252 Sheen Lane

Richmond

SW14 8RL

Structural Impact Assessment

Job number:	224205
Revision:	1
Status:	Planning
Date:	September 2024

DOCUMENT CONTROL

Revision	*Status*	*Created by:*	*Approved by:*
1	For Planning	Adam Atkinson MEng(Hons) CEng MIStructE	Tim Botfield MEng(Hons) CEng MIStructE

CONTENTS

NON-TECHNICAL SUMMARY

This report has been prepared by Structural Design Studio Limited (SDS) on the instruction of ABL3 Architects, acting on behalf of the Client. This report is solely for the use of our Client and is not for the use of, or to be relied upon, by any third party. SDS have a great deal of experience in the design of residential refurbishments and basement structures such as this, particularly in London, and are familiar with the planning process for subterranean structures.

This report provides information in accordance with the advice provided in the London Borough of Richmond Upon Thames' (LBR) Planning Advice Note (PAN) *Good Practice Guide on Basement Developments (dated May 2015)*; and *Basement Assessment User Guide* by Metis Consultants Ltd.

The following report has been prepared to help ensure that the structures on both the site and neighbouring sites are safeguarded during the works. It should be read in conjunction with all other relevant information and reports associated with this planning application.

A Ground Investigation Report and Basement Impact Assessment has been completed by Ground & Water geotechnical engineers, to assess the underlying ground conditions and review the effects of the proposals with respect to Richmond's planning requirements.

This report supports the conclusion that should the works be completed by a competent contractor the basement can be safely constructed without any significant adverse effect on the property, neighbouring properties, groundwater, surface water or on the stability of the adjoining ground.

1.0 Introduction

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1.5 The proposed works comprise the construction of a single storey basement below part of the existing property. The design of the basement has been carefully considered as demonstrated in this report. The ground conditions have been investigated on site by geotechnical engineers Ground & Water. The results have been used to inform the design of the basement and are summarised within this report. Reference should be made to Ground & Waters document for the full report.

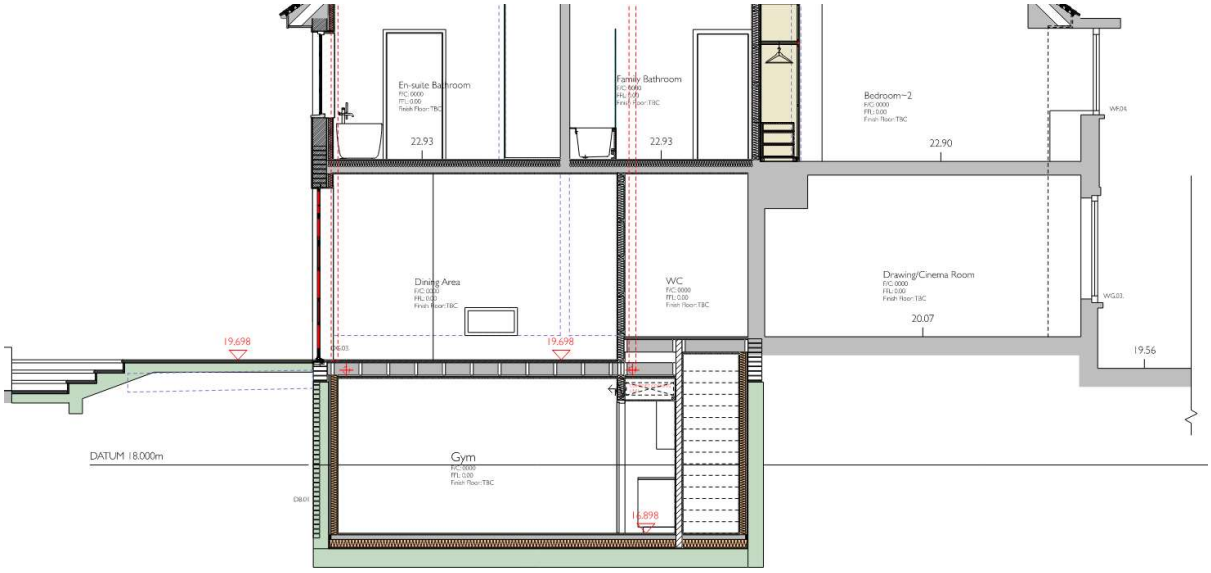


Figure 1 - Indicative architectural section *of the proposed basement below* part of *No.252 Sheen Lane*

2.0 Desk Study

2.1 The property is not a listed or locally listed building. It is also not located within the St Matthias conservation area.

2.2 According to British Geological Survey (BGS) record information the expected Bedrock geology comprises London Clay Formation with Superficial Deposits of Taplow Gravel member (Sand and Gravel) on top.

2.3 According to Nicholas Barton's Lost Rivers of London map, the site does not appear to be in the vicinity of any nearby hidden rivers.

2.4 Based on a review of Planning Portal, the neighbouring properties No.250 and No.254 Sheen Lane do not appear to have basements (to be verified by Party Wall Surveyor).

2.5 According the Environment Agency's Flood Maps for Planning the site is located in Flood Zone 1 and is considered to have a Very Low risk of flooding from rivers or sea.

2.6 According to LBR's Strategic Flood Risk Assessment (SFRA) maps:

- Fluvial and Tidal Flood Risk – the site is not located within Environment Agency Flood Zone 2 or 3, it is also not within a Critical Drainage Area
- Surface Water Flood Risk – the site is considered to have a low chance of flooding
- Groundwater, Sewer, and Artificial Flood Risk – the site is in an area considered to have between a 50% and 74.9% susceptibility to groundwater flooding. It is also not in a Throughflow Catchment Area

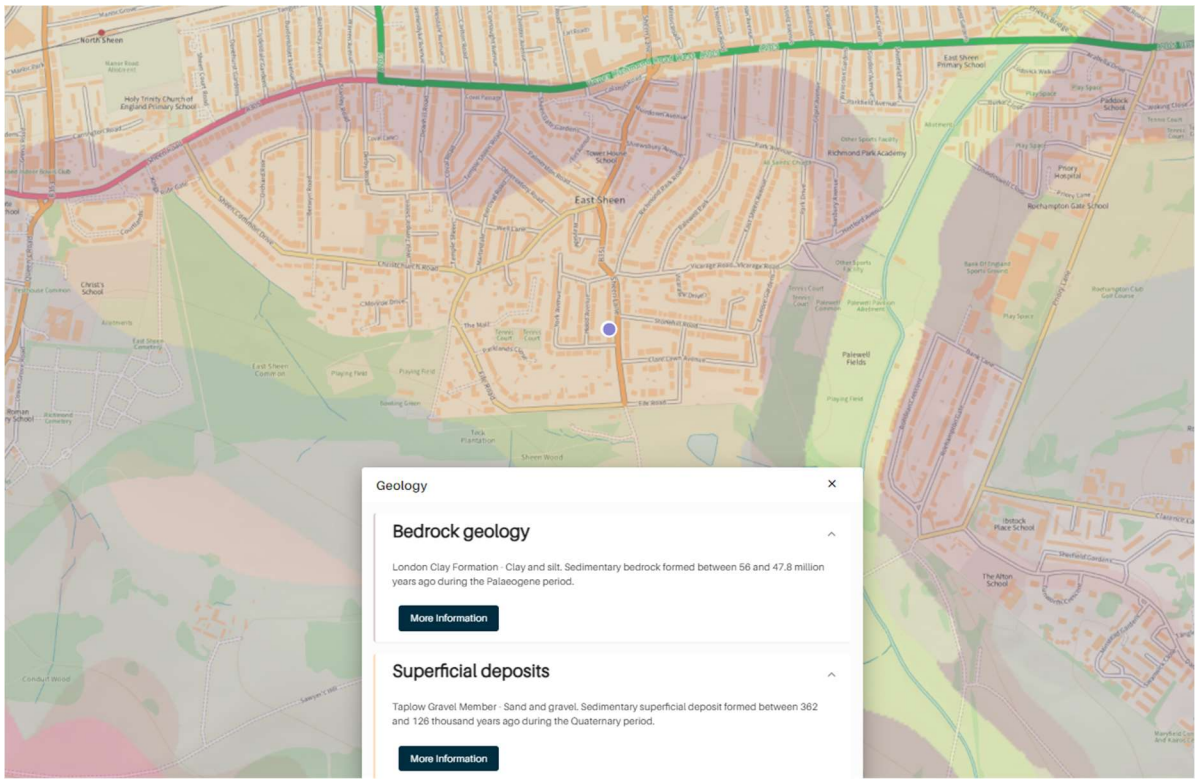


Figure 2 - BGS map indicating bedrock geology of London Clay Formation and Superficial Deposits of Taplow Gravels

3.0 Appraisal of Existing Site and Structure

3.1 No.252 Sheen Lane is a 2-storey, semi-detached, single dwelling comprising a ground floor and first floor level. There is also a small existing cellar below the current kitchen.

3.2 The property fronts onto Sheen Lane on the East and backs onto the neighbouring garden of a property in Hood Avenue to the West. The adjoining property to the North is No.250 Sheen Lane. The neighbouring property to the South is No.254 Sheen Lane.

3.3 The property is accessed from the front at ground floor level. The site is relatively level and does not contain any significant slopes.

Figure 3 - site location

3.4 The original property is expected to have been constructed in circa 1900 and is of traditional construction using solid load bearing masonry brickwork walls and timber floors and roof.

3.5 Lateral loads are assumed to be resisted through the cellular geometry of the masonry shear walls and nominal diaphragm action of the timber floors.

3.6 No.250 Sheen Lane forms the pair of semi-detached properties with No.252 and is of similar external size / appearance. The original layout is assumed to be similar but mirrored to No.252. Based on a review of planning portal it is understood the property does not currently have a basement – to be verified prior to works.

3.7 No.254 Sheen Lane bounds the property to the South. The main properties are detached but have adjoining single storey garages / infill extension on the boundary. The exact position of the Party Wall line relative to the existing boundary wall(s) on site is to be determined by the Surveyor / Client during the Party Wall process. Based on a review of planning portal it is understood the property does not currently have a basement – to be verified prior to works.

4.0 Site Investigation

4.1 A site-specific ground investigation has been completed by Ground and Water (G&W) in July 2024. This comprised 4No. trial pits and 2No. window samples to depths between 2-4.4m below ground level, with further probing to ascertain the soils at depth down to approx 8m BGL.

4.2 A Basement Impact Assessment (BIA) following LBR's screening and scoping criteria has also been completed by G&W. Reference should be made to these reports and other relevant supplementary reports for further detail regarding ground investigations. A brief summary of the findings and conclusions of the reports are outlined below.

4.3 Encountered soil conditions generally conformed with anticipated conditions based on local geology maps. A capping of approximately 1m topsoil and made ground was noted to overlie the superficial Taplow Gravel. Based on dynamic probing results the bedrock London Clay Formation is expected to be at approx 5.3 BGL.

4.4 The report recommends that foundations should bypass any Made Ground and should be founded onto competent, moisture stable soils. The proposed founding depth of approx 3.5m BGL, onto the Taplow Gravel member, is considered suitable for this. An allowable bearing capacity of approximately 250kN/m^2 has been calculated for foundations at this level.

4.5 A groundwater strike was encountered within one of the window samples during the site investigation at 3.25m BGL. Groundwater monitoring was undertaken on 2No. subsequent occasions where standing water was noted at 2.8 – 3.4m BGL. As there is a potential for groundwater to collect behind retaining walls, the basement is designed to withstand a level of hydrostatic pressure.

4.6 Dewatering using sumps and pumps may be required during the basement construction if groundwater is encountered in the excavation. The Contractor will account for this and should seek the advice of a reputable dewatering company.

4.7 Maximum amounts of short and long term heave were analysed as 3.48mm and 4.89mm respectively.

4.8 Sub-surface concrete should be designed as suitable for DS-1 and ACEC-1 classifications with regards to aggressive ground conditions.

5.0 Groundwater Flow

5.1 In accordance with LBR's 'Good Practice Guide on Basement Developments, May 2015':

Basements constructed just above or below the groundwater table could act as a barrier in the ground, thereby diverting groundwater flow around them. A basement constructed below the groundwater table may locally obstruct the natural flow, and depending on the geology and topography, this could result in a local rise in the groundwater level. However, for small, isolated basements this impact is likely to be very localised because a basement has a small building volume in a large expanse of aquiver. Therefore, groundwater will still be able to flow around and potentially below the basement, and thereby it would not affect the overall groundwater table. In general, a small basement is unlikely to have a significant effect on the groundwater regime of a local area.

The proposed development is not deemed to adversely affect groundwater flow.

6.0 Engineering Design

6.1 The basement design has been developed in accordance with the ground investigation to ensure a robust structural design that is specific to the development.

6.2 Structural drawings and calculations can be seen in appendices A and B respectively.

6.3 The basement will be constructed using reinforced concrete (RC). The external retaining walls will be formed using L-shaped underpins cast in maximum 1m wide sections in a traditional underpinning sequence. The underpins will support vertical loads on ground bearing bases designed to spread the load to within acceptable limits.

6.4 The L-shaped underpins will also resist the lateral pressures from soil, surcharge and groundwater. Horizontal propping will be installed in the temporary condition to resist the lateral pressures until the RC basement structure has been cast and cured to form the permanent structure.

6.5 The base slab will have compressible void former below and is designed as suspended between the ground bearing bases to mitigate the effects of heave from the underlying clay soils.

6.6 Along the boundary with number 254, there are two options considered for the retaining structure along this line depending on ownership / treatment of the boundary:

1) the existing boundary wall is first underpinned in mass concrete (in 1m wide sections, in sequence) down to basement founding level, the basement retaining walls are then constructed in-bound of these using reinforcement concrete to provide resistance to lateral forces.

2) piles are bored from ground level down through the underlying clay soils. Piles would provide resistance to lateral forces, without undermining the boundary wall, and so the boundary wall would not necessarily require underpinning.

The most suitable method will be determined during detailed design and via the Party Wall process.

6.7 A CCTV survey of the existing drainage network will be conducted to confirm the existing arrangement and condition prior to works commencing on site. It is proposed to maintain gravity connections above ground floor level wherever possible. The new drainage at basement level will be routed to a submersible pumping station which will pump waste directly to the outfall. A non-return valve will be installed to protect against sewer surcharging.

6.8 The waterproofing strategy for the basement will be developed by a specialist waterproofing sub-consultant appointed by the Contractor. Two means of defence will be used to protect against water ingress. It is assumed at this stage that this will comprise either an integral or barrier system as the first means of defence, and a cavity drain system as the secondary means. The cavity drain system will collect in a sump and be pumped to high level where it can run via gravity to the outfall.

7.0 Ground Movements

7.1 If deemed necessary and in agreement through the Party Wall process ground movement monitoring system may be installed to the neighbouring properties No.250 and No.254, with trigger values set to allow the works to be controlled appropriately in the event of ground movement occurring. A draft criterion is outlined below, to be agreed during the Party Wall process.

Monitoring shall be completed as follows:

1) One month prior to any works being started to provide a base reading.
2) Weekly readings during the underpinning and bulk excavation phases, until the basement slab has been cast and cured.
3) On a monthly basis thereafter for a three-month period following completion of the notifiable works.

Cumulative movement of survey points must not exceed:

a). Settlement
Code amber trigger values: +/-6mm
Code red trigger values: +/-8mm
b). Lateral displacement
Code amber trigger values: +/-6mm
Code red trigger values: +/-8mm

Movement approaching critical values:

Code amber trigger value:

All interested parties, including the Adjoining Owner's Surveyor and his Engineer should be informed and further actions immediately agreed between two of the three Surveyors and implemented by the Building Owner. The Contractor is to ensure that he has 24 hour/ 7 days a week access to emergency support provision including but not limited to additional temporary props, needles, waling beams and concrete supply at the start of the excavation and prior to any likelihood of this trigger value being reached. If this value is reached the Contractor must without delay provide all interested parties with his plan to implement any emergency remedial and supporting works deemed necessary. The Contractor must be ready to carry out these works without delay if the movement continues and approaches the trigger value above.

Code red trigger value:

All interested parties including Adjoining Owner's Surveyor and Engineer will be informed immediately. Works will stop and be made safe using methods and equipment agreed at the above stage. The Contractor is to ensure that the movement has stopped as a result of the implemented remedial works designed and installed at this stage. The requirements of the Party Wall Act will also ensure that two of the three Surveyors and their advising Engineers shall then enter into an addendum Award, setting out whether or not the Building Owner's works can re-commence and when, and if so agree additional precautions or modifications to the proposals prior to re-commencement.

8.0 Construction

8.1 The construction of a basement is a specialist area of work and a suitably qualified and experienced Contractor should be appointed.

8.2 The Contractor should appoint a suitably qualified temporary works engineer to design the temporary propping and sequencing required for the basement works. Detailed method statements and calculations for the enabling and temporary works will need to be prepared by the Contractor for comment by all relevant parties including Party Wall surveyors and their engineers if requested. The Contractor will need to ensure that adequate supervision and monitoring is provided throughout the works particularly during the excavation and demolition stages.

8.3 An assumed sequence of works is outlined below:

8.3.1 Site set-up, hoarding installed, services isolated etc

8.3.2 Movement monitoring points installed and initial readings taken as per Party Wall agreements

8.3.3 Existing ground floor structure slab carefully broken out

8.3.4 Excavation for key underpins that will provide foundations for temporary propping that supports load bearing bearing walls that are not being directly underpinned.

8.3.5 Cast bases for key pins, wait to cure and install temporary needles and props to support internal walls onto bases at basement level

8.3.6 Continue underpinning perimeter walls in max 1m wide sections in a traditional 5-stage underpinning sequence. Each underpin is either to be backfilled following construction, or propped against the central earth bund locally. Once cured, the ground bearing underpin bases provide vertical support to the superstructure. Continue to undertake movement monitoring as agreed within Party Wall agreements.

8.3.7 Excavate central earth bund approximately 0.5m to reveal top of underpins and allow installation of high level horizontal propping to provide temporary restraint to overturning.

8.3.8 Continue to excavate central earth bund to approximately 0.5m above basement slab level and install low level horizontal propping to provide temporary restraint to sliding.

8.3.9 Excavate to formation level generally and excavate deeper locally for cavity drain chamber.

8.3.10 Cast cavity drain chamber, install any below slab services and drainage as required and then lay compressible void former between underpin bases

8.3.11 Cast base slab. Once cured this will provide the permanent prop against sliding and therefore the low level propping can be removed.

8.3.12 Construct internal load bearing basement wall

8.3.13 Install LG floor steelwork

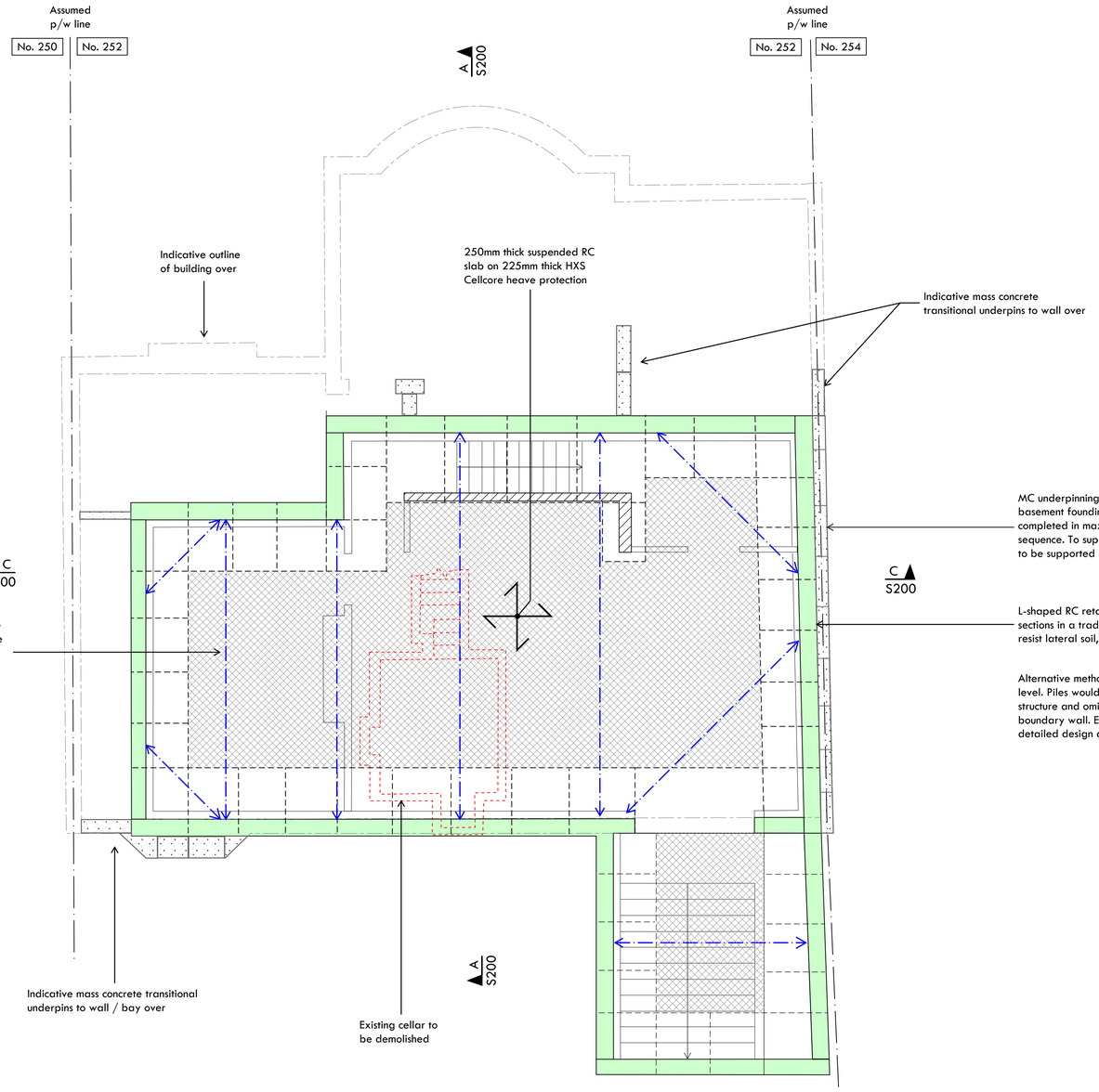
8.3.14 Install metal decking between beams and cast new LG floor slab. Once the slab is cured it will provide a permanent high level prop to the top of the underpins to prevent overturning and so the high level temporary propping can be removed. The basement structure is now complete.

8.3.15 Installation of services, waterproofing etc

APPENDIX A – Proposed Structural Drawings

Key:

- Structure under
- Structure removed



General notes:

1. Do not scale from this drawing
2. To be read in conjunction with all other structural drawings and the structural specification
3. To be read in conjunction with all other relevant disciplines drawings and specifications
4. All levels, setting out, waterproofing and fireproofing to be confirmed with the Architect
5. The Contractor is responsible for the temporary stability of the existing and proposed structure throughout the works. The sequencing and method of installation should be carefully considered and the temporary works should be designed and detailed by a suitably qualified person (appointed by the Contractor) prior to commencing the works
6. Contractor to request splices if required for handling purposes

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Studio 3, Three Eastfields Avenue, SW18 1GN

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Project

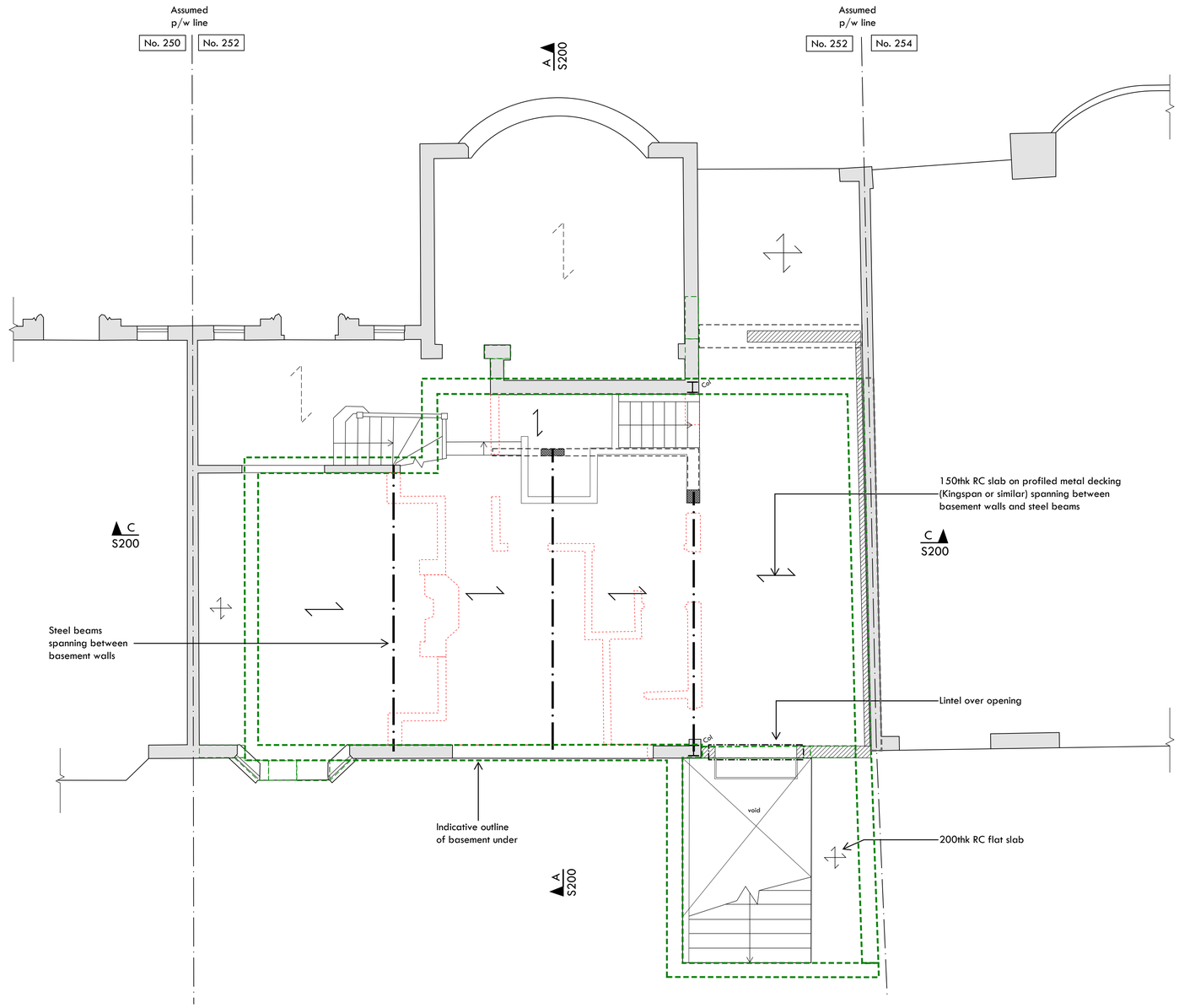
252 Sheen Lane, SW14 8RL

Drawing Title:

Proposed Basement Plan

Job. No.	Drawing no.	Revision
224205	S090	Preliminary

Scale	Date	Drawn by	Rev. no:
1:50@A1	July 24	AA	P1



Key:

- Structure under
- Structure removed
- New timber rafter/joist span (sizes and spacings as noted on plans)
- Assumed existing joist span direction. SDS to be notified if actual span differs from that shown
- Moment Connection

Padstone Schedule:

P1 - 440mm long x 100mm wide x 215mm tall mass concrete

P2 - 330mm long x 100mm wide x 150mm tall mass concrete

Lintel Schedule:

LN1 - 140mm high x 100 wide pre-stressed concrete lintel. 1 No. per 100mm wall thickness

LN2 - Catnic CN71A Solid Wall Lintel

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Project

252 Sheen Lane, SW14 8RL

Drawing Title:

Proposed Ground Floor Plan

Job. No.	Drawing no.	Revision
224205	S100	Preliminary

Scale	Date	Drawn by	Rev. no:
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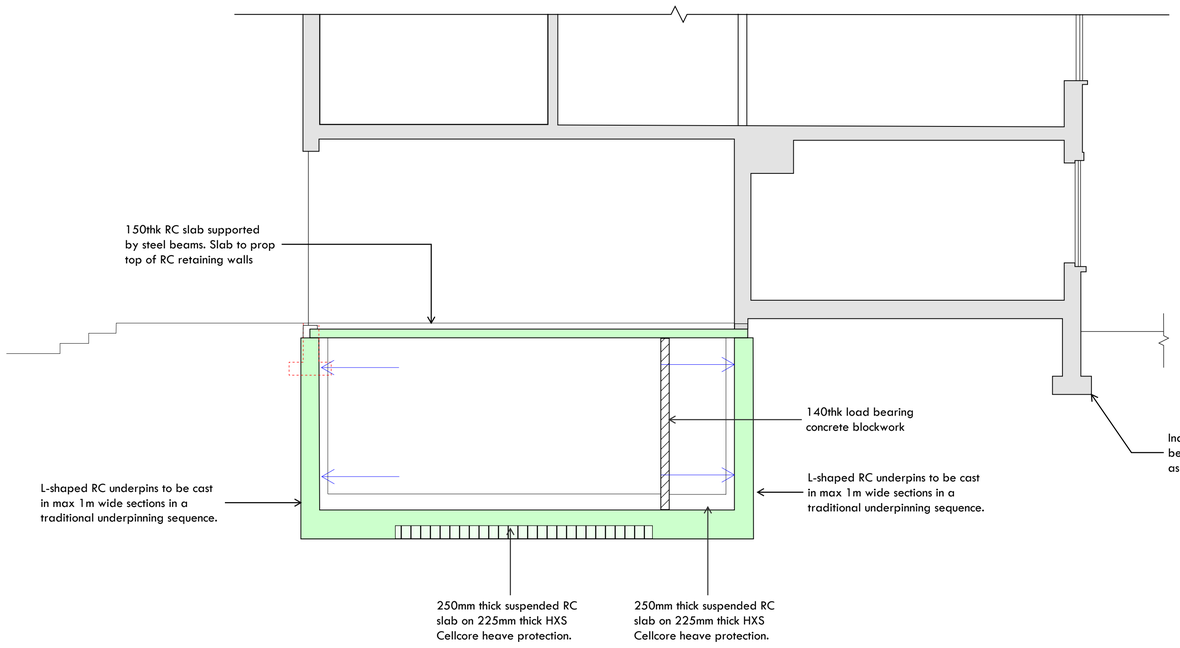
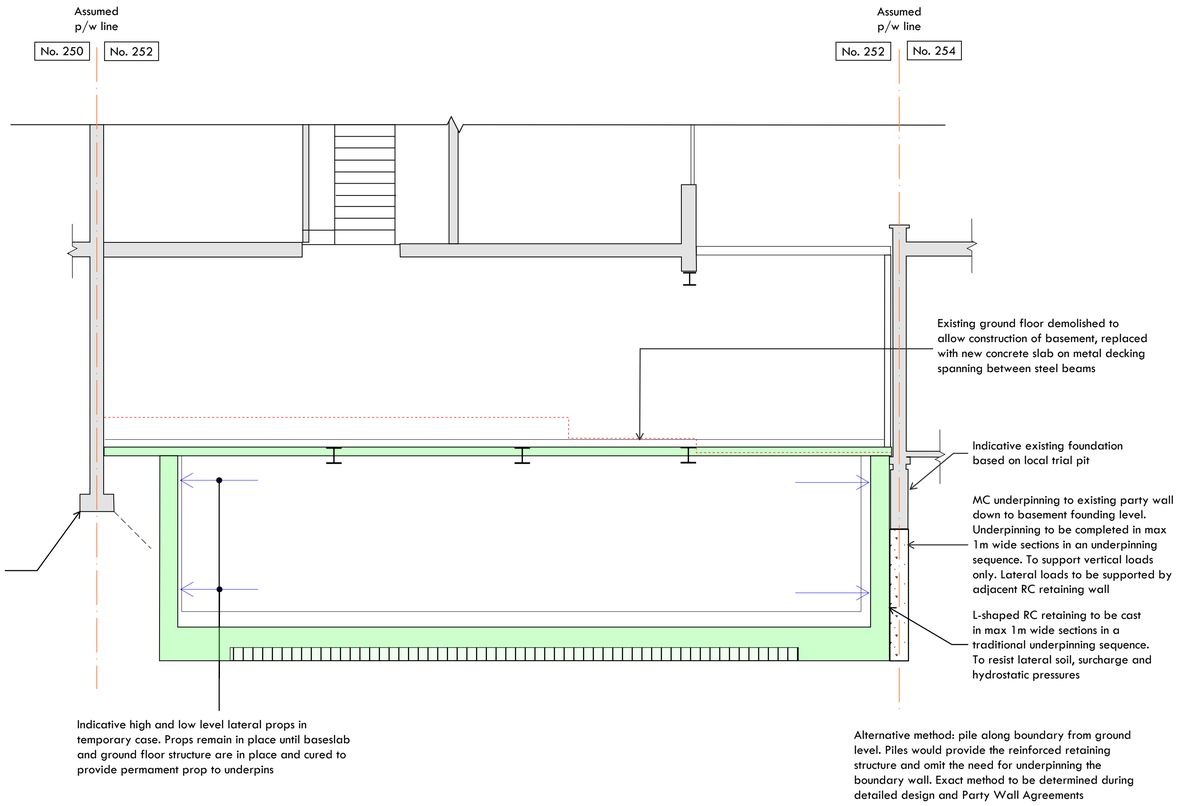


SECTION AA



SECTION CC

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Project

252 Sheen Lane, SW14 8RL

Drawing Title:

Proposed Sections

Job. No.	Drawing no.	Revision
224205	S200	Preliminary

Scale	Date	Drawn by	Rev. no:
1:50@A1	Aug 24	AA	P1

APPENDIX B – Retaining Wall Calculations

Project name:		
252 Sheen Lane		
Project number:	Sheet:	Revision:
224205	1	1
Date:	Engineer:	Checked:
Sep '24	AA	AA

STRUCTURAL Design STUDIO

Preliminary retaining wall design for planning:

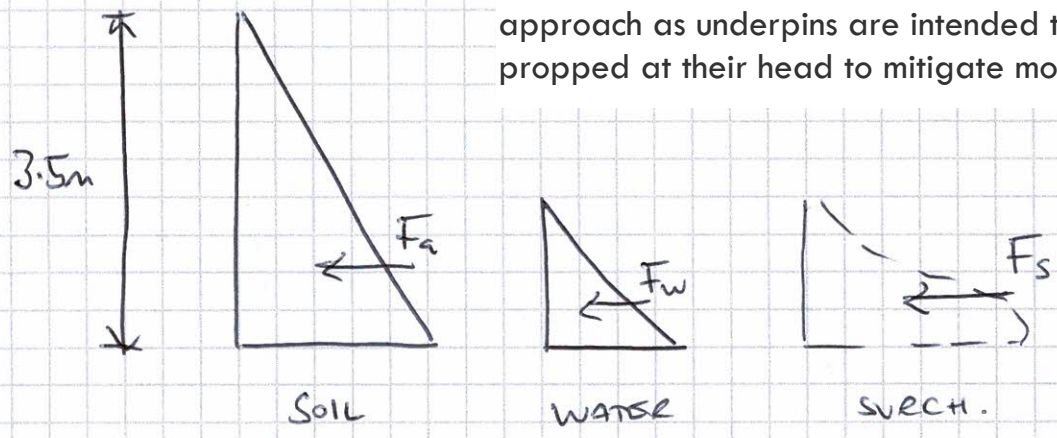
Take soil properties from site investigation, conservatively use:

Soil density = 20 kN/m2
K coefficient = 0.42

Allow for 1m head of ground water

Where party wall surcharges the in-bound basement wall, take surcharge load as derived on other page

[cantilevered design is considered a conservative approach as underpins are intended to be propped at their head to mitigate movement]



REVIEWING UNDERPIN AS CANTILEVER:

F_a = $0.5 \times 20 \times 0.42 \times 3.5^2$ = 51 kN/m @ 1.2m

F_w = $0.5 \times 10 \times 1^2$ = 5 kN/m @ 0.3m

F_s = AS DERIVED = 7 kN/m @ 0.7m

M_{Ed} (BASE) = $(51 \times 1.35 \times 1.2) + (5 \times 1.5 \times 0.3) + (7 \times 1.5 \times 0.7)$

= 82.6 + 2.3 + 7.4

= 92 kNm ULS

V_{Ed} (BASE) = (51 x 1.35) + (5 x 1.5) + (7 x 1.5)

= 87 kN ULS

BENDING:

TAKE $h = 300$; $f_{ck} = 32\ N/mm^2$; $d = 215mm$

$K = 0.067$; $Z = 0.937d$

$\therefore A_{s,reqd} = 1091\ mm^2/m$.

$\therefore$ USE H20 @ 200 IN BASE

(1571 mm^2/m)

SHEAR:

$\rho_L = 0.76\%$

$V_{Rdc} = 0.67\ N/mm^2$

$V_{Ed} = (87 \times 10^3) / (215 \times 1000) = 0.40\ N/mm^2$

$V_{Rdc} > V_{Ed} \Rightarrow$ OK IN SHEAR

USE 300 THK STEM C32/40

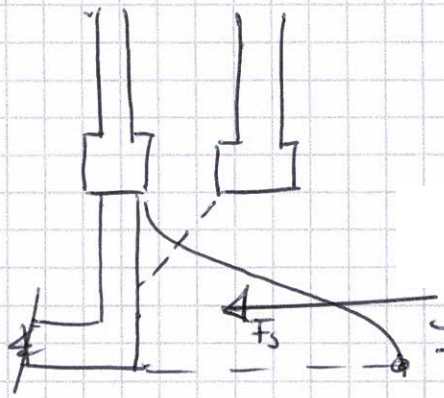
SURCHARGE FROM ADJACENT PROPERTY:

CONSERVATIVE ASSUMPTION THAT ALL FLOORS AND ROOF SPAN SIDE-SIDE: UDL ONTO FLANK WALL:

ROOF,	3m/2 x (1.1 ; 0.6)	=	1.65	0.90
Floors	2Nb. x 3m/2 x (0.75 ; 1.5)	=	2.25	4.50
Masonry walls	8m x 4.0	=	32.00	
			35.90	5.40

≈ 41.3kN/m SLS

APPLYING BOUSINESQ EQNS THE ADJACENT LINE LOAD APPLIES APPROX 7kN/m² @ 2m BGL



F_S = 0.5 x 7 x 2 = 7kN @ 0.67m.

Project name:

252 Sheen Lane

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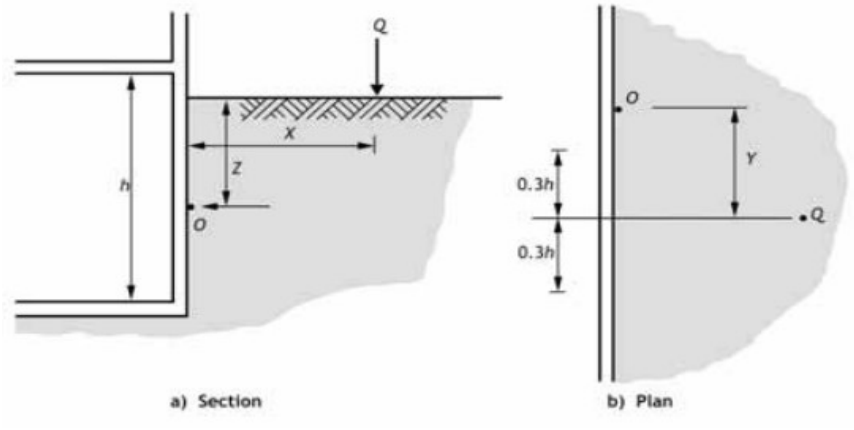
Date:	**Engineer:**	**Checked:**
Sep '24	AA	AA

Calc:

Surcharge load from neighbouring property

Lateral pressure due to point load / line load in accordance with Boussinesq equations:



Ref: Concrete Centre - Concrete Basements Fig. 7.2

Lateral earth pressure coefficient	K =	0.42	
Point / line load	Q =	41.3	kN/m
Distance away from structure (on plan)	X =	1	m

Apply Boussinesq equations:

Line load:

Parameter, $R = (X^2 + Z^2)^{0.5}$

Boussinesq pressure, $P_B = K(2QZ^3)/(\pi R^4)$

Following Terzaghi it is standard practice to double the lateral pressure calculated using the Boussinesq equations to obtain the lateral pressure to be used in design:

Hence, Design lateral pressure $P_s = 2*P_B$

Z (m)	R	P_B (kN/m^2)	P_s (kN/m^2)
0.00	0.00	0.00	0.00
0.50	1.12	0.88	1.77
1.00	1.41	2.76	5.52
1.50	1.80	3.53	7.06
2.00	2.24	3.53	7.07
2.50	2.69	3.28	6.57
3.00	3.16	2.98	5.96
3.50	3.64	2.70	5.39
4.00	4.12	2.45	4.89
4.50	4.61	2.23	4.46
5.00	5.10	2.04	4.08
5.50	5.59	1.88	3.76
6.00	6.08	1.74	3.48
6.50	6.58	1.62	3.24
7.00	7.07	1.52	3.03
7.50	7.57	1.42	2.84
8.00	8.06	1.34	2.68
8.50	8.56	1.26	2.53
9.00	9.06	1.20	2.39
9.50	9.55	1.14	2.27
10.00	10.05	1.08	2.17

Project name:

252 Sheen Lane

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224205	1	1
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Calc:

Surcharge load from neighbouring property

Lateral pressure due to point load / line load in accordance with Boussinesq equations: