halstead ASSOCIATES

7 GREVILLE PLACE

LONDON

NW6 5JP

STRUCTURAL FEASIBILITY REPORT

PREPARED FOR

MR N RAVEENDRAN

Ref: 16497/DO/mf

Date: August 2016

1 Athenaeum Road
Whetstone
London N20 9AA

t. 020 8445 7721
e. office@halsteads.co.uk
w. www.halsteads.co.uk

CONSULTING engineers
QUANTITY surveyors
PROJECT coordinators
CDM coordinators
Party Wall surveyors

CONTENTS

1.00 BRIEF

1.01 The Structural Engineering design brief was to produce a feasibility study into the construction of a new basement extension to an existing three storey semi-detached house at 7 Greville Place, London NW6. The existing house has a full footprint basement and the proposed works will extend the basement to the front and side of the existing layout.

1.02 This Report is to be read in conjunction with Halstead Associates Drawing Nos. 16497/PL01, PL02 and PL03.

1.03 This report is also to be read in conjunction with Jomas Geotechnical Study Ground Investigation and Basement Impact Assessment, reference P939372J779, dated 11 February 2016.

2.00 SCREENING

2.01 Structural Stability Screening Assessment

1.	Does the proposed basement involve underpinning of the existing building?	Yes
2.	Does the proposed basement extend lower than the party fence structure to the right?	Yes
3.	Does the proposed basement extend lower than the building structure to the right?	Yes
4.	Does the proposed basement extend lower than the party fence structure to the left?	Yes
5.	Does the proposed basement extend lower than the building structure to the left?	Yes
6.	Does the proposed basement undermine the public highway?	Yes

3.00 SITE INVESTIGATIONS

3.01 A desk study and associated site based geotechnical investigation was carried out in January 2016 by Jomas Associates Ltd which incorporated two boreholes (4m and 9m deep) and a ground water monitoring point within one of the boreholes.

3.02 The boreholes revealed a narrow band of made ground of up to 0.5m in thickness at shallow level. Below this level firm to stiff brown slightly gravely clay was recorded in both boreholes to their full depth.

3.03 Ground water levels were found to be approximately 1.8m below ground level within borehole WS1 during a return visit to the property. However, it is expected that the water is that which has accumulated within the monitoring installation via run off from the clay surface, or alternatively has been trapped within pockets within the clay. The water is expected to be limited in volume and to be very slow to recharge.

4.00 BASEMENT FORMATION

4.01 Given the proximity to adjacent properties and to the back of the public footpath to the front of the property, it is expected that the walls of the new basement extension will be formed in an underpinning type sequence. This will involve carrying out local excavations of around 1m in width and down to the formation level of the new basement, followed by the fixing of reinforcement within the excavations and the casting of concrete to form an individual retaining wall section complete with base.

The sequencing of this work would be such that no more than 20% of a single wall elevation would be excavated at any given time. At the required excavation depth, suitable shoring would be required to provide a safe working area for site operatives. Typical sequencing for the excavation of a wall section is shown on Drawing No. 16497/PL03.

4.02 At the expected depth required for the excavation, it is likely that temporary shoring to the retaining wall sections will be required in the short term in order to prevent overturning and/or sliding, until the basement slab has been installed. The slab will then act to brace the perimeter walls against the existing building.

4.03 Whilst it has not been established at this stage, it is possible that underpinning of the existing walls to the house directly adjacent to the new basement will be required in order to achieve the new slab levels. Again, this will be carried out in a sequence whereby the extent of the excavation on a single wall line will be limited to 20% of the length of the wall at any one time.

Ideally, this underpinning will be carried out with access gained from the existing basement, therefore limiting the depth of the excavation. However, it is likely that preference will be not to disturb the existing slab and tanking to the basement and as a result the works may need to be carried out externally.

4.00 **BASEMENT FORMATION (Cont'd)**

This would require a much deeper excavation but can be achieved on the basis that suitable shoring is provided in line with good practice.

4.04 Once the basement slab and perimeter walls are fully in place, along with intermediate supporting columns and walls, then the ground floor slab can be cast. This will take support off the existing wall of the building with the use of recessed reinforced concrete pockets into the masonry.

4.05 At 3-3.5m depth down to formation level, it is not expected that the recovery of the load consolidating clays would be significant. Notwithstanding, an allowance is to be made within the design of the basement slab for theoretical heave pressures.

4.06 The Contractor will provide a method statement prior to commencement of work on site in which full details of hours, site set up and method for the formation of reinforced and under reinforced underpinning sections will be detailed. Drawing No. 16497/PL03 shows as indicative sequence for the construction of RC retaining wall "underpin" sections.

5.00 GROUND MOVEMENT & PREDICTED DAMAGE CATEGORY

5.01 Any ground works pose an elevated risk to adjacent properties. The proposed works undermines the adjacent property along the Party Wall line.

5.02 It is not expected that any cracking will occur during the works. However, our experience informs us that there is a risk of movement to the neighbours.

5.03 To reduce the risk to the development:

- Employ a reputable firm for extensive knowledge of basement works.
- Employ suitably qualified Consultants. Halstead Associates have extensive experience with basement constructions.
- Design the underpins to be suitably propped during construction until permanent props are in place.
- Provide method statements for the Contractors to follow.
- Investigate the ground, now completed.
- Record and monitor the external properties. This is completed by a condition survey under the Party Wall Act before and after the works are completed.

5.04 The maximum level of cracking anticipated is Hairline cracking which can be repaired with decorative cracking and can be repaired with decorative repairs. Under the Party Wall Act damage is allowed (although unwanted) to occur to a neighbouring property as long as repairs are suitably undertaken to rectify this. To mitigate this risk the Party Wall Act is to be followed and a Party Wall Surveyor will be appointed.

5.00 GROUND MOVEMENT & PREDICTED DAMAGE CATEGORY (Cont'd)

5.05 Burland Scale:

Extract from The Institution of Structural Engineers "Subsidence of Low-Rise Buildings"

Classification of visible damage to walls with particular reference to type of repair and rectification consideration.

Category of damage	Approximate crack width	Limiting tensile strain	Definitions of cracks & repair types / considerations
0	Up to 0.1	0.0 – 0.05	HAIRLINE – Internally cracks can be filled or covered by wall covering and redecorated. Externally, cracks rarely visible & remedial works rarely justified
1	0.2 to 2	0.05 – 0.075	FINE – Internally cracks can be filled or covered by wall covering, and redecorated. Externally, cracks may be visible, sometimes repairs required for weather tightness or aesthetics. NOTE: Plaster cracks may, in time, become visible again if not covered by a wall covering.

6.00 MONITORING

6.01 In order to safeguard the existing structures during underpinning and new basement construction movement monitoring is to be undertaken.

Monitoring Level Proposed	Type of Works
Monitoring 1 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works.	Loft conversion, cross wall removals, insertion of padstones Survey of LUL and Network Rail tunnels. Mass concrete, reinforced and piled foundations to new build properties.
Monitoring 2 Visual inspection and production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Part Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate.	Removal of lateral stability and insertion of new stability frames. Removal of main masonry load bearing walls. Underpinning works less than 1.2mm deep.
Monitoring 3 Visual inspection and production of condition survey by Part Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment.	Lowering of existing basement and cellars more than 2.5m. Underpinning works less than 3.0m deep in clays. Basements up to 2.5m deep in clays.

6.00 MONITORING (Cont'd)

Monitoring 4 Visual inspection of production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment. Lateral movement between walls by laser measurements.	New basements greater than 2.5m and shallower than 4m deep in gravels. Basements up to 4.5m deep in clays. Underpinning works to Grade I Listed Building.
Monitoring 5 Visual inspection of production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by theodolite at specific times during the project.	Underpinning works to Grade I Listing Building. Basements to Listed Building. Basements deeper than 4m in gravels. Basements deeper than 4.5m in clays. Underpinning basements to buildings that are expressing defects.
Monitoring 6 Visual inspection of production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data gathering. Weekly interpretation.	Double storey basements supported by piled retaining walls in gravels and soft sands (N<12).

6.00 MONITORING (Cont'd)

Monitoring 7 Visual inspection of production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical & lateral monitoring movement by electronic means with live data transfer.	Larger multi-storey basements on particular projects.
Monitoring Conclusion	
Monitoring 4 Visual inspection of production of condition survey by Party Wall Surveyors at the beginning of the works and also at the end of the works. Visual inspection of existing Party Wall during the works. Inspection of the footing to ensure that the footings are stable and adequate. Vertical monitoring movement by standard optical equipment. Later movement between walls by laser measurements.	New basements greater than 2.5m and shallower than 4m deep in gravels. Basements up to 4.5m deep in clays. Underpinning works to Grade I Listed Building.

6.02 Before the works begin a detailed monitoring report is required to confirm the implementation of the monitoring. The items that this should cover are:

- Risk Assessment to determine level of monitoring
- Scope of Works
- Applicable Standards
- Specification for Instrumentation
- Monitoring of existing cracks
- Monitoring of movement

6.00 MONITORING (Cont'd)

- Reporting
- Triggering Levels using a RED AMBER GREEN system

Recommended levels are:

Movement	Category	Action
0mm – 5mm	Green	No action required.
5mm – 12mm	Amber	Crack monitoring: Carry out a local structural review. Preparation for the implementation of remedial measures should be required.
>12mm	Red	Crack monitoring: Implementation of structural support as required. Cease works with the exception of necessary works for the safety and stability of the structure and personnel. Review monitoring data and implement revised method of works.

7.00 WATERPROOFING

7.01 As this form of construction will not allow external damp proofing systems to be employed, it is envisaged that the Architect will opt for a proprietary drained cavity system to line the external face of the retaining wall and slab. Any inflow of ground water which may result would then be directed to an internal sump and then pumped as necessary into the surface water system.

8.00 PARTY WALLS

8.01 Given the proximity of adjacent buildings, Party Wall Agreements may be required with neighbouring home owners, particularly in light of the recommendations for monitoring during the works.

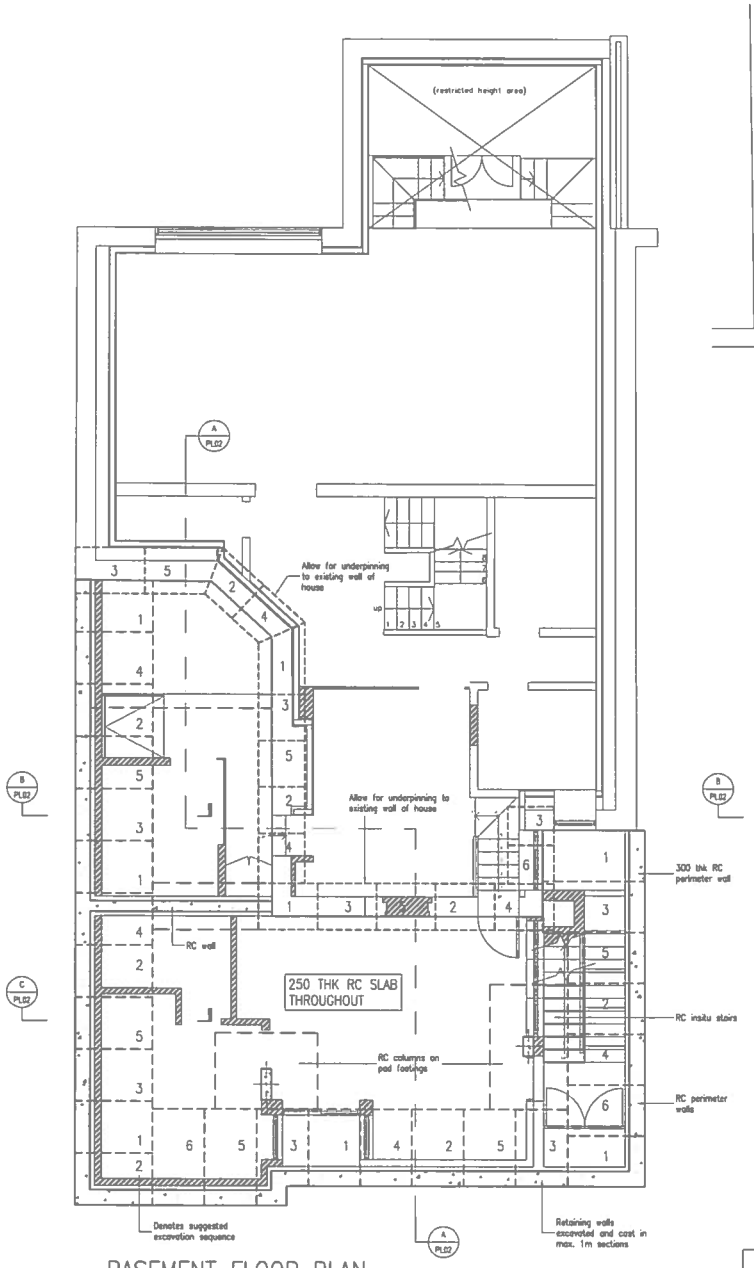
9.00 TEMPORARY WORKS

9.01 A competent Contractor, experienced in this form of residential basement construction must be used, and a Temporary Works Coordinator should be employed to ensure that the stability of the ground and adjoining buildings is maintained though out the construction process.

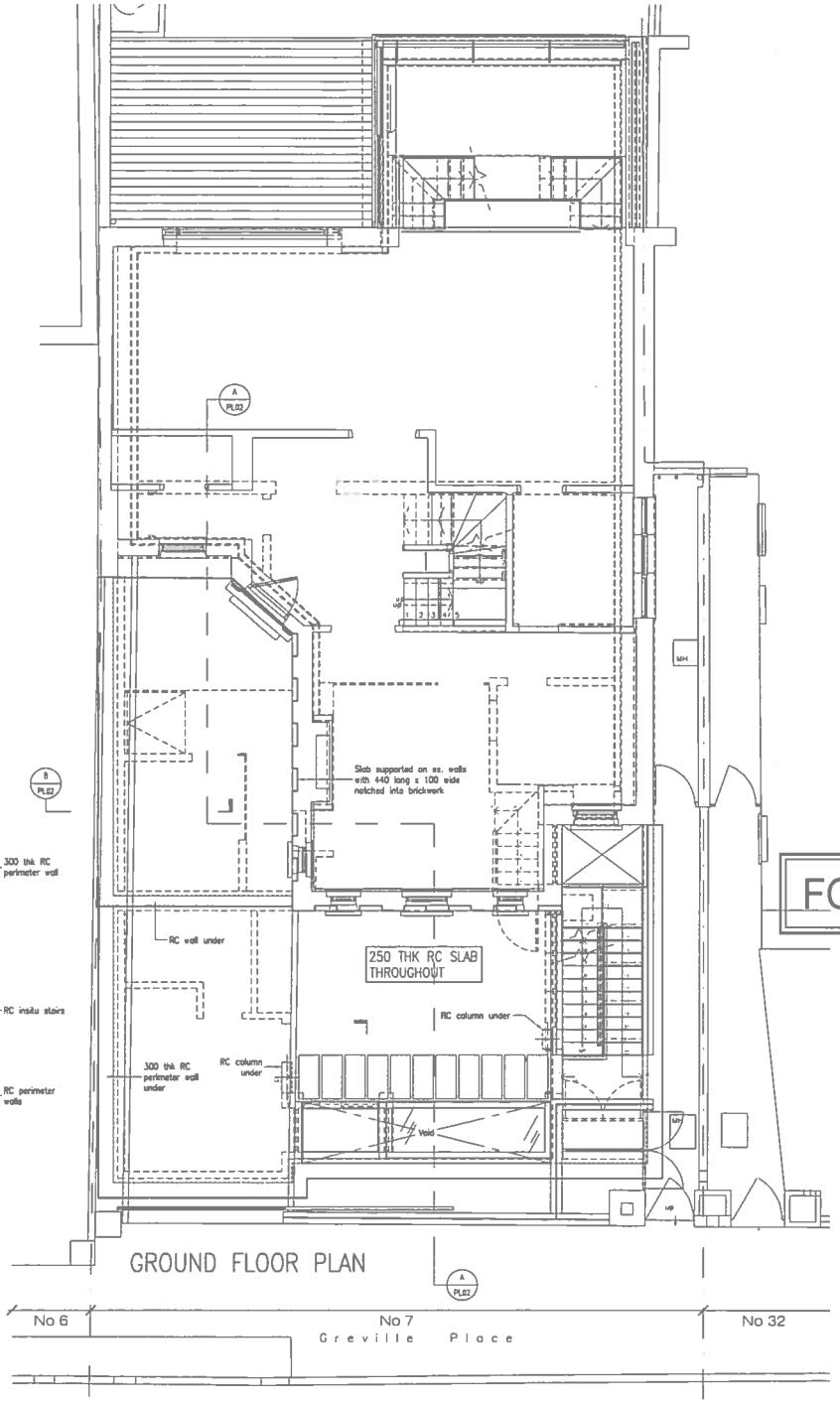
David Oates CEng BEng (Hons) MIStructE

APPENDIX A

Halstead Associates Drawing Nos. 16497/PL01, PL02 and PL03A.



BASEMENT FLOOR PLAN



GROUND FLOOR PLAN

FOR INFORMATION ONLY

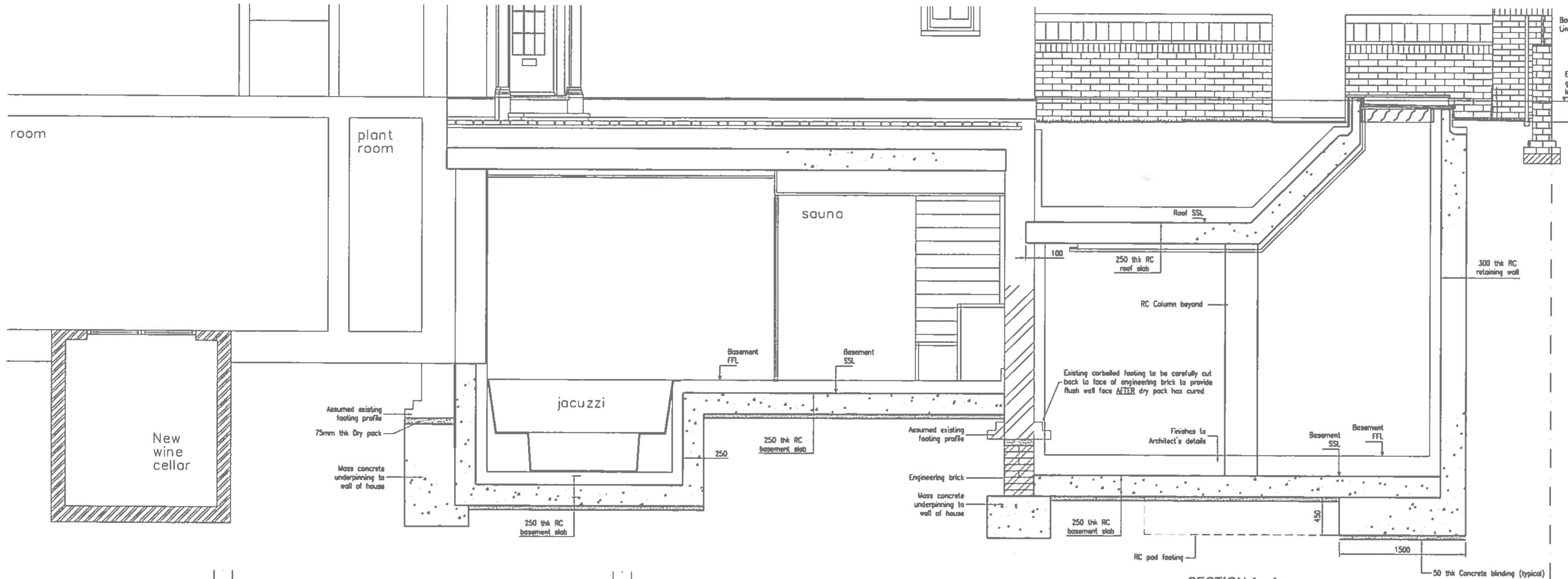
Notes:
1. The drawing is to be read in conjunction with all relevant Consultant's drawings and specifications.

Rev.	Date	Revisions	By	Engineer

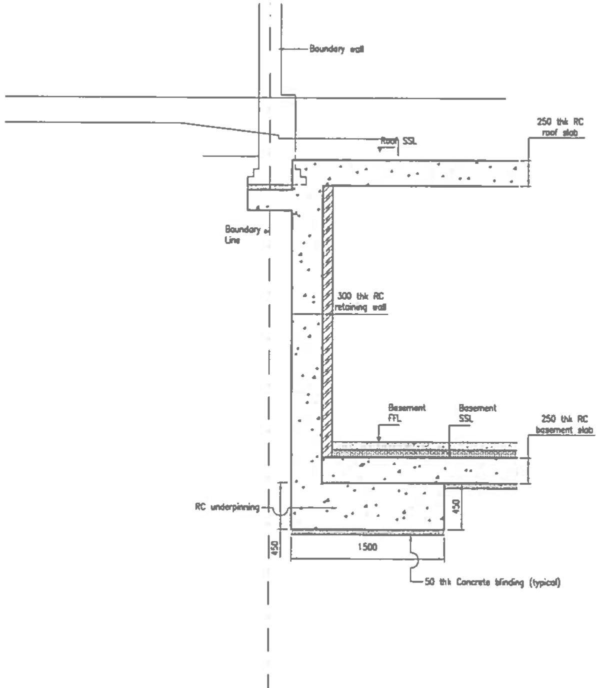
Project: 7 GREVILLE PLACE, NW6 5JP
Title: GA BASEMENT AND GROUND FLOOR PLANS
Client: Mr N Raveendran
Architect: Schneider Designers

Drawn by: JK
Checked by: DO
Date: 26th February 2016
Scale: 1:50 @ A1
Drawing No: 16497/PL01

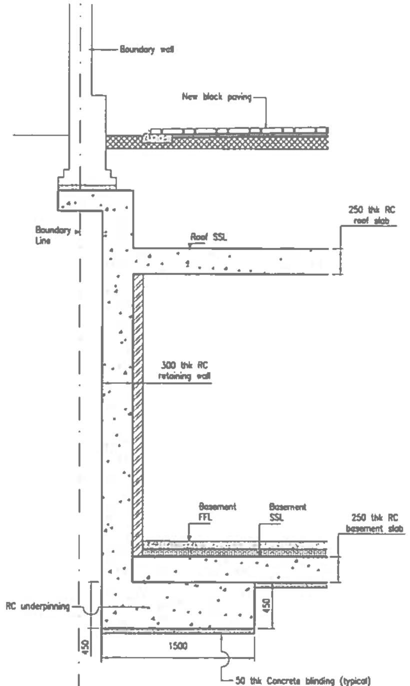
halstead ASSOCIATES
CHARTERED STRUCTURAL ENGINEERS
1 Atherstone Road
Wimbledone
London N20 9AA
t 020 8445 7731
f 020 8446 7198
e office@halsteads.co.uk
w www.halsteads.co.uk



SECTION A - A
SCALE 1:25



SECTION B - B
SCALE 1:25



SECTION C - C
SCALE 1:25

DPC, FINISHES AND WATERPROOFING TO ARCHITECT'S DETAILS

FOR INFORMATION ONLY

Notes:
1. The drawing is to be read in conjunction with all relevant Consultant's drawings and specifications.

Rev.	Date	Revisions	By	Engineer

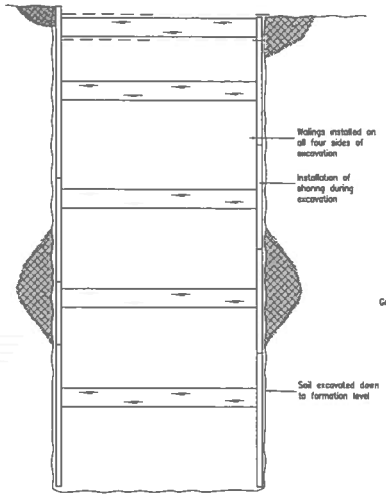
Project: 7 GREVILLE PLACE, NW6 5JP

Title: STRUCTURAL SECTIONS

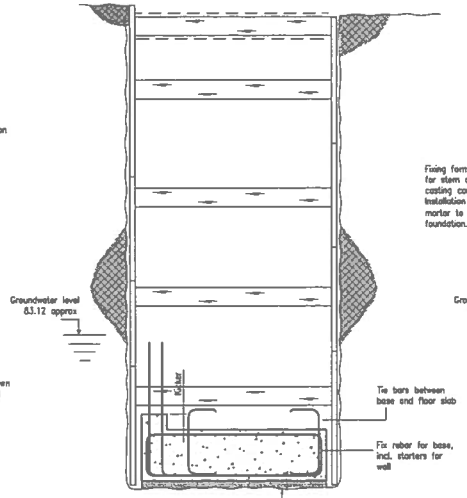
Client: Mr N Raveendran
Architect: Schneider Designers

Drawn by: JK
Checked by: DO
Date: 26th February 2016
Scale: AS NOTED @ A1
Drawing No: 16497/PL02

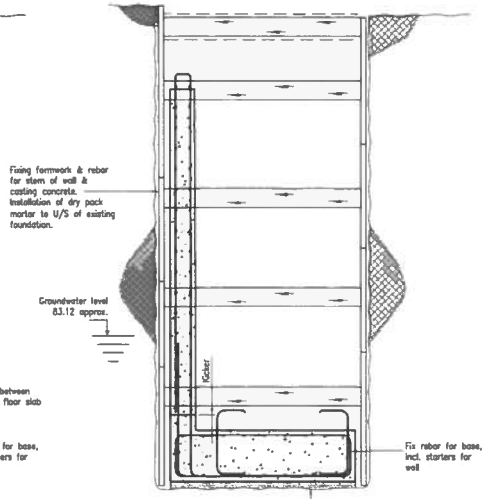
halstead ASSOCIATES CONSTRUCTION CONSULTANTS



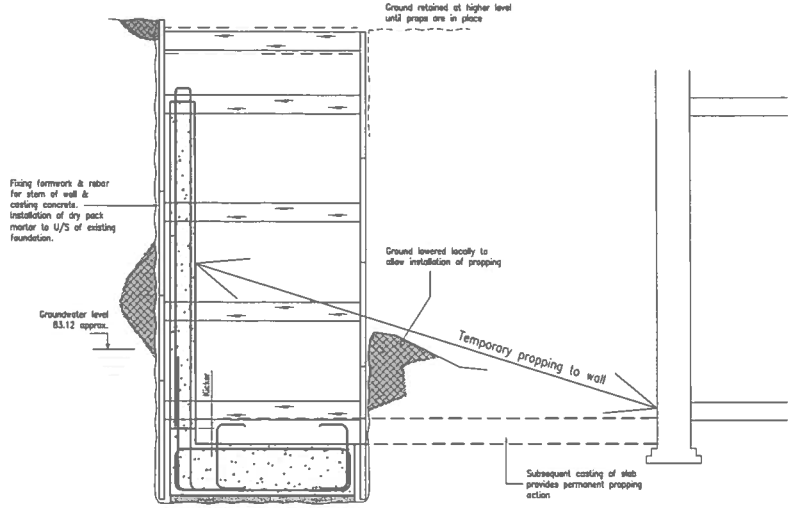
STAGE 1
SCALE 1:25



STAGE 2
SCALE 1:25



STAGE 3
SCALE 1:25



STAGE 4 ONWARDS
SCALE 1:25

FOR INFORMATION ONLY

Rev.	Date	Revisions	By	Engineer
A	20.07.16	Further sequencing information added.	DO	

Notes:
1. The drawing is to be read in conjunction with all relevant Consultant's drawings and specifications.

Project:	7 GREVILLE PLACE, NW6 5JP
Title:	SUGGESTED CONSTRUCTION SEQUENCING FOR RETAINING WALL SECTIONS
Client:	Mr N Raveendran
Architect:	Schneider Designers
Drawn by:	JK
Checked by:	DO
Date:	26th February 2016
Scale:	AS NOTED @ A1
Drawing No:	16497/PL03
	A

halstead
CONSTRUCTION STRUCTURAL EXPERTS
1 Alderbrook Road
Wimbledon
London SW12 8AA
t. 020 8445 7721
f. 020 8445 7198
e. office@halsteads.co.uk
w. www.halstead.co.uk