BASEMENT IMPACT ASSESSMENT

FOR

PROPOSED BASEMENT WORKS

AT

62 PARLIAMENT HILL
LONDON
NW3 2TJ

Project No. P5003

ISSUE 1.1 – JULY 2021

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DOCUMENT CONTROL SHEET

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NON-TECHNICAL EXECUTIVE SUMMARY

The proposals for the refurbishment and extension of the Ground/Lower Ground floor flat at 62 Parliament Hill, include the lowering of the floor of the existing cellar space to create a new basement level. There is also an extension to the existing lower ground floor to the front of the property. Michael Alexander Ltd have been appointed to prepare a Basement impact Assessment to address the key areas highlighted in the London Borough of Camden Planning Guidance Basements (CPGB) of January 2021 and the Campbell Reith pro forma BIA; and have considered the potential impacts in respect of Groundwater, Surface Flow and Flooding, and Ground Stability.

SCREENING

A screening study was carried out in accordance with the flow charts in CPGB and to Section 4 of Campbell Reith pro forma BIA.

In respect of Groundwater, it was highlighted that at the time of Screening the level of any potential water table was unknown, and that there would be an increase in impermeable area within the garden.

The screening for Ground Stability highlighted that the proposed foundations would be deeper than that of the adjoining property, and that the excavation would be within 5m of the public highway. It was also noted that the site is likely to be underlain by shrinkable London Clay soils and that it was necessary to establish whether there was any local evidence of subsidence to adjoining buildings.

The site was not found to be at risk of surface water flooding. It was noted that it needed to be checked whether the proportion of hard surface/paved external areas would be changed by the works, so that the peak run-off to the sewers will not be affected.

SCOPING

As a result of the findings of the Screening study, Soil Investigations were commissioned, and the scope of Impact Assessment was defined.

INVESTIGATIONS

Soil investigations including ground water monitoring have been carried out by Jomas Associates – refer their report ‘Geotechnical Desk Study and Ground Investigation’ reference number P3481J2251. The investigation comprised window sampling boreholes, installation of standpipes for measurement of groundwater, trial pits and associated geotechnical testing. Jomas have also been commissioned to carry out a ‘Ground Movement Assessment’ and Building Damage Assessment.

The window samples confirmed the presence of Made Ground underlain by London Clay, with groundwater not encountered during the investigations nor during a return monitoring visit. Trial pits on existing foundations found these to be of traditional corbelled brickwork type, with some evidence of former underpinning to the rear section of the party wall

IMPACT ASSESSMENT

Groundwater was not encountered during the investigations; the site is underlain by an unproductive strata and no spring line nor any other surface water feature were located nearby the site. Therefore, since the basement does not extend below the water table it should not cause any adverse Impact in respect of groundwater levels or flows.

Given the observations in respect of differential foundation depths and the proximity of the public highway, detailed consideration of Ground Stability has been made in the Impact Assessment. An approach for construction of the basement has been described, including the temporary propping to ensure ground stability during the works and limiting of ground movements.

A Ground Movement Assessment has demonstrated that potential damage to adjoining properties is ‘Very Slight’ as defined by Burland, which is within typically acceptable limits. During the works, precise monitoring will be carried out at regular intervals by a specialist monitoring Contractor to check if the behaviour is in line with the predictions of the Ground Movement Assessment.

There is a small increase in the area of hard landscaping, but SUDS measures, such as using lined permeable paving to the proposed terrace will be adopted to ensure the volume and rate of run-off entered the public sewer in storm events will be not increased as a result of the works.

SUMMARY

A detailed Basement Impact Assessment has been produced in accordance with the Council’s requirements. As for all sites, a number of considerations have been highlighted within the Desk Study Stage of the assessment, but these have been addressed by investigation and detailed studies, so that any potential impact of the basement has been effectively mitigated.

It is therefore concluded that the proposed basement works, executed in accordance with the approach set out in this report, are unlikely to adversely impact the site or surrounding environs

1.00 INTRODUCTION

1.01 Michael Alexander Consulting Engineers has been appointed by the Building Owner to prepare a Basement Impact Assessment Report to support the Planning Application for the proposed renovations, alterations and extensions to the Ground/Lower Ground Floor flat at 62 Parliament Hill, London NW3 2TJ.

1.02 This document has been prepared by Isaac Hudson MEng MA (Cantab) CEng MIStructE who is a chartered structural engineer. The document will be approved by a chartered geologist from Jomas Associates Ltd.

1.03 The existing residential property is a semi-detached house which has historically been converted into flats and now provides accommodation over lower ground, ground, first and second floors and in addition has a loft conversion in the roof. We understand the building was built in the late nineteenth century – refer figure (a).

1.04 The existing property is located within the South Hill Park Conservation Area, but is not Listed.

1.05 The house is attached to 64 Parliament Hill to the North. The property is also bounded by Parliament Hill to the West, Tanza Road to the south and 39 Tanza Road to the east

1.06 The proposed works include lowering the floor of the existing cellar space to create a full basement level, together with extensions at lower ground floor level and internal refurbishment at both Lower Ground and Ground Floor levels. This document addresses the specific issues relating to the basement construction, as described in Camden Planning Guidance Basements (CPGB) of January 2021 and in Campbell Reith pro forma BIA.

1.07 In preparing our report we have made reference to The Camden Geological, Hydrogeological and Hydrological Study; together with other available sources of local information.

2.00 BASEMENT PROPOSALS

2.01 The architectural proposal for the basement is shown on the following Sher + White drawings.

2101/PL.13	Basement Plan
2101/PL.12	Lower Ground Floor Plan
2101/PL.11	Ground Floor Plan
2101/PL.28	Long Section A-A

2.02 The structural proposals for the new basement have been developed by Michael Alexander Engineers and shown in the Basement Impact Assessment drawings as shown in Appendix D.

2.03 The details of the existing structure and site boundaries will be subject to detailed exploratory work prior to and during the works on-site.

2.04 The design and construction of the building structure shall be in accordance with current Building Regulations, British Standards, Codes of Practice, Health and Safety requirements and good building practice.

2.05 The details of the existing building are shown on the survey drawings prepared by Greenhatch Group: -

39543-01-P	Topographic Survey
39543-02-P	Existing Floor Plans
39543-03-E	Existing Elevations
39543-04-S	Existing Sections

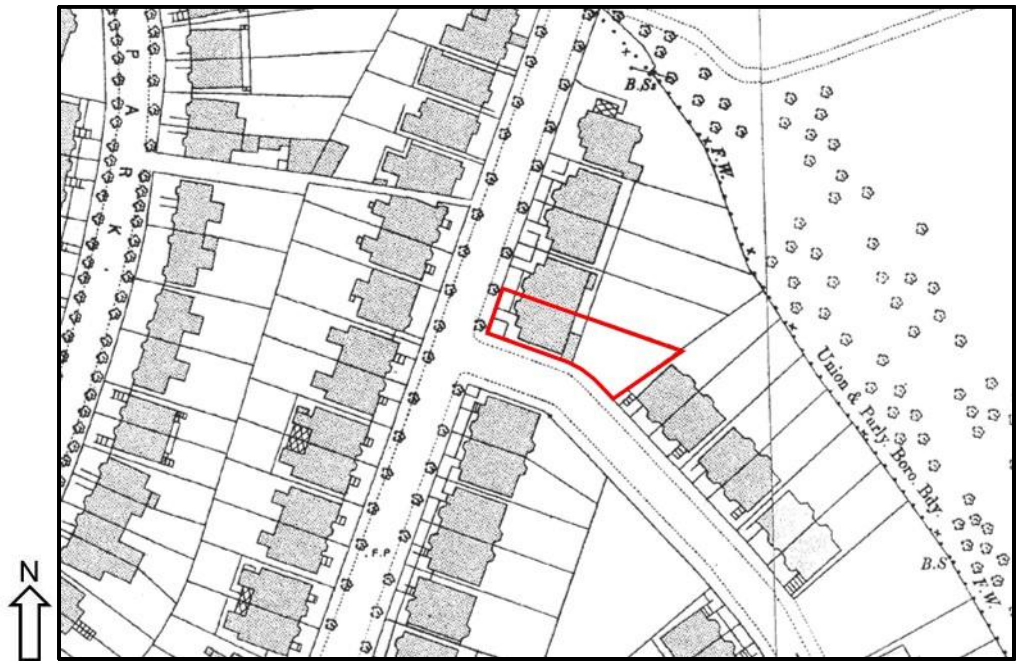

Figure (a)
1895 Map

3.00 SUBTERRANEAN (GROUND WATER) FLOW

3.01 Stage 1: Screening

The impact of the proposed development on ground water flows is considered here as outlined in Camden Planning Guidance Basements (CPGB) of January 2021 and in the Campbell Reith pro forma BIA. The references are to the screening chart Figure 12 in CPGB and to Section 4 of Campbell Reith pro forma BIA.

3.01.1 GW Q1a *Is the site located directly above an aquifer?*

No. The Camden Geological, Hydrogeological and Hydrological Study (Figure (b)) suggests the site is above an Unproductive strata.

3.01.2 GW Q1b *Will the proposed basement extend beneath the water table surface?*

The soil strata and whether groundwater is encountered is to be confirmed by Ground Investigations. However, since the proposed basement does not extend below the lowest level of the garden, it is not anticipated that ground water will be encountered.

3.01.3 GW Q2 *Is the site within 100m of (i) a watercourse, (ii) a well (used or disused) or (iii) a potential spring line?*

With reference to the Camden Geological, Hydrogeological and Hydrological Study (Figures (c), (d) and (e)),

(i) No watercourses are within 100m from the site; the Hampstead Ponds are circa 200m from the site. The nearest 'lost' watercourse is a tributary of the River Fleet which ran around 200m to the north east connecting to the Hampstead Ponds

(ii) No wells are understood to be within 100m from the site. From the British Geological Survey 'Geoindex' the nearest water wells are within Hampstead Heath, 350m to the East of the site, and on East Heath Road, approximately 500m to the west.

(iii) The site is approximately 150mm from the boundary between London Clay and Claygate Member strata, but since both strata are generally cohesive, no spring lines are likely.

3.01.4 GW Q3 *Is the site within the catchment of the pond chains of Hampstead Heath?*

No. With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain. Refer figure (f).

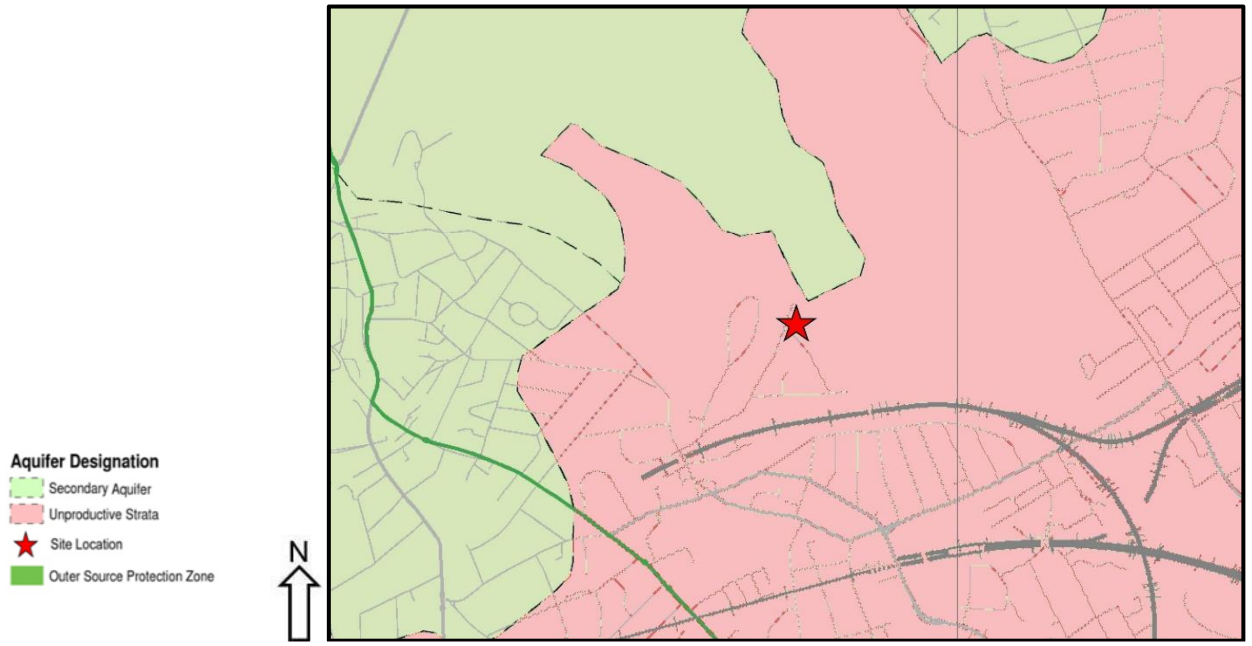

Figure (b)
Aquifer Designation Map
(Extract from Fig 8 of Camden Geological, Hydrogeological and Hydrological Study)

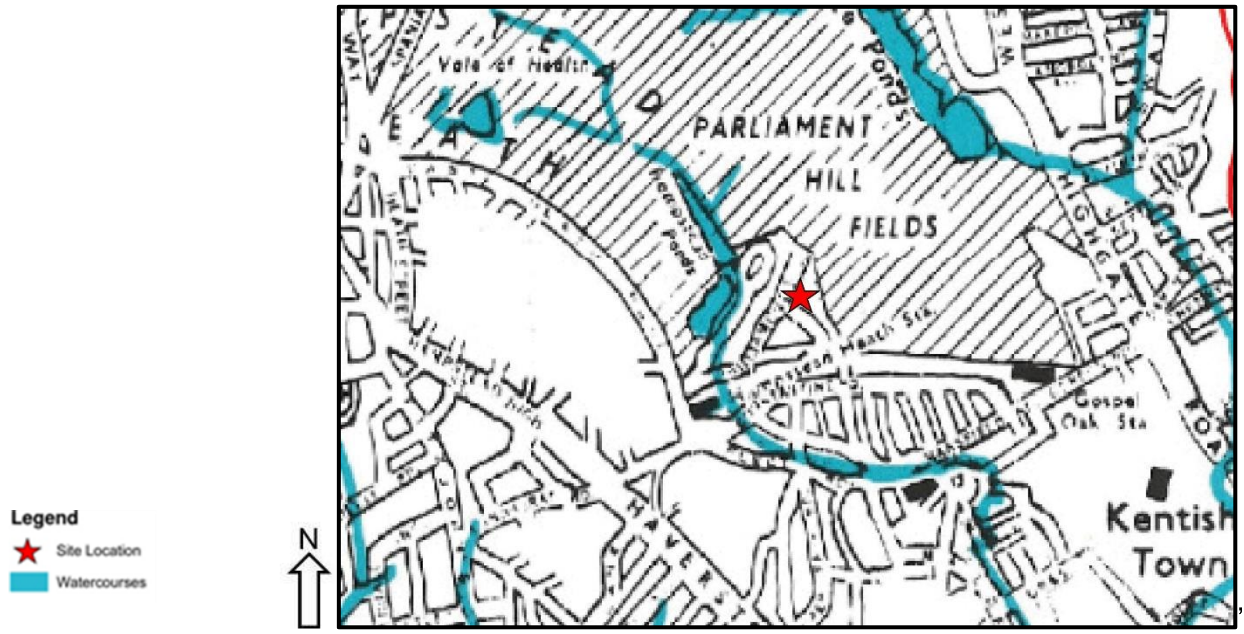

Figure (c)
Watercourses
(Extract from Fig 11 of Camden Geological, Hydrogeological and Hydrological Study -Lost Rivers of London by Barton)

3.01.5 GW Q4 *Will the proposed basement development result in a change in the proportion of hard surface/paved areas?*

Yes. As described in section 5.04 of this report, there will be a small net increase in hard landscaping within the rear garden.

3.01.6 GW Q5 *As part of the site drainage, will more surface water (e.g. rainfall and-runoff) than at present be discharged to the ground (e.g. via soakaways and /or SUDS)?*

No. Currently surface water from the site is discharged to the ground in the garden area only, and this will also be true after the proposed works.

3.01.7 GW Q6 *Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?*

No. The lowest excavation proposed is circa 77mOD which is significantly above the water level in the adjoining ponds which are 69.3mOD and 74.39mOD. The site is not likely to be in proximity of a potential spring line.

3.01.8 On the basis of items 3.01.1 to 3.01.7 above, and in reference to Figure 12 of CPGB and to Section 4 of Campbell Reith pro forma BIA, the aspects that need to be carried forward to the scoping stage in respect of Ground Water Flow are:

- Whether the proposed basement extends beneath the water table surface.
- The net increase in hard landscaping in the rear garden.

3.02 Stage 2: Scoping

3.02.1 With reference to the Camden Geological, Hydrogeological and Hydrological study Appendix F2, the potential impacts which will need to be considered will include:-

- The groundwater flow regime may be altered by the proposed basement.
- Whether the sealing off of the ground surface will result in a change in the degree of wetness of the underlying ground.

In response to the above issues: -

- Soil Investigations including ground water monitoring have been commissioned.
- A ground water assessment by a geotechnical engineer/hydrogeologist has been commissioned.

Figure (d)
Surface Water Features
(Extract from Fig 12 of Camden Geological, Hydrogeological and Hydrological Study)

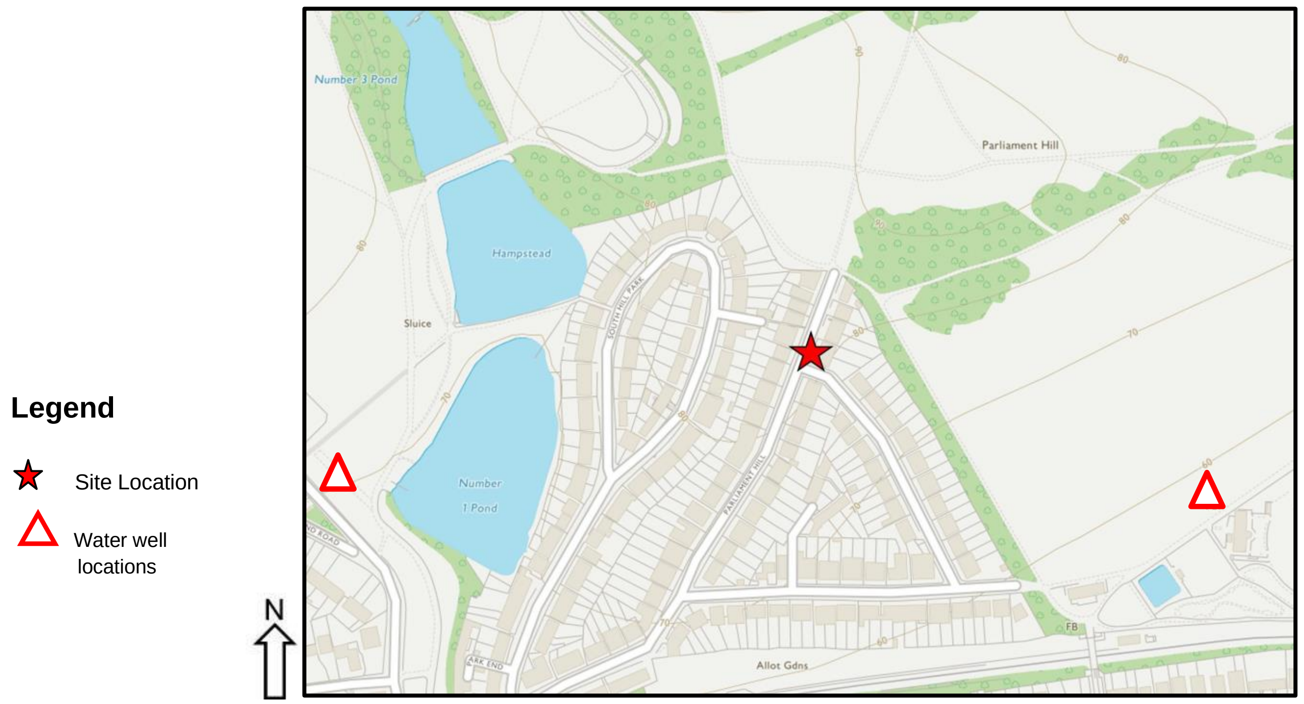

Figure (e)
Waterwells (also showing Infrastructure)
(Extract from British Geological Survey)

3.03 Stage 3: Site Investigation and Study

3.03.1 A site investigation was carried out by Jomas Associates in April 2021 which included trial pits and window sampling. Refer to their report 'Geotechnical Desk Study and Ground Investigation Report' reference P3481J2251 of May 2021.

3.03.2 No groundwater was encountered during the investigations nor in subsequent return monitoring visits.

3.03.3 The shallowest soil strata recorded on site has been made ground, underlain by clay, which is considered likely to be the London Clay Formation.

3.04 Stage 4: Impact Assessment

3.04.1 A hydrogeological assessment has been carried out by a chartered geologist and is included in Jomas Associates' report. Since the basement does not extend below the water table it should not cause any adverse Impact in respect of groundwater levels or flows

3.04.2 Notwithstanding the observations in respect of the groundwater table, it is possible that perched water could be encountered during the excavation within the Made Ground laying on top of the impermeable London Clay Formation; Provision for this is reflected in the proposed construction method – refer Appendix E.

3.04.3 In summary of the above assessment of the Impact of the proposals in respect of Subterranean (Groundwater) Flow, it is concluded that the proposed basement works, executed in accordance with the approach set out in this report, are unlikely to adversely impact the site or surrounding environs.

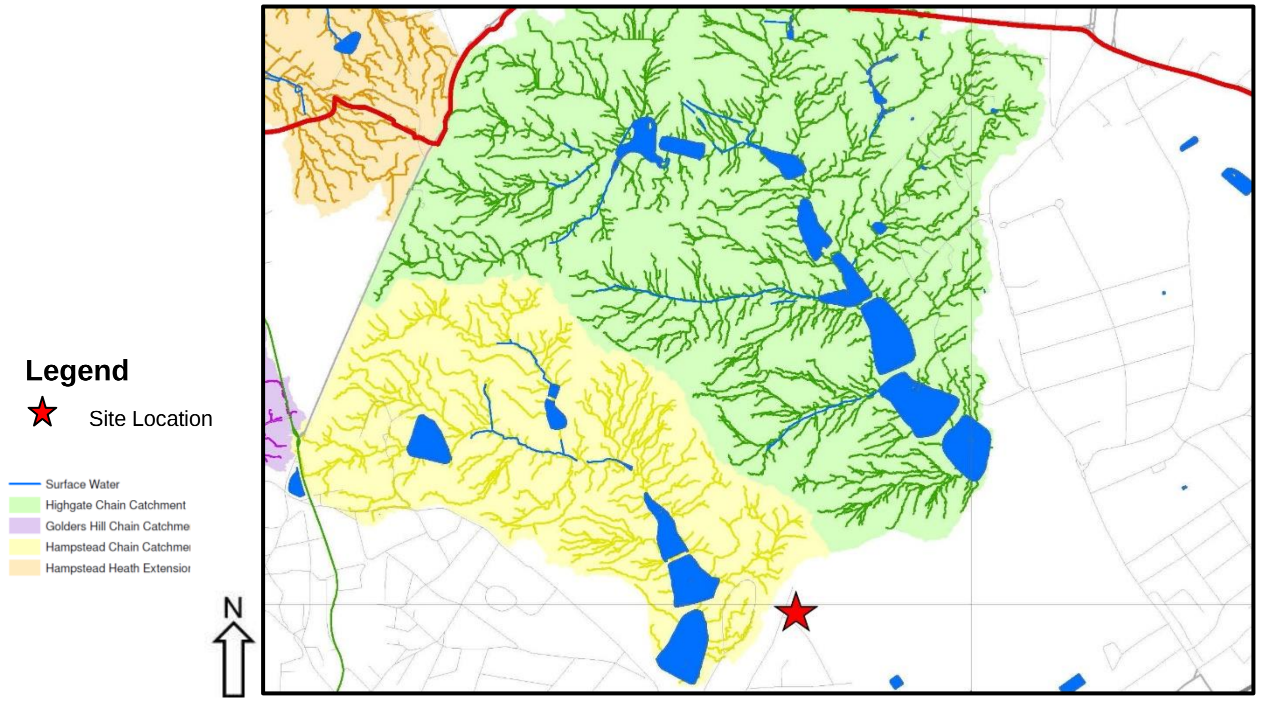

Figure (f)
Hampstead Heath Surface Water Catchments and Drainage
(Extract from Fig 12 of Camden Geological, Hydrogeological and Hydrological Study)

4.00 GROUND STABILITY

4.01 Stage 1: Screening

4.01.1 GS Q1 *Does the existing site include slopes, natural or manmade, greater than 7˚?*

No. The rear garden slopes away from the property at around 4 degrees.

4.01.2 GS Q2 *Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7˚?*

No. The basement construction will not change the profile of the ground at the boundaries of the property.

4.01.3 GS Q3 *Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7˚?*

No. With reference to the Camden Geological, Hydrogeological and Hydrological Study, (refer Figure (h)), there are no neighbouring areas which have slopes greater than 7 degrees.

4.01.4 GS Q4 *Is the site within a wider hillside setting in which the general slope is greater than 7˚?*

No. The overall slope of the hill is around 5 degrees. Refer figures (i) and (j).

4.01.5 GS Q5 *Is the London Clay the shallowest strata at the site?*

Yes. With reference to Camden Geological, Hydrogeological and Hydrological Study, the site is within the area underlain by the London Clay Formation (Figure (g)).

4.01.6 GS Q6 *Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?*

Yes. Two trees are proposed to be felled as part of the proposed development. Works will be carried out within tree protection zones of the retained trees.

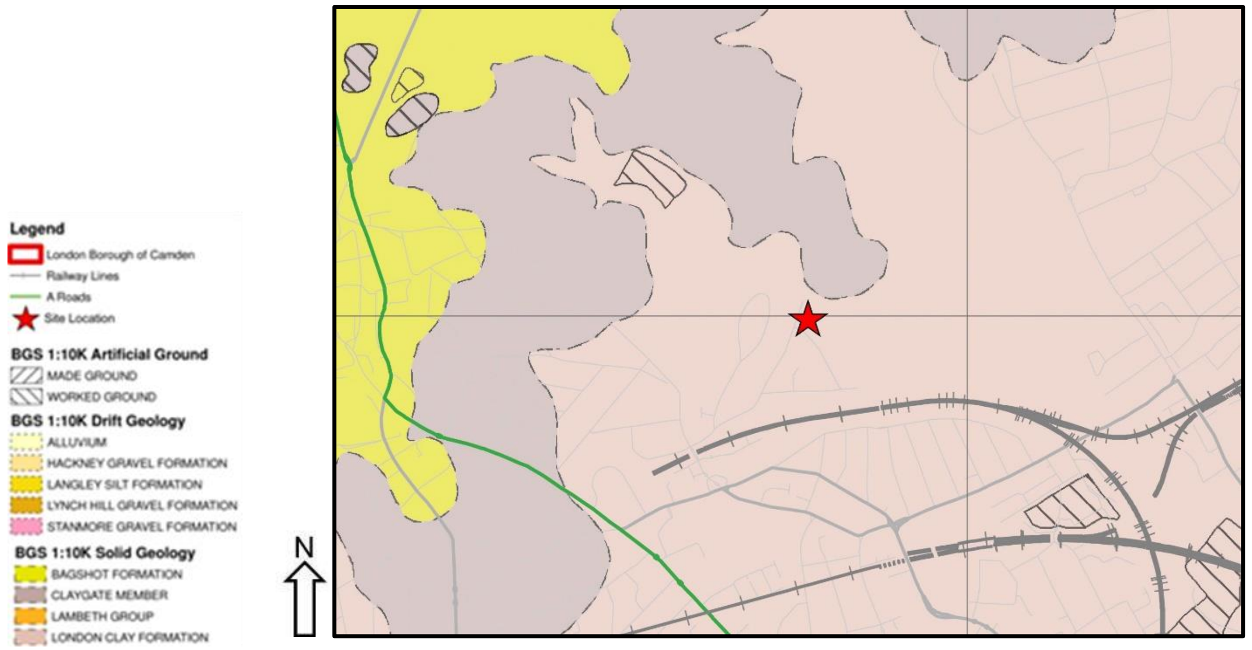

Figure (g)
Geological Map
(Extract from Fig 4 of Camden Geological, Hydrogeological and Hydrological Study)

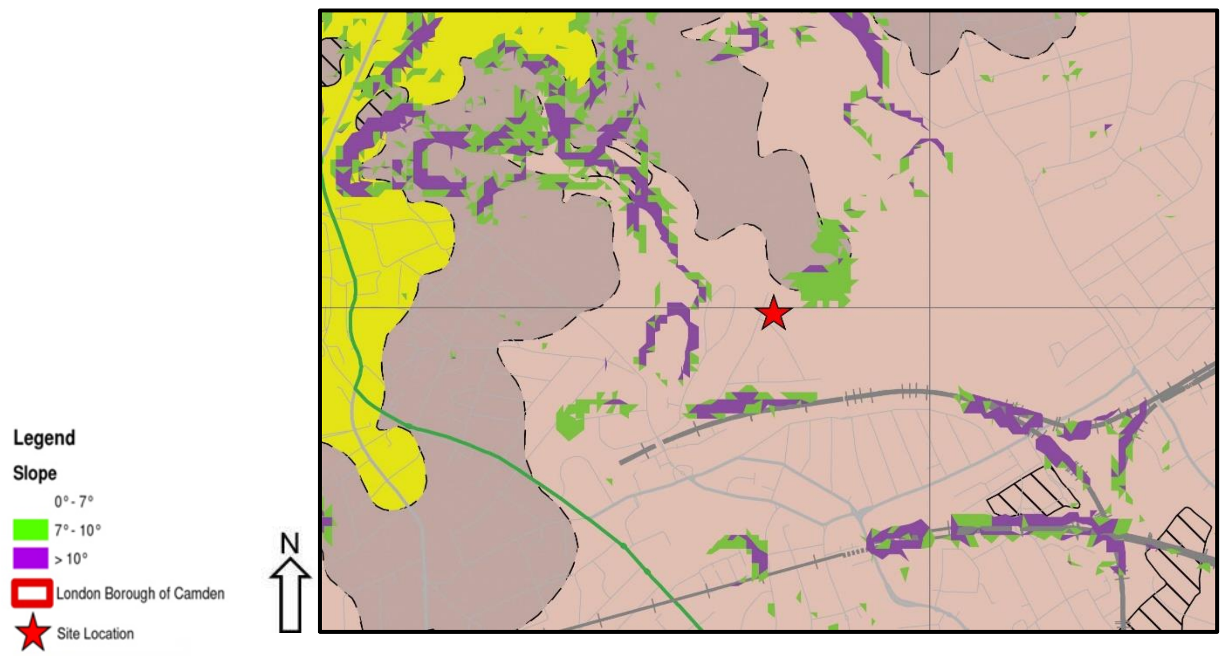

Figure (h)
Slope Angle Map
(Extract from Fig 16 of Camden Geological, Hydrogeological and Hydrological Study)

4.01.7 GS Q7 *Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?*

Yes. In 2008 there was a report of possible subsidence to the front bay window to the property. This was investigated and there was subsequently management of the trees within the street to address the issue.

4.01.8 GS Q8 *Is the site within 100m of a water course or a potential spring line?*

No, With reference to the Camden Geological, Hydrogeological and Hydrological Study (Figures (c), (d) and (e)),

(i) No watercourses are within 100m from the site; the Hampstead Ponds are circa 200m from the site. The nearest 'lost' watercourse is a tributary of the River Fleet which ran around 200m to the north east connecting to the Hampstead Ponds .

(ii) The site is approximately 150mm from the boundary between London Clay and Claygate Member strata, but since both strata are generally cohesive, no spring lines are likely.

4.01.9 GS Q9 *Is the site within an area of previously worked ground?*

No.

4.01.10 GS Q10 *Is the site within an aquifer?*

No, the site is above an unproductive strata.

4.01.11 GS Q11 *Is the site within 50m of the Hampstead Heath ponds?*

No, the Hampstead Ponds are circa 200m from the site.

4.01.12 GS Q12 *Is the site within 5m of a highway or pedestrian right of way?*

Yes. The proposed basement works will be within 5m of Parliament Hill and Tanza Road.

4.01.13 GS Q13 *Will the proposed basement significantly increase the differential depth of foundations relative to neighboring properties?*

Yes. 64 Parliament Hill has an existing basement level to the rear of the property, so the proposed to excavations to the rear of no. 62 Parliament Hill will not significantly affect the existing differential depth of the foundations. However, to the front to the property the proposed works will result in the new foundations being deeper than the those of no. 64 Parliament Hill.

Legend

N

Figure (i)
Topography Map (Extract from streetmap.co.uk)

Legend

N

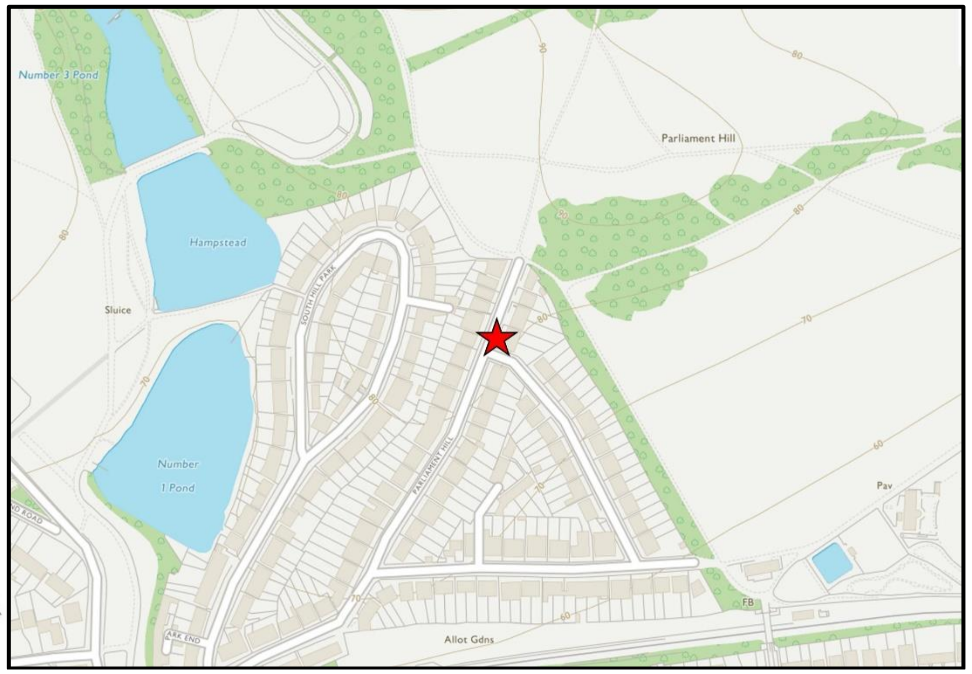

Figure (j)
Topography Map
(Extract from Ordnance Survey Mapping)

4.01.14 GS Q14 *Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?*

No. With reference to Open Street Map (figure (k)) there are no tunnels located below the site. The nearest London Underground tunnel is the northern line which runs in a deep tunnel approximately 1.2km to the west of the site. The London Overground runs in a tunnel approximately 450m to the south west of the site.

4.01.15 On the basis of items 4.01.01 to 4.01.14 above and in reference to Figure 13 of CPGB and to Section 4 of Campbell Reith pro forma BIA, the aspects that should be carried forward to a scoping stage in respect of land stability are:-

- The underlying soil strata being London Clay.
- The removal of existing trees
- The local history of subsidence
- The basement being within 5m of the public highway.
- The increase in differential foundation depths.

4.02 Stage 2: Scoping

4.02.1 With reference to the Camden Geological, Hydrogeological and Hydrological study Appendix F3, the potential impacts which will need to be considered will include:-

- The risk of damage caused by seasonal shrink-swell of London Clay.
- Whether the removal of trees will affect slope stability.
- Given the local subsidence history, whether the works impact on adjoining properties.
- The risk of damage to the road or pavement, or any underground services buried under.
- The risk of structural damage to the adjoining sites during and following the basement construction.

4.02.2 In response to the above issues: -

- A site soil and ground water investigation including trial pits has been commissioned.
- An assessment of ground stability has been made.
- An outline construction method statement has been prepared.
- A ground movement and building damage assessment has been commissioned.

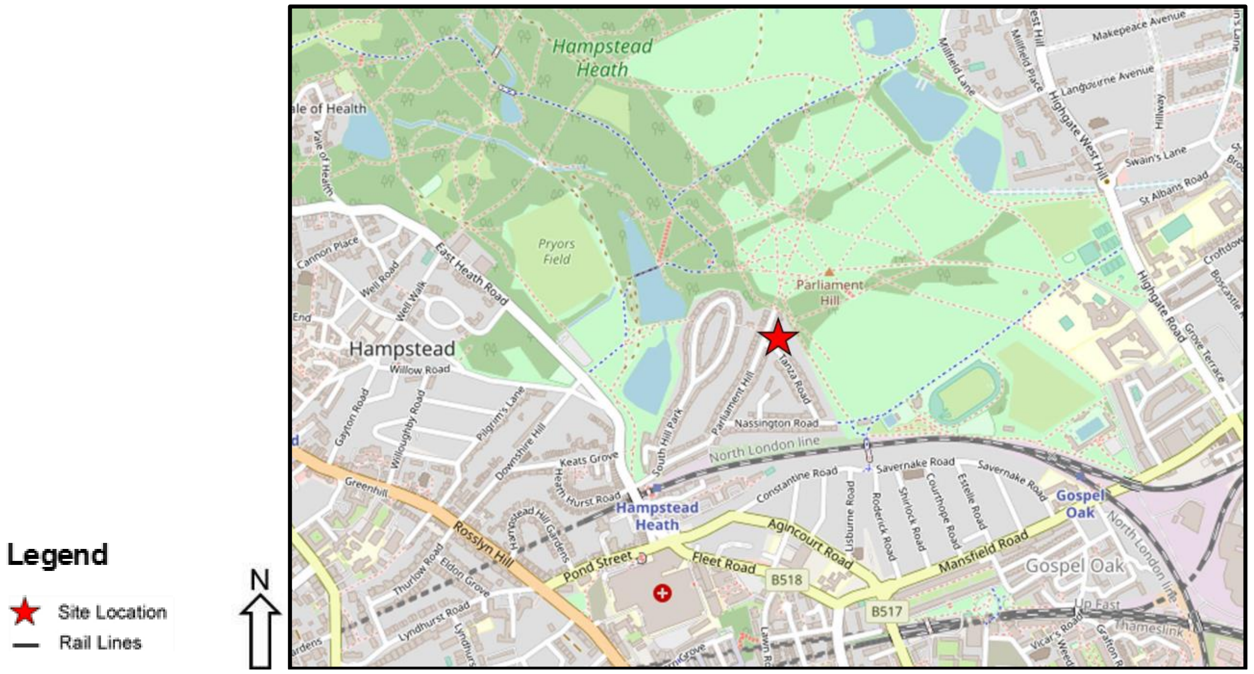

Figure (k)
Map of Underground Infrastructure
(Extract from Open Street Map)

4.03 Stage 3: Site Investigation and Study

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4.03.1 A site investigation was carried out by Jomas Associates in April 2021 which included trial pits and window sampling. Refer to their report 'Geotechnical Desk Study and Ground Investigation Report' reference P3481J2251 of May 2021

In summary of the findings: -

- A varying thickness of made ground was encountered over London Clay to the full depth of the investigation.
- Existing foundations were conventional brick spread footings.
- To the rear of the property, the brick footings to the party wall have been underpinned, which we assume was part of the works create a basement level to the rear of no. 64 Parliament Hill.
- Ground water was not encountered during the investigations nor in the return visits.

4.03.2 In addition, a Ground Movement Assessment will be prepared by Jomas Associates.

4.04 Stage 4: Impact Assessment

4.04.1 To convert the existing cellar to a full basement will require an excavation of around 1.7m to the rear of the property, but circa 3m to the front of the property. This reflects the variation in the existing floor level with in the cellar. The excavation will be through the made ground and then the well understood London Clay stratum. Provided appropriate construction methods are employed there should be no significant impact in terms of ground stability.

4.04.2 The new basement will generally be constructed by underpinning the existing perimeter walls. This is a well-established method and used successfully on numerous single storey basements within the London Clay. Where the basement will extend outside the footprint of the existing building RC cantilevered retaining walls will be cast in sections.

4.04.3 Temporary propping will be provided to minimise any local ground movements during excavation works and prior to the reconstruction of the lower ground floor, which will act as a permanent prop.

4.04.4 The unloading of the ground due to the basement excavation may cause some heave of the underlying clay subsoils in both short and long term. Heave forces acting on the basement under the building will be counteracted by the weight of the building over. This will be considered in more detail in the Ground Movement Assessment.

4.04.5 The foundations of the extension of the new basement beyond the footprint of the building will be of sufficient depth to ensure that there will be no future risk of seasonal shrink swell subsidence resulting from the action of tree roots from the retained trees.

4.04.6 No surface water features, such as water courses or potential spring lines, has been identified within 100m from the site therefore no risk of changes to groundwater flow regimes within slopes affecting the slope stability or risk of damage to the adjoining sites caused by soil dewatering is anticipated.

4.04.7 The removal of the two trees is not considered likely to cause any ground stability issues. The garden does not have a steep slope and hence will not rely on the presence of roots for its slope stability. Significant trees and other vegetation will remain in the garden so the ground wetness is unlikely to change significantly.

4.04.8 The construction methodology for works adjacent to the public highway will be carefully considered. The services in the pavement will be scanned and marked prior to the commencement of the works. The design of the temporary works (e.g. propping, retaining structures etc) will be designed for the worst case overburden of a lorry mounting the pavement in front of the site.

Ground Movements

4.04.9 Consideration has been given as to the foundation levels of the adjoining properties, as described in clause 4.01.13.

4.04.10 To assist in determining the impact of the proposals, Jomas Associates have been commissioned to carry out a Ground Movement Assessment. Their assessment has used 3D models developed in Oasys Pdisp and Xdisp to model ground movements in both the short-term (during construction) and long-term conditions. The impact of the ground movements on adjoining structures has then been assessed by deriving elastic strains on adjoining facades and comparing limits set out in the Burland classification system.

4.04.11 The Building Damage predictions were as follows: -

58 Parliament Hill – Category (0) Negligible.
64 Parliament Hill – Category (1) Very Slight for 4 no. walls, else Category (0) Negligible

These are within the typical acceptable damage limits for basement works within the London Borough of Camden.

4.04.12 An outline construction method has been developed, which is included in Appendix E. This sets out the measures which will be taken to mitigate the impact of the works, with specific reference to avoiding any adverse impact on the pavement or buried services and to the neighbouring properties.

Monitoring

4.04.13 Measurement monitoring of the temporary works, Party Walls and adjoining structures will be carried out during the construction period. The precise scope of monitoring will be prepared in conjunction with the advisors to the Adjoining Owners. Monitoring points will also be installed on structures facing the public highway.

4.04.14 The 'monitoring and contingency plan' will include trigger values for vertical and horizontal movement and frequency of measurement. There will be an increased frequency of monitoring during the underpinning and excavation works to enable mitigation to be effectively implemented if trigger values are exceeded. If 'Amber' trigger values are exceeded, then the monitoring frequency will be further increased and a detailed review of construction methods will be carried. If 'Red' trigger values are exceeded then all further excavation will be stopped, and the excavation made safe before a revised plan of works can be implemented.

Impact Assessment Conclusion

4.04.15 In summary of the above assessment of the Impact of the proposals in respect of Ground Stability, it is concluded that the proposed basement works, executed in accordance with the approach set out in this report, are unlikely to adversely impact the site or surrounding environs.

5.00 SURFACE FLOW AND FLOODING

5.01 Stage 1: Surface Flow and Flooding Screening

5.01.1 SF Q1 *Is the site within the catchment of the pond chains on Hampstead Heath?*

No. With reference to the Camden Geological, Hydrogeological and Hydrological Study, the site is not within the catchment of the pond chains on Hampstead, nor the Golder's Hill Chain.

5.01.2 SF Q2 *As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?*

No. On completion of the development the surface water flows will be routed in the same way as the existing condition, with rainwater run-off collected in the existing drainage system and discharged to the combined sewer in Parliament Hill. Refer Thames Water asset search in Appendix B. The invert level of the sewers are around 5.5m below street level. SUDS measures will be adopted as required to ensure the volume of rainfall and peak run off will not be increased as a result of the works.

5.01.3 SF Q3 *Will the proposed basement development result in a change in the proportion of hard surface/paved external areas?*

This will be determined by determining the area of the existing building footprint and external hard landscaping – and comparing it with total impermeable area for the proposed condition.

5.01.4 SF Q4 *Will the proposed basement result in changes to the profile of inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?*

No. There will be no change from the development on the quantity or quality of surface water being received by adjoining sites as a result of the development.

5.01.5 SF Q5 *Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream water courses?*

No. The surface water quality will not be affected by the development, as in the permanent condition collected surface water will generally be from roofs, or external hard landscaping as existing.

Figure (I)
Areas at Risk of Flooding
(Extract from Environment Agency flood map)

5.01.6 On the basis of items 5.01.1 to 5.01.5 above and in accordance with the Figure 14 in Camden Planning Guidance CPGB and to Section 4 of Campbell Reith pro forma BIA, the aspect that should be carried forward to a scoping stage in respect of Surface Flow and Flooding is confirmation as to whether there is any increase in hard landscaped areas.

5.01.7 From a review of the Environment Agency Flood map (figure (l)) we note that the property is in flood zone 1.

5.01.8 The Environment Agency 'Flooding from Surface Water map' (figure (m)) the site is classified as being of 'very low' risk of flooding from surface water.

5.01.9 We have obtained a 'Sewer Flooding History Enquiry' for the site from Thames Water. They have confirmed they have no records of local flooding caused by surcharging of the public sewer.

5.01.10 On the basis of the above and in accordance with the requirements set out in Camden Planning Guidance CPGB, a flood risk assessment in accordance with PPS25 is not required.

5.02 Stage 2: Scoping

5.02.1 In response to the findings of the Screening stage, an assessment of the potential change in the proportion of hard landscaped areas is required.

5.03 Stage 3: Investigations

5.03.1 Refer diagrams in Appendix A which show the hard landscaping, building profile and landscaping before and after the proposed works.

5.03.3 There is a small net increase in the footprint of hard landscaping in the garden, primarily due to the addition of the rear terrace.

5.04 Stage 4: Impact Assessment

5.04.1 As set out in section 5.03 above, there will be a small increase impermeable area as a result of the works. SUDS measures will be adopted to ensure that this does not increase run off. Options that will be considered will include lined permeable paving under the new garden level terrace.

5.04.2 By the measures described above the volume and rate of run-off entered the public sewer in storm events will be not increased as a result of the works.

5.04.3 In summary of the above assessment of the Impact of the proposals in respect of Surface Flow and Flooding, it is concluded that the proposed basement works, executed in accordance with the approach set out in this report, are unlikely to adversely impact the site or surrounding environs.

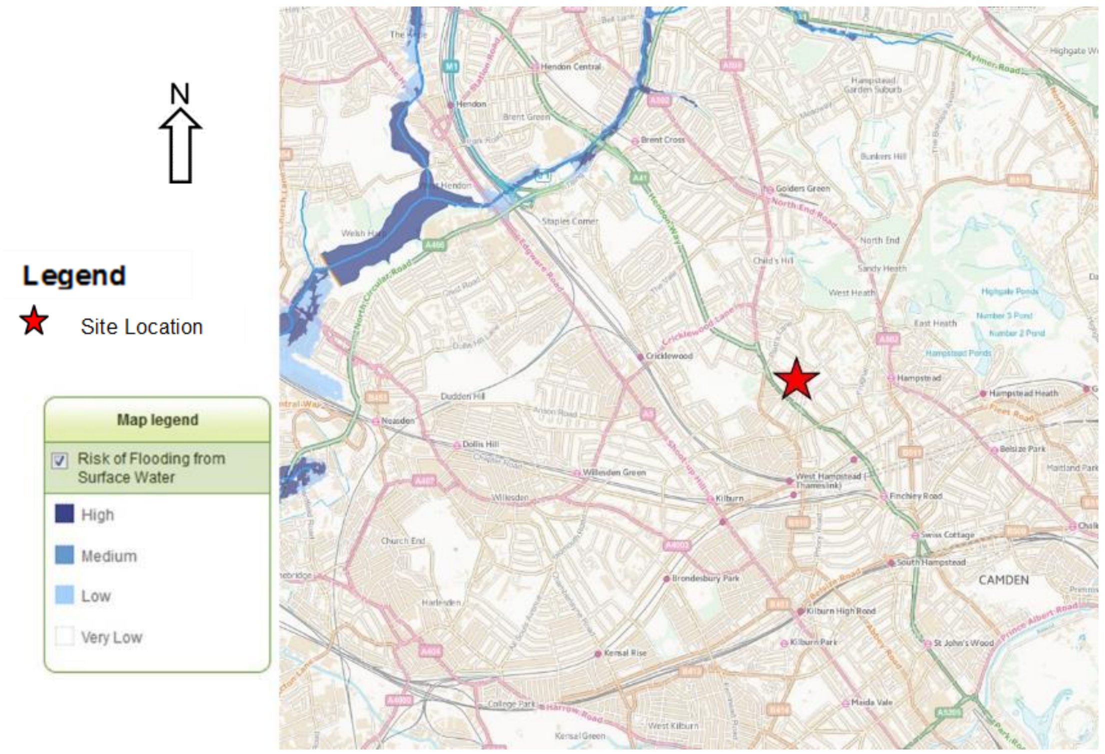


Figure (m)
Flooding from Surface Water
(Extract from Environment Agency flood map)

APPENDIX A

IMPERMEABLE AREA PLANS

`

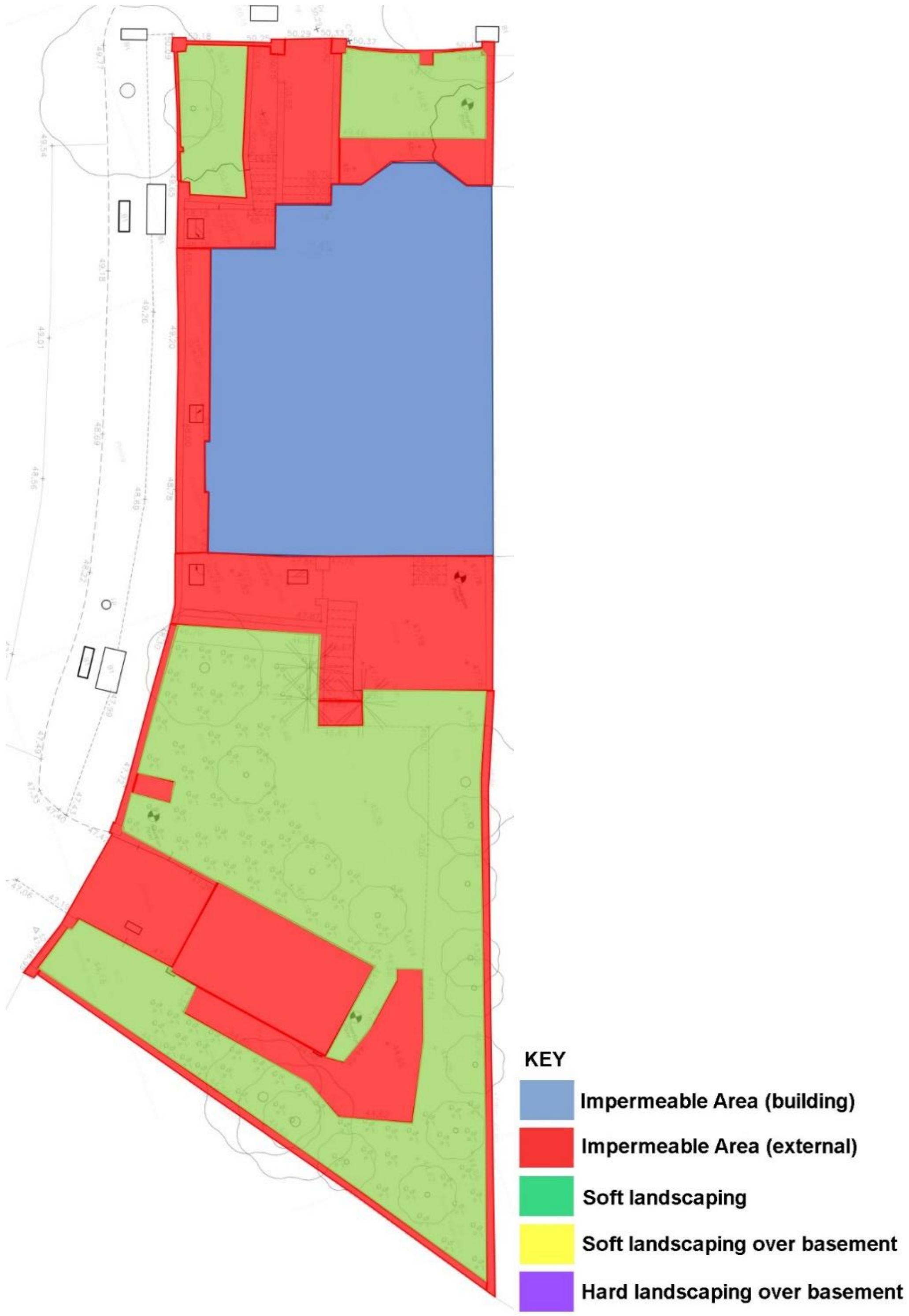


Figure A1 - Existing Impermeable Area Plan

Figure A2 - Proposed Impermeable Area Plan

APPENDIX B

THAMES WATER RECORDS

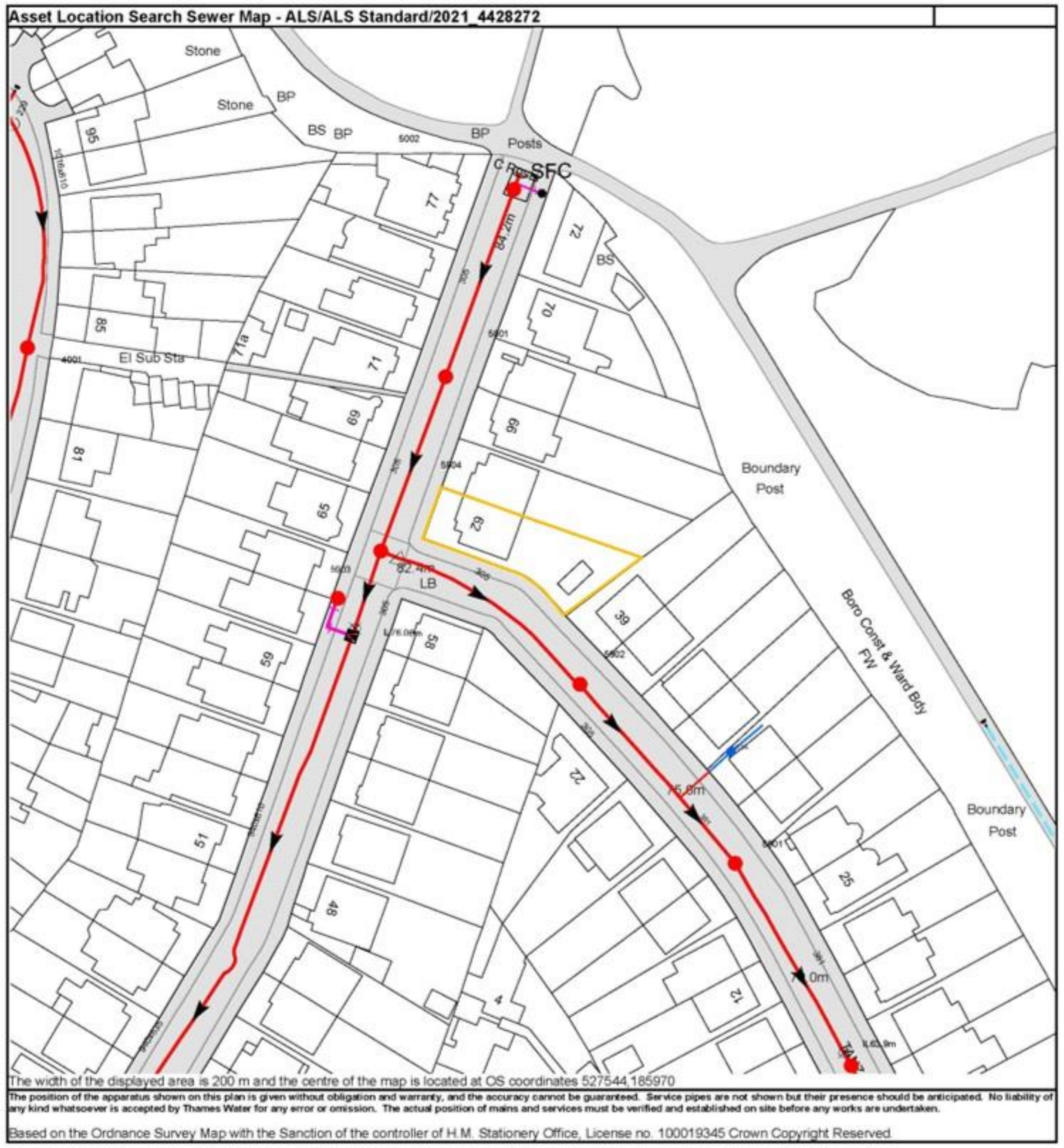


Figure B1 - Extract from Thames Water Asset Search showing combined sewers

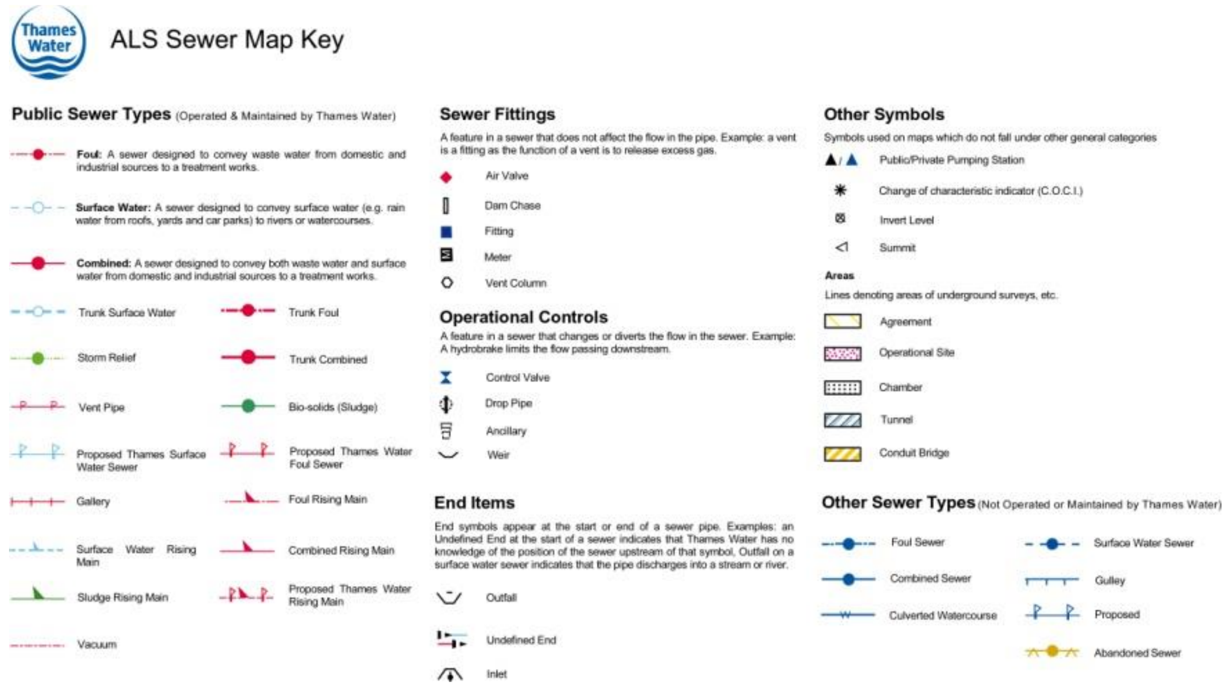


Figure B2 - Key to Thames Water Asset Search

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5901	73.33	67.85
6802	68.77	63.57
4001	84.02	77.72
5903	n/a	n/a
5904	82.66	76.89
5001	83.63	78.74
5002	84.62	80.56
5902	78.27	72.37
591A	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Figure B3 - Manhole Invert and Cover Levels

Sewer Flooding
History Enquiry

Thames Water Property Searches

Michael Alexander Consulting Engineers

Regents Park Road

Search address supplied 62
Parliament Hill
London
NW3 2TJ

Your reference	P5003 62 Parliament Hill
Our reference	SFH/SFH Standard/2021_4428275
Received date	**14 May 2021**
Search date	**14 May 2021**

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

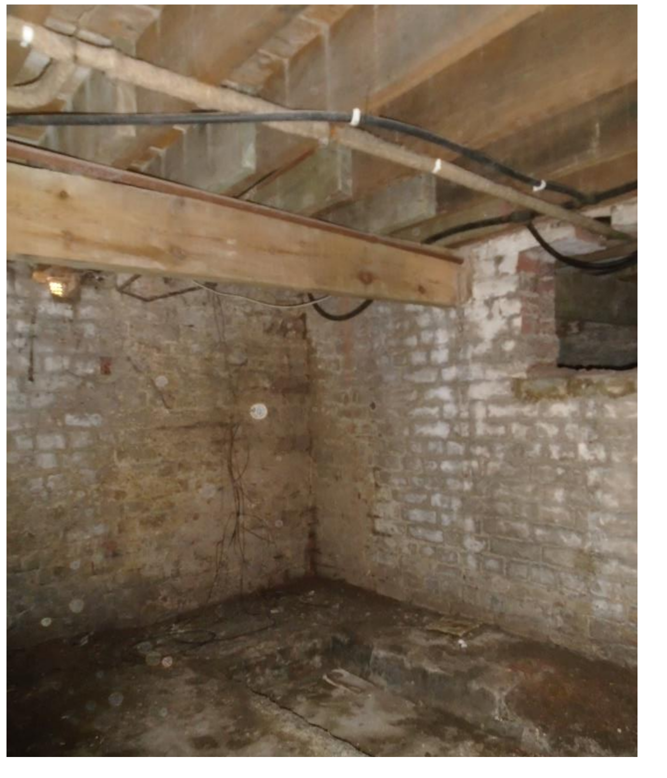
APPENDIX C

PHOTOGRAPHS

Photograph 1 – Aerial view of 62 Parliament Hill

Photograph 2 – View of Property from Tanza Road

Photograph 3 – View of House from garden



Photograph 4 – View of existing cellar space

APPENDIX D

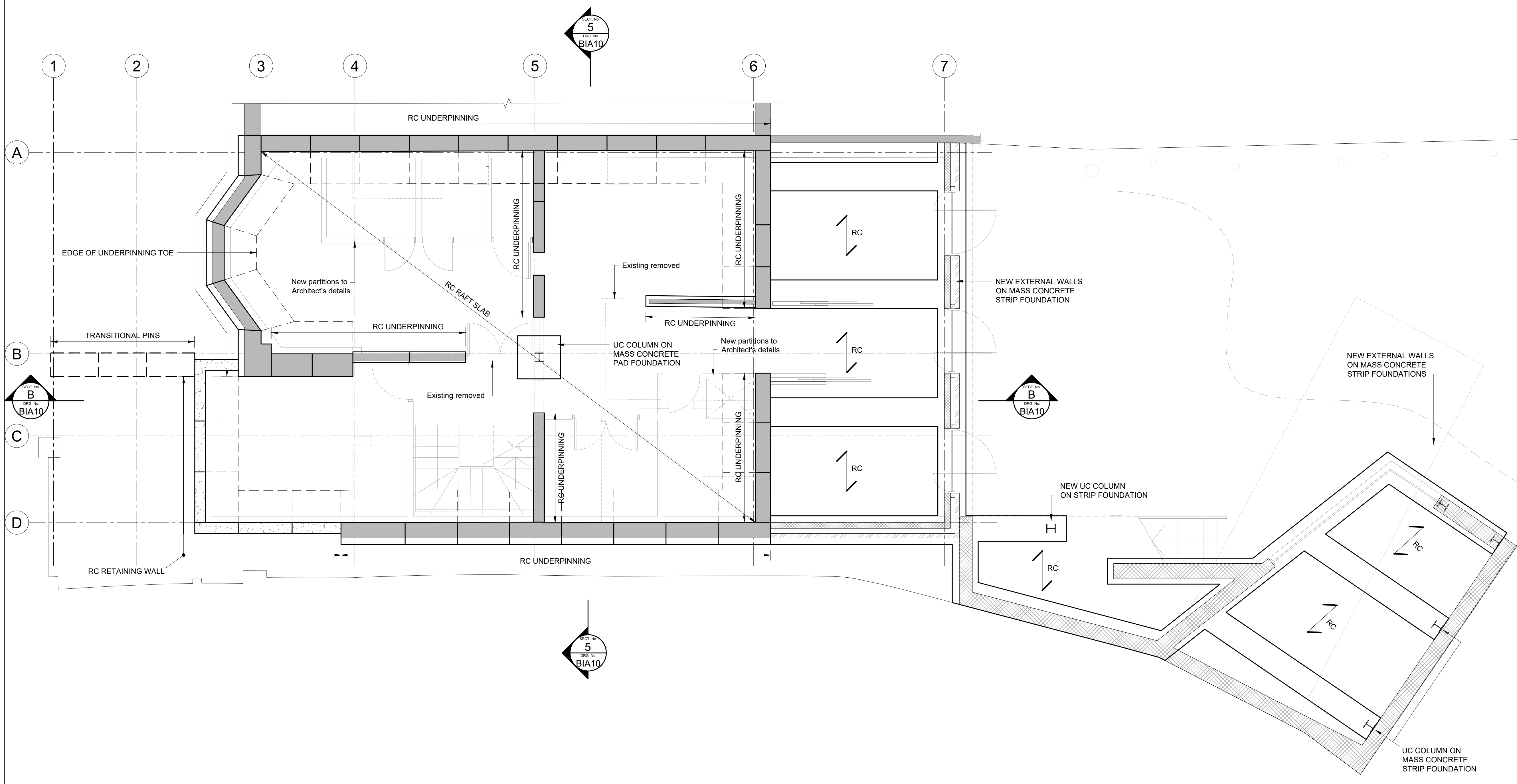
OUTLINE STRUCTURAL DRAWINGS

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions are in millimetres and to be checked on site.

LEGEND

- Existing walls retained
- Existing walls to be demolished
- New concrete underpinning/wall
- New masonry wall
- New non load-bearing partition
- RC — Span direction of new in-situ RC slab on Cordek void former



PROPOSED BASEMENT PLAN

Scale 1:50

ALL UNDERPINNING AND RC RETAINING WALLS TO BE CAST IN SECTIONS NO LONGER THAN 1.2M. UNDERPINNING TO BE CARRIED OUT IN SEQUENCE. UNDERPINNING TO BE NO LESS THAN 250MM THK.

Rev.	Date	Description	By
P2	04.06.21	ISSUED FOR BIA	RJC
P1	10.05.21	ISSUED FOR COMMENT	RJC

PRELIMINARY

Architect
SHER + WHITE LTD

Project Title
62 PARLIAMENT HILL
LONDON NW3 2TJ

Drawing Title
PROPOSED BASEMENT PLAN

MichaelAlexander
Berkeley House
304 Regents Park Road
London N3 2JX
tel +44 (0)20 8445 9115
email mail@maengineers.com
web www.maengineers.com

Drawn	RJC	MAY 2021
Checked	IH	MAY 2021
Scale	1:50 / 1:100	Size A1 / A3
Project No. P5003	Drawing No. BIA01	Rev. P2

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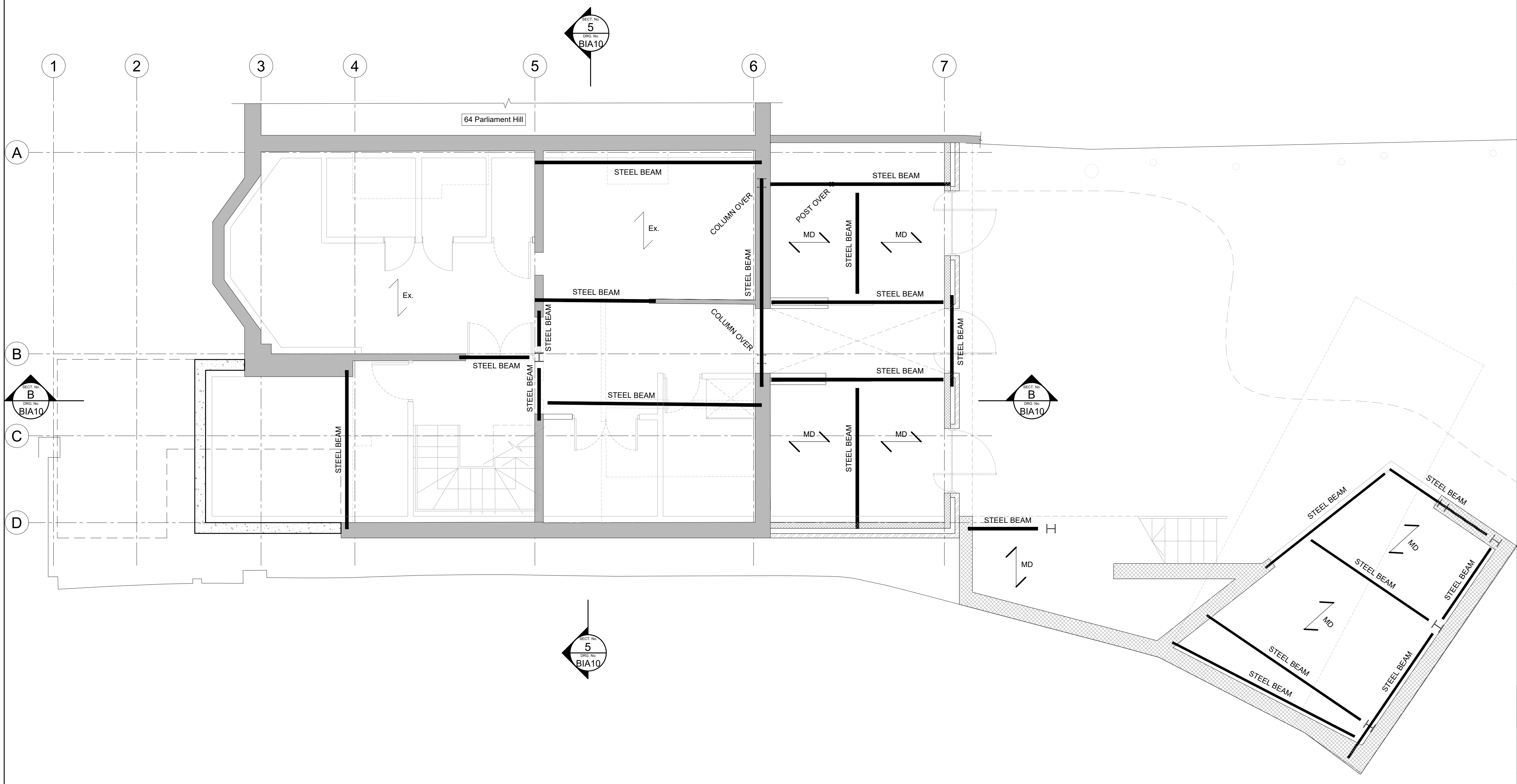

PROPOSED BASEMENT PLAN SHOWING STRUCTURE OVER

Scale 1:50

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions are in millimetres and to be checked on site.

LEGEND

- Existing walls retained
- Existing walls to be demolished
- New steel beam
- New concrete underpinning/wall
- New masonry wall
- New non load-bearing partition
- Ex. Span direction of existing timber joists
- MD Span direction of new 150thk. slab on metal decking

Rev.	Date	Description	By
P2	04.06.21	ISSUED FOR BIA	RJC
P1	10.05.21	ISSUED FOR COMMENT	RJC

PRELIMINARY

Architect
SHER + WHITE LTD

Project Title
62 PARLIAMENT HILL
LONDON NW3 2TJ

Drawing Title
PROPOSED BASEMENT PLAN
SHOWING STRUCTURE OVER

MichaelAlexander
Berkeley House
304 Regents Park Road
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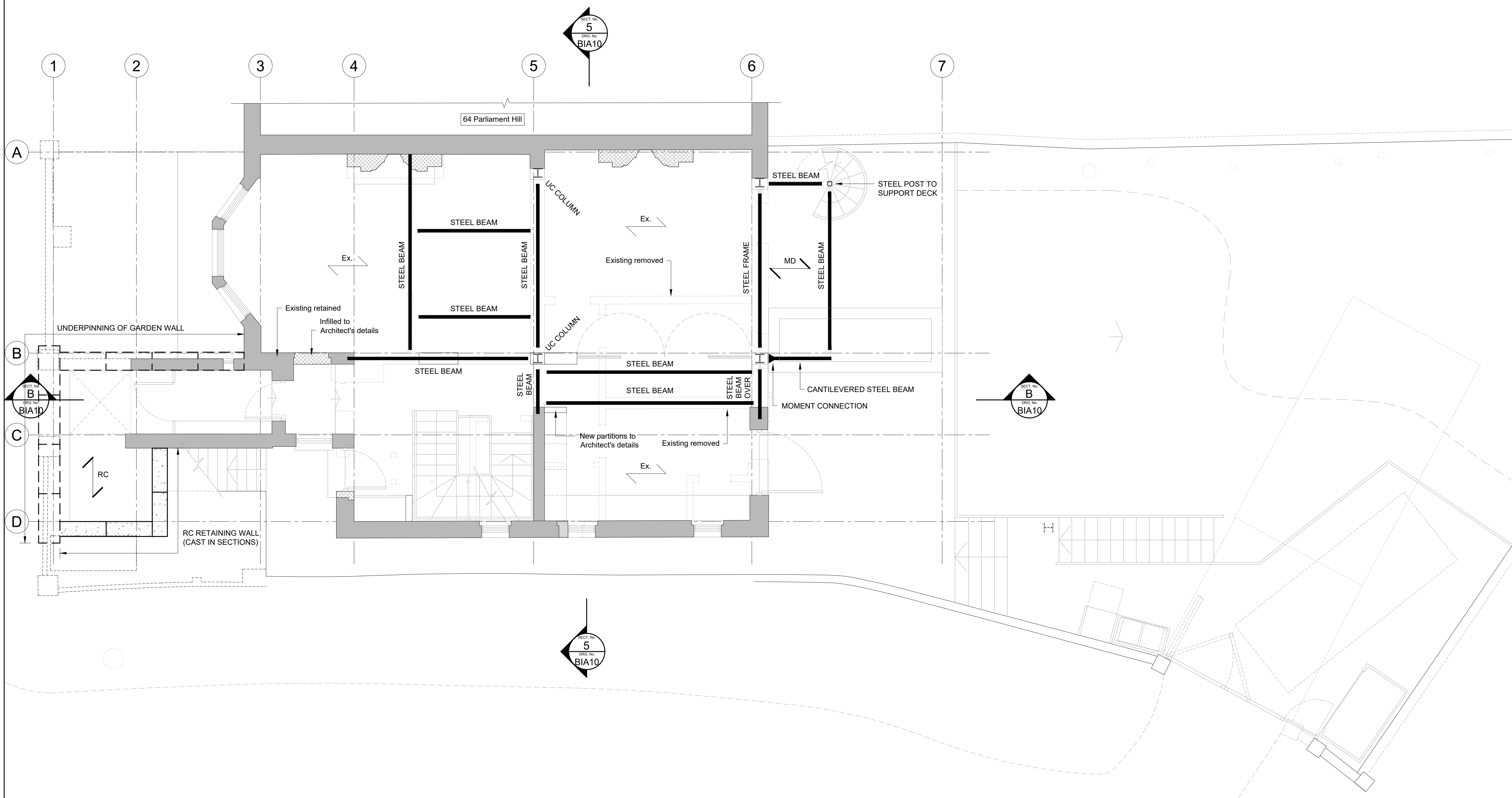
web www.maengineers.com

Drawn: RJC MAY 2021
Checked: IH MAY 2021
Scale: 1:50 / 1:100 — Size: A1 / A3
Project No.: P5003 — Drawing No.: BIA02 — Rev.: P2

0 — 100mm WHEN PLOTTED @ 1:1 FOR A1 — 100 — 50mm WHEN PLOTTED @ 1:2 FOR A3 — 200



PROPOSED LOWER GROUND FLOOR PLAN SHOWING STRUCTURE OVER

Scale 1:50

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions are in millimetres and to be checked on site.

LEGEND

- Existing walls retained
- Existing walls to be demolished
- New steel beam
- New concrete underpinning/wall
- New masonry wall
- New non load-bearing partition
- Ex. — Span direction of existing timber joists
- MD — Span direction of new 150thk. slab on metal decking

Rev.	Date	Description	By
P2	04.06.21	ISSUED FOR BIA	RJC
P1	10.05.21	ISSUED FOR COMMENT	RJC

PRELIMINARY

Architect
SHER + WHITE LTD

Project Title
62 PARLIAMENT HILL
LONDON NW3 2TJ

Drawing Title
PROPOSED
LOWER GROUND FLOOR PLAN

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Drawn	RJC	MAY 2021
Checked	IH	MAY 2021
Scale	1:50	A1
Size	1:100	A3

Project No.	Drawing No.	Rev.
P5003	BIA03	P2

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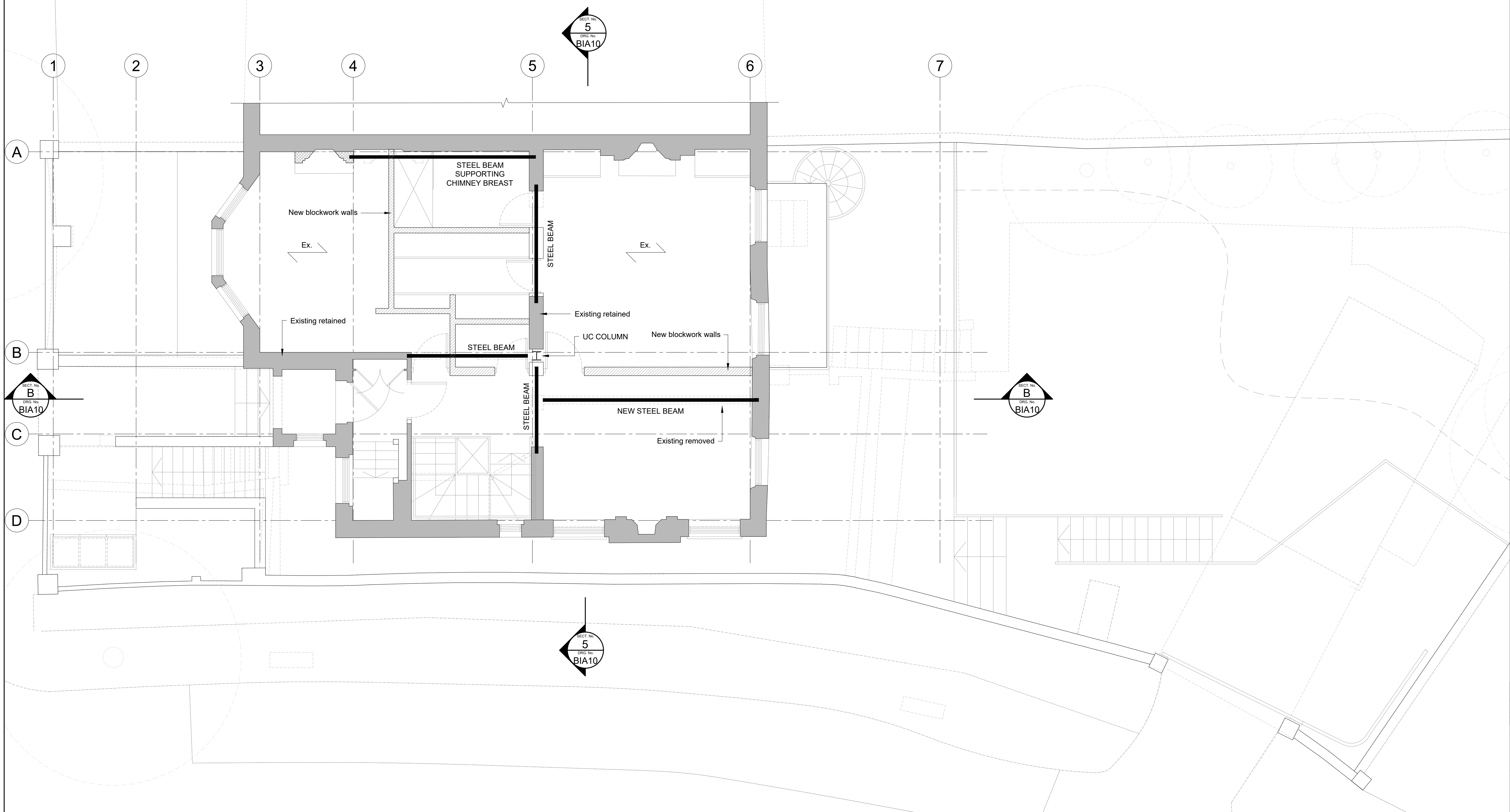

PROPOSED GROUND FLOOR PLAN SHOWING STRUCTURE OVER

Scale 1:50

NEW STEEL BEAMS TO BE INSTALLED BELOW FIRST FLOOR STRUCTURE

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions are in millimetres and to be checked on site.

LEGEND

- Existing walls retained
- Existing walls to be demolished
- New steel beam
- New blockwork walls
- New non load-bearing partition
- Ex. Span direction of existing timber joists

Rev.	Date	Description	By
P2	04.06.21	ISSUED FOR BIA	RJC
P1	10.05.21	ISSUED FOR COMMENT	RJC

PRELIMINARY

Architect
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Project Title
62 PARLIAMENT HILL
LONDON NW3 2TJ

Drawing Title
PROPOSED
GROUND FLOOR PLAN

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web www.maengineers.com

Drawn	RJC	MAY 2021
Checked	IH	MAY 2021
Scale	1:50	A1 (Size)
	1:100	A3
Project No.	Drawing No.	Rev.
P5003	BIA04	P2

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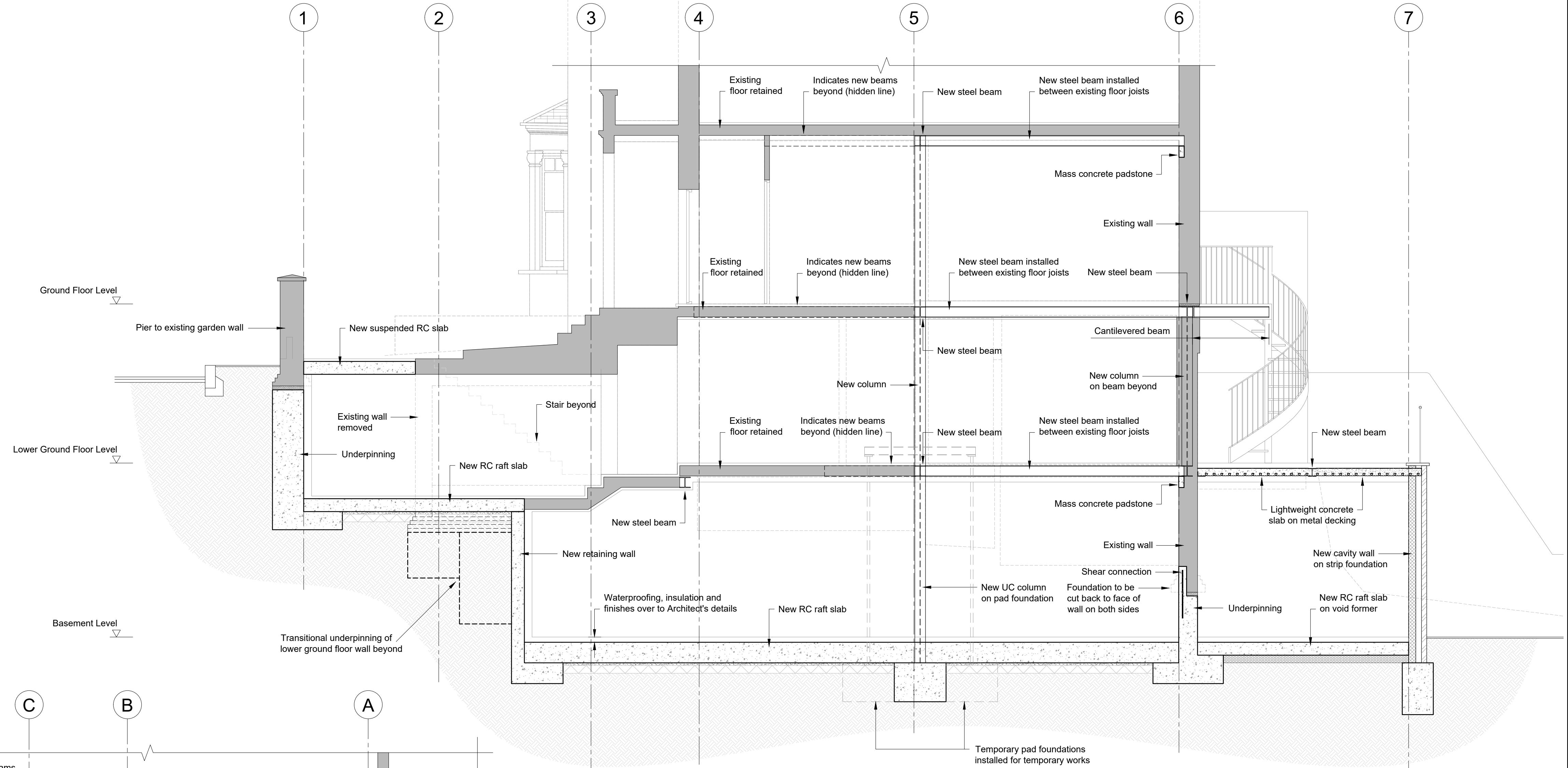
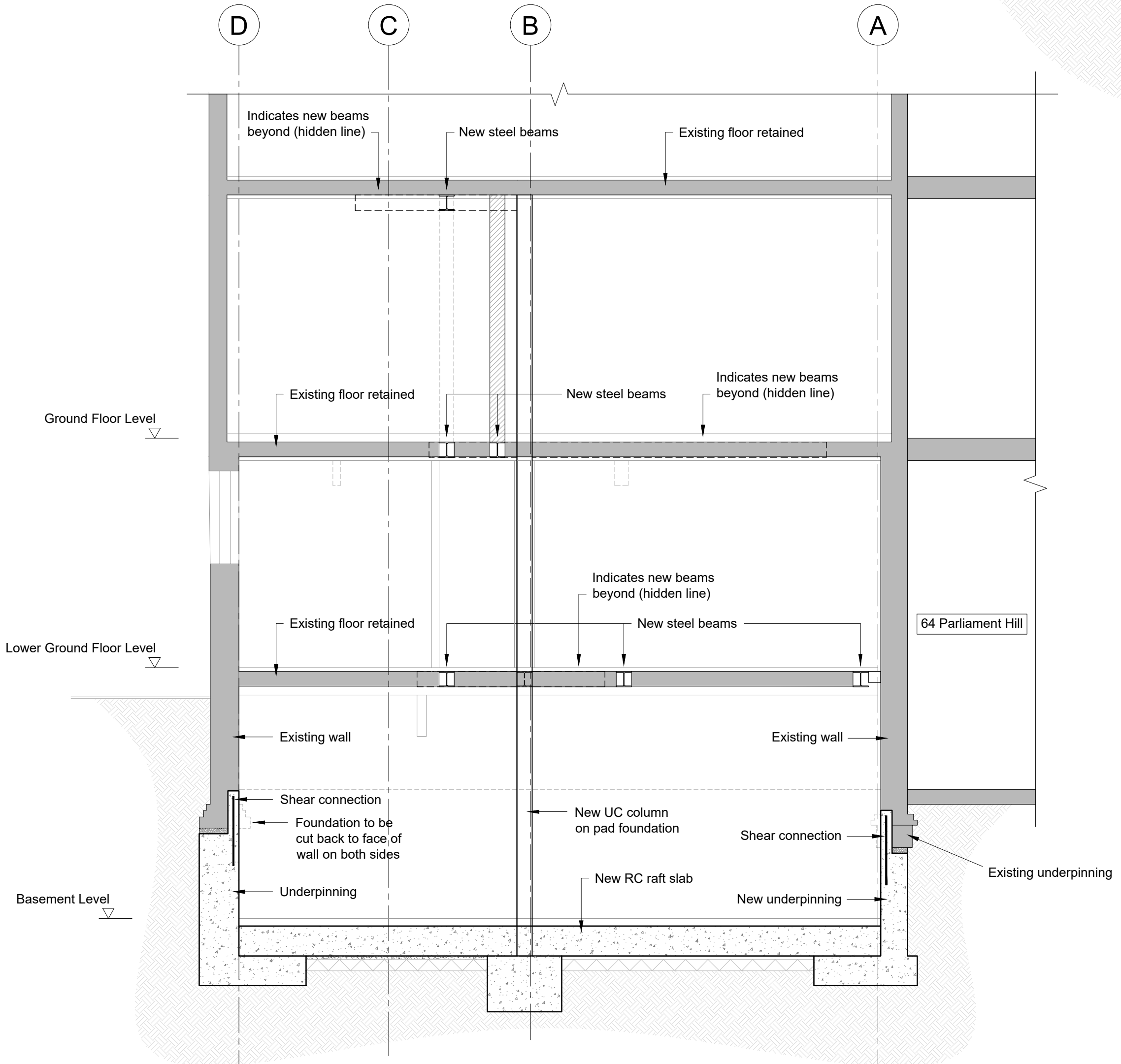


SECTION B-B

Scale 1:50



SECTION 5-5

Scale 1:50

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NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions are in millimetres and to be checked on site.

Rev.	Date	Description	By
P2	04.06.21	ISSUED FOR BIA	RJC

PRELIMINARY

Architect
SHER + WHITE LTD

Project Title
62 PARLIAMENT HILL
LONDON NW3 2TJ

Drawing Title
PROPOSED
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email mail@maengineers.com
web www.maengineers.com

Drawn	
RJC	MAY 2021
Checked	
IH	MAY 2021
Scale	Size
1:50	A1
1:100	A3

Project No.	Drawing No.	Rev.
P5003	BIA10	P2

APPENDIX E

CONSTRUCTION METHOD STATEMENT

CONSTRUCTION METHOD STATEMENT

E.01 The following provides an outline Method Statement for the construction of the basement. This will be developed and finalised by the appointed Contractor, once the detailed design is complete. An outline construction programme will be prepared by the Main Contractor and included in the Construction Management Plan.

E.02 Prior to works commencing, schedules of condition will be carried out to adjoining properties as part of the party wall process.

E.03 Precise monitoring points will be fixed to the party walls and adjoining buildings in accordance with the agreed 'Monitoring and Contingency Plan'. Initial 'base' readings will be taken.

E.04 The site and adjoining pavement will be scanned and marked for services prior to the commencement of any excavation works.

E.05 A full depth trial excavation will be carried out by the Contractor prior to the commencement of the main excavation works. This will enable the Contractor to identify whether there is any perched water on the interface between the made ground and London Clay, and to check how readily the subsoil stands un-supported.

Any perched water should be collected in sumps during the excavation works and pumped. Should the excavation sides be found locally to be unstable or if there is unacceptable loss of material from the excavated face, then contingency plans will be developed, likely to include back shuttering behind the underpinning. These proposals will include measures to ensure no voids are left behind the back shuttering.

E.06 The construction will commence with the underpinning works to the party wall and other perimeter walls. This will be carried out to an agreed sequence, to ensure there is at least 2m between any two open pins. The underpinning to the walls will be constructed to a typical underpinning sequence of 1,4,2,5 and 3. Underpinning will commence from the underside of the existing foundations. Once the perimeter walls are underpinned, the retained internal walls will be underpinned.

E.07 Where internal walls are be removed as part of the works, temporary works will be installed prior to demolition. These will be supported on temporary bases, founded below the level of the proposed basement slab.

E.08 Lateral props will be installed within the existing building close to lower ground level prior to demolition of the existing internal structure. In general, these will be installed full width across the building from wall to wall, or across corners.

E.09 The timing of the demolition, excavation and reconstruction works shall be to a continuous programme to minimise the heave of the clay subsoils that might result from the temporary unloading.

E.10 The remaining sections of retaining structure, outside the footprint of the house, can then be constructed in sections.

E.11 Bulk excavation will then commence. Any minor water inflows to the basement excavation will be collected in sumps and pumped. Temporary propping will be installed as described previously.

E.12 Regular precise monitoring of targets will be carried out throughout the works, with a greater frequency during excavation works. During the works, if 'Amber' monitoring levels are reached, then situation will be assessed, and mitigation measures considered. If 'Red' values are reached, then excavation will be stopped and immediate contingency plans implemented.

E.13 When bulk excavation is complete to basement level, the bottom surface of the excavation will be immediately blinded.

E.14 The basement raft slab will then be constructed on top of the concrete underpin toes, to act as a permanent prop to the base of the underpinning.

E.15 Works can then proceed with the construction of the replacement lower ground floor. The lower ground floor will act as a permanent prop to the excavation, so following its installation the temporary propping can be removed

E.16 The internal works will then be progressed, with steelwork installed to support the walls over. On completion of the permanent steelwork, the vertical propping can be carefully removed.

APPENDIX F

PRELIMINARY STRUCTURAL CALCULATIONS

F1.00 INTRODUCTION

F1.01 These preliminary calculations are for planning purposes only. Detailed calculations will be developed in due course in respect of Part A of The Building Regulations

F2.00 BRITISH STANDARDS

F2.01 The following Standards will be applied in the detailed design: -

BS648	Weights of Building Materials
BS5268: Part 2	Structural use of Timber: Permissible Stress design, materials and workmanship
BS5628: Part 1	Structural use of unreinforced masonry
BS5950:Part1	Structural Steelwork-Simple & continuous construction
BS5977:Part1	Lintels: Method for Assessment of Load
BS6399:Part 1	Code of Practice for Dead and Imposed Load
BS6399:Part 3	Code of Practice for Imposed Roof Load
BS8110:Part 1	Structural use of concrete

F3.00 LOADING

F3.01 A load take down has been carried out for existing and proposed conditions. The loadings generated for existing and proposed conditions, are summarised below.

F3.02 Jomas have adopted these loads in preparing the ground movement assessment. The loads have also been applied to the underpinning calculations in F4.00.

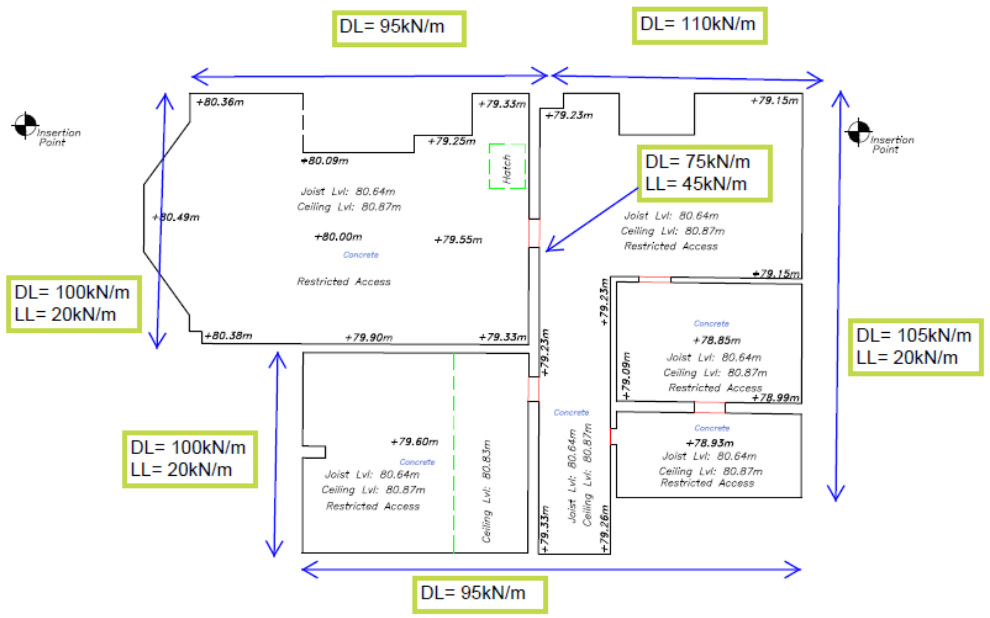


Figure F3.1 Existing Line Loads

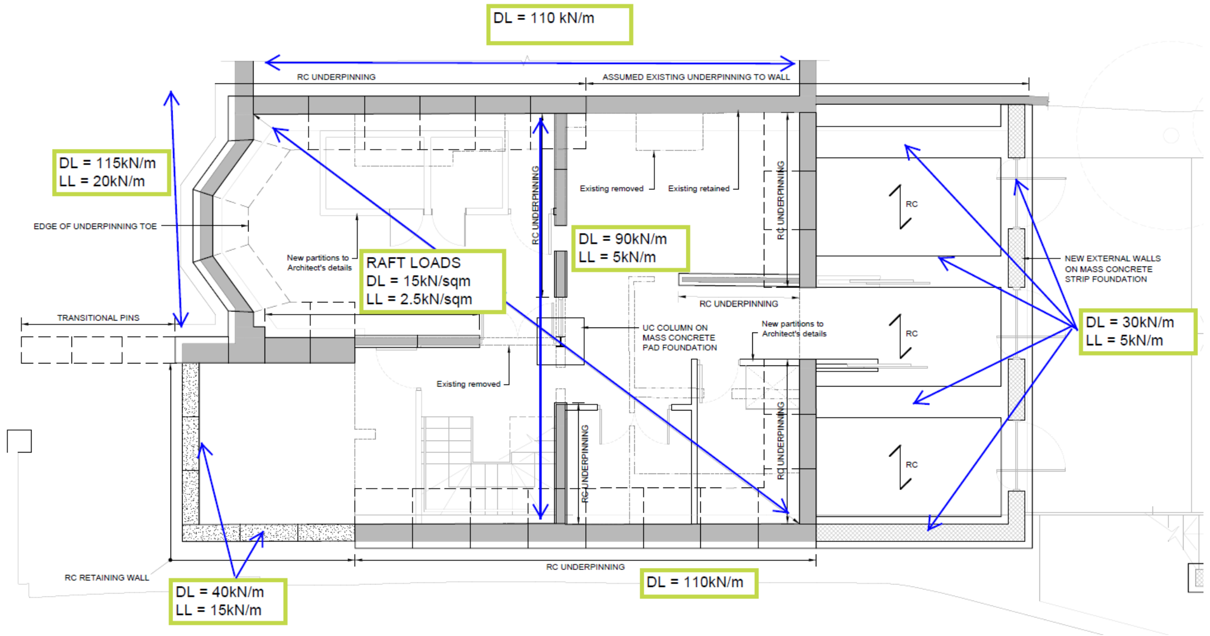


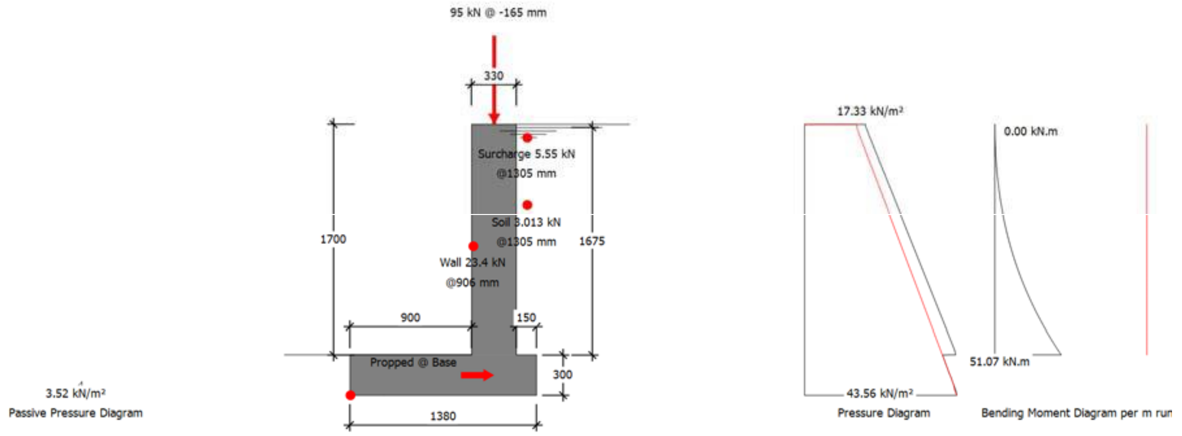
Figure F3.2 Proposed Line Loads

F4.00 UNDERPINNING DESIGN

F4.01 Approach

- The existing masonry walls act as retaining walls for the current level difference of soils and there is no sign of any distress to the walls. We have therefore assumed that these will continue to act in the same way as before. There will be some nominal restraint of the foundation where it is embedded in the ground, but we note there is currently no slab at cellar level.
- We have checked the new reinforced concrete underpins as cantilever retaining walls, allowing for an increased overburden to account for the depth of soil above the top of the new RC wall.
- Additionally, we have run a check assuming a continuous concrete wall running from lower ground floor down to basement level. Whilst this does not correctly model the actual wall, it has been used to confirm that any horizontal force on the interface between the existing footings and the RC wall can be accommodated by the proposed underpinning. Hence, we have demonstrated that any existing base propping of the existing masonry walls by the soil can be provided by the underpin.
- Conservatively all checks have been carried out for the minimum thickness walls with maximum retained height.

F4.02 MasterKey : Retaining Wall Design to BS 8002 : 1994 and BS 8110 : 1997 RC underpinning



Reinforced Concrete Retaining Wall with Reinforced Base

Summary of Design Data

Notes All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³) Dry Soil 19.50, Saturated Soil 21.70, Submerged Soil 11.70, Concrete 24.00
Concrete grade fcu 40 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm) Wall inner cover 40 mm, Wall outer cover 40 mm, Base cover 40 mm
Reinforcement design fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table Surcharge 37.00 kN/m², Water table level 1675 mm
Unplanned excavation depth Front of wall 200 mm
† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Additional Loads

Wall Propped at Base Level Therefore no sliding check is required
Vertical Line Load 95 kN/m @ X -165 mm and Y 0 mm - Load type Live
† Dimensions Ties, line loads and partial loads are measured from the inner top edge of the wall]

Soil Properties

Soil bearing pressure Allowable pressure @ front 130.00 kN/m², @ back 130.00 kN/m²
Back Soil Friction and Cohesion = Atn(Tan(25)/1.2) = 21.24°
Base Friction and Cohesion = Atn(0.75xTan(Atn(Tan(24)/1.2))) = 15.55°
Front Soil Friction and Cohesion = Atn(Tan(25)/1.2) = 21.24°

Loading Cases

G_{Soil}- Soil Self Weight, G_{Wall}- Wall & Base Self Weight, Fv_{Heel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge, P_p- Passive Earth Pressure
Case 1: Geotechnical Design 1.00 G_{Soil}+1.00 G_{Wall}+1.00 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p
Case 2: Structural Ultimate Design 1.40 G_{Soil}+1.40 G_{Wall}+1.60 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising 48.633/133.545 0.364 OK

Wall Sliding - Virtual Back Pressure

Fx/($Rx_{Friction}$+ $Rx_{Passive}$) 0.000/(35.330+0.178) 0.000 OK
Prop Reaction Case 2 (Service) 58.3 kN @ Base

Soil Pressure

Virtual Back (No uplift) Max(100.485/130, 83.519/130) kN/m² 0.773 OK
Wall Back (No uplift) Max(119.789/130, 64.215/130) kN/m² 0.921 OK

Structural Design

At Rest Earth Pressure

At rest earth pressures magnification (1+Sin( )) x OCR = (1+Sin(21.24)x 1 1.36

Prop Reaction

Maximum Prop Reaction (Ultimate) 87.0 kN @ Base

Wall Design (Inner Steel)

Critical Section Critical @ 0 mm from base, Case 2
Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm² OK
Compression Steel Provided (Cover) Main H12@200 (40 mm) Dist. H12@175 (52 mm) 565 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 282 mm, 1000 mm, 1005 mm², 500 N/mm², 40.0 N/mm² 268 mm
Mr=fn(above,As',d',x,x/d) 565 mm², 46 mm, 28 mm, 0.10 117.2 kN.m
Moment Capacity Check (M/Mr) M 51.1 kN.m, Mr 117.2 kN.m 0.436 OK
Wall Axial Design (N/Ncap) N 170.8 kN, Ncap 5280.0 kN 0.032 OK
Wall Slenderness Leff/tk =2.00x1700.0/330.0 10.3 OK
Kmin = (Nuz-N)/(Nuz-Nbal) Min(1.0, 5866.7 - 170.8)/(5866.7 - 2345.4) 1.0
M_{add}= N.Kmin.h. ²/2000 170.8x1.0x330.0x10.3²/2000 3.0kN.m
(M+Madd)/Mr_{Axial} M+Madd 54.0 kN, Mr_{Axail}141.9 kN.m 0.381 OK
Shear Capacity Check F 70.1 kN, vc 0.572 N/mm², Fvr 161.3 kN 0.43 OK

Base Top Steel Design

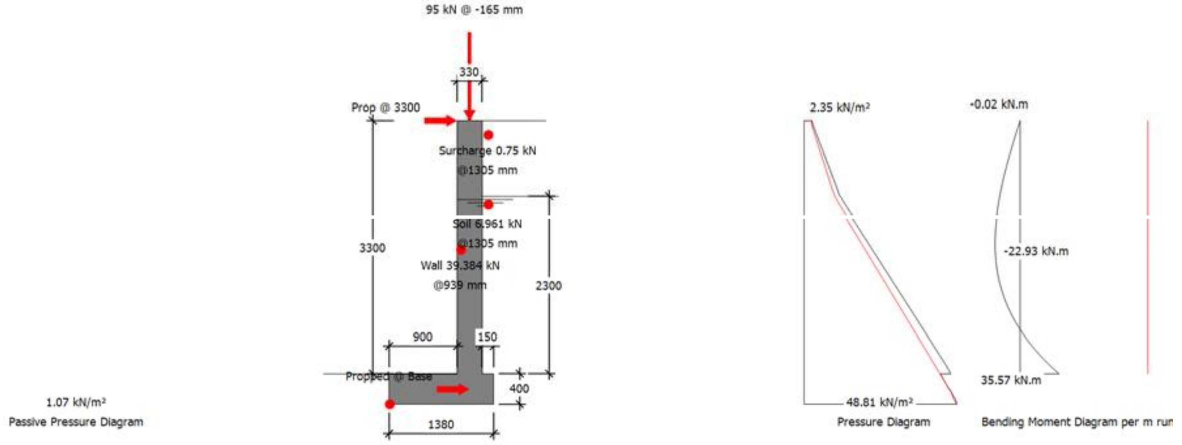
Steel Provided (Cover) Main H16@150 (40 mm) Dist. H12@175 (56 mm) 1340 mm² OK
Compression Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 252 mm, 1000 mm, 1340 mm², 500 N/mm², 40 N/mm² 236 mm
Mr=fn(above,As',d',x,x/d) 1005 mm², 48 mm, 37 mm, 0.15 137.4 kN.m
Moment Capacity Check (M/Mr) M 0.0 kN.m, Mr 137.4 kN.m 0.000 OK
Shear Capacity Check F 0.0 kN, vc 0.672 N/mm², Fvr 169.4 kN 0.00 OK

Base Bottom Steel Design

Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm² OK
Compression Steel Provided (Cover) Main H16@150 (40 mm) Dist. H12@175 (56 mm) 1340 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 252 mm, 1000 mm, 1005 mm², 500 N/mm², 40 N/mm² 239 mm
Mr=fn(above,As',d',x,x/d) 1340 mm², 48 mm, 28 mm, 0.11 104.7 kN.m
Moment Capacity Check (M/Mr) M 55.8 kN.m, Mr 104.7 kN.m 0.533 OK
Shear Capacity Check F 122.4 kN, vc 0.611 N/mm², Fvr 153.9 kN 0.80 OK

F4.02

MasterKey : Retaining Wall Design to BS 8002 : 1994 and BS 8110 : 1997
RC underpinning full height
Reinforced Concrete Retaining Wall with Reinforced Base



Summary of Design Data
Notes All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³) Dry Soil 19.50, Saturated Soil 21.70, Submerged Soil 11.70, Concrete 24.00
Concrete grade fcu 40 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm) Wall inner cover 40 mm, Wall outer cover 40 mm, Base cover 40 mm
Reinforcement design fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table Surcharge 5.00 kN/m², Water table level 2300 mm
Unplanned excavation depth Front of wall 370 mm
† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Additional Loads
Wall Propped at Base Level Therefore no sliding check is required
Additional Wall Prop Prop @ 3.3 m
Vertical Line Load 95 kN/m @ X -165 mm and Y 0 mm - Load type Live
† Dimensions All props are measured from the top of the base
Ties, line loads and partial loads are measured from the inner top edge of the wall

Soil Properties
Soil bearing pressure Allowable pressure @ front 130.00 kN/m², @ back 130.00 kN/m²
Back Soil Friction and Cohesion = Atn(Tan(25)/1.2) = 21.24°
Base Friction and Cohesion = Atn(0.75xTan(Atn(Tan(24)/1.2))) = 15.55°
Front Soil Friction and Cohesion = Atn(Tan(25)/1.2) = 21.24°

Loading Cases
G_{Soil}- Soil Self Weight, G_{Wall}- Wall & Base Self Weight, Fv_{Heel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge, P_p- Passive Earth Pressure
Case 1: Geotechnical Design 1.00 G_{Soil}+1.00 G_{Wall}+1.00 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p
Case 2: Structural Ultimate Design 1.40 G_{Soil}+1.40 G_{Wall}+1.60 Fv_{Heel}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p

Geotechnical Design
Wall Stability - Virtual Back Pressure
Case 1 Overturning/Stabilising 101.951/201.990 0.505 OK
Wall Sliding - Virtual Back Pressure
$Fx/(Rx_{Friction}+ Rx_{Passive})$ 0.000/(39.540+0.016) 0.000 OK
Prop Reactions Case 2 (Service) 71.0 kN @ Base, 14.5 kN @ 3.700 m
Soil Pressure
Virtual Back (No uplift) Max(96.687/130, 109.248/130) kN/m² 0.840 OK
Wall Back (No uplift) Max(111.341/130, 94.594/130) kN/m² 0.856 OK

Structural Design
At Rest Earth Pressure
At rest earth pressures magnification (1+Sin( )) x OCR = (1+Sin(21.24)x 1 1.36

Prop Reactions
Maximum Prop Reactions (Ultimate) 103.7 kN @ Base, 22.5 kN @ 3.300 m

Wall Design (Inner Steel)
Critical Section Critical @ 0 mm from base, Case 2
Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm² OK
Compression Steel Provided (Cover) Main H12@200 (40 mm) Dist. H12@175 (52 mm) 565 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 282 mm, 1000 mm, 1005 mm², 500 N/mm², 40.0 N/mm² 268 mm
Mr=fn(above,As',d',x,x/d) 565 mm², 46 mm, 28 mm, 0.10 117.2 kN.m
Moment Capacity Check (M/Mr) M 35.6 kN.m, Mr 117.2 kN.m 0.304 OK
Wall Axial Design (N/Ncap) N 188.6 kN, Ncap 5280.0 kN 0.036 OK
Wall Slenderness Leff/tk =0.97x3300.0/330.0 9.7 OK
Wall Axial-Mom Design (M/Mr_{Axial}) M 35.6 kN, Mr_{Axial}144.0 kN.m 0.247 OK
Shear Capacity Check F 78.6 kN, vc 0.572 N/mm², Fvr 161.3 kN 0.49 OK

Wall Design (Outer Steel)
Critical Section Critical @ 1697 mm from base, Case 2
Steel Provided (Cover) Main H12@200 (40 mm) Dist. H12@175 (52 mm) 565 mm² OK
Compression Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 284 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm² 270 mm
Mr=fn(above,As',d',x,x/d) 1005 mm², 48 mm, 16 mm, 0.05 66.4 kN.m
Moment Capacity Check (M/Mr) M 22.9 kN.m, Mr 66.4 kN.m 0.345 OK
Wall Axial Design (N/Ncap) N 188.6 kN, Ncap 5280.0 kN 0.036 OK
Wall Slenderness Leff/tk =0.97x3300.0/330.0 9.7 OK
Wall Axial-Mom Design (M/Mr_{Axial}) M 22.9 kN, Mr_{Axial}96.9 kN.m 0.237 OK
Shear Capacity Check F 0.2 kN, vc 0.470 N/mm², Fvr 133.5 kN 0.00 OK

Base Top Steel Design
Steel Provided (Cover) Main H16@150 (40 mm) Dist. H12@175 (56 mm) 1340 mm² OK
Compression Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 352 mm, 1000 mm, 1340 mm², 500 N/mm², 40 N/mm² 334 mm
Mr=fn(above,As',d',x,x/d) 1005 mm², 48 mm, 37 mm, 0.10 195.0 kN.m
Moment Capacity Check (M/Mr) M 0.0 kN.m, Mr 195.0 kN.m 0.000 OK
Shear Capacity Check F 0.0 kN, vc 0.553 N/mm², Fvr 194.7 kN 0.00 OK

Base Bottom Steel Design
Steel Provided (Cover) Main H16@200 (40 mm) Dist. H16@200 (56 mm) 1005 mm² OK
Compression Steel Provided (Cover) Main H16@150 (40 mm) Dist. H12@175 (56 mm) 1340 mm²
Leverarm z=fn(d,b,As,fy,Fcu) 352 mm, 1000 mm, 1005 mm², 500 N/mm², 40 N/mm² 334 mm
Mr=fn(above,As',d',x,x/d) 1340 mm², 48 mm, 28 mm, 0.08 146.2 kN.m
Moment Capacity Check (M/Mr) M 54.6 kN.m, Mr 146.2 kN.m 0.373 OK
Shear Capacity Check F 124.7 kN, vc 0.503 N/mm², Fvr 176.9 kN 0.70 OK

APPENDIX G

OUTLINE CONSTRUCTION PROGRAMME

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PROGRAMME/ACTION LIST