CampbellReith
consulting engineers

Garages and land adjacent to 25–26 Wolsey Mews London, NW5 2DX

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-64

Revision: F1

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Contents

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 the Garages and land adjacent to 25 – 26 Wolsey Mews (planning reference 2015/3741/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 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 original Basement Impact Assessment (BIA) was prepared by Ellis and Moore. The initial audit raised several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised and this audit only relates to the current BIA, however, the query tracker in Appendix 2 includes the queries on the previous BIA.

1.5. The qualifications of the individuals involved in the current BIA undertaken by Chelmer meet CPG4 requirements. A Structural Engineer's Report (SER) prepared by Price and Myers is also presented. The SER has now been updated with the findings of the further geotechnical work undertaken by Chelmer and to reflect the proposed pile configuration as requested following the second audit.

1.6. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a single storey basement. The basement is to be constructed by installing a '*combined contiguous/secant'* pile wall with a reinforced concrete lining wall. The remaining building loads are to be supported on internal piles. Sketches to indicate the construction sequence and propping arrangements are included in the SER. Further geotechnical parameters are required for detailed design.

1.7. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed. This is subject to a separate approvals process.

1.8. The ground investigation encountered Made Ground over possible Head Deposits overlying the London Clay. Groundwater was shallow and a '*combined contiguous/secant bored piled wall*' to seal out groundwater is proposed in the BIA.

1.9. The BIA has confirmed the neighbouring properties do not comprise basements. It is suggested in the impact assessment that consideration should be given to underpinning the '*flank*' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

1.10. Mitigation measures were presented for the increase in run off due to the slight increase in hard surface area and also flooding from infrastructure failure.

1.11. The proposed basement is within the tree protection zone of a tree in the neighbouring property garden and the recommendations in the arboricultural assessment should be followed.

1.12. Negligible to Very Slight damage is predicted for the two neighbouring properties. Mitigation measures are required for the walls where Very Slight damage is predicted and Chelmer's response to this query is discussed in Section 4 and included in Appendix 3.

1.13. An outline works programme has now been provided as requested. A detailed programme should be provided by the appointed Contractor at a later date.

1.14. Proposals for movement monitoring with trigger values are included. Details and trigger values should be agreed as part of the Party Wall awards. The BIA recommends condition surveys.

1.15. It is accepted that there are no slope stability, wider hydrogeological, or any surface water concerns regarding the proposed development.

1.16. It is accepted that the BIA and supplementary documents adequately identify the potential impacts of the proposed basement and, subject to agreement of the Party Wall awards, describe suitable mitigation.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for the Garages and land adjacent to 25 – 26 Wolsey Mews, Camden Reference 2015/3741/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; and,

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 "Erection of 2 x 2 storey plus basement dwellings following demolition of the three single storey garages."

2.6. The Audit Instruction also confirmed the site does not comprise a listed building, nor is it a neighbour to a listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 30 October 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report – Ellis and Moore Consulting Engineers Ltd, dated June 2015 which includes as part of the appendices a factual Ground Investigation Report by Chelmer Site Investigations , dated March 2015
- Burd Harward Architects drawings Nos:

  1590_E01

  1590_E02

  1590_E03

  1590_E04

  1590_H04

  1590_P01C

  1590_P02C

  1590_P03C

  1590_P04A

  1590_P05B

  1590_P06A

  1590_P07
- 2 No residents' consultation responses

2.8. Following the initial audit, supplementary information was provided between 26 May and 28 June 2016 by email and the documents provided are as follows:

- Basement Impact Assessment Report – Chelmer Consultancy Services, dated May 2016 which includes as part of the appendices a factual ground investigation information by Chelmer Site Investigations, dated January 2016
- Structural Engineer's Report (Stage C) – Price and Myers, dated April 2016
- Burd Harward Architect's Drawings comprising:

  Proposed plans

  Proposed sections

  Proposed elevations

2.9. Further information was provided by email on 15 September 2016 in response to the queries raised in the second audit and the documents provided are as follows:

- Basement Impact Assessment Report (Rev 1) – Chelmer Consultancy Services, dated September 2016

- Structural Engineer's Report (Stage C- V3) – Price and Myers, dated July 2016
- Outline Construction Programme – Burd Harward Architects, dated September 2016
- Pdisp input and output

2.10. Further mitigation measures for the predicted ground movements were requested and the responses from Chelmer and Burd Harward Architects were received via email on 18 October 2016. These, together with the revised Structural Engineers Report and outline programme are included in Appendix 3. The revised BIA and Pdisp input and output are not included due to file size, however, the accompanying email to the revised BIA is also included in the Appendix.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	See Audit paragraph 4.2.
Is data required by Cl.233 of the GSD presented?	Yes	Chelmer BIA, supporting documents and supplementary documents. Outline works programme now provided.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Chelmer BIA, Structural Engineer's Report (SER) and appendices.
Are suitable plan/maps included?	Yes	Architect's drawings and Arup GSD, Environment Agency (EA) and Camden SFRA map extracts with site location indicated within BIA.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	As above.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.3.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 7.4.
Is a conceptual model presented?	Yes	BIA Sections 9.4 and 10.1.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.3.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.2 although one issue should have been carried forward from the screening.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 8.4.
Is factual ground investigation data provided?	Yes	Appendix C of the BIA.
Is monitoring data presented?	Yes	Section 9.8 and within Appendix C of the BIA.
Is the ground investigation informed by a desk study?	Yes	Additional ground investigation undertaken by Chelmer appears to be informed by the desk study in the leading sections of the BIA.
Has a site walkover been undertaken?	Yes	BIA Section 1.3.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Section 10.2.3 states there is no evidence of basements in the vicinity of the site.
Is a geotechnical interpretation presented?	Yes	Some interpretation presented in BIA Section 10.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Section 10.4.9.
Are reports on other investigations required by screening and scoping presented?	Yes	Ground investigation and arboricultural assessment undertaken with reports provided.
Are baseline conditions described, based on the GSD?	Yes	Within various sections of the BIA.
Do the base line conditions consider adjacent or nearby basements?	Yes	BIA Sections 10.2.3 and 10.2.4.
Is an Impact Assessment provided?	Yes	BIA Section 10.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Revised Chelmer BIA.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Section 10.9.
Has the need for monitoring during construction been considered?	Yes	BIA Section 10.7.
Have the residual (after mitigation) impacts been clearly identified?	N/A	None identified.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Although predicted damage requires mitigation measures.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	BIA report.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	As above.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Category 0 (Negligible) and Category 1 (Very Slight) damage predicted for the two immediate neighbouring properties. Mitigation measures required for walls where Category 1 damage is predicted (see Audit paragraph 4.21).
Are non-technical summaries provided?	Yes	BIA Sections 7.5, 8.5, 9.15, 9.16 and 11.

4.0 DISCUSSION

4.1. A Basement Impact Assessment (BIA) prepared by Ellis and Moore was previously audited, however, several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties were raised. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised in the initial audit. This audit only relates to the current BIA although the query tracker in Appendix 2 includes the queries on the previous BIA.

4.2. The Basement Impact Assessment (BIA) was prepared by Chelmer Consultancy Services and the individuals involved have CEng MICE, C.WEM FCIWEM and CGeol FGS qualifications.

4.3. A Stage C Structural Engineers Report (SER) was prepared by Price and Myers and the author has CEng qualifications although it is not stated from which institution. It was requested that the report be made up to date with the findings of the further geotechnical work which was referenced in the report. This has now been updated as requested.

4.4. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a basement. The basement is to be constructed by installing a secant pile wall with a reinforced concrete lining wall. A total of 10 internal piles are also proposed to support the remaining building loads. Sketches to indicate the construction sequence with temporary propping indicated are provided in the SER. The piles are indicated to be installed from ground level with the internal piles then cut down to basement level following excavation.

4.5. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed.

4.6. The founding level of the basement floor is indicated to be 3.57m below the finished floor level of the proposed ground floor. The depth of excavation required is indicated to vary between 3.50 and 4.20m. The ground investigation encountered Made Ground to a maximum depth of 1.80m below ground level (bgl) over possible Head Deposits described as gravelly clay and clayey gravel to maximum 2.90m bgl overlying the London Clay. The possible Head Deposits were not encountered in one of the boreholes.

4.7. Groundwater was monitored to within 0.80m bgl. Whilst a 'No' response is given to Question 1b of the Hydrogeology screening which relates to whether or not the proposed basement will extend beneath the water table surface, the presence of perched water is subsequently acknowledged. It is further stated in Section 10.2.7 of the BIA that current geotechnical standards require the use of a '*worse credible'* approach to selection of groundwater pressures therefore, a design groundwater level at ground level is recommended.

4.8. A '*combined contiguous/secant bored piled wall'* where the 'male' piles are taken down to full depth and the 'female' piles taken only as deep as required to '*seal out groundwater and to control groundwater pressures in order to minimise obstruction of any permeable horizons in the London Clay at depth'* is proposed in the BIA.

4.9. The BIA states that '*no evidence has been found for any existing modern basements in the vicinity of the site*'. A trial pit undertaken against the property to the south, No 25 Wolsey Mews, revealed brickwork over concrete founded on the Made Ground at 1.15m bgl. The foundations to the neighbouring property to the north, Nos 3 – 7 Islip Street, were not investigated.

4.10. It is suggested in the impact assessment that consideration should be given to underpinning the '*flank* ' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

4.11. The BIA hydrology screening states there will be a small increase in the hard surfaced area as a result of the development and '*a temporary intervention storage which could include rainwater harvesting is proposed*'. Although the site is not in an area at risk from sewer flooding, a combined sewer is located beneath the roadway and non-return valves and '*pumped above ground loop systems on the drains serving the basement and lightwell*" are proposed to prevent water from the sewer system entering the basement in the event of surcharge from the sewer.

4.12. In response to Question 6 of the land stability screening, it is stated that part of the development is within the root protection area of a tree located in the rear garden of Nos 3 – 7 Islip Street. An arboricultural assessment was previously undertaken and it is stated in the BIA that guidance in this assessment should be followed. A 'Yes' response is given to Question 7 of which relates to whether or not there is a history of shrink/swell subsidence in the area although it is stated that there is no evidence of damage consistent with differential foundation movement.

4.13. The retaining wall parameters given on Section 10.4.9 of the BIA are considered incomplete as the Young's Modulus of the different strata is not given. Appropriate values should be advised by a geotechnical engineer for detailed design.

4.14. A ground movement assessment considering heave/settlement from the excavation and construction using Oasys Pdisp and vertical and horizontal movements from installation and excavations based on CIRIA C580 was used.

4.15. Four stages of the excavation and construction have been modelled using Oasys Pdisp; Stage 1 (construction of perimeter BPW and bearing piles, and bulk excavation of central areas to formation level condition – undrained condition), Stage 2 (construction of basement slab – undrained condition), Stage 3 (construction of superstructure on basement slab/bearing piles and perimeter BPW – undrained condition) and Stage 4 (as Stage 3, except – drained condition).

Although contour plots from the analysis and a summary of predicted displacements have been presented, the full input and output from the programme are not provided. There is no indication that unloading from the demolition of the three garages have been considered, however, in this case, they are considered negligible. The predicted movements are included in the damage assessment.

4.16. The full input and output from the Pdisp has now been provided as requested. It appears from the input that only the London Clay has been modelled, although since the overlying soils are to be excavated and the heave is likely to occur in the London Clay, this is not considered to have a significant effect on the ground movements.

4.17. Following the initial audit, several queries were raised on the approach in the GMA. An 'enhanced' CIRIA C580 approach from guidance by Ball, Langdon and Creighton (2014) which used lower displacement ratios than indicated by CIRIA C580 was used to calculate the ground movements. The assumed pile length was contradictory to that indicated in other sections of the report. The pile length and depth of excavation used to calculate ground movements due installation and excavation was the difference between the assumed pile length and the neighbouring property foundation depths and the difference between the excavation depth and the neighbouring property foundation depths respectively.

4.18. It was requested the approach to the GMA be re-considered with the assumed pile length indicated, the full depth of excavation and length of the pile used, together with the percentages of wall depth given in CIRIA C580.

4.19. The GMA has been revised as requested. It is indicated the bored pile wall is assumed to be 9.57m deep. The displacement ratios for the installation are indicated to be an average between the ratios for contiguous and secant piled walls given in CIRIA C580 which is considered reasonable. Corner stiffening effects have been used in the calculation of the ground movements for Nos 25 and 26 Wolsey Mews. Although the depth of excavation used in the damage assessment calculation for No 3 – 7 Islip Mews is the difference between the assumed foundation depth (0.90m) and the depth of excavation (4.20), this is not considered to have a significant effect on the ground movements.

4.20. Category 0 (Negligible) damage is predicted for the front wall to Nos 25 and No 26 with Category 1 (Very Slight) predicted for the rear end of the flank wall and No 3 – 7 Islip Street. CPG4 requires mitigation measures where predicted damage is indicated to be Category 1 or higher and the impacts re-evaluated.

4.21. Burd Haward Architects have indicated in a telephone conversation that mitigation measures have already been implemented in the design undertaken to date and discussions with the neighbours are already underway (Appendix 3). An email response dated 18 October 2016 from

Chelmer (Appendix 3), who undertook the BIA, states that '*switching to a fully contiguous BPW, in order to reduce further the predicted displacements, would not be appropriate owing to the high groundwater levels and the presence of permeable gravels and silt/sand horizons'.* It is further stated that '*the proposed movement monitoring and trigger levels should these be exceeded are included in the negotiations for the Party Wall agreements in order to provide reassurance to the owners of the adjoining/adjacent buildings that movements resulting from the basement will be monitored, and, in the event that any excessive movements are recorded, that a plan exists to deal with them'.*

4.22. It was stated in the scoping that use of adequate temporary and permanent support and best practice methods would reduce the potential impact on the roadway, which is accepted, although no further discussion was provided.

4.23. An outline works programme has now been included as requested. Details should be provided by the appointed Contractor at a later date.

4.24. Proposals are provided for monitoring with trigger levels. Details and trigger levels should be agreed as part of the Party Wall award.

4.25. It is accepted that there are no slope stability concerns, wider hydrogeological concerns, or any surface water concerns regarding the proposed development.

5.0 CONCLUSIONS

5.1. The original Basement Impact Assessment (BIA) was prepared by Ellis and Moore. The initial audit raised several queries relating to the BIA format, hydrogeology, hydrology and stability of the proposed structure and neighbouring properties. A new BIA undertaken by Chelmer Consultancy Services was submitted in response to the queries raised and this audit only relates to the current BIA, however, the query tracker in Appendix 2 includes the queries on the previous BIA.

5.2. The qualifications of the individuals involved in the current BIA undertaken by Chelmer meet CPG4 requirements. A Structural Engineer's Report (SER) prepared by Price and Myers is also presented. The SER has now been updated with the findings of the further geotechnical work undertaken by Chelmer and to reflect the proposed pile configuration as requested following the second audit.

5.3. The site currently comprises 3 single storey garages which are to be demolished to construct a two storey building over a single storey basement. The basement is to be constructed by installing a secant pile wall with a reinforced concrete lining wall. The remaining building loads are to be supported on internal piles. Sketches to indicate the construction sequence and propping arrangements are included in the SER.

5.4. London Underground (LUL) Northern Line tunnels are indicated to be within 30m of the site and the BIA recommends the level and alignment of these tunnels should be confirmed. This is subject to a separate approvals process.

5.5. The depth of excavation required is indicated to vary between 3.50 and 4.20m. The ground investigation encountered Made Ground over possible Head Deposits overlying the London Clay although the possible Head Deposits were not encountered in one of the boreholes.

5.6. Groundwater was monitored to within 0.80m bgl and a '*combined contiguous/secant bored piled wall*' where the 'male' piles are taken down to full depth and the 'female' piles taken only as deep as required to seal out groundwater is proposed in the BIA.

5.7. The BIA has confirmed the neighbouring properties do not comprise basements and a foundation depth of 1.15m bgl for No 25 Wolsey Mews was revealed by trial pitting. The foundations to No 3 – 7 Islip Street were not investigated but assumed to be at 0.90m bgl.

5.8. It is suggested in the impact assessment that consideration should be given to underpinning the '*flank*' wall to No 25 which the trial pitting indicated to be founded on Made Ground.

5.9. Mitigation measures are presented for the increase in run off due to the slight increase in hard surface area and also flooding from infrastructure failure.

5.10. Young's Modulus values for the different strata are not included. These will be required for detailed design.

5.11. The proposed basement is within the tree protection zone of a tree in the neighbouring property garden and the recommendations in the arboricultural assessment should be followed.

5.12. The full input and output from the Pdisp analysis which was used in the damage assessment has now been provided as requested.

5.13. The GMA has been revised to address the queries raised on the second audit as discussed in Section 4. Negligible to Very Slight damage is predicted for the two neighbouring properties. Mitigation measures are required for the walls where Very Slight damage is predicted and Chelmer's response to this query is discussed in Section 4 and included in Appendix 3.

5.14. An outline works programme has now been provided as requested. A detailed programme should be provided by the appointed Contractor at a later date.

5.15. Proposals for movement monitoring with trigger values are included. Details and trigger values should be agreed as part of the Party Wall awards. The BIA recommends condition surveys.

5.16. It is accepted that there are no slope stability, wider hydrogeological, or any surface water concerns regarding the proposed development.

5.17. It is accepted that the BIA and supplementary documents adequately identify the potential impacts of the proposed basement and, subject to agreement of the Party Wall awards, describe suitable mitigation.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Francis	Not given but states building is adjacent to the development	03-08-15	Stability and ground movements	GMA revised (see Audit paragraphs 4.19 to 4.21).

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date Closed Out
1	BIA Author Qualifications	Input of a Chartered Geologist is required with respect to the appraisal of groundwater flow.	Closed – Qualifications of individuals involved in current BIA meet requirements.	01/07/16
2	BIA format	Screening, scoping, impact assessment not undertaken in accordance with Arup GSD.	Closed – Current BIA was broadly undertaken in accordance with CPG4 and Arup GSD requirements.	01/07/16
3	BIA format	Non-technical summaries and conceptual model not provided.	Closed – Provided in current BIA.	01/07/16
4	BIA format	A sufficient desk study and site walkover not undertaken.	Closed – Undertaken as part of current BIA.	01/07/16
5	BIA format	A works programme has not been submitted as required by cl.233 of the GSD.	Closed – Outline programme provided. Detailed programme to be provided by the appointed Contractor at a later date.	18/10/16
6	BIA format	Geotechnical interpretation not provided.	Closed – Interpretation in current BIA, however, Young's Modulus values will have to be provided for detailed design.	01/07/16
7	Hydrogeology	Groundwater level to be reconsidered.	Closed – Further groundwater monitoring undertaken and conservative assumption suggested for design.	01/07/16
8	Surface flow and flooding & Subterranean flow	Contradictory information in Stage 1 and Stage 4 of the BIA report.	Closed – Issues identified appropriately addressed in current BIA.	01/07/16
9	Flooding	Mitigation measures not provided in the event of flooding due to infrastructure failure	Closed – Provided in current BIA.	01/07/16

10	Stability	Supporting analyses for ground movement assessment not provided.	Closed – Provided. GMA revised as per comments following second audit. Full input and output from the Pdisp analysis to be provided.	18/10/16
11	Stability	No impact assessment on the roadway.	Closed – Measures to reduce potential impacts provided in scoping.	01/07/16
12	Stability	BIA offers monitoring of vertical movements building to the '*right* ' (assumed to be 25 Wolsey Mews) but does not appear to consider horizontal movements and other properties such as 26 Wolsey Mews and 3- 7 Islip Street.	Closed – Monitoring proposals considering all the immediate neighbouring properties provided in current BIA together with trigger values. Details and trigger values to be agreed as part of Party Wall award.	18/10/16 N/A
13	Construction management plan	Not provided.	To be provided by appointed Contractor at a later date with details to be agreed with Council.	N/A
14	Stability	Structural Engineer's report not up to date with geotechnical findings and pile configuration.	Open – Updated as requested.	18/10/16
15	Stability	Predicted damage requires mitigation measures	See Audit paragraph 4.21 and email responses in Appendix 3. The predicted damage and mitigation measures are subject to agreement at the Party Wall award stage.	N/A

Appendix 3: Supplementary Supporting Documents

Structural Engineer's Report (Stage C- V3) – Price and Myers, dated July 2016
Outline Construction Programme – Burd Harward Architects, dated September 2016
Email responses (received on 18 October 2016) from Chelmer and BHA on mitigation measures

PRICE&MYERS

REPORT

Wolsey Mews Garages, London

Structural Engineer's Report Stage C

Prepared by: Sam Riley MEng CEng MIStructE
Job Number: 24712

Date	Version	Notes / Amendments / Issue Purpose
4.4.2016	1	Stage C structural report
7.4.2016	2	Corrections regarding building purpose
22.7.2016	3	Camden Planning department comments addressed

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Contents

1 The Site

The proposed building will be residential and will include two storeys above ground plus basement in Kentish Town, London.

The existing site is largely under developed, but includes three single storey precast concrete garages, an unreinforced ground bearing slab and some surface water gulley's, all of which will need to be removed in order to facilitate the proposals.

The site is bounded by Wolsey Mews Road to the West, a three storey building to the north, a two storey building to the south, and the land to the east is currently undeveloped.

2 Ground Conditions

A geotechnical report was produced by 'Chelmer Site Investigations' in May 2016. The report included the results of 2no trial pits, 2 bore holes and a window sample. From these investigations it can be seen that between 1.2-1.8m of made ground is present over 0.5-0.6m River Terrace Deposits/Made Ground (predominantly clays and gravels). In the window sample a band of 0.2m deep Gravel was found beneath the River Terrace Deposits. Below the River Terrace Deposits and band of Gravel is the Weathered London Clay formation, commencing at depths 0f 6.0m (window sample), 7.0m (Borehole 2) and 8.0m (borehole 1). The window sample and boreholes were terminated within the Weathered London Clay formation.

In the window sample water was encountered at a depth of 2.9m below existing ground level. This happens to coincide with the level of the Gravel band between the clays, and may represent a perched water table, this will need to be addressed in the permanent design of the basement retaining wall.

Finally, the report recommends that the structural design assume a water table level at ground level. This approach will be adopted in the permanent design of the structure.

3 Proposed Structure

Substructure

The presence of the existing building structures to the north and south of the site, as well as Wolsey Mews road to the west, means that an open cut basement construction will not be possible without prior underpinning to these structures, which would add cost and increase the length of the construction programme. It is therefore proposed that a piled retaining wall be installed to the perimeter of the basement to support both vertical loads from the new building, as well as resist lateral loads from the soil and water pressures and the surcharges from the road and the adjacent building foundations. In the permanent case the piled retaining walls will be propped by the RC basement and ground floor slabs, they will also need to be carefully propped in the temporary case in order to maintain stability.

As noted above, the window sample carried out by 'Chelmer Site Investigations' revealed that water was found at 2.9m, where there is 200mm thick band of dense gravels between clay strata above and below. In anticipation of perched water being present within the gravel layer it is proposed that a 'combined contiguous/secant bored piled wall be implemented, with the male piles being taken down to full depth, and the female piles taken only as deep as required to seal out groundwater from the basement structure. This approach will help to limit the

movement of fines caused by water seeping between gaps between piles which would otherwise potentially cause voids to form beneath the adjacent foundations, and also continue to allow free movement of ground water beneath the basement structure.

The remainder of the gravity loads will be distributed to internal piles via an RC basement slab and ground beams/pile caps.

The geotechnical report advises that the structural design should assume a design water table level at ground level, this approach will be adopted in the structural design. With this in mind, a design check will be required in the later design stages to see if the self-weight of the building is greater than the buoyancy uplift force, otherwise the piles will have to be designed to resist tension forces generated as well as compression forces.

Superstructure

The superstructure will consist of an RC first floor slab supported off of the perimeter masonry walls and a masonry spine wall. The majority of the internal walls will be constructed from non-load bearing masonry to allow future flexibility of the spaces.

The main roof will be constructed from deep exposed timber rafters. Lateral thrust from the rafters will be resisted by a perimeter steel beam and steel ties as necessary.

External Works

The majority of the site is to be used for the new building, and as such the scope of the external works is small. Although the proposals have not yet been developed in detail there will be an external light well to the east of the site at basement level which is likely to include hard landscaping.

The existing ground level is to be lowered, therefore some small RC retaining walls will be required beneath the external skins to the perimeter of the building to resist lateral earth pressures due to the differences in level between the external ground and the ground floor slab.

4 Design Criteria

Codes and Standards

The structure will be designed in accordance with the appropriate British Standards and relevant codes of practice. As follows:

Loads	BS 6399
Concrete	BS 8110
Steel	BS 5950
Timber	BS 5268
Masonry	BS 5628

Loadings

Typically loadings will be taken from BS 6399.

At this stage the following live load allowances have been made:

Office spaces -	2.5kN/sqm UDL & 2.7kN PL

Residential spaces -	1.5kN/sqm UDL & 1.4kN PL
Flat Roofs - access for maintenance only -	0.75kN/sqm
Pitched Roofs -	0.6kN/sqm

Design Fire Periods

It is anticipated that much of the structure, such as the RC slab soffits, RC walls, masonry walls and the timber rafters and steel ties to the roof will be exposed as part of the architectural design. All structural elements will be sized and designed to the relevant codes cited above for a fire period of 1 hour.

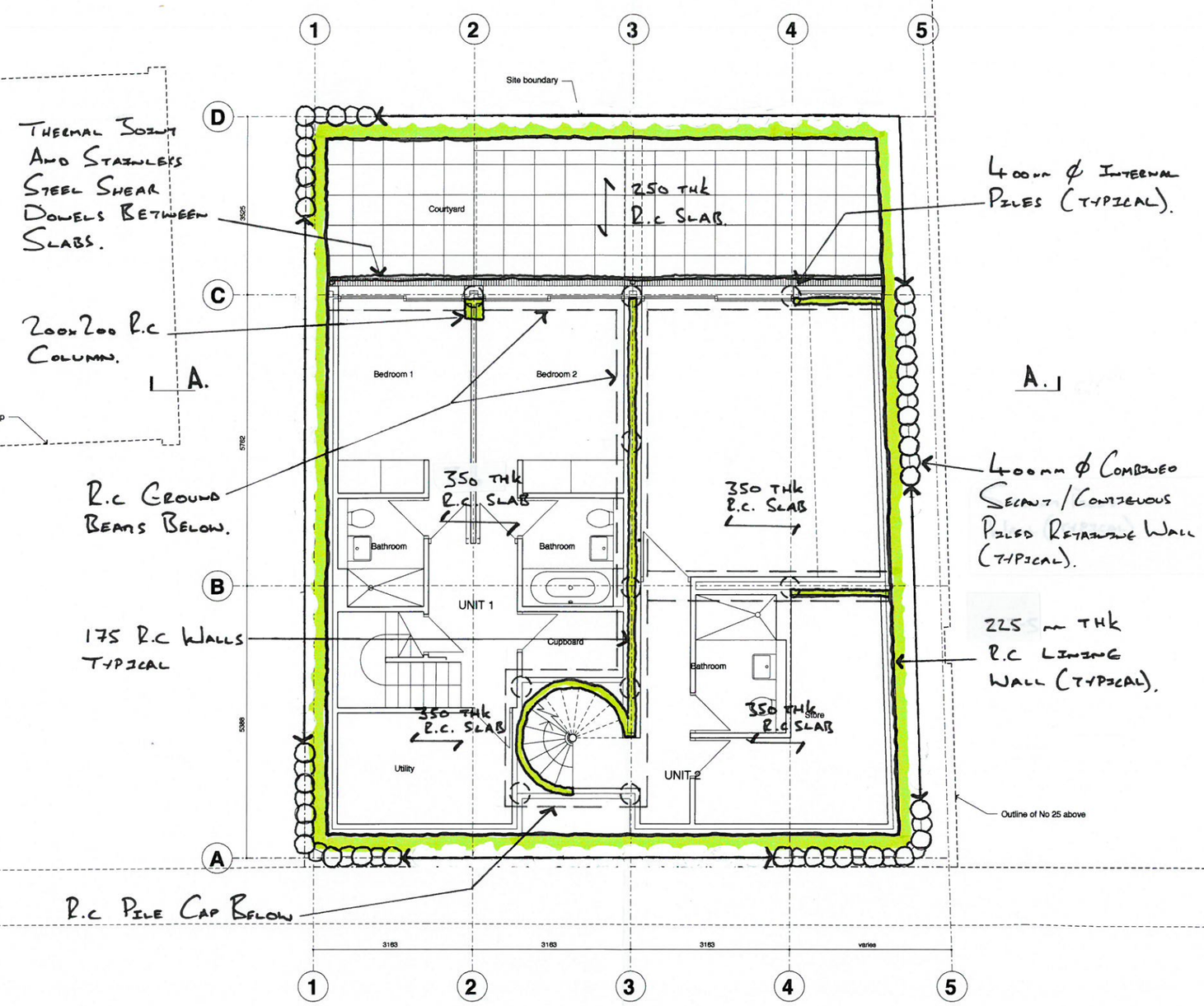
Disproportionate Collapse

The proposed structure is two storeys tall plus basement and is residential throughout. According to Part A3 of the Building Regulations the structure is class 2a and as such horizontal ties will be required between the RC slabs and masonry walls.

Appendix A
Stage C structural layout drawings

BASEMENT

1:100 @ A3



THERMAL JOINT AND STAINLESS STEEL SHEAR DOWELS BETWEEN SLABS.

200x200 R.C COLUMN.

R.C GROUND BEAMS BELOW.

175 R.C WALLS TYPICAL

R.C PILE CAP BELOW

400mm ϕ INTERNAL PILES (TYPICAL).

400mm ϕ COMBINED SECANT / CONTIGUOUS PILED RETAINING WALL (TYPICAL).

225 mm THk R.C LINING WALL (TYPICAL).

BASEMENT SLAB TO BE FOUNDED ON 50m CONCRETE BLINDING ON 150m WELL COMPACTED HARDCORE.

WOLSEY MEWS

PRICE&MYERS

Consulting Engineers
37 Alfred Place London WC1E 7DP T 020 7631 5128

Job No 24712 Page 01. Ver A.

Date MAR'16 Eng S.RILEY Chd

Job WOLSEY MEWS GARAGES, LONDON

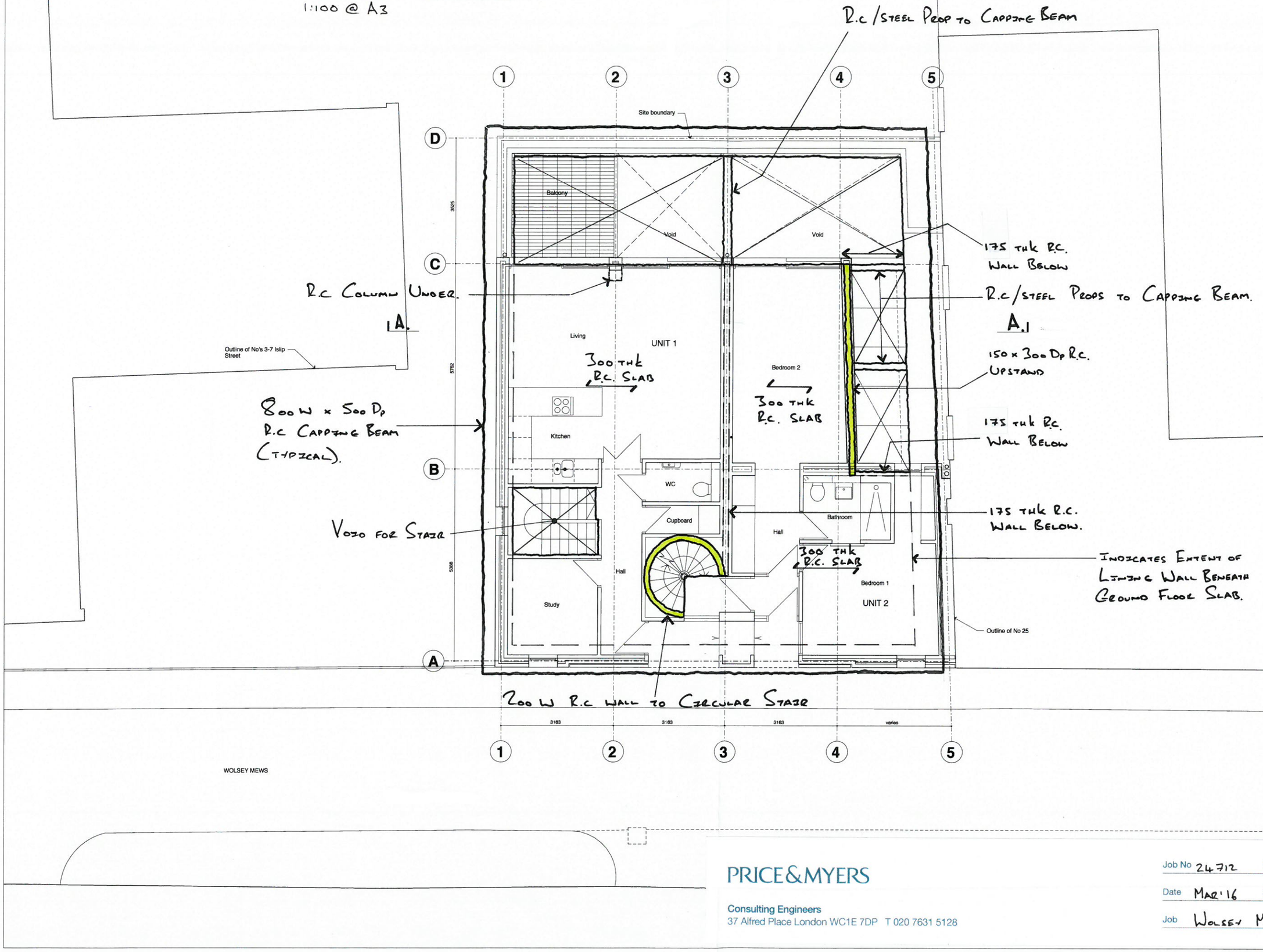
Preliminar

Basement Plan
Wolsey Mews Garages
NW5 2DX

1590_L01_B

GROUND FLOOR

1:100 @ A3



PRICE&MYERS

Consulting Engineers
37 Alfred Place London WC1E 7DP T 020 7631 5128

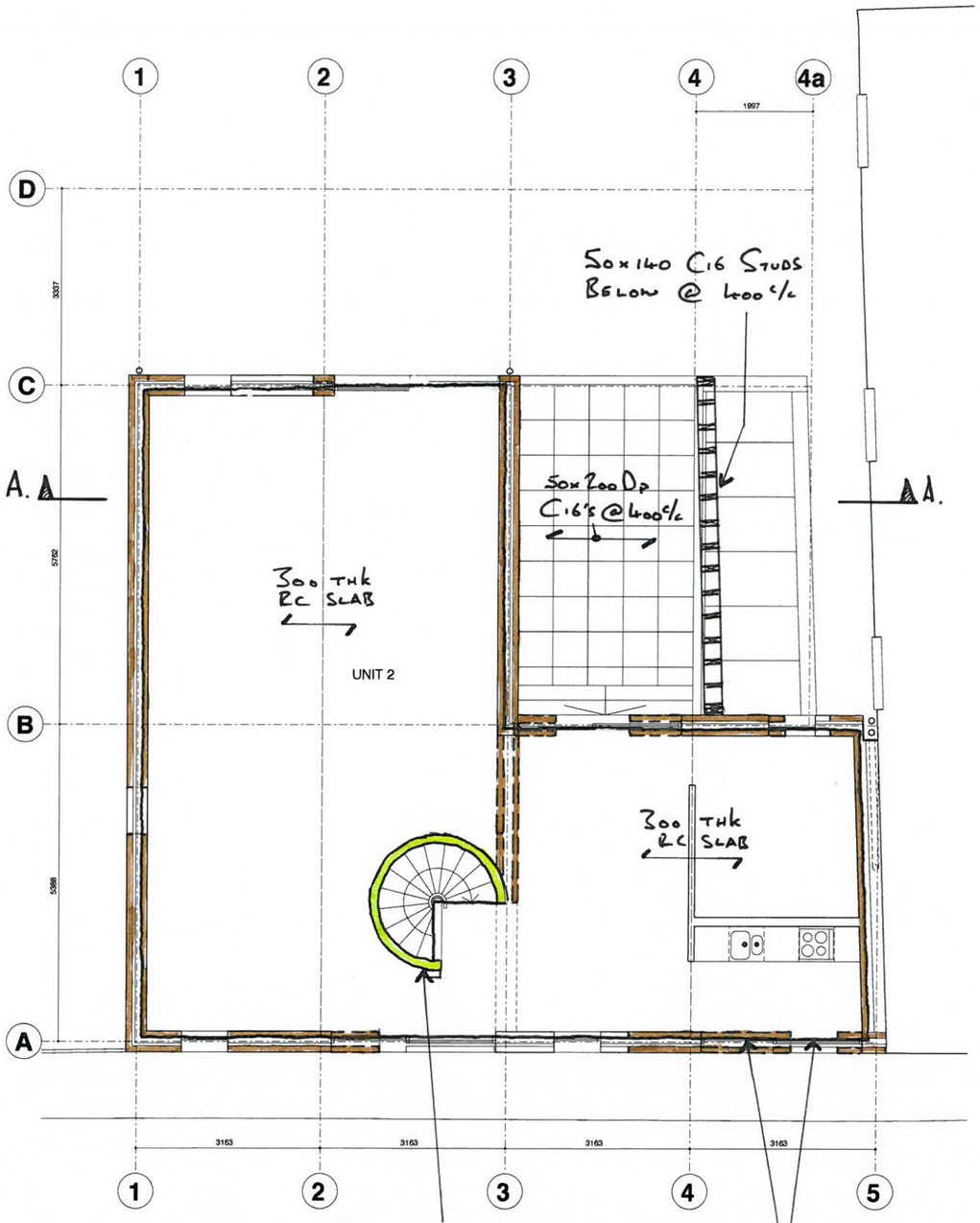
Job No 24712 Page 02. Ver

Date MAR'16 Eng S.RILEY Chd

Job WOLSEY MEWS GARAGES, LONDON

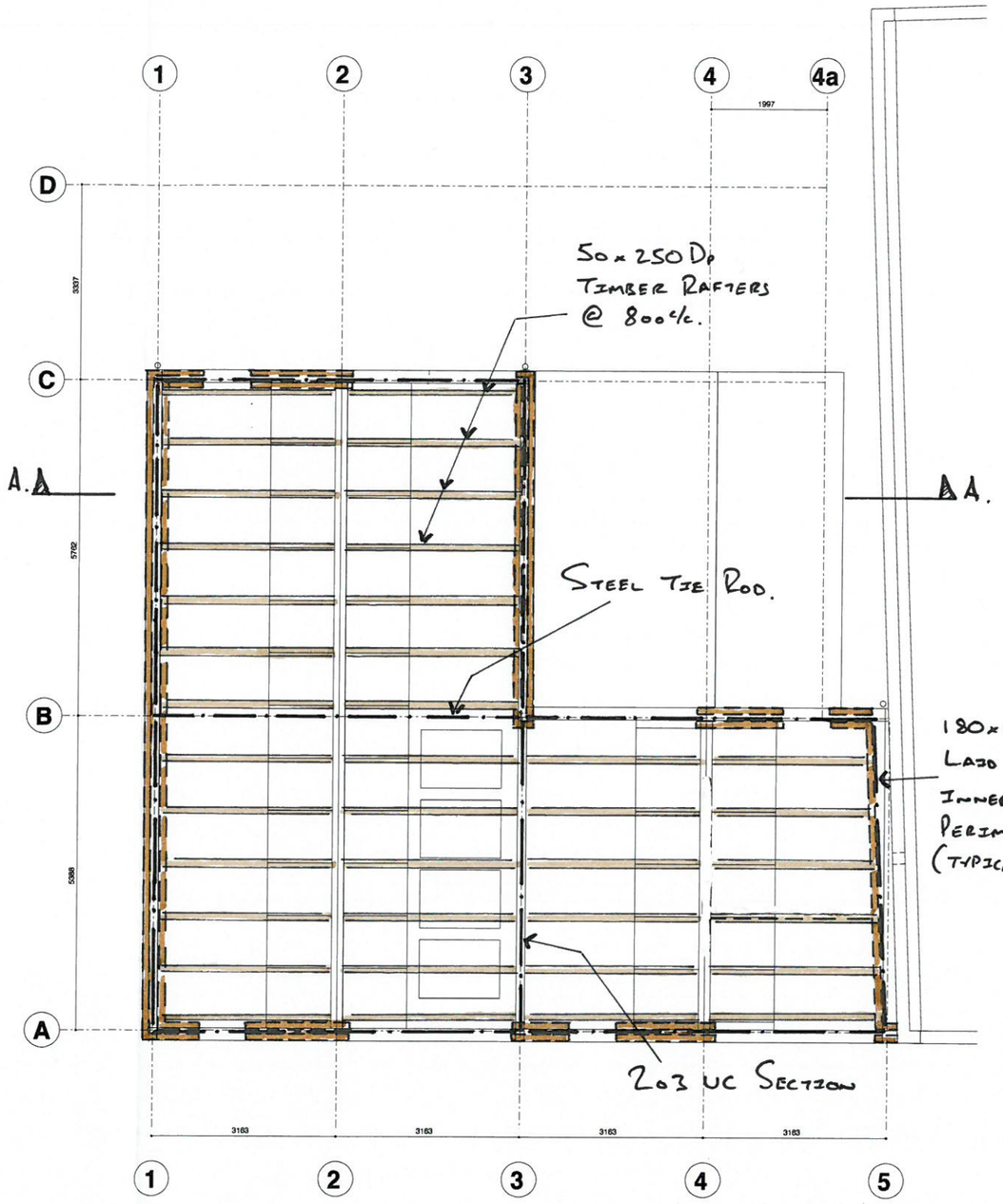
First Floor

1:100 @ A3



Roof

1:100 @ A3



PRICE&MYERS

Consulting Engineers
37 Alfred Place London WC1E 7DP T 020 7631 5128

Job No 24712 Page 03. Ver

Date Mar'16 Eng S.Riley Chd

Job Wolsey Mews Garages, London

Preliminar

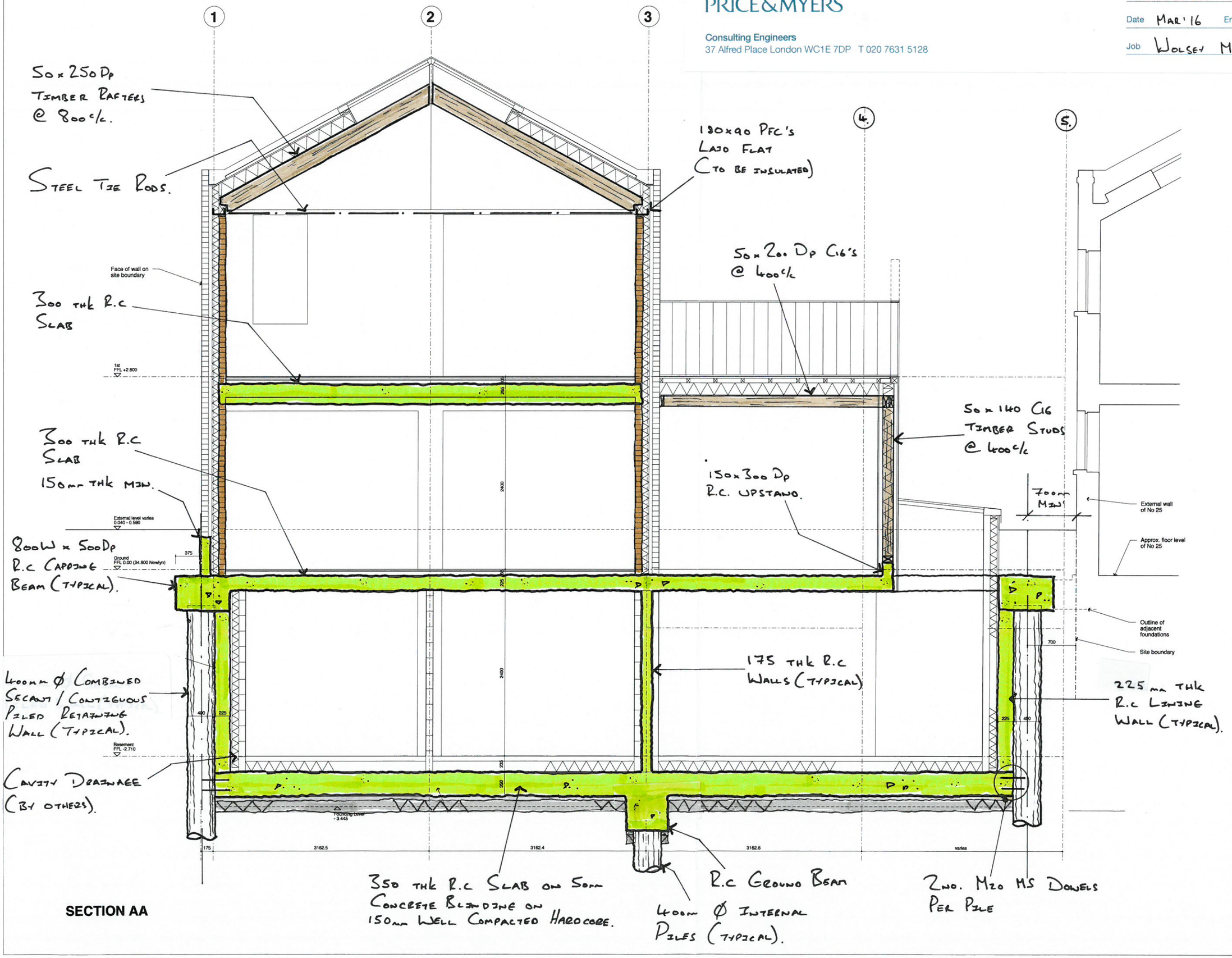
First Floor & Roof Plans
Wolsey Mews Garages, NW

1590_L02_A

PRICE & MYERS
Consulting Engineers
37 Alfred Place London WC1E 7DP T 020 7631 5128

Job No 24712 Page 04. Ver
Date MAR'16 Eng S.RILEY Chd
Job WOLSEY MEWS GARAGES, LONDON

SECTION A-A
1:50 @ A3



SECTION AA

Appendix B

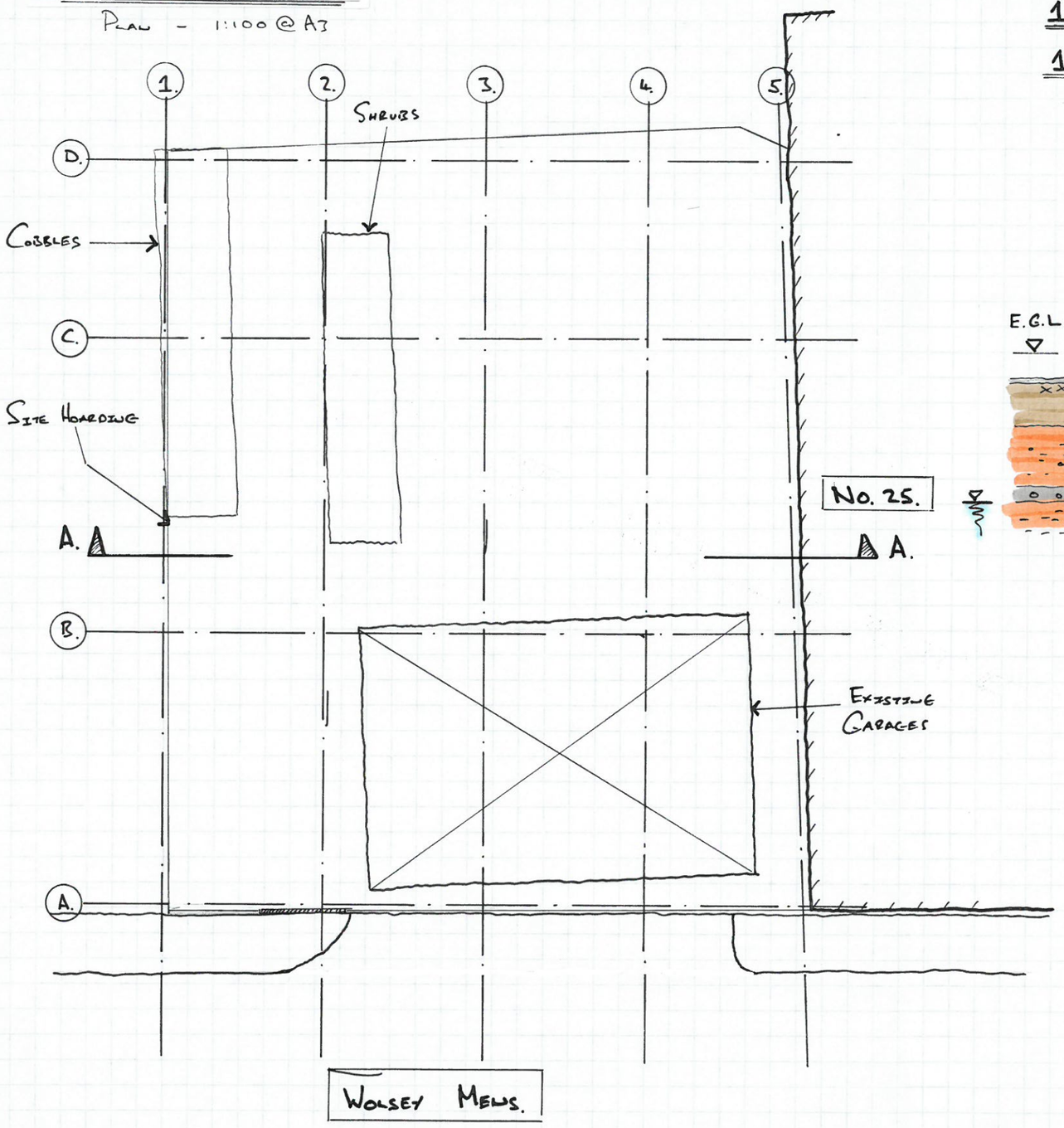
Basement construction sequence

PRICE&MYERS
Consulting Engineers

Job No 24712 Page sk 5 Rev
Date MAR'16 Eng S.RILEY Chd
Job WOLSEY MEWS GARAGES, LONDON

1. EXISTING LAYOUT

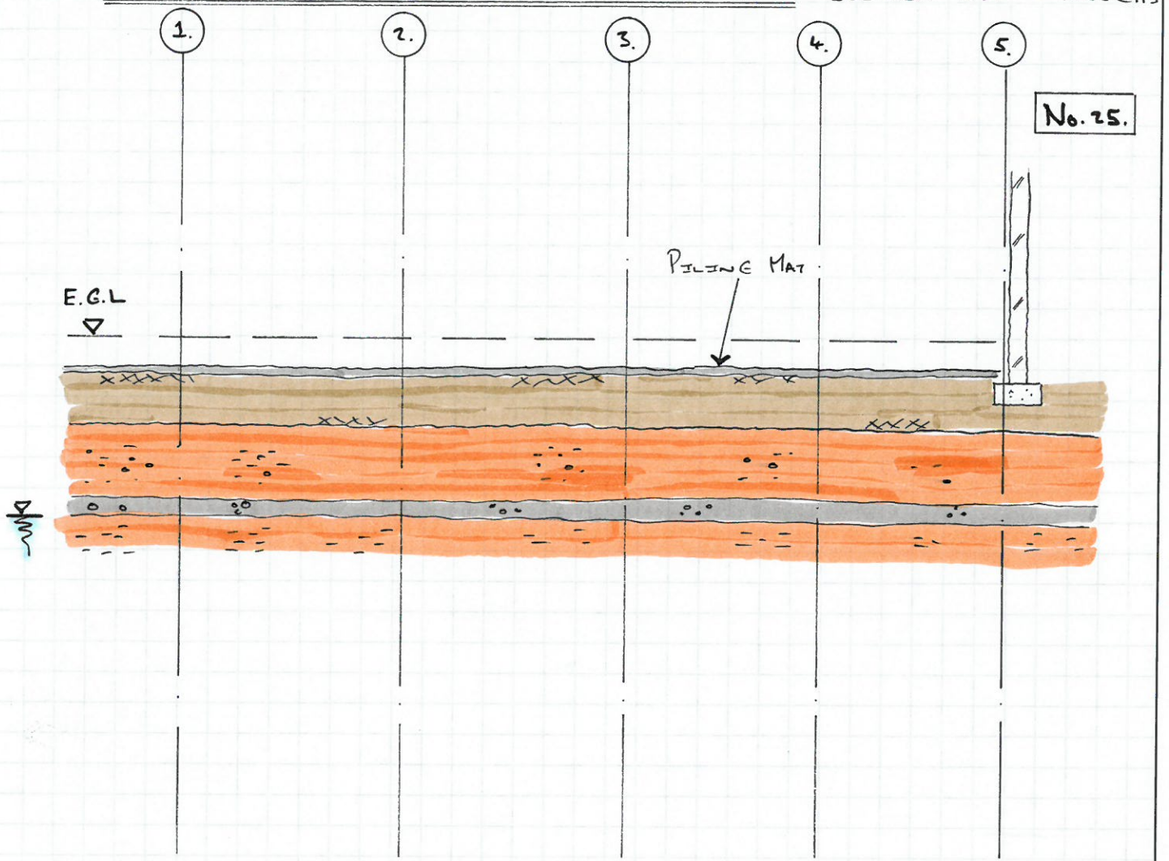
PLAN - 1:100 @ A3



1a. REMOVE EXISTING STRUCTURES / CONCRETE SLAB + DRAINAGE.

1b. EXCAVATE AND INSTALL PILING MAT

SECTION A-A - 1:100@A3

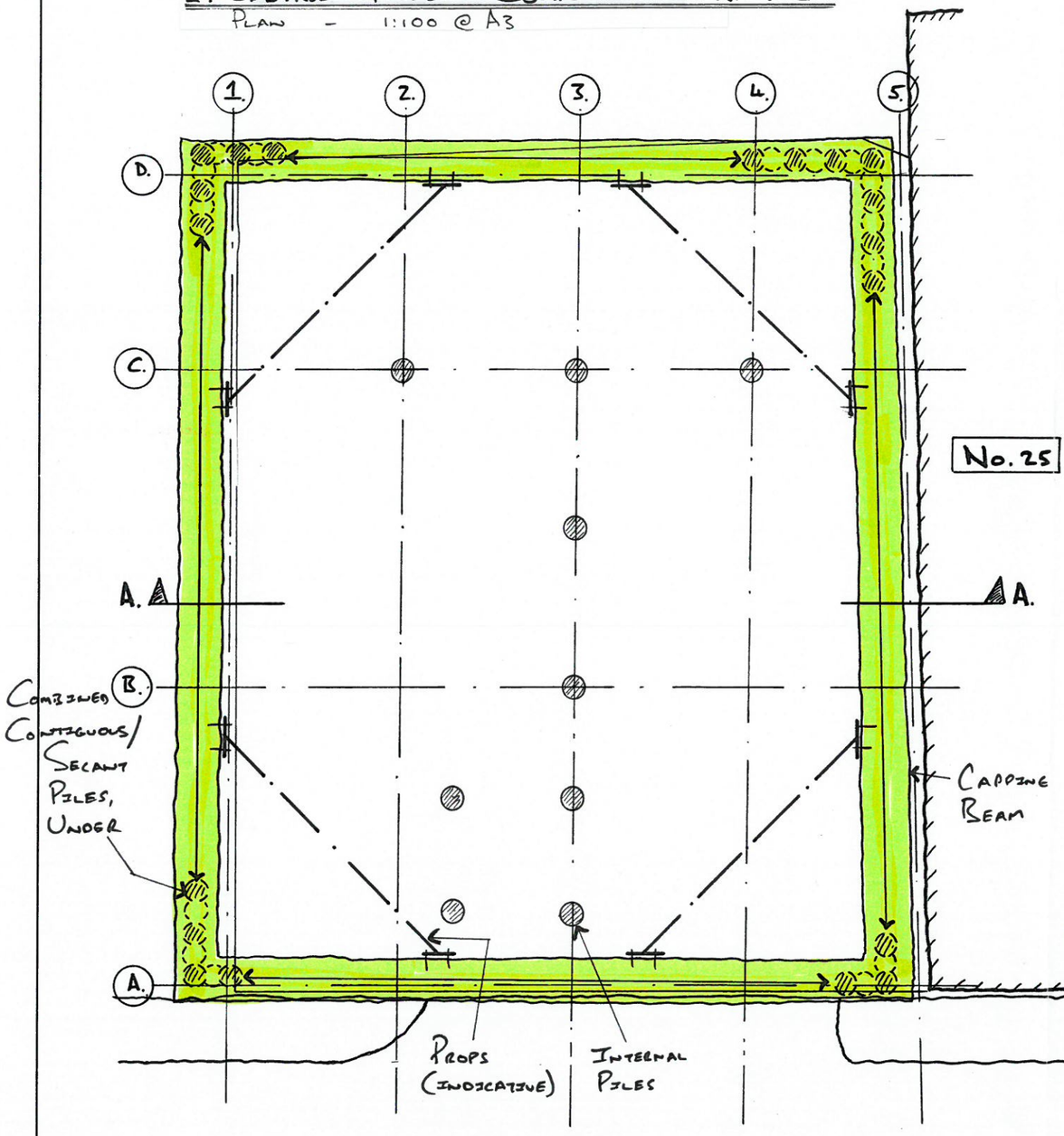


PRICE&MYERS
Consulting Engineers

Job No 24712 Page sk6 Rev A.
Date MAR '16 Eng S.RILEY Chd
Job WOLSEY MENS GARAGES, LONDON

2. INSTALL PILES + COMMENCE EXCAVATION

PLAN - 1:100 @ A3

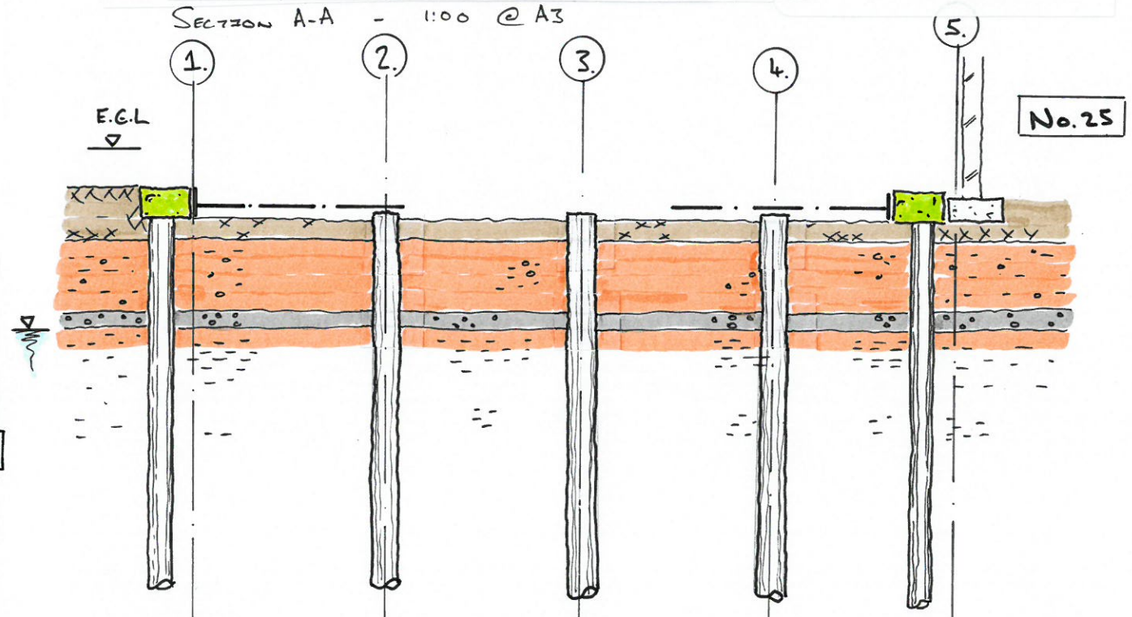


No.25

WOLSEY MENS.

2a. INSTALL COMBINED CONTIGUOUS/SECANT PILED WALL, CAPPING BEAM, HIGH LEVEL PROPS + INTERNAL PILES

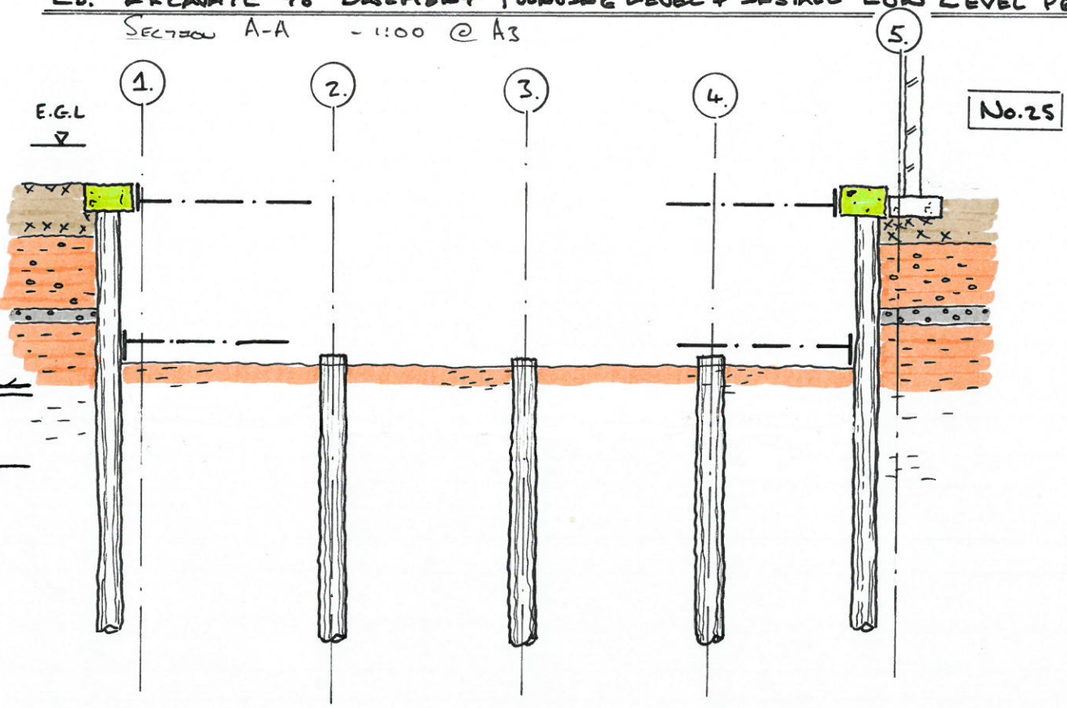
SECTION A-A - 1:100 @ A3



No.25

2b. EXCAVATE TO BASEMENT FOUNDING LEVEL + INSTALL LOW LEVEL PROPS

SECTION A-A - 1:100 @ A3



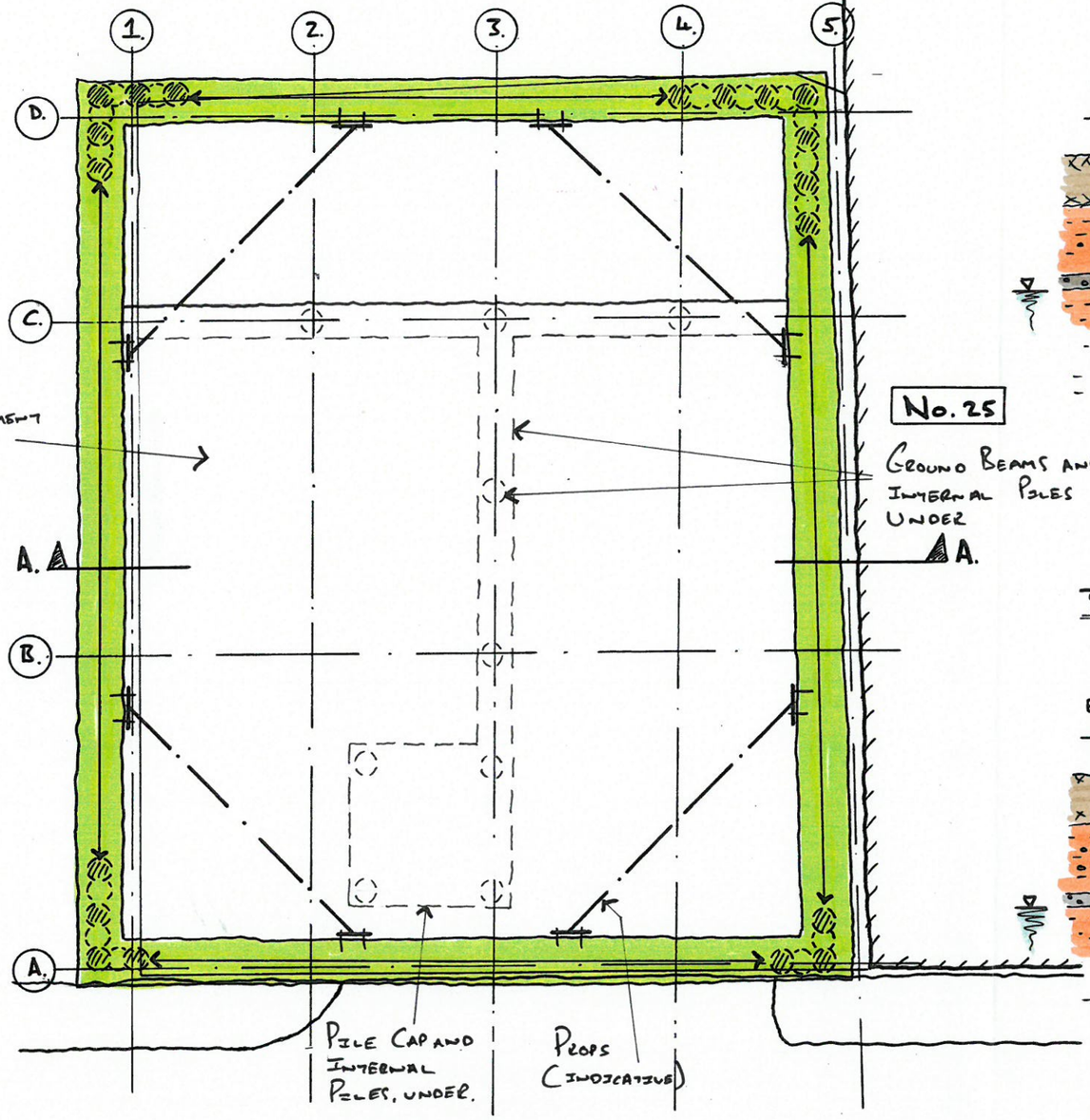
No.25

PRICE&MYERS
Consulting Engineers

Job No 24712 Page Sk 7 Rev
Date MAR '16 Eng S.RILEY Chd
Job WOLSEY MEWS GARAGES, LONDON

3. INSTALL SUBSTRUCTURAL ELEMENTS + BASEMENT SLAB

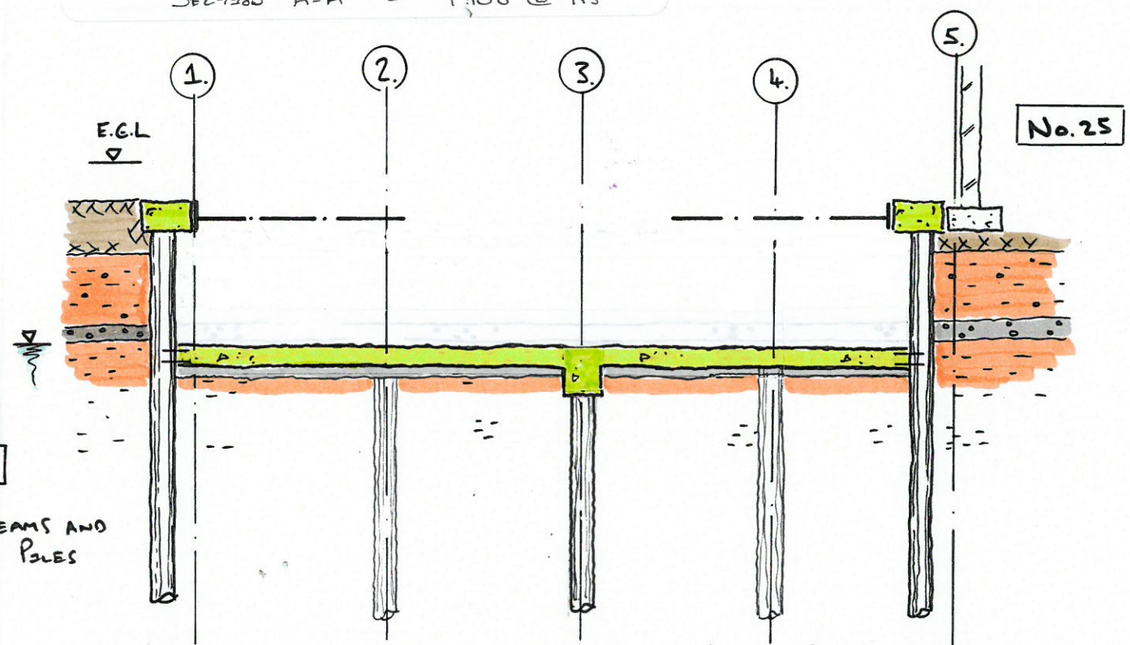
PLAN - 1:00 @ A3



WOLSEY MEWS.

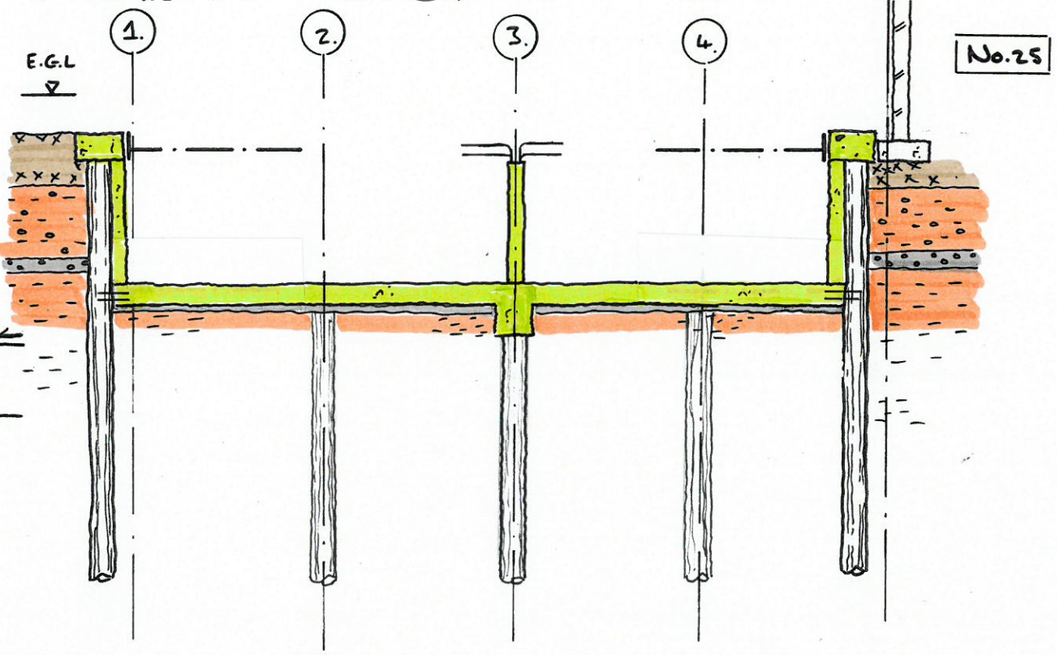
3a. INSTALL DRAINAGE, GROUND BEAMS + BASEMENT SLAB, REMOVE LOWER PROPS.

SECTION A-A - 1:100 @ A3



3b. INSTALL LINING WALL + BASEMENT → GROUND R.C WALLS.

SECTION A-A - 1:100 @ A3

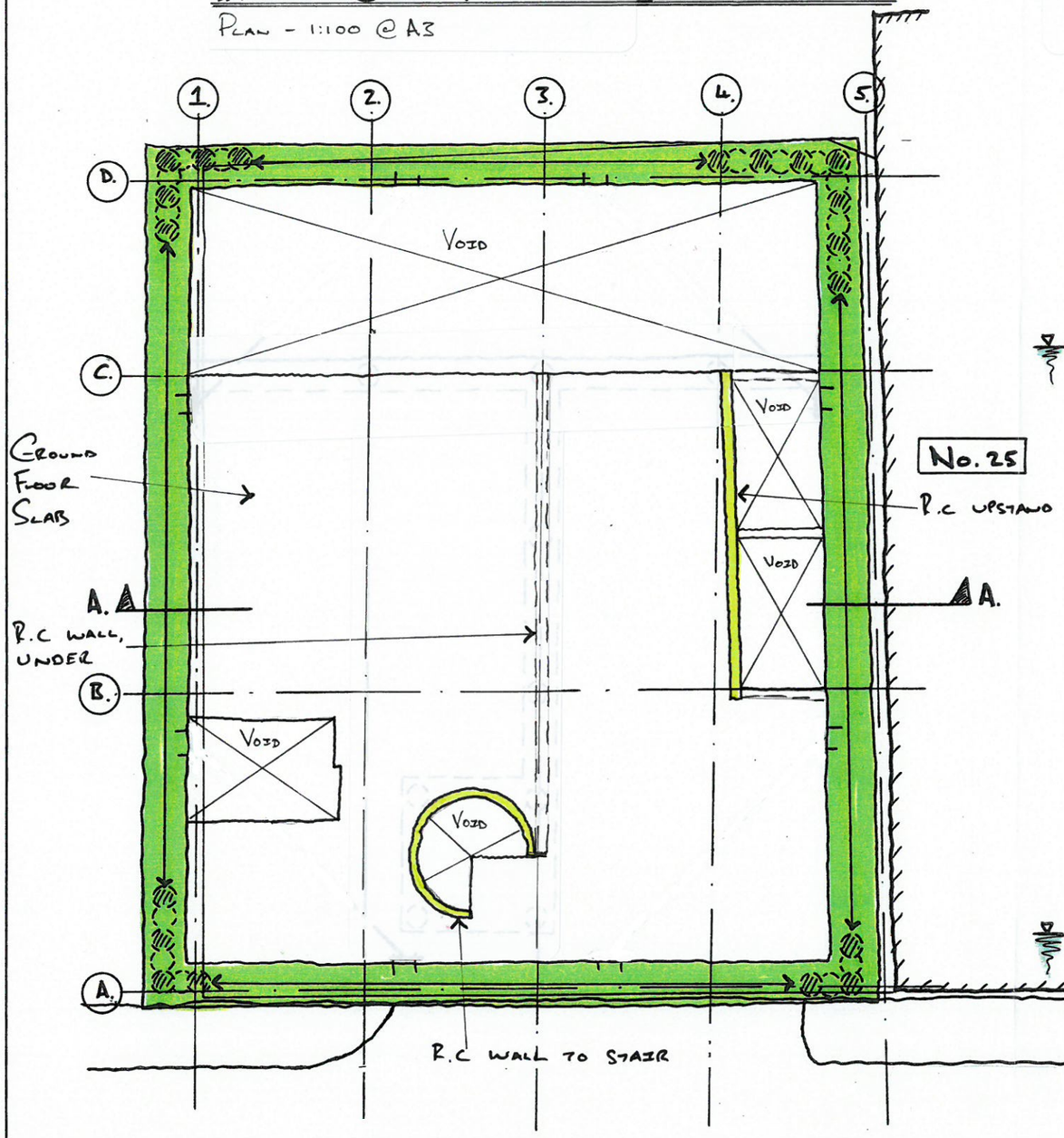


PRICE&MYERS
Consulting Engineers

Job No 24712 Page sk 8 Rev
Date MAR '16 Eng S.RILEY Chd
Job WOLSEY MEWS GARAGES LONDON

4. INSTALL GROUND FLOOR SLAB STRUCTURAL ELEMENTS

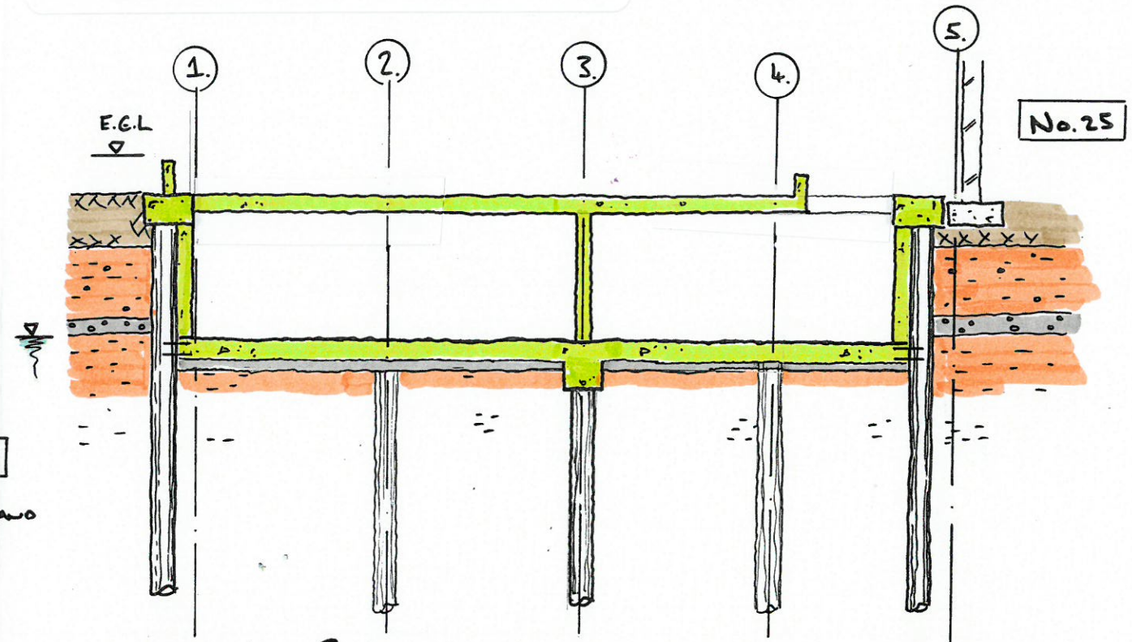
PLAN - 1:100 @ A3



WOLSEY MEWS.

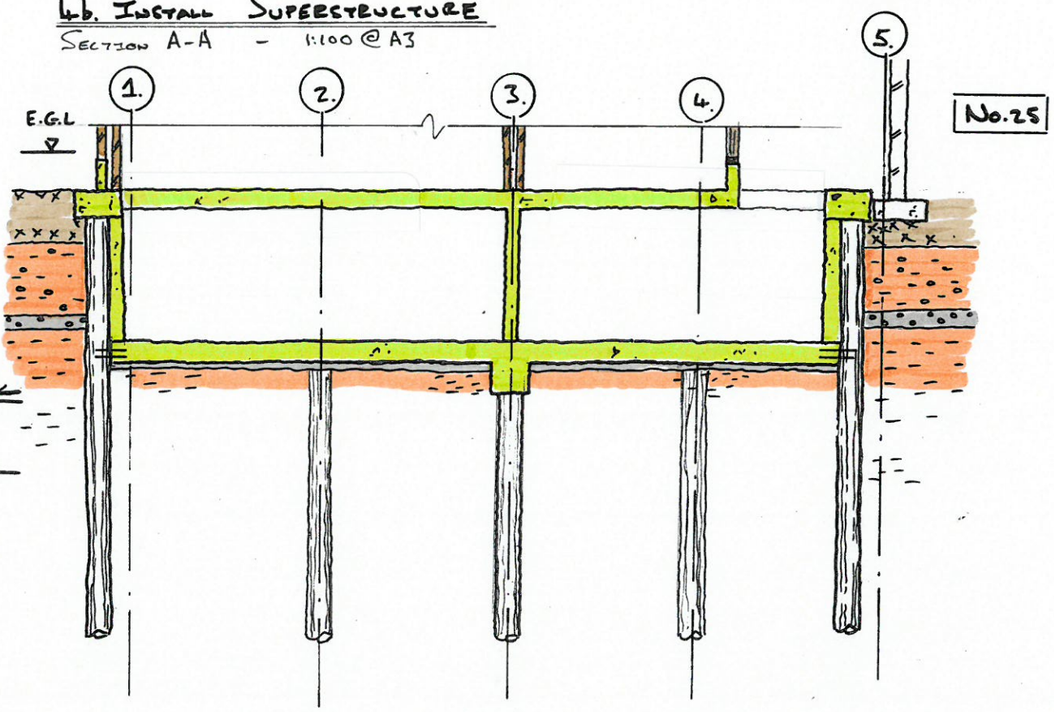
4a. INSTALL GROUND FLOOR STRUCTURAL ELEMENTS

SECTION A-A - 1:100 @ A3



4b. INSTALL SUPERSTRUCTURE

SECTION A-A - 1:100 @ A3



1590 - Wolsey Mews, NW5

BHA Outline Construction Programme - Foundation & Basement Works

15.9.16

Activity	Week																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Site set up including movement monitoring of adjacent properties																				
Leveling of site and installation of pillling mat																				
Install perimeter Secant piling and internal piling																				
Excavate ground, prepare pile heads and cast perimeter capping beam																				
Install temporary high level props to capping beam																				
Excavate to basement foundation level and install low level temporary props																				
Install below ground drainage including connection to public sewer																				
Install ground beams and RC basement slab, remove lower props																				
Install RC lining walls to perimeter																				
Install internal RC walls, columns and stair core																				
Install RC ground floor slab and remove upper props																				
Install RC upstand walls to ground floor slab																				
Remove plant and clear site																				

Fwd: Wolsey Mews Garages - 2015/3741/P
Buddy Haward
to:
fatimadrammeh
18/10/2016 13:05
Hide Details
From: Buddy Haward <buddy@burdhaward.com>
To: fatimadrammeh@campbellreith.com
History: This message has been replied to.

Dear Fatima

With reference to your e-mail of the 3.10.16, and our subsequent conversation, I have discussed the matter with Mark Donald and he has drafted the following e-mail in response.

Regards

Buddy Haward
buddy@burdhaward.com

Burd Haward Architects
United House
North Road
London N7 9DP
T 020 7267 9815
www.burdhaward.com

Begin forwarded message:

From: Mark Donald <mdonald@siteinvestigations.co.uk>
Subject: Wolsey Mews Garages - 2015/3741/P
Date: 18 October 2016 at 11:33:39 BST
To: Buddy Haward <buddy@burdhaward.com>

Hi Buddy

Finally got internet.

My engineer has suggested the following text, although what Fatima is asking for is already in the report, although the one key relevant element which isn't included is the reason for the

recommended switch from secant BPW to combination secant/contiguous walls. So:

Mitigation to reduce potential structural damage

The recommended use of a combined contiguous/secant bored pile wall (BPW) in which the 'male' piles are taken down to full depth but the 'female' piles are only taken as deep as is required to seal out groundwater and to control groundwater pressures, instead of a fully secant BPW (see BIA paragraphs 10.2.6 and 10.9.1), was proposed for two reasons:

1. In order to minimize obstruction of any permeable horizons in the London Clay at depth;
2. In order to reduce the ground movements which would arise from installation of the BPWs, which are related in CIRIA Report C580 to the depth of the piles, so the reduced depth of the female piles will reduce the predicted displacement resulting from installation of the BPW.

Switching to a fully contiguous BPW, in order to reduce further the predicted displacements, would not be appropriate owing to the high groundwater levels and the presence of permeable gravels and silt/sand horizons.

Detailed recommendations for movement monitoring on the neighbouring buildings are given in Section 10.7 of the BIA report, including specific locations for the targets (paragraph 10.7.2) and trigger points & resultant actions (paragraphs 10.7.3 and 10.7.4). It is understood that these proposals are included in the negotiations for the Party Wall agreements in order to provide reassurance to the owners of the adjoining/adjacent buildings that movements resulting from the basement will be monitored, and, in the event that any excessive movements are recorded, that a plan exists to deal with them.

I trust this finally puts this to bed.

Cheers
Mark

Mark Donald BSc, MSc, DMS, CEng, CSci, Eur Ing, MCSM, MIMMM
Consultancy Director

Chelmer
'Groundbreaking Services'

Essex	01245 400930	*Spain*	0034 9511 96375
London	0203 6409136	*Website*	www.chelmer.website

Registered Company: Chelmer Site Investigation Laboratories Ltd
Unit 15 East Hanningfield Industrial Estate | Old Church Road | East Hanningfield | Chelmsford | Essex CM3 8AB

Re: Wolsey Mews Garages - 2015/3741/P
Buddy Haward
to:
FatimaDrammeh
18/10/2016 14:54
Hide Details
From: Buddy Haward <buddy@burdhaward.com>
To: FatimaDrammeh@campbellreith.com
History: This message has been replied to.

Hi Fatima

Yes, I can confirm that our Party Wall Surveyors have served notices to both adjacent properties (No 25 & 3-7 Islip St) and they have subsequently appointed their own PWS's. Negotiations, including condition surveys and movement monitoring, are currently ongoing with both all parties.

Regards

Buddy Haward
buddy@burdhaward.com

BHA

Burd Haward Architects
United House
North Road
London N7 9DP
T 020 7267 9815
www.burdhaward.com

> On 18 Oct 2016, at 14:35, FatimaDrammeh@campbellreith.com wrote:
>
> Hi Buddy,
> Thanks for the response. Can I confirm as discussed on our telephone conversation last week that the negotiations with the neighbours with regards to ground movements are already underway?
>
> Kind regards
> Fatima Drammeh
> Geotechnical Engineer
>
> (Embedded image moved to file: pic14363.jpg)

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

Tel +44 (0)20 7340 1700
www.campbellreith.com
(Embedded image moved to file: pic06924.gif)

From: Buddy Haward <buddy@burdhaward.com>
To: fatimadrammeh@campbellreith.com
Date: 18/10/2016 13:05
Subject: Fwd: Wolsey Mews Garages - 2015/3741/P

Dear Fatima

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Regards

Buddy Haward
buddy@burdhaward.com

(Embedded image moved to file: pic45024.gif)

Burd Haward Architects
United House
North Road
London N7 9DP
T 020 7267 9815
www.burdhaward.com

Begin forwarded message:

From: Mark Donald <mdonald@siteinvestigations.co.uk>
Subject: Wolsey Mews Garages - 2015/3741/P
Date: 18 October 2016 at 11:33:39 BST
To: Buddy Haward <buddy@burdhaward.com>

Hi Buddy

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Cheers
Mark

Mark Donald BSc, MSc, DMS, CEng, CSci, Eur Ing, MCSM, MIMMM
Consultancy Director

Essex| 01245 400930 | | 0034 9511 96375 Spain | |

London| 0203 6409136 Websit| e www. | chelmer.website

Registered Company: Chelmer Site Investigation Laboratories Ltd
Unit 15 East Hanningfield Industrial Estate | Old Church Road | East Hanningfield | Chelmsford | Essex CM3 8AB

From: **Studio** studio@burdhaward.com
Subject: Fwd: 1590_Wolsey Mews_BIA
Date: 15 September 2016 at 11:33
To:

BH

From: Mark Donald <mdonald@siteinvestigations.co.uk>
Subject: RE: 1590_Wolsey Mews_BIA
Date: 8 September 2016 at 17:39:19 BST
To: Buddy Haward <buddy@burdhaward.com>
Cc: Matthew Proctor <mproctor@siteinvestigations.co.uk>, Lauren Creswell <lcreswell@siteinvestigations.co.uk>, Jack Hunter <jhunter@siteinvestigations.co.uk>

Hi Buddy

My colleague Jack will be sending the revised report over in the next few minutes.

We have revised the Damage Category Assessment following the conversation with Fatima Drammeh of Campbell Reith. The ground level behind the piles has been taken as the internal floor level within No.25, while the displacement ratios have been averaged between those for secant and contiguous BPWs (which is slightly conservative) and the modification previously used in accordance with the Ball, Langdon & Creighton (2014) paper has been omitted (though we remain of the opinion that provided the contractor complies with its conditions then it would be applicable).

The changes made are as follows:

- Para 3.3: Variation in levels around the site clarified, and depth of excavation below No.25's FFL identified.
- Para 10.5.3: Number of sub-zones for perimeter piles corrected (the original report erroneously stated that the perimeter piles were as deep as the internal bearing piles – apologies for that), and the reason why greater pile lengths and an additional sub-zone for the internal piles was required is explained.
- Table 2: Sub-zones 1-10, b-e corrected to 1-10, b-d.
- Para 10.5.13: Levels clarified and made more precise. Allowance for the recommended combination contiguous/secant BPWs added to the displacement ratios.
- Table 5A: Depths of installation and excavation corrected, and movements re-calculated.
- Para's 10.6.4 to 10.6.7: Geometry and damage category calculations revised, including clearer explanation and justification in 10.6.6 of deflection calculations.
- Figure 10B: Damage Category remains 0.
- Para's 10.6.8-10 (formerly Para 10.6.8): New DCA for No.25's flank wall.
- New Figure 11A.
- Subsequent para's re-numbered and previous Figure 11 has become Figure 12.
- Para's 11.11 & 11.12 revised to suit the revisions to the DCA.

Please don't hesitate to contact me should you have any further questions.

Regards
Mark

Mark Donald BSc, MSc, DMS, CEng, CSci, Eur Ing, MCSM, MIMMM

Consultancy Director

Essex	01245 400930	***Spain***	0034 9511 96375
London	0203 6409136	***Website***	www.chelmer.website

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