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44 Downshire Hill, London NW3

Basement Screening Assessment

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Executive Summary

Details	Summary of Main Text
Introduction	This report has been prepared on the instructions of Mr N A Leifer who is proposing to lower the existing Garden (basement) floor level by 300mm to allow the restoration of adequate ceiling height as part of the required underpinning works.
Site description	The site is at 44 Downshire Hill, London.
Environmental Setting	Strata comprising London Clay Formation soils (an aquiclude), described as stiff brown clay, are shown to underlie the site. The site is not within a groundwater source protection zone. The nearest significant surface water feature is Hampstead Heath Ponds located approximately 230m from the site.
Ground Investigation	
Ground Conditions Encountered	Historic trial pits excavated within the footprint of the existing Garden Floor (basement) shows the presence of London Clay under the floor.
Groundwater	Not encountered in the historic trial pits.
Screening Assessment	
Surface Flow and Flooding	The assessment has not identified any surface flow and flooding issues at the site.
Subterranean (groundwater) flow	The assessment has not identified any groundwater issues at the site.
Slope Stability	The near surface London Clay has a high potential for swelling and shrinkage as a result of seasonal moisture content change and through the influence of tree growth or removal. No slopes are being created at the site and therefore the impact will be low.
Foundation Design	Settlement analysis have been undertaken on the proposed underpinning works and they indicate the predicted category of damage will be very slight, in accordance with Camden Planning Guidance CPG 4, Basement and Lightwells
Further Work	The effect of potential impacts are low and therefore Basement Impact Assessment as described in the London Borough of Camden guidance CPG 4 is not required for this project.

Limitations and Exceptions

1 This report and its findings should be considered in relation to the terms and conditions proposed and scope of works agreed between MLM Consulting Engineers Ltd (MLM) and the client.

2 The Executive Summary, Conclusions and Recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon until considered in the context of the whole report and the development, if any, proposed.

3 The assessment and interpretation of contamination and associated risks are based on the scope of work agreed with the client and the report may not be sufficient to fully address contaminations or to allow detailed remediation design to proceed without further investigation and analysis.

4 Any assessments made in this report are based on the ground conditions as revealed by the exploratory holes and pits, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant data which may have been obtained for the sites including previous site investigation reports. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.

5 Interpretations and recommendations contained in the report represent our professional opinions, which were arrived at in accordance with currently accepted industry practices at the time of reporting and based on current legislation in force at that time.

6 Where the data available from previous site investigation reports, supplied by the Client, have been used, it has been assumed that the information is correct. No responsibility can be accepted by MLM for inaccuracies within the data supplied.

7 Whilst the report may express an opinion of possible configuration of strata between or beyond exploratory hole or pit locations, or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only and no liability can be accepted for the accuracy.

8 Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. It should be noted that groundwater levels can vary due to seasonal or other effects.

9 The copyright in this report and other plans and documents prepared by MLM is owned by them and no such report, plan or document may be reproduced, published or adapted without their written consent. Complete copies of this report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its commission.

10 This report is prepared and written in the context of the proposals stated in the introduction to this report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to us for re-assessment and, if necessary, re-appraisal.

1 Introduction

1.1 General

This report has been prepared by MLM Consulting Engineers Ltd (MLM) on the instructions of Mr N A Leifer who is proposing to lower the existing Garden floor (basement) level by 340mm to allow the formation of adequate ceiling height as part of the underpinning works.

This report presents the findings of a Basement Screening Assessment undertaken in accordance with the guidelines published by the London Borough of Camden (LBC) in support of the planning application.

1.2 Terms of Reference

The terms of reference for the work were set out in the MLM proposal 773819-FEE-ENV-001 dated 15 March 2016.

1.3 Proposed Development

Major engineering works (underpinning) are required to stabilize the building and replace the existing, inadequate foundations. As part of these works, it is intended to lower the Garden floor (basement) level by 300mm to restore the headroom. The settlement of the building in relation to the kitchen floor had contributed to the reduction in the Garden floor headroom.

2 The Site

2.1 Location and Description

The site is at 44 Downshire Hill, London. The site is located within a row of terrace houses. The house is rectangular in shape and measures approximately 10.3m by 6.4m. It is bordered to the north by No 33 Downshire Hill, to the east by a garden associated with 44 Downshire Hill and gardens associated with buildings on Keats Grove, to the south by 45 Downshire Hill and St John Downshire Hill Church beyond it and to the west by Downshire Hill and residential dwellings beyond it.

The Garden floor (basement) is currently at approximate level of 72.65m AOD and the Downshire Hill is at approximate level of 73.5m AOD. The ground gently inclines towards Hamstead Heath at a gradient of 1:60.

The National Grid Reference for the approximate centre of the site is 52699, 185721.

A location plan of the site is presented as Figure 1.

2.2 Geology

The geological map of the area shows the site to be underlain by the London Clay Formation soils and potentially for superficial Head Deposits to be present. The Camden Geological, Hydrogeological and Hydrogeological Study (prepared by Arup, on behalf of LBC) confirms that the site is only underlain by London Clay and there are no overlying permeable superficial strata.

Trial pits excavated within the existing Garden floor confirmed the presence of the London Clay. Records of the trial pits are shown in Appendix A. No groundwater was recorded in the pits.

2.3 Hydrogeology

The Environment Agency website provides the following hydrogeological information:

Table 2.1 Aquifer Properties

Aspect	Designation	Description
Groundwater Source Protection Zone	No SPZ	The site is not within a catchment area where groundwater is discharged to a source.
Aquifer Designation – Bedrock Deposit	Unproductive Strata	These are deposits with low permeability that have negligible significance for water supply or river base flow.

Groundwater was not encountered during the excavation of the trial pits within the existing Garden Floor.

2.4 Hydrology

The closest significant surface water feature is Hampstead Ponds located approximately 230m to the north east of the site.

2.5 Existing Site Drainage Information

The Environment Agency website indicates that the site is free from surface water flooding. This is confirmed by flood map enclosed within Camden Geological, Hydrogeological and Hydrogeological Study. The nearest road that has historically flooded is Willow Road, some 145m to the North West of the site.

3 Screening Assessment

The Camden Geological, Hydrogeological and Hydrogeological Study compiled by Arup(2010) and the London Borough of Camden Planning Guidance CPG 4: Basement and Lightwells(2015) contains a list of questions within three flowcharts for surface water flow, groundwater flow and slope stability. The response to these questions are presented in the following sections.

3.1 Surface Flow and Flooding Screening Assessment

Table 3.1 Surface Flow and Flooding Screening from LBC Study

Question		MLM Response
1	Is the site within the catchment of the pond chains on Hampstead Heath?	No (The site is 230m from the Heath)
2	As part of the proposed site drainage will surface water flows (e.g. volume of rainfall and peak run off) be materially changed from the existing route?	No. There is no change to the number of rooms within the proposed building and therefore no increase in run off. The basement is being lowered by 340mm within the London Clay and therefore there will not be decrease in storage capacity in the area.
3	Will the proposed basement development result in change in the proportion of hard surfaced/paved areas?	No. There is no increase in hard surface. Only the existing floor is being lowered.
4	Will the proposed basement development result in changes to the profile of the inflows of surface water being received by adjacent properties or downstream watercourses?	No. No changes are being proposed to the roof and therefore no change in surface water runoff. The proposed level of the Garden floor (basement) will be above the existing footings and therefore the proposed floor will not impact on the ground water flow, if any ground water is flowing within the low permeable London Clay.
5	Will the proposed basement result in changes in quality of surface water being received by adjacent properties or down stream	No. There is no increase in surface run off from site and there will not be any impact on the near surface groundwater flow.
6	Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No. The site is not near these areas and no groundwater was observed within the trial pits. Seepages from Downshire Hall was observed near the Garden Floor lobby. Therefore tanking is being provided to reduce the ingress of water.

There will not be any change in the surface water run off or in the near surface groundwater from the site.

3.2 Subterranean (groundwater) Flow Screening Flowchart

Table 3.2 Groundwater Screening from LBC Study

Question	MLM Response
1a Is the site located directly over an aquifer?	No. The site is located over London Clay, classified as Unproductive Strata
1b Will the proposed basement extend beneath the water table surface?	No. The site is underlain by clay and no perched water was observed in the trial pits.
2 Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No, the nearest water course is 230m from the site
3 Is the site within the catchment of the pond chains of Hampstead Heath?	No
4 Will the proposed basement development result in change in the proportion of the hard surfaced/paved areas.	No. There will not be any increase in the hard surface area within the proposed development.
5 As part of the site drainage, will more surface water (e.g. rainfall and run off) than at present be discharged to the ground (e.g. via soakways and or SUDS)?	No. There will not be any increase in the hard surface area within the proposed development.
6 Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No. No pond is nearby. There is no evidence of historic flooding near the site.

The assessment has not identified any groundwater issues at the site.

3.3 Slope Stability Screening Assessment.

Table 3.3 Slope Stability Screening from LBC Study

Question	MLM Response
1 Does the existing site include slopes, natural or man-made greater than 7^0 (approximately 1 in 8)?	No, the site is shallower at 1:60
2 Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7^0 (approximately 1 n 8)?	No; there will not be any external regrading of the ground.
3 Does the development neighbour land, including railway cuttings and the like with the slope greater than 7^0 (approximately 1 in 8)?	No. The surrounding land is mainly covered with gardens and residential dwellings.
4 Is the site within a wider hillside setting in which the general slope is greater than 7^0 (approximately 1 in 8)?	No. The surrounding area is at 1:60.
5 Is London Clay the shallowest strata at the site?	Yes. However no new slopes are being formed. The area of excavation is very unlikely to impact on the existing excavations as the retaining wall is some 4.7m from the area of excavation.

Question		MLM Response
6	Will any trees be felled as part of the proposed development and or are any works proposed within any tree protection zones where trees are to be retained?	No; only work within the building are being proposed.
7	Is there a history of seasonal shrink swell subsidence in the local area, and or evidence of such effects at the site?	No; though some roots were observed but desiccation is not considered to be an issue at the site.
8	Is the site within 100m of a watercourse or a potential spring line.	No, the nearest water course is 230m from the site
9	Is the site within an area of previously worked ground?	No. None are shown on the British Geological Survey plan or Environment Agency website.
10	Is the site within an aquifer? If so will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No
11	Is the site within 50m of the Hampstead Heath ponds?	No
12	Is the site within 5m of highway or pedestrian right of way?	Yes. The area of excavation is approximately 4.7m from the highway. However the ground between the site and highway will not be lowered and the risk of causing instability to the highway is very low.
13	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No.
14	Is the site over (or within the exclusion zone of) any tunnels eg railway lines.	No. None are shown on the BGS and Ordnance Survey.

The assessment has not identified any slope stability issues at the site.

3.4 Appraisal of Potential Impacts

The screening assessment has confirmed that the proposed development will not cause harm to the built and natural environment; result in flooding or lead to ground instability. However settlement analysis have been undertaken on the proposed underpinning to confirm that there are no impact on the existing structure from the proposed underpinning works as required by paragraph 2.9 of Camden Planning Guidance 4.

4 Assessment on the Impact of the Works on the Existing Structure

4.1 General

Paragraph 2.9 of the Camden Planning Guidance 4 requires confirmation that the proposed underground development does not impact on the existing fabric of the listed building. Therefore settlement analysis of the loading from the underpins have been undertaken using PDISP software and presented below. In addition movement caused by the installation and excavation in front of the underpins have been undertaken and presented.

4.2 Settlement of the Underpins from Building Loads

The PDISP software has been utilised to assess the effect of locally loading the ground by construction of the underpin.

The PDISP, a pressure induced displacement analysis programme, uses solutions proposed by Boussinesq. In PDISP the loads are analysed without considering the stiffening effects of the foundation.

The loadings on the underpins and soil parameters for the analysis have been derived from the following documents compiled by Claymore Design and Build Ltd and submitted for planning application reference 2016/2195L:

- Structural Analysis Calculations dated 22 March 16
- Test Pit Details dated 21 February 2016

These documents indicate the site is underlain by thin layer of made ground followed by the London Clay with safe bearing capacity of 150kN/m^2 from 1.0m bgl.

Based on the work presented in Tomlinson (1995), the underlying London Clay from 1m bgl will have an undrained shear strength of 83kN/m^2. Site investigations undertaken elsewhere along the Downshire Hill indicates the near surface London Clay to be exhibiting undrained shear strength of between 60kN/m^2 and 80kN/m^2. Therefore for this assessment a lower bound undrained shear strength of 60kN/m^2 has been taken for the London Clay from 1m bgl. For the deeper London Clay soil parameters from Patel (1992) have been utilised and these concur with other investigations undertaken in the area. A summary of the soil parameters used in the PDISP analysis are presented in Table 4.1.

Table 4.1 Generalised Strata Sequence

Strata	Depth (mbgl)	Undrained Shear Strength (kN/m^2)	Young's Modulus		Reference
			Undrained (kN/m^2)	Drained (kN/m^2)	
London Clay	0-0.8	30kN/m^2	7350	7350	Burland et al 2001
London Clay	0.8-3	60kN/m^2	21000	15750	
London Clay	3-5	86kN/m^2	30100	22575	
London Clay	+5	130kN/m^2	45500	34125	

Claymore Design & Build drawings indicate the existing internal foundations are approximately 0.5m wide and 0.4m below existing floor level. These loading were applied to PDISP and the maximum long term settlement, caused by the existing foundations, is 16mm. A PDISP plot is presented in Appendix B.

The layout of the underpins are shown on Claymore Design & Build drawing number 53031-1. These loading were applied to PDISP and the maximum long term settlement, caused by deepening the underpin, is 15mm. A PDISP plot is presented in Appendix C. Since the settlement of the underpin is less than predicted for existing conditions, it is unlikely that the construction of the underpin will cause any additional settlement. ie resultant settlement will be 0mm

4.3 Movement caused by the Installation of Underpins

Thornburn (1992) indicate that ground movement caused by underpinning is affected by the quality of the workmanship and the founded soil. He recommended the use of empirical charts formulated by Peck. However, since then it has been shown that Peck's charts are very conservative in predicting deflection in the London Clay, and new empirical methods have been presented in CIRIA Report C580 for embedded retaining walls.

CIRIA C580 method is presented as factors on charts based on the data collected by numerous researchers. The data include the behaviour at numerous sites in London where the underlying geology is the London Clay.

As the stiffness of the underpinning is similar to that of embedded walls, and since the excavation will be shallow, it is considered suitable to use the charts presented in CIRIA Report C580.

The predicted ground movements due to the installation of the wall is presented in this section and the movement due to the excavation in front of the wall is presented in the following section.

The ground movements are presented in the CIRIA charts as percentage of movement/wall depth. The wall depth is the depth of the underpinning. Claymore Design & Build drawings indicates the depth of the underpinning will be approximately 1.08m.

Figure 2.8 of CIRIA Report suggests that horizontal movement and settlement near the party wall will be 0.08% and 0.05% of the wall depth respectively. Therefore, the horizontal movement and settlement at the party wall will be 1mm and 1mm respectively. The details are presented in Table 4.2 below.

Table 4.2 Calculation of Ground Movement caused by Underpin Installation

	% from Figure 2.8 of CIRIA Report C580 for Secant Wall by the wall	Ground movement
Horizontal movement	0.08	=0.08% of 1.1m of wall =1mm
Settlement	0.05	=0.05% of 1.1m of wall =1mm

The % of movement decreases from the face of the wall. Therefore the maximum movement occurs by the wall.

4.4 Ground Movement Arising from Excavation in front of the Wall

Ground movements arising from excavation are presented as factors in charts for clays and sands in the CIRIA Report. Factors are presented for both low and high stiffness props. As the maximum depth of excavation is 0.4m deep, the excavation can be considered to be high stiffnes. Figure 2.11 of CIRIA Report suggests that horizontal movement and settlement near the party wall will be 0.15% and 0.04% of the maximum depth respectively. Therefore, the horizontal movement and settlement at the party wall will be 1.65mm and 0.55mm respectively. The details are presented in Table 4.3 below.

Table 4.3 Calculation of Ground Movement caused by Excavation

	% from Figure 2.11 of CIRIA Report C580 for Secant Wall by the wall	Ground movement
Horizontal movement	0.15	=0.15% of 1.1m of wall =1.65mm
Settlement	0.04	=0.04% of 1.1m of wall =0.5mm

4.5 Potential Damage to Buildings

The potential damage is determined by summing up the short term and long term horizontal movement and settlement. These are summarised in Table 4.4.

Table 4.4 Summary of Ground Movement

	Horizontal Movement		Vertical Movement	
	Short Term(mm)	Long Term(mm)	Short Term(mm)	Long Term(mm)
Deepening of the underpin	-	-		0
Installation of the underpin	-	1	-	1
Ground movement caused by excavation	-	1.65	-	0.5
Total	-	2.65	-	1.5

On the assumption that the workmanship will be of good quality and all the aforementioned work will be undertaken consecutively, the overall long settlement will be 1.5mm at the party wall and long term horizontal movement of 2.65mm.

The shortest width of the building at the party wall will be 4.7m and therefore the maximum strain within the building will be 0.013%. Based on the guidance given in Camden Planning Guidance CPG 4, Basement and Lightwells, the potential category of damage will be very slight.

5 Conclusions and Recommendations

The desk study has identified that the site is underlain by London Clay.

The screening assessment has confirmed that the proposed development will not cause harm to the built and natural environment; result in flooding or lead to ground instability. Therefore Basement Impact Assessment as described in the London Borough of Camden guidance CPG 4 is not required for this project. However settlement analysis have been undertaken on the proposed underpinning works and they indicate the predicted category of damage will be very slight, in accordance with Camden Planning Guidance CPG 4, Basement and Lightwells.

6 References

1 Arup (2010), Camden Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development, London Borough of Camden.

2 London Borough of Camden Planning Guidance CPG 4: Basement and Lightwells(2015).

3 British Geological Survey (2006) Sheet 256 North London. 1:50,000 scale Geology Map, Solid and Drift Edition.

4 Building Research Establishment (1993) Building on shrinkable clay. BRE Digest 240 - Part 1.

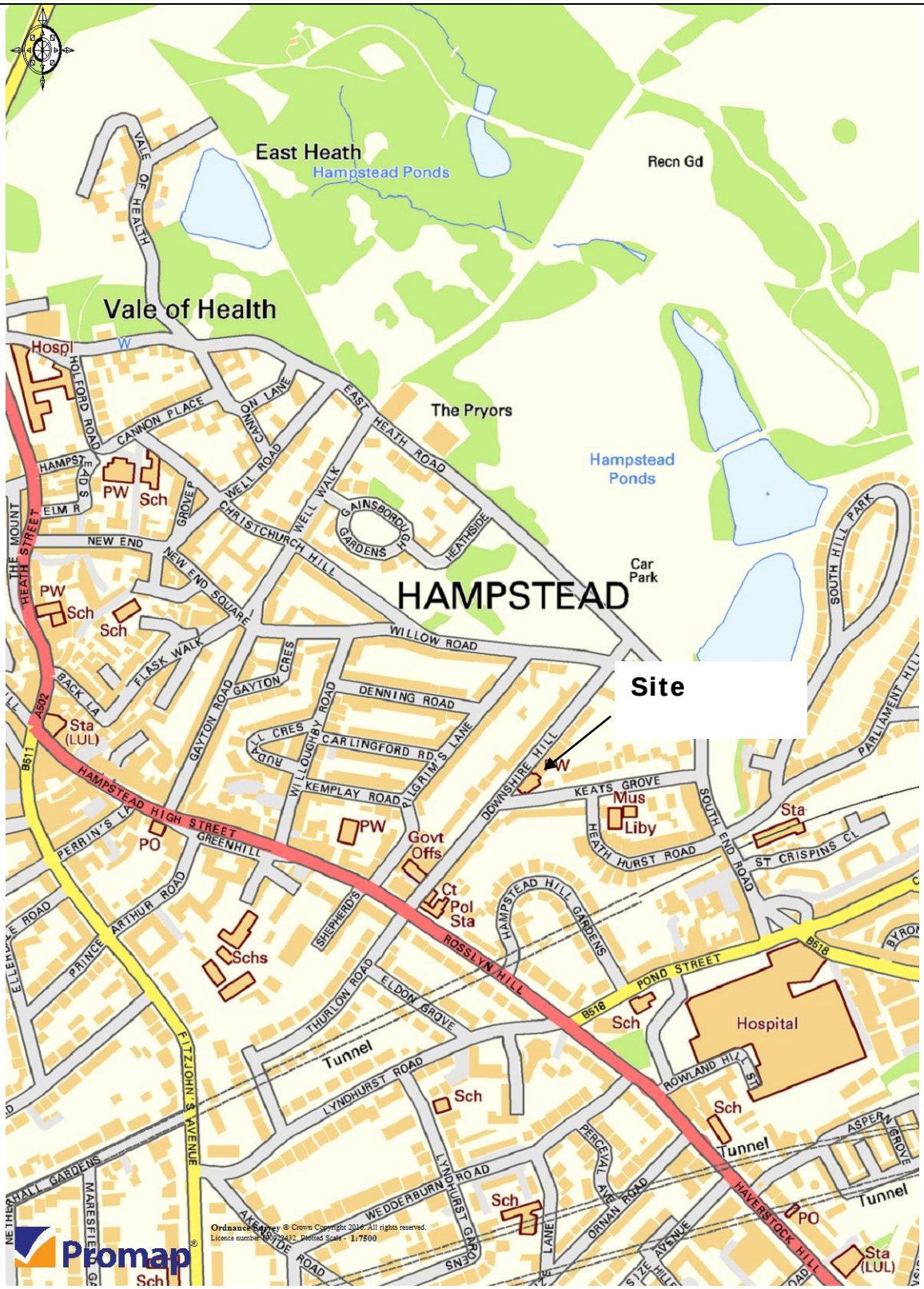
5 Tomlinson M.J.(1998), Foundation Design and Construction. Longman.

6 Thames Water. Guidance for Working near our Assets.

7 Burland J B, Standing J R and Jardine F M (2001), Building Response to Tunnelling, Case Studies from Construction of the Jubilee Line Extension, London.

Figures

Figure 1: Site Location Plan



MLM www.mlm.uk.com	Figure	1	Site Location Plan
	Project		44 Downshire Hill
	Project Ref		773819
	Date		April 2016

Appendices

Appendix A: Historic Trial Pit Records
Appendix B: PDISP Printout for Existing Conditions
Appendix C: PDISP Printout for Underpin

Appendix A

Historic Trial Pit Records

Claymore Design & Build Ltd

Winterbourne
Bonchurch Village Rd
Ventnor IOW PO38 1RQ

mb: 0773 9891981
tel: 01983 508795
email: [redacted]

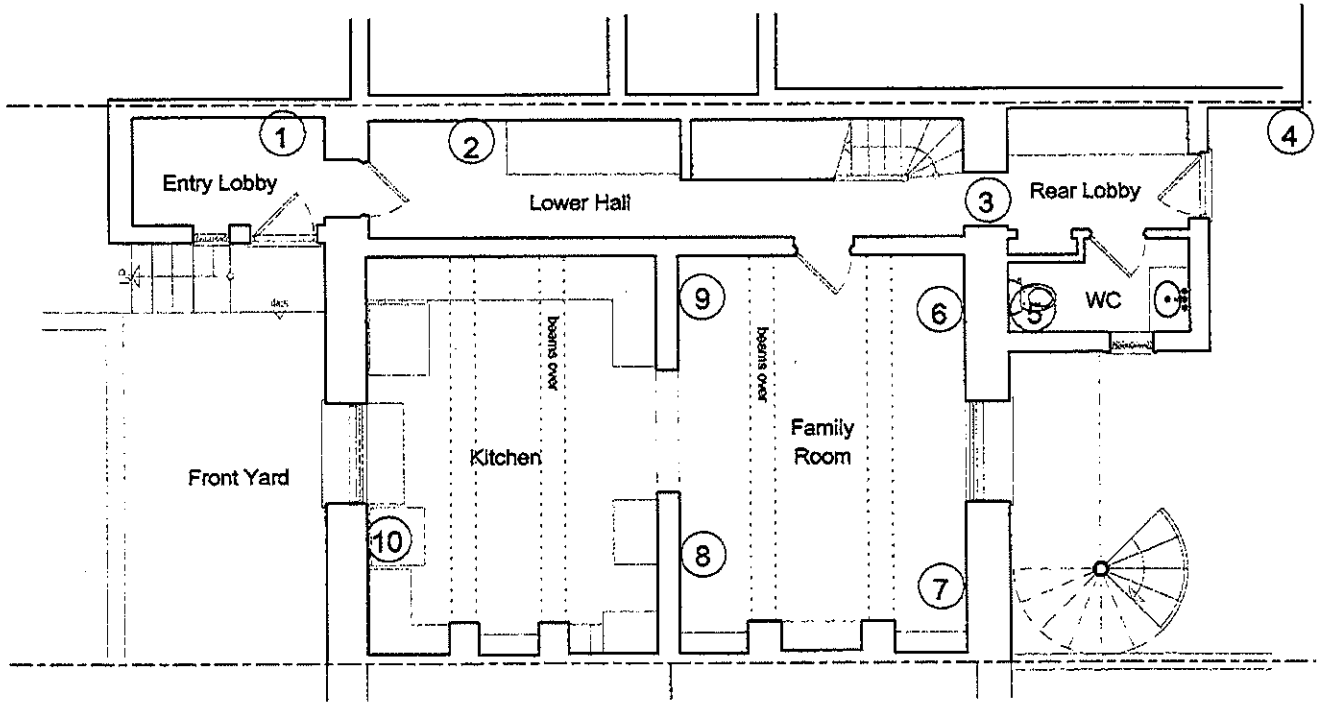
TEST PITS

21 February 2016

44 Downshire Hill, London NW3 1NU

drawing ref: 53021-24

date	Loc.	Pit depth below Existing FFL	adjacent footing	adjacent footing depth	adjacent footing width (approx)	Pit Base Substrate	Est bearing capacity kg/m²
19-Jan-16	1	330mm drilled footing	concrete	330mm	500mm+	Stiff London clays with small rubble	25,000
19-Jan-16	2	180mm	soft brick	180mm	450mm+ ?	Stiff London clays with small rubble	25,000
19-Jan-16	3	250mm	soft brick	250mm	500mm	Moist London clays with small rubble	20,000
27-Jan-16	4	750mm	concrete	745mm	500mm+	Top of footing 450mm . Moist London clays with small rubble	25,000
16-Feb-16	5	1350mm	soft brick, stepped	340mm	500mm	Firm London clays, >5% grit	25,000
18-Feb-16	6	1350mm	soft brick, stepped	340mm	500mm	Firm London clays, >5% grit	25,000
11-Feb-16	7	1350mm	brick, stepped	360mm	580mm	Firm London clays, ivy roots first 300mm	25,000
27-Jan-16	8	340mm	soft brick, stepped	320mm	340mm	Firm London clays	25,000
29-Jan-16	9	300mm	soft brick, stepped	280mm	320mm	Firm London clays, >5% grit	25,000
19-Feb-16	10	1360mm	soft brick, stepped	320mm	520mm	Moist London clays	20,000



GARDEN FLOOR -TEST PITS

44 Downshire Hill, London NW3 1NU

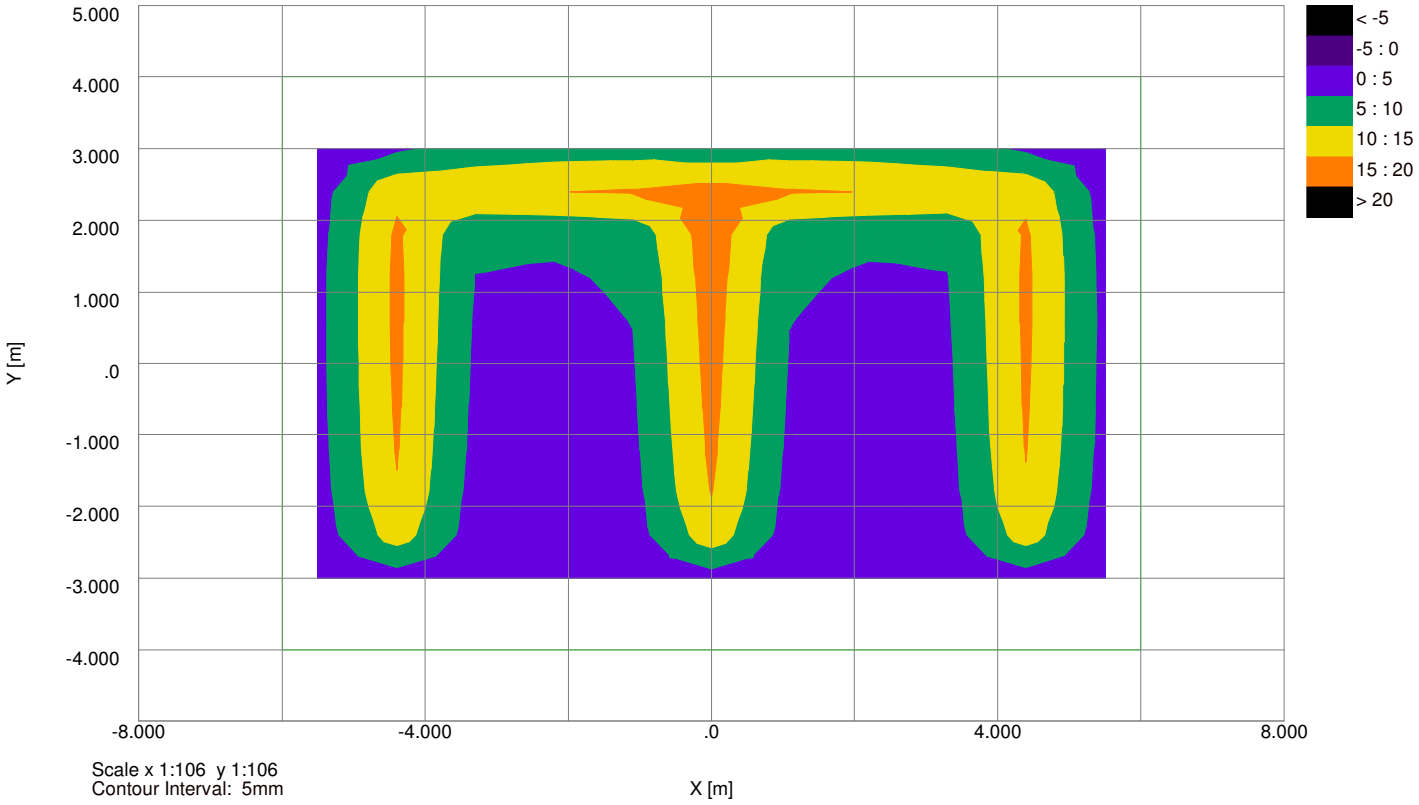
1:100 21 Feb16 53021-24

Claymore Design & Build

Appendix B

PDISP Printout for Existing Conditions

Settlement Contours : Grid 1 at -0.4000m

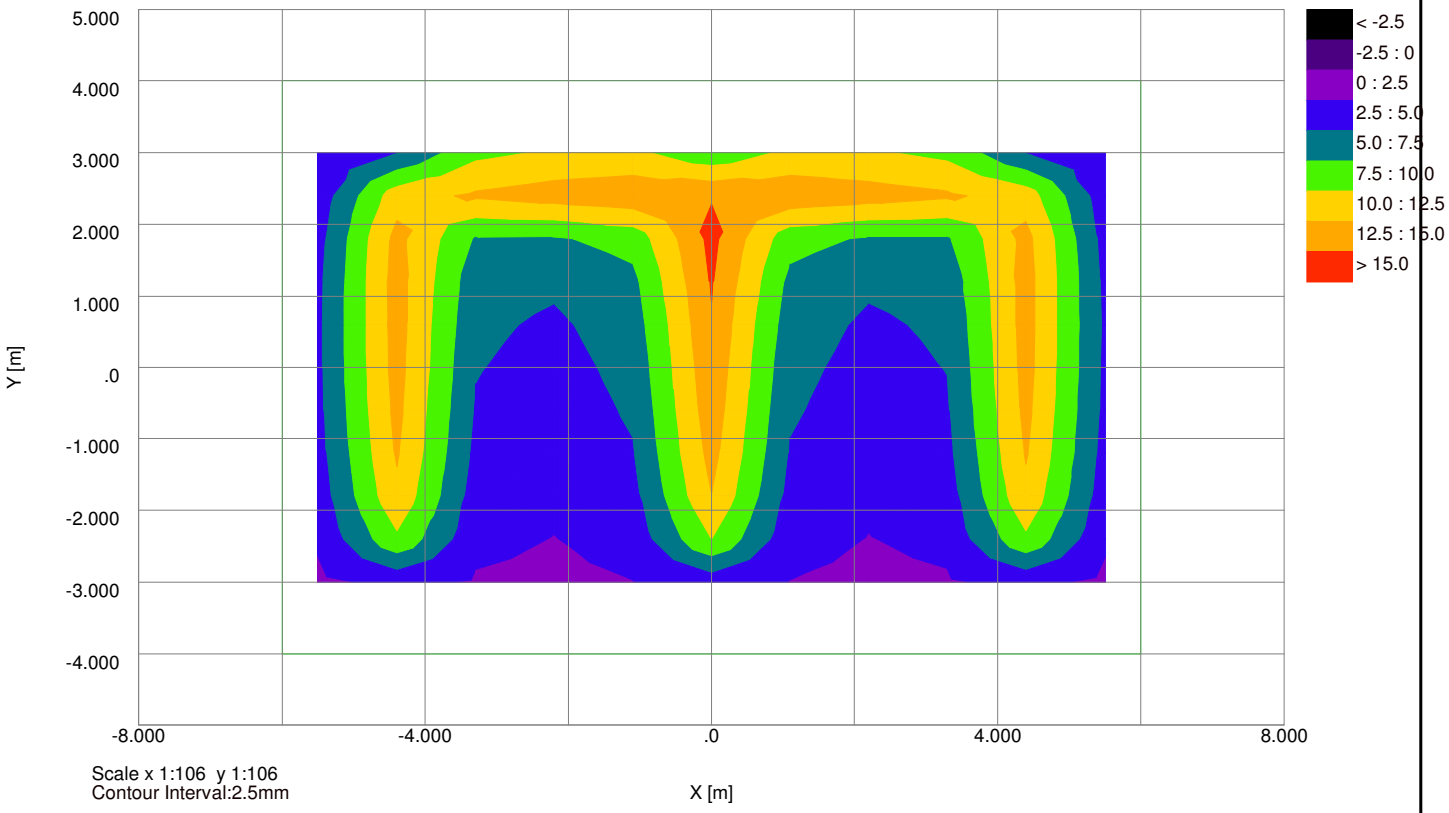


Scale x 1:106 y 1:106
Contour Interval: 5mm

Appendix C

PDISP Printout for Underpin

Settlement Contours : Grid 1 at -1.080m



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Contour Interval:2.5mm