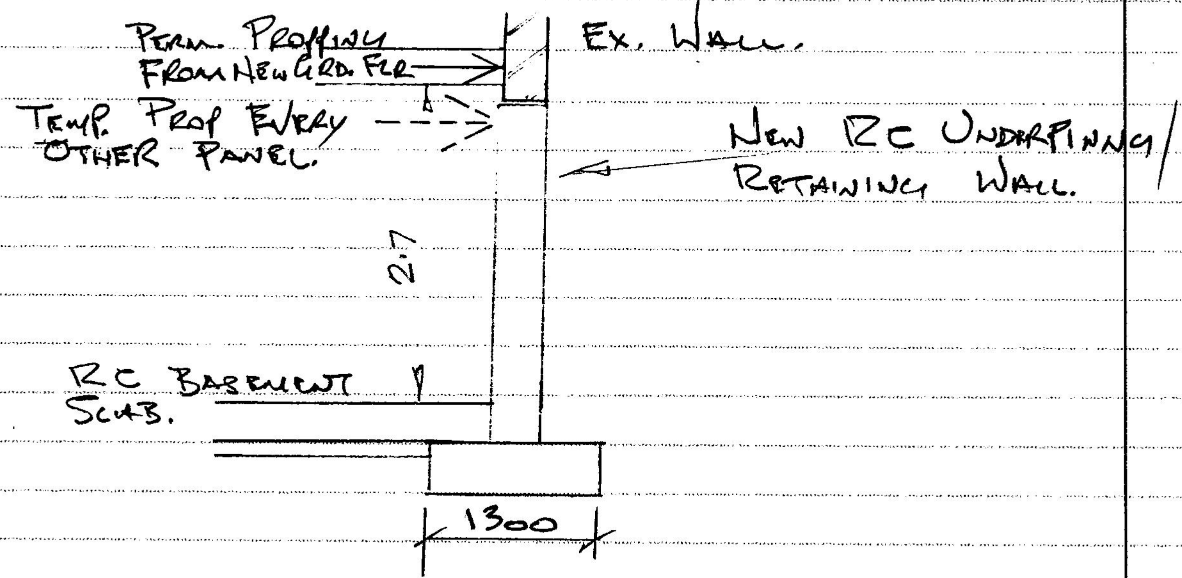
Robert Savage & Associates
architects designers structural engineers
11 Eton Garages, Lancaster Grove, Belsize Park, London NW3 4PE
Telephone: 020 7433 3561
Facsimile: 020 7433 3716

Robert Savage & Associates
architects designers structural engineers
11 Eton Garages · Lancaster Grove · London NW3 4PE
Facsimile 0207 433 3716 · Telephone 0207 433 3561 ·
E-mail roger@eton11.freeserve.co.uk

PROJECT	London NW3	SHEET No. C1
No. of Sheets		Date

CALCULATION SHEET

NEW BASEMENT UNDERPINNING/RETAINING WALL
UNDER FLANK WALL.



SECTION.

LOAD TO EX. FOUNDATION FROM ABOVE.
INCL. 1M WIDTH FLOORS.

BRICKWORK LWR GRD - 1ST. FLRS.	$= 6.6 \times .36 \times 20$	$= 47.5$	KN/M
" 1ST. - 3RD FLRS	$= 6 \times .25 \times 20$	$= 30.0$	" "
FLOOR DEAD	$5 \times 1 \times 1$	$= 5.0$	" "
" SUPER	$5 \times 1.5 \times 1$	$= 7.5$	" "
ROOF TOTAL	1.6×2	$= 3.2$	" "
	TOTAL	$= 93.2$	" "

NEW RC WALL	$= 3 \times .4 \times 25$	$= 30.0$	" "
	TOTAL	$= 123.2$	" "

SOIL STRESS $= \frac{123.2}{1.3} = 95 KN/M^2$

RETAINED SOIL GRAVELLY FIRM CLAY $20 KN/M^3$

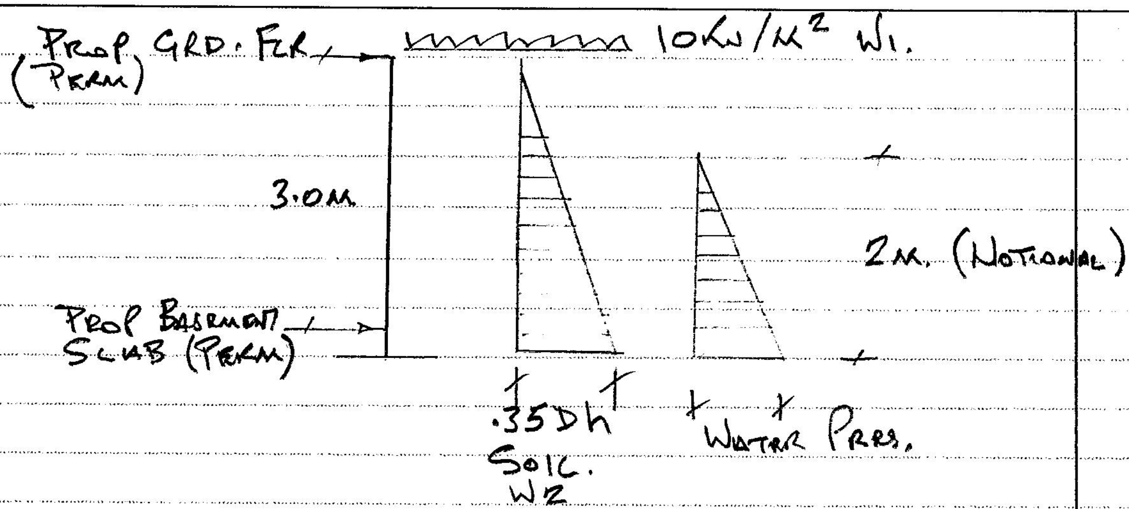
SURCHARGE $= 10 KN/M^2$

SOIL PRESSURE COEFFICIENT $K = .35$

Robert Savage & Associates
architects designers structural engineers
11 Eton Garages · Lancaster Grove · London NW3 4PE
Facsimile 0207 433 3716 · Telephone 0207 433 3561 ·
E-mail roger@eton11.freeserve.co.uk

PROJECT 13A CROSSFIELD RD LONDON NW3	SHEET No. C2.
No. of Sheets	Date

CALCULATION SHEET



TEMP. CONDITION. – PROPPED CANT.
PERM. " SIMPLE SPAN.

$W_1 = 10 \times .35 = 3.5kN/m^2$

$W_2 = 20 \times .35 \times 3 = 21kN/m^2$

$W_3 = 10 \times 2 = 20kN/m^2$

COMBINED $W_2 + W_3 = \left(21 \times \frac{3}{2}\right) + \left(20 \times \frac{2}{2}\right) = 51.5kN$ TOTAL

BASE M - TEMP. $= \frac{W_1 h^2}{8} + \frac{W_{2-3}\, h}{15} = \frac{3.5 \times 3^2}{8} + \frac{51.5 \times 3}{15} = 14.2$ kN. M.

$\frac{L}{A} = 95kN/m^2 \quad \frac{M}{Z} = \frac{14.2 \times 6}{1.3^2 \times 1} = 50kN/m^2.$

MAX. SOIL STRESS $= 95 + 50 = 145kN/m^2$. ACTUAL

PERM. FROM SOIL REPORT. $= 125kN/m^2$.

OVERSTRESS $= \frac{20}{125} \times 100 = 16\% < 25\%$

∴ ACCEPTABLE SHORT. TERM.

Robert Savage & Associates
architects designers structural engineers
11 Eton Garages · Lancaster Grove · London NW3 4PE
Facsimile 0207 433 3716 · Telephone 0207 433 3561 ·
E-mail roger@eton11.freeserve.co.uk

PROJECT 13A CROSSFIELD RD LONDON NW3	SHEET No. C3
No. of Sheets	Date

CALCULATION SHEET

PERMANENT CONDITION.

$$M = \frac{W_1 h^2}{8} + .128 W_{2-3} h = \frac{3.5 \times 3^2}{8} + .128 \times 51.5 \times 3$$

= 23.7 kN. M. ELASTIC

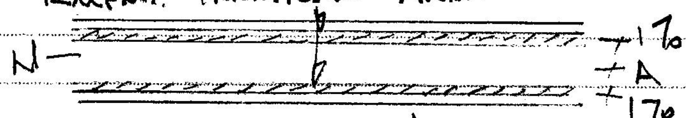
400 mm THICK WALL C35A CONC.

Ast T12 @ 150 = 754 mm^2

$$f_{y\text{-}st} = \frac{23.7 \times 10^6}{350 \times .9 \times 754} = 100\,N/mm^2.$$

FOR .2 mm CRACK WIDTH. $f_{y\text{-}st}$ = 130 N/mm^2 > 100

REINFMT. TRANSPOSED AREA



ELASTIC ASSESSMENT.

CHECK FOR UNCRACKED SECTION.

$$Z/M = \frac{bd^2}{6} \text{ CONC.} = \frac{10^3 \times 400^2}{6} = 26.67 \times 10^6\,mm^3$$

$$Z_{st}/M = \frac{2 \times 754 \times 14 \times 170^2}{182} = 3.35 \times 10^6\,mm^3$$

TOTAL = 26.67 + 3.35 = 30.02 × $10^6\,mm^3$

$$f_{yt\,\text{CONC.}} = \frac{23.7 \times 10^6}{30.02 \times 10^6} = .79\,N/mm^2 \text{ ELASTIC.}$$

MAX $f_{y\,\text{CONC.}}$ FOR UNCRACKED SECTION = 1.6 N/mm^2

.79 < 1.6

BASEMENT DESIGN CONFORMS TO A GRADE 3 STANDARD.

MONITORING METHOD STATEMENT

Contract/Job Name	
Contract/Job Number	
Date	
Method Statement Written by	**Artur Migacz**
Method Statement Approved by	
Signature of Approver	

1 INTRODUCTION

This Method Statement describes the specific safe working methods which will be used to carry out the work. It gives details of how the work will be carried out and what health and safety issues and controls are involved.

2 DESCRIPTION OF WORK

Due to excavation works at 13A CROSSFIELD Rd monitoring of the neighbouring buildings has been commissioned.

3 SCOPE OF WORK

In order to check the walls movement detailed monitoring of approximately 40 targets at 13A #12 CROSSFIELD Rd will be provided. The targets will be installed in pairs at low and high level along the facades. The targets will be monitored in X-, Y- and Z-axis on weekly basis.

4 METHOD OF WORK

- Instrumentation

The monitoring will be carried out using instrument Leica Total Station TCA1800 with angle measurement accuracy **1"** and distance measurement accuracy **1 mm + 2 ppm**, Leica Tripods and Leica Prism Kits.

- Survey Control

Permanent survey control will be established with Survey Nails drilled and epoxy resined into solid surfaces where possible and additional control stations in the form of retro-reflective targets established away from the site will be used. The monitored targets will be installed in places where visual access is not obstructed.

- Plant and Equipment

All survey equipment used will carry up to date calibration certificates, and will be battery powered.

5 LOCATION OF WORK

Work will be carried out within:

- 13A CROSSFIELD RD.
- Public areas

Robert Savage & Associates Ltd
architects designers structural engineers

11 Eton Garages • Lancaster Grove • London NW3 4PE
Telephone +44 (0)20 7433 3561 • Facsimile +44 (0)20 7433 3716 • E-mail office@rsa.me.uk

13a Crossfield Road, London NW3 4NS

Surface water flow

We have noted the requirements outlined in the Camden Planning advice CPG 4 – 3.51. Although our basement design extends into the rear garden area it is relatively small and as the sub-soil of London clay is largely impervious we do not consider that the loss of absorbetive strata due to the basement construction sufficiently high in volume to result in any flooding that already occurs due to storm water conditions.

However, we accept that there will be a loss of ground surface that could contribute to evaporation of surface water that will now be artificially drained into the storm water system. Given the largely impermeable sub-soil a full SUDS scheme is untenable.

We would therefore propose adopting a storm water run-off attenuation scheme comprising an Aquacell formed void 50% of the 1 in 100 year storm water run-off volume plus 20% for global warming, with a restricted outflow to the main sewer. We would propose say a 50mm dia. outflow pipe with a 100mm high level overflow using a 73mm/one hour storm water hard surface run off volume from roof areas and non-permeable external drained areas. Consideration is being given to a rain-water harvesting tank for horticultural purposes, although we accept this would have a minimal contribution to flood risk management.

Dewatering basement excavations.

The soil report indicates the presence of water in the SI borehole. It was considered this was not from standing ground water but perched water from higher levels seeping into the borehole.

In view of this conclusion it is not considered necessary to dewater the excavation by the use of well points or other extensive systems.

The main risk of water entering any excavation is likely to arise from seepage via gaps in the contiguous piling. Similarly, therefore, it not considered necessary to adopt secant piling to provide a water tight curtain. The assumption is that any water entering the excavations will result from the high level perched water. Consequently it is proposed that once soil is removed to the London clay level in from of the contiguous piling the gaps between the piles will be shuttered and concrete poured in to seal off any water ingress.

With the underpinning process we would not anticipate any water under the existing building so dry conditions are assumed. However, should either perched water or rain water penetrate into the excavation a small sump will be provided locally at the edge of the base of each underpinning panel to collect any water ingress. The sump will be drained using a submersible pump with the water taken into a settling tank and then to the sewerage system.

This preliminary proposal is subject to alteration after a trial underpinning panel is undertaken and consultation with the contractor on site.

Roger Lankester CEng. MIStructE. MCIWEM
24/7/17.

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Utility Services

We confirm that we have checked the information and location of the existing incoming utilities services, which enter the property adjacent to the external front staircase and are outside zone of influence of the proposed works.

J Savage.
27/07/2017

London

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

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com

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A list of Members is available at our Registered Office at: Friars Bridge Court, 41- 45 Blackfriars Road, London SE1 8NZ
VAT No 974 8892 43