BASEMENT IMPACT ASSESSMENT

FOR

PROPOSED BASEMENT WORKS

AT

THE COACH HOUSE
6 KIDDERPORE AVENUE
LONDON
NW3 7SP

Project No. P3439

ISSUE 1.6 – ISSUED FOR PLANNING

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DOCUMENT CONTROL SHEET

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APPENDICES

NON-TECHNICAL EXECUTIVE SUMMARY

The proposals for the renovation and re-modelling works at The Coach House, 6 Kidderpore Avenue, include the construction of a single storey basement under the existing footprint of the existing building and a new lightwell extending out in the rear garden footprint. 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 March 2018 and the Campbell Reith pro forma BIA; 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 and whether the site was located directly above an aquifer were unknown.

The screening for Ground Stability highlighted that the proposed foundations would be deeper than that of the adjoining properties, 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 impact on the general hill side slope was also to be considered along with the site being potentially locate above an aquifer.

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, 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 'Basic Geotechnical Ground Investigation Report to Supplement a Basement Impact Assessment' reference number P9945J1083, and to their 'Ground Movement Assessment' (latest issues of both documents dated June 2019). The investigation comprised window sampling boreholes, installation of standpipes for measurement of groundwater, trial pits and associated geotechnical testing.

The window samples confirmed the presence of Made Ground underlain by London Clay, with groundwater encountered during the return visits only and below the deepest excavation level. Trial pits on existing foundations found these to be of traditional corbelled brickwork type.

IMPACT ASSESSMENT

The water table was encountered during the investigations below the deepest point of the proposed basement excavation, the site was found being 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. 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 building footprint but it is more than offset by the replacement of hard landscaping with gardens and permeable surfacing therefore 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 being 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.

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 including a single storey basement at The Coach House, 6 Kidderpore Avenue, London NW3 7SP.

1.02 This document has been prepared by Giovanni Sclavi BEng MSc(Hons) GIPENZ and reviewed by Isaac Hudson MEng MA (Cantab) CEng MIStructE who is a chartered structural engineer. The document has been approved by Roni Savage of Jomas Associates Ltd, a chartered geologist.

1.03 The existing residential property is a detached two storey house (with room in the roof). We understand the building was built in the early twentieth century as an outbuilding but has subsequently been converted and extended to provide residential accommodation.

1.04 The existing property is located within the Camden Town Conservation Area, but is not Listed.

1.05 The site is bounded by Kidderpore Avenue to the front, a pedestrian passage (Croft Way) adjoining the former King's College London Hampstead campus to the left (north-west), 6a Kidderpore Avenue to the right (south-east) and 1 Kidderpore Gardens to the back.

1.06 The proposed works are for the renovation and re-modelling of the building predominantly on the inside including a new single storey basement under the existing footprint of the existing building and for a new lightwell extending out in the rear garden footprint. This document addresses the specific issues relating to the basement construction, as described in Camden Planning Guidance Basements (CPGB) of March 2018 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 P-U-R-A Ltd drawings.

20-101	Lower Ground Floor Plan as Proposed
20-102	Ground Floor Plan as Proposed
20-104	Sections as Proposed
20-107	First Floor Plan as Proposed

2.02 The structural proposal 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 Jon Skellern Associates.

06KA_S	Site Survey
06KA_G	Ground Floor
06KA_1	First Floor
06KA_E	Elevations
06KA_X	Sections

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 March 2018 and in 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?*

To be confirmed by Ground Investigations. The Camden Geological, Hydrogeological and Hydrological Study (Figure (a)) suggests the site is above an Unproductive strata but close to the stratigraphic boundary with a Secondary Aquifer

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.

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 (b), (c) and (d)),

(i) No watercourses are within 100m from the site; the Hampstead pond chains are also remote from the site. The nearest 'lost' watercourse is the River Westbourne which ran around 150m to the south east of the site along Heath Drive.

(ii) No wells are understood to be within 100m from the site. From the British Geological Survey 'Geoindex' the nearest water well is on Greenhill (approximately 1150m east of the site). No closer wells are evident on historic maps

(iii) No, the site is close to 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.

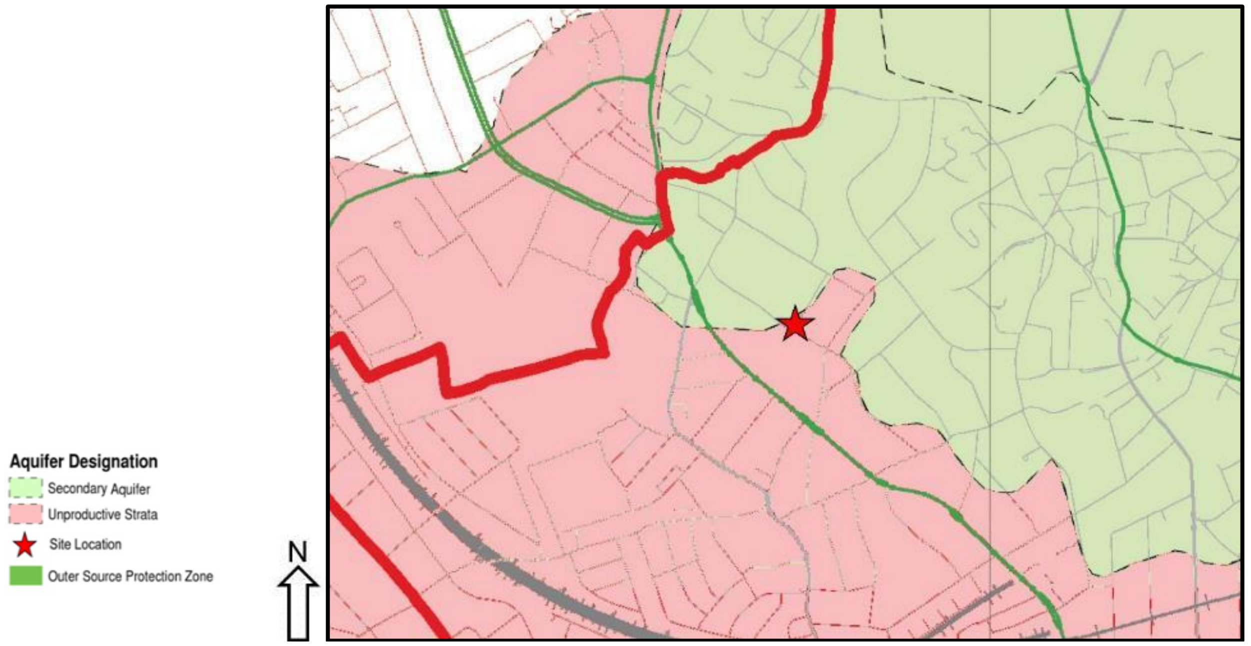


Figure (a)
Aquifer Designation Map
(Extract from Fig 8 of Camden Geological, Hydrogeological and Hydrological Study)

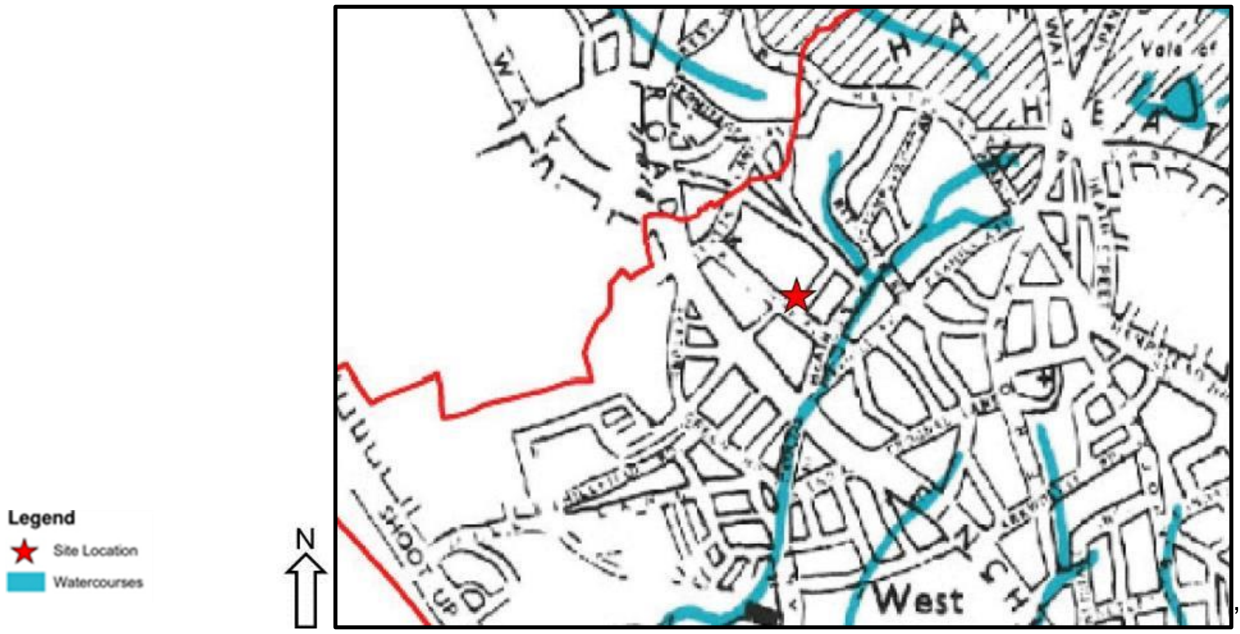


Figure (b)
Watercourses
(Extract from Fig 11 of Camden Geological, Hydrogeological and Hydrological Study -Lost Rivers of London by Barton)

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

No. As described in section 5.04 of this report, there will be no increase in the proportion of hard surface/paved areas.

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 nearest ponds (the Whitestone Pond) are not in close proximity to the site, and 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:

- Confirmation of the local hydrogeology.
- Whether the proposed basement extends beneath the water table surface.

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.

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.

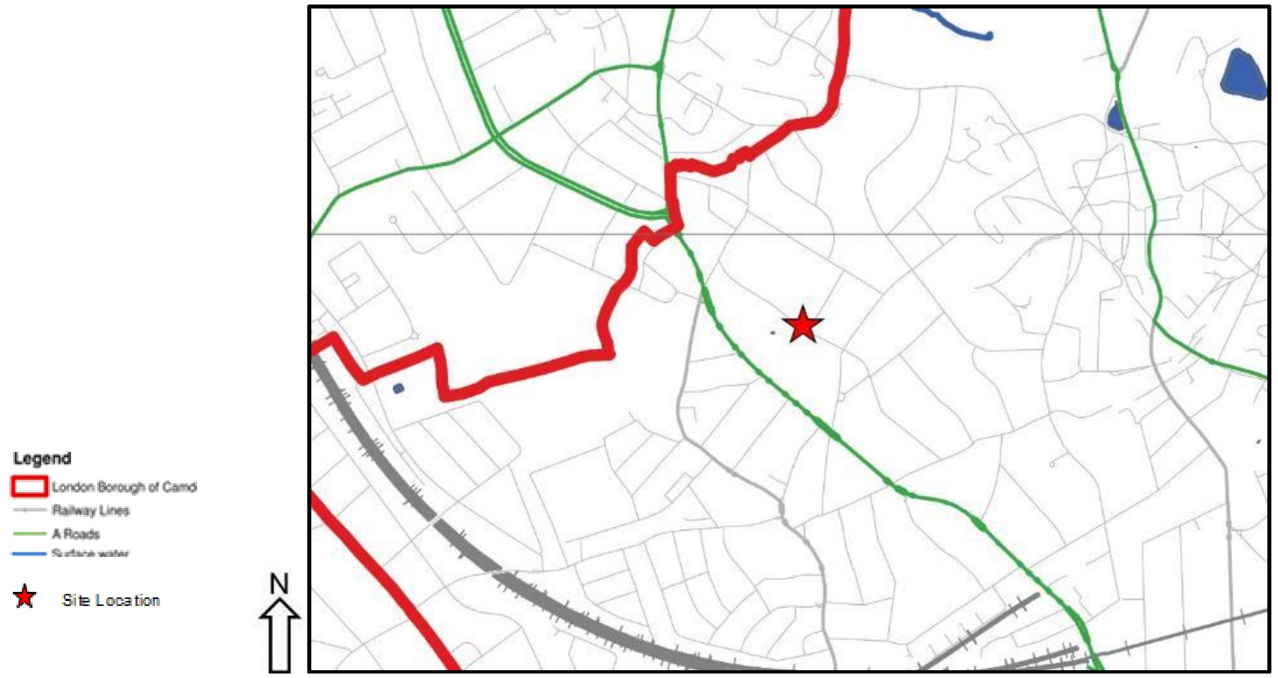


Figure (c)
Surface Water Features
(Extract from Fig 12 of Camden Geological, Hydrogeological and Hydrological Study)

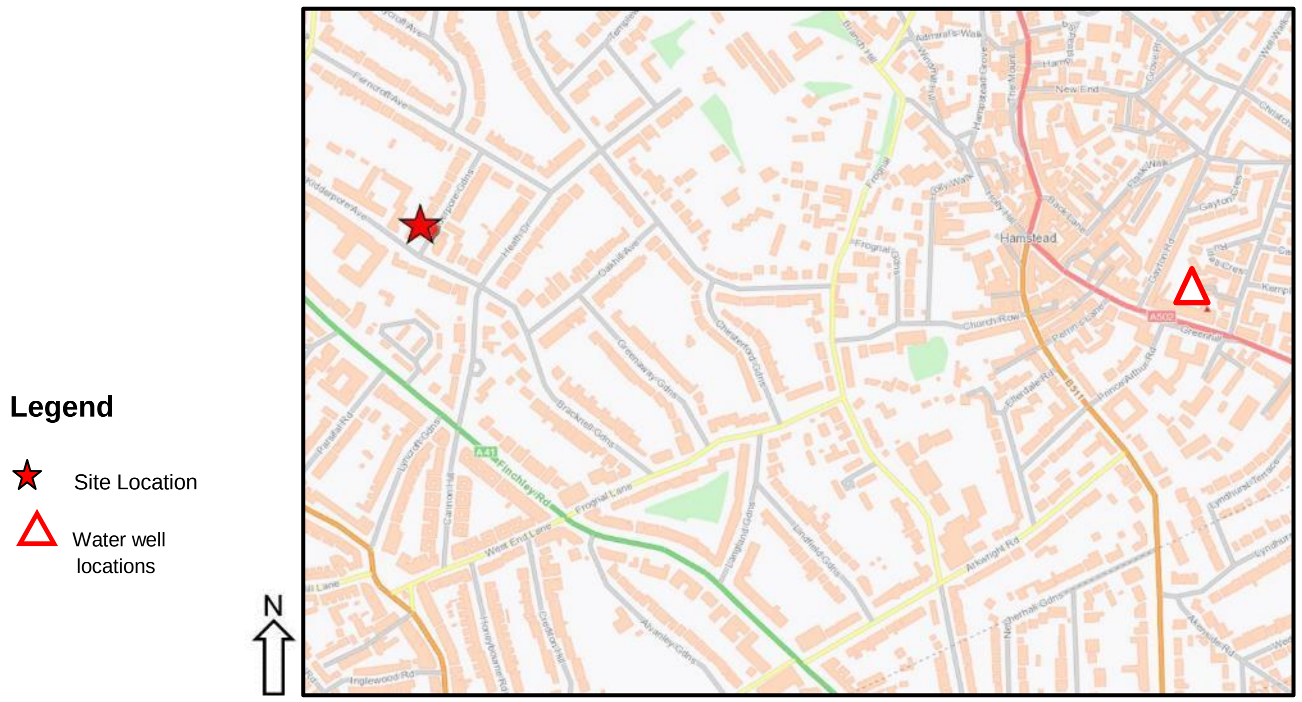


Figure (d)
Waterwells (also showing Infrastructure)
(Extract from British Geological Survey)

3.03 Stage 3: Site Investigation and Study

3.03.1 A site investigation was carried out by Jomas Associates in May 2017 which included trial pits and window sampling. Refer to their report 'Basic Geotechnical Ground Investigation Report to Supplement a Basement Impact Assessment' reference P9945J1083 of June 2017 and to their 'Ground Movement Assessment' of December 2018.

3.03.2 No groundwater was encountered during the investigations, but it was recorded during the return visit to a level ranging from 4.47m to 5.44m below ground.

3.03.3 The shallowest soil strata recorded on site has been made ground, consisting of a gravelly clay (the gravel consisting of bricks and flint), to a depth of 2.0m underlain by brown 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 section 5 of Jomas Associates' report.

3.04.2 In summary it notes that no potential subterranean (groundwater) flow impacts associated with the construction of the proposed development have been identified since:-

- The shallowest strata encountered is made ground underlain by brown clay considered likely to be London Clay Formation and as such would be classed as a Non-Aquifer.
- Ground water was recorded during the investigations to a level ranging from 4.47m to 5.44m below ground; the recorded levels are consistent with the water levels in the historic British Geological Survey logs and are therefore considered to be typical of the groundwater table. However the water table sits below the anticipated deepest point of the general excavation, being 3.50m, hence the proposed basement will not have any negative effect.
- No spring line nor any other surface water feature were located nearby the site.

3.04.3 It is however possible that perched water could be encountered during the excavation within the Made Ground laying on top of the impermeable London Clay Formation; however the Made Ground encountered by Jomas was cohesive so the presence of perched water is unlikely. However, provision for this is reflected in the proposed construction method – refer Appendix E.

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 site is generally level, with a slight slope from north to south and east to west. There are no slopes >7 degrees within the site.

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 (f)), 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 site is level but situated in an area with a general shallow slope and locally this may be in excess of 7 degrees. However the Camden Geological, Hydrogeological and Hydrological Study, (refer Figure (f)), indicates that areas with a consistent slope angle greater than 7 degrees are locally found approximately 80m to the west of the boundary with Croft Way i.e. remote from the site.

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

Yes, to be confirmed by Ground Investigation. With reference to Camden Geological, Hydrogeological and Hydrological Study, the site is shown close to the stratigraphic boundary between the London Clay Formation and the Claygate Member (a subdivision of the London Clay formation) (Figure (e)).

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?*

No. All the trees within the site boundary will be retained.

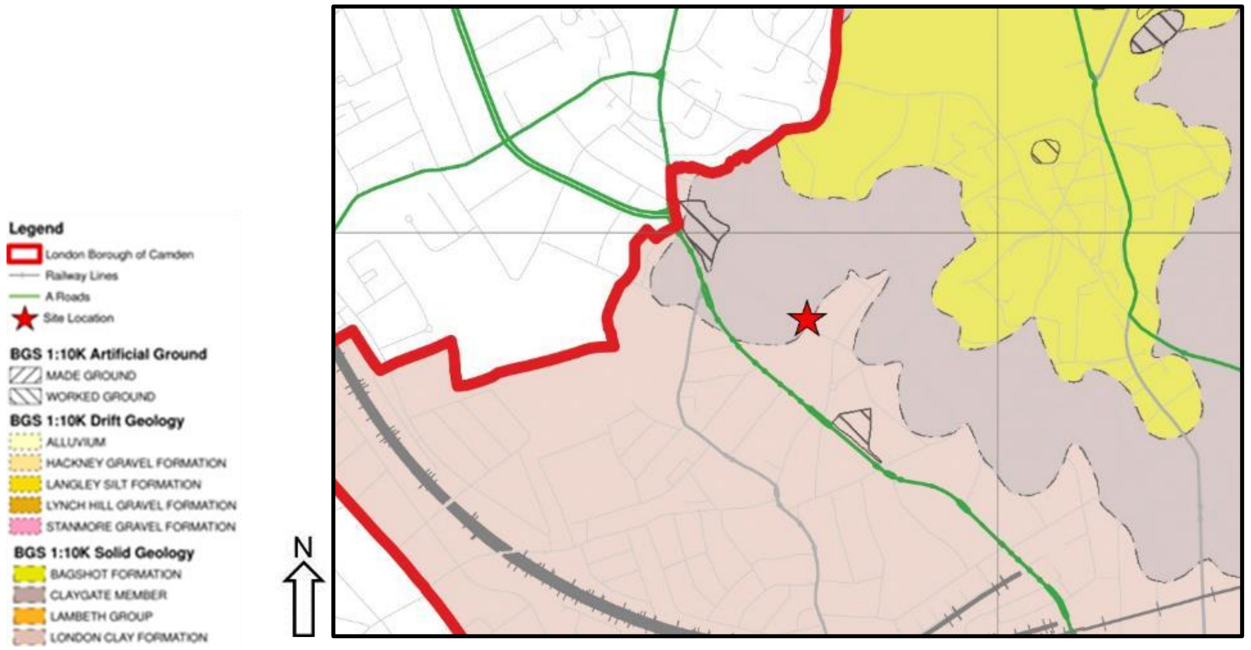


Figure (e)
Geological Map
(Extract from Fig 4 of Camden Geological, Hydrogeological and Hydrological Study)

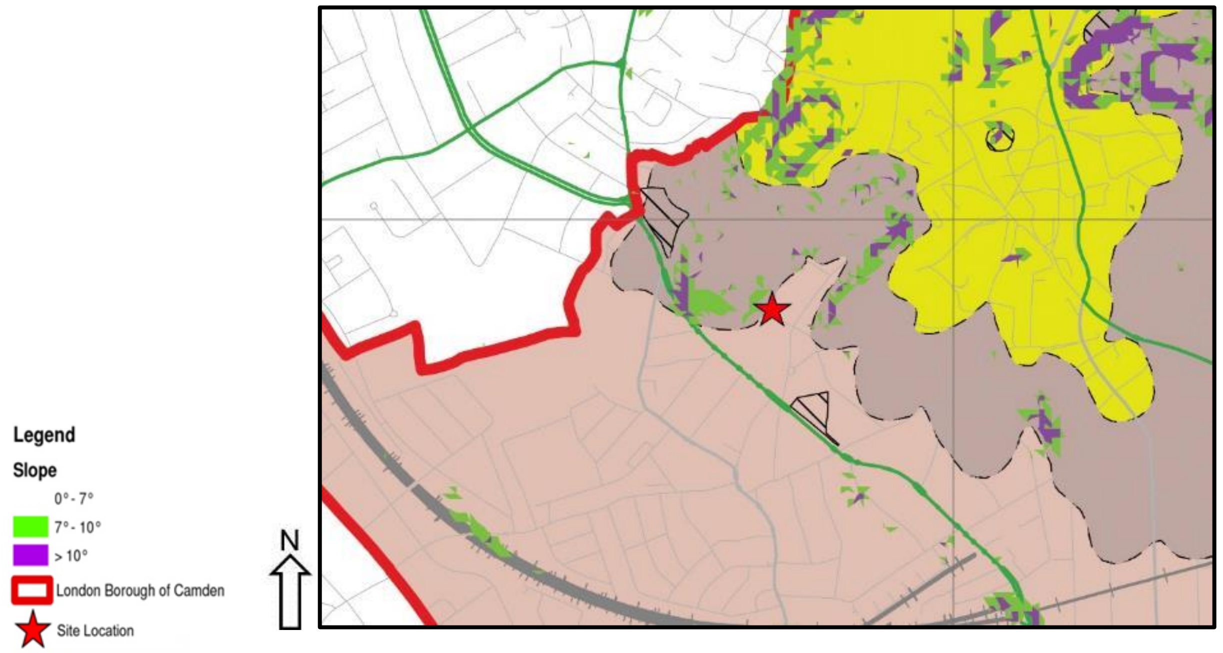


Figure (f)
Slope Angle Map
(Extract from Fig 16 of Camden Geological, Hydrogeological and Hydrological Study)

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?*

No. We currently have no specific evidence of vegetation induced movement having been experienced on site or in the immediate surrounding area.

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 (refer Figures (b) and (c)), the site is located approximately 150m to the north west of the subterranean River Westbourne. Since London Clay and Claygate Member are generally cohesive strata, spring lines on the stratigraphic boundary are unlikely.

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?*

To be confirmed by Ground Investigation. The Camden Geological, Hydrogeological and Hydrological Study (Figure (a)) suggests the site is above an Unproductive strata but close to the stratigraphic boundary with a Secondary Aquifer, which we understand to be the Claygate Member.

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

No. With reference to the Camden Geological, Hydrogeological and Hydrological Study, the Hampstead pond chains are located to the East approximately 1900m 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 will be less than 5m from a pedestrian passage, Croft Way, adjoining the King's College site.

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

Yes. No.6 Kidderpore Avenue has a lower Ground Floor level than the Coach House and no.1 Kidderpore Gardens has a Lower Ground Floor. However the new development will significantly increase the differential depth of foundations.

Legend

★ Site Location

N

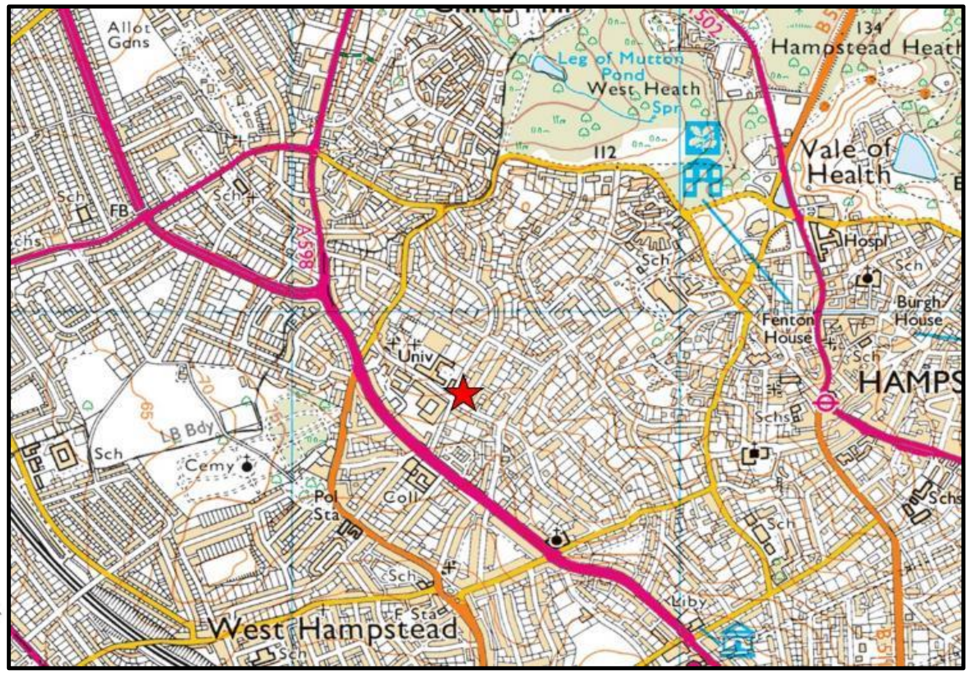


Figure (g)
Topography Map
(Extract from streetmap.co.uk)

Legend

★ Site Location

N

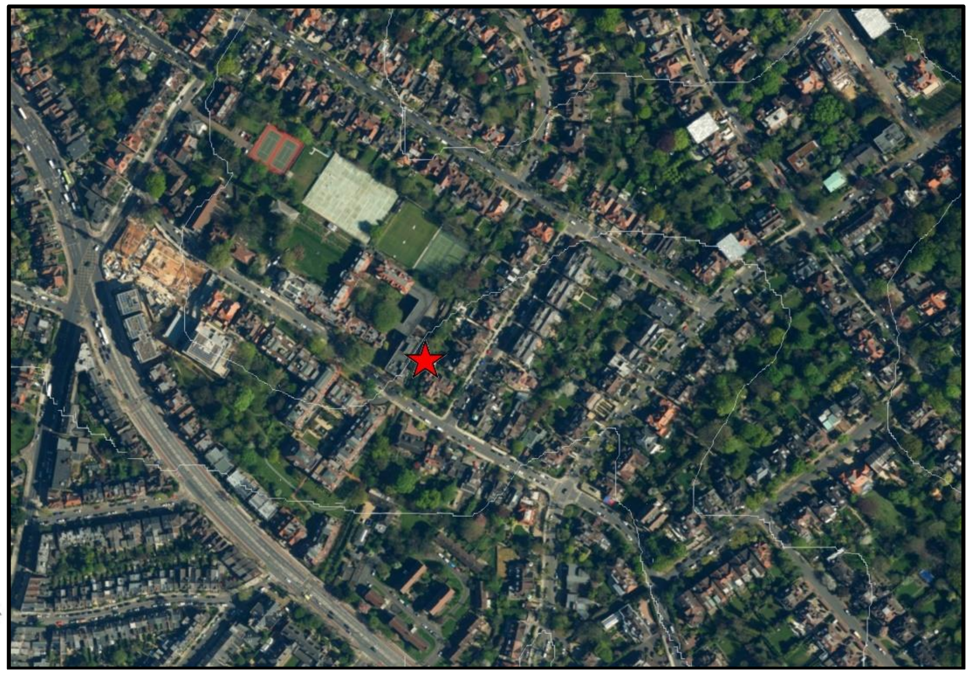


Figure (h)
Topography Map
(Extract from Ordnance Survey Mapping)

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 (j)) there are no tunnels located below 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 site being in proximity of slopes >7°.
- Confirmation as to whether the underlying soil strata is London Clay.
- Establishing whether there is any local evidence of subsidence to adjoining buildings.
- Confirmation as to whether the site is above an Aquifer.
- The basement being within 5m of a pedestrian 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 affecting the slope stability of the neighbouring sites.
- The risk of damaged caused by seasonal shrink-swell of London Clay.
- The risk of structural damage to the adjoining sites during and following the basement construction.
- The risk of structural damage to the adjoining sites caused by soil dewatering.
- The risk of damage to the road or pavement, or any underground services buried under.
- The risk of damage to the neighbouring properties.

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.

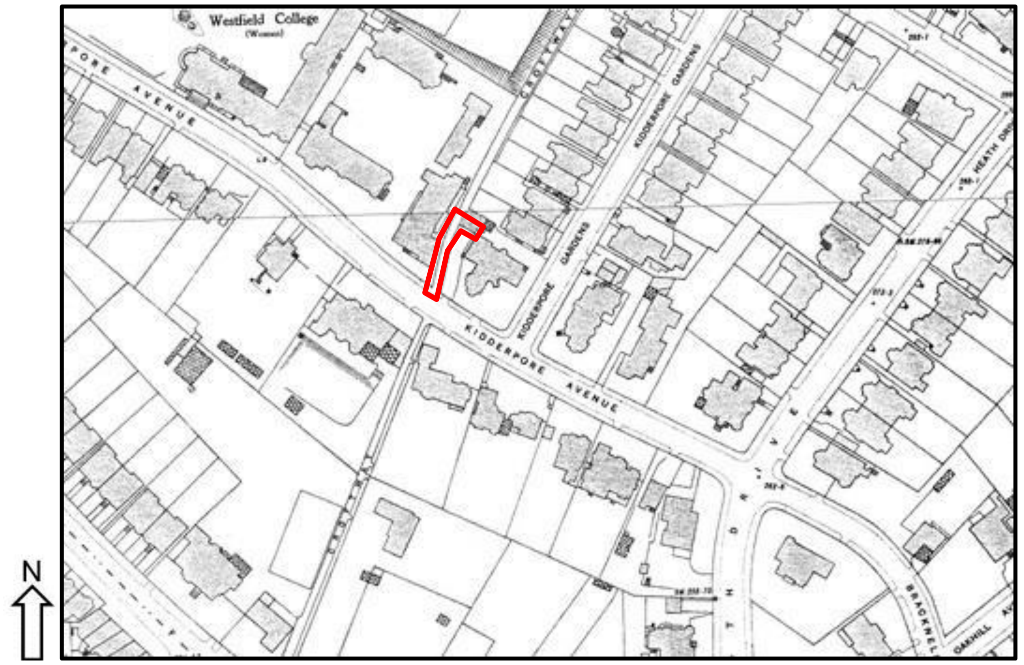


Figure (i)
1873 Map

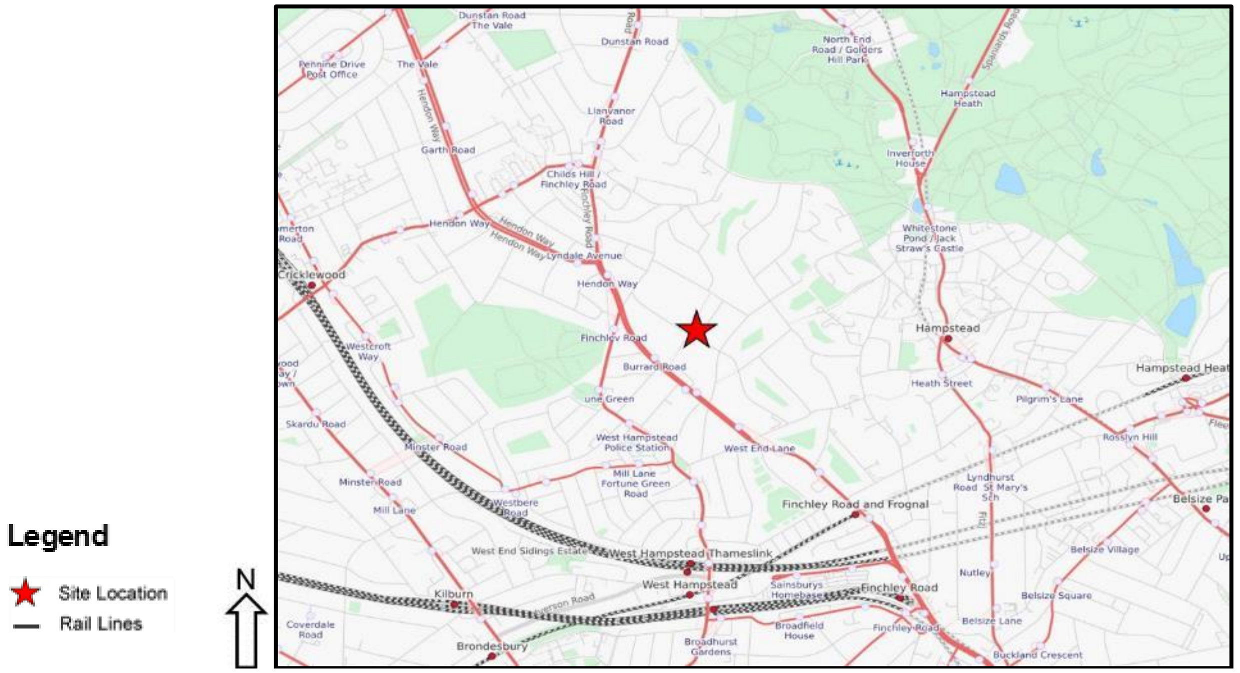


Figure (j)
Map of Underground Infrastructure
(Extract from Open Street Map)

4.03 Stage 3: Site Investigation and Study

4.03.1 The Jomas Associates' Site Investigation of May 2017 is summarised in their report P9945J1083 (latest revision June 2019). 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.
- Ground water was not encountered during the investigations but was found during the return visits, but below the level of the proposed basement.

4.03.2 In addition, a Ground Movement Assessment was carried out by Jomas dated December 2018 (latest revision June 2019)

4.04 Stage 4: Impact Assessment

4.04.1 The proposed basement is around 3.50m deep and will be excavated 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.
The section of retaining wall along the boundary with no. 6 Kidderpore Avenue will be design for the addition line load imposed by the foundations of the neighbouring property.

4.04.3 Temporary propping will be provided to minimise any local ground movements during excavation works and prior to the reconstruction of the ground floor, which will act as a permanent prop. To ensure the effectiveness of the propping, pre-loaded and adjustable; 'active' propping will be adopted.

4.04.3a It is known that a Thames Water main runs along Croft Way. Thames Water 'Mains' and 'Design' teams have been contacted in respect of the works, and all necessary approvals will be obtained prior to commencement of works to ensure the method is agreed with Thames Water.

The pavement will be scanned and marked prior to the commencement of the works to ensure the location of any other services are identified. Further trial pits to the walls adjacent to Croft Way will be carried out in advance of the works to confirm that these have similar depth and profile to the adjoining walls.

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 new basement will not suffer from seasonal shrink swell subsidence as the depth of the proposed basement will be below the level of any tree root activity.

4.04.6 No surface water feature, such as water courses or potential spring line, 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 As noted within the Section 4.01.1, the site is level. Whilst the slope angle map shows areas approximately in the vicinity with slopes greater than 7 degrees, these are remote from the site situated approximately 80m to the west of the boundary with Croft Way. Assuming that the excavation for a single level of basement would be 3.5m, this would mean that there would be a slope angle of 2.5 degrees from the base of the excavation to the change in slope.

It should also be noted that the buildings and redevelopment between the site and the area of increased slope angle will have foundations and retaining walls that will extend into underlying deeper geology and further reduce the potential for the construction of a single level basement at 6 Kidderpore Avenue to have an impact on the stability of these slopes.

Ground Movements

4.04.8 Consideration has been given as to the foundation and elevations of the adjoining properties, as described in clause 4.01.13.

4.04.8a To assist in determining the impact of the proposals, Jomas Associates have carried out a Ground Movement Assessment - refer section 3 of their report.

4.04.8b The report notes that the assessment has been undertaken using proprietary spreadsheets and the commercially available software Oasys Pdisp and Xdisp, which consider the three-dimensional ground movement field induced by the proposed works. The analysis suggests that the damage to adjoining properties could be 'Category 0-Negligible' or worst case 'Category 1-Very Slight' as defined by Burland.

4.04.9 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

4.04.10 Measurement monitoring of the temporary works, Party Walls and adjoining structures (especially where these are showing sign of existing cracking) 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.

4.04.11 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.

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 a surface water drainage system and discharged to the combined sewer in Kidderpore Avenue. Refer Thames Water asset search in Appendix B. The invert level of the sewers are around 3m below street level.

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

To be established. 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 be generally be from roofs, or external hard landscaping as existing.

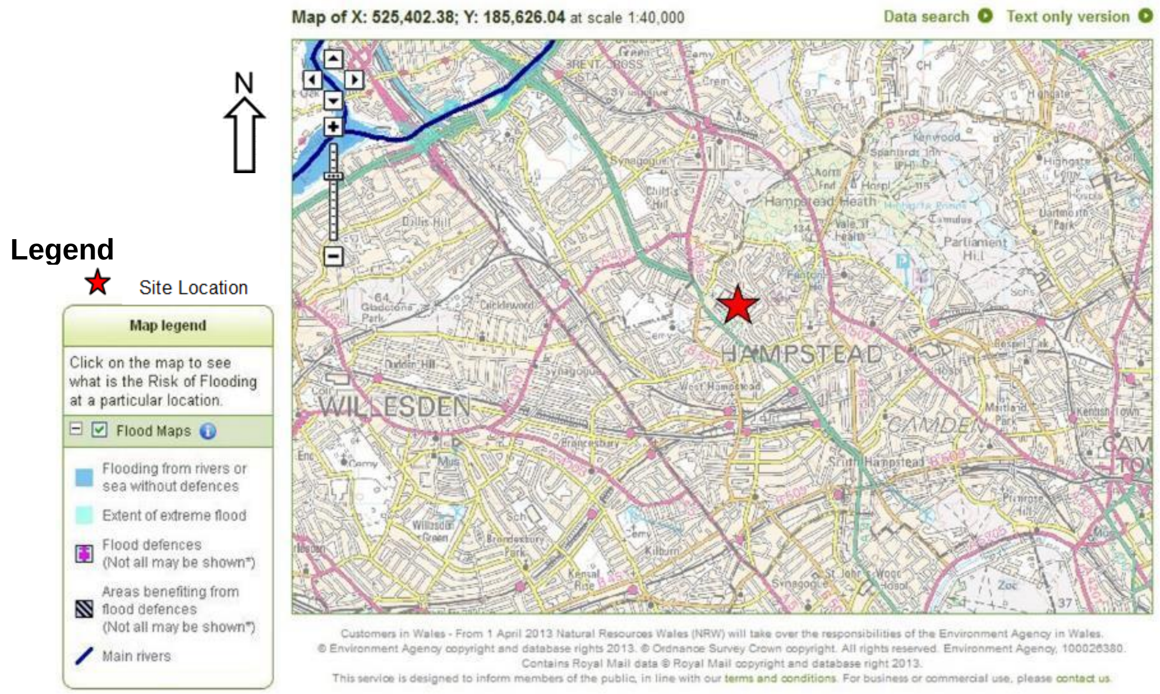


Figure (n)
Areas at Risk of Flooding from Rivers or Sea
(Extract from Environment Agency flood map)

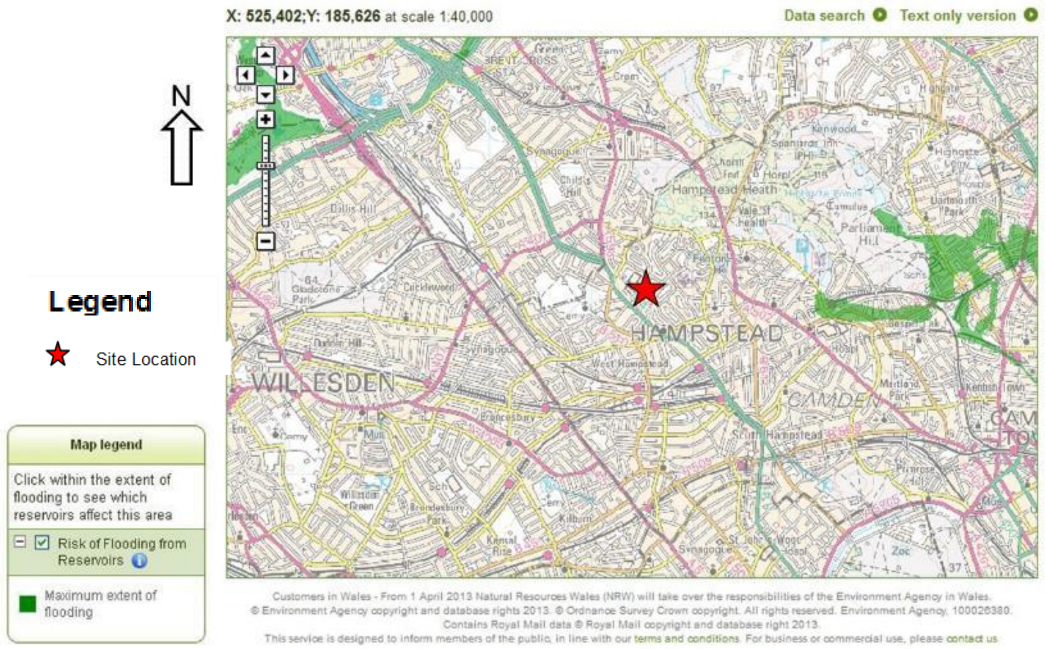


Figure (o)
Areas at Risk of Flooding from Reservoirs
(Extract from Environment Agency flood map)

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 aspects that should be carried forward to a scoping stage in respect of Surface Flow and Flooding are:-

- Confirmation as to whether there is any increase in hard landscaped areas.

5.01.7 On the basis of the above and in accordance with the Figure 14 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 loft landscaping before and after the proposed works.

5.03.2 The existing rear garden is astroturf laid on top of concrete slabs joined with mortar, representing impermeable hard landscaping.

The proposal for the rear garden is to remove the existing hard standing, and subbase and install new topsoil for the growing of grass and/or installation of other permeable surfaces.

To the front garden, the existing shed will be removed, along with its supporting concrete slab, to be replace with soft landscaping. Soil and gardens will be created in its place.

5.03.3 There is a small increase in the building footprint but it is more than offset by the replacement of hard landscaping with gardens and permeable surfacing as described above.

5.04 Stage 4: Impact Assessment

5.04.1 As set out in section 5.03 above, there will be no increase in impermeable area as a result of the works.

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.

Figure (p)
Flood Map
(Extract from Fig 15 of Camden Geological, Hydrogeological and Hydrological Study)

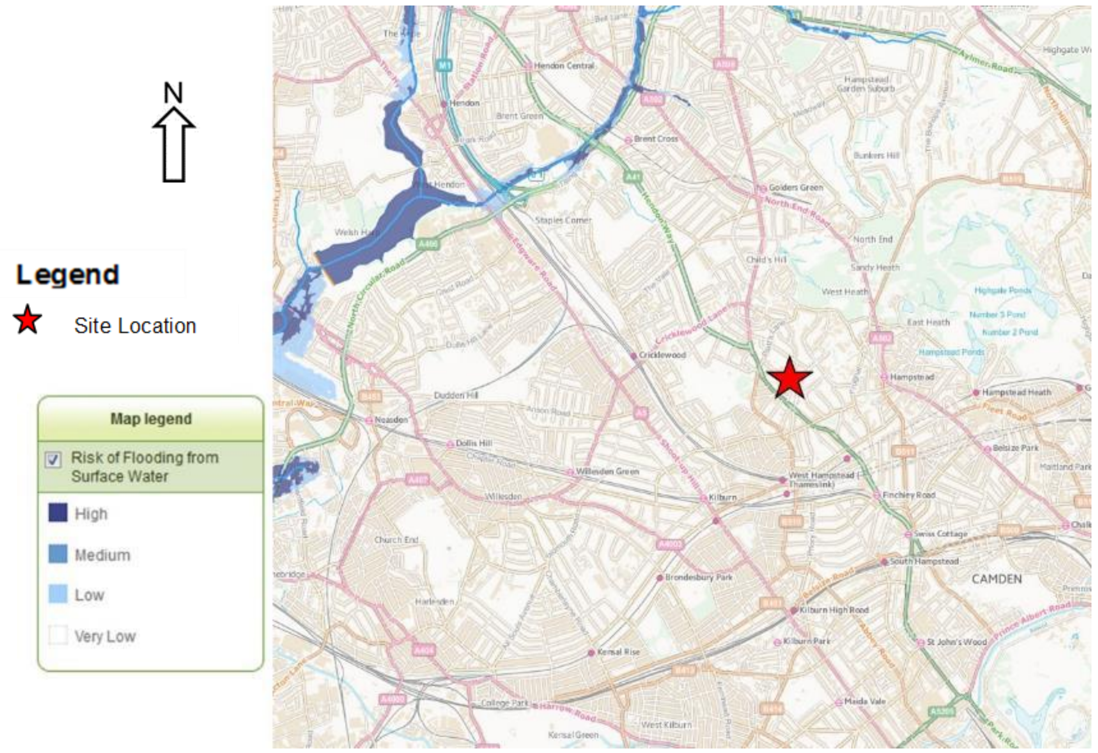


Figure (q)
Flooding from Surface Water
(Extract from Environment Agency flood map)

APPENDIX A

IMPERMEABLE AREA PLANS

`

KEY

- Impermeable Area (building)
- Impermeable Area (external)
- Soft landscaping
- Shared driveway

Figure A1 - Existing Impermeable Area Plan

KEY

- Impermeable Area (building)
- Impermeable Area (external)
- Soft landscaping
- Shared driveway

Figure A2 - Proposed Impermeable Area Plan

APPENDIX B

THAMES WATER RECORDS

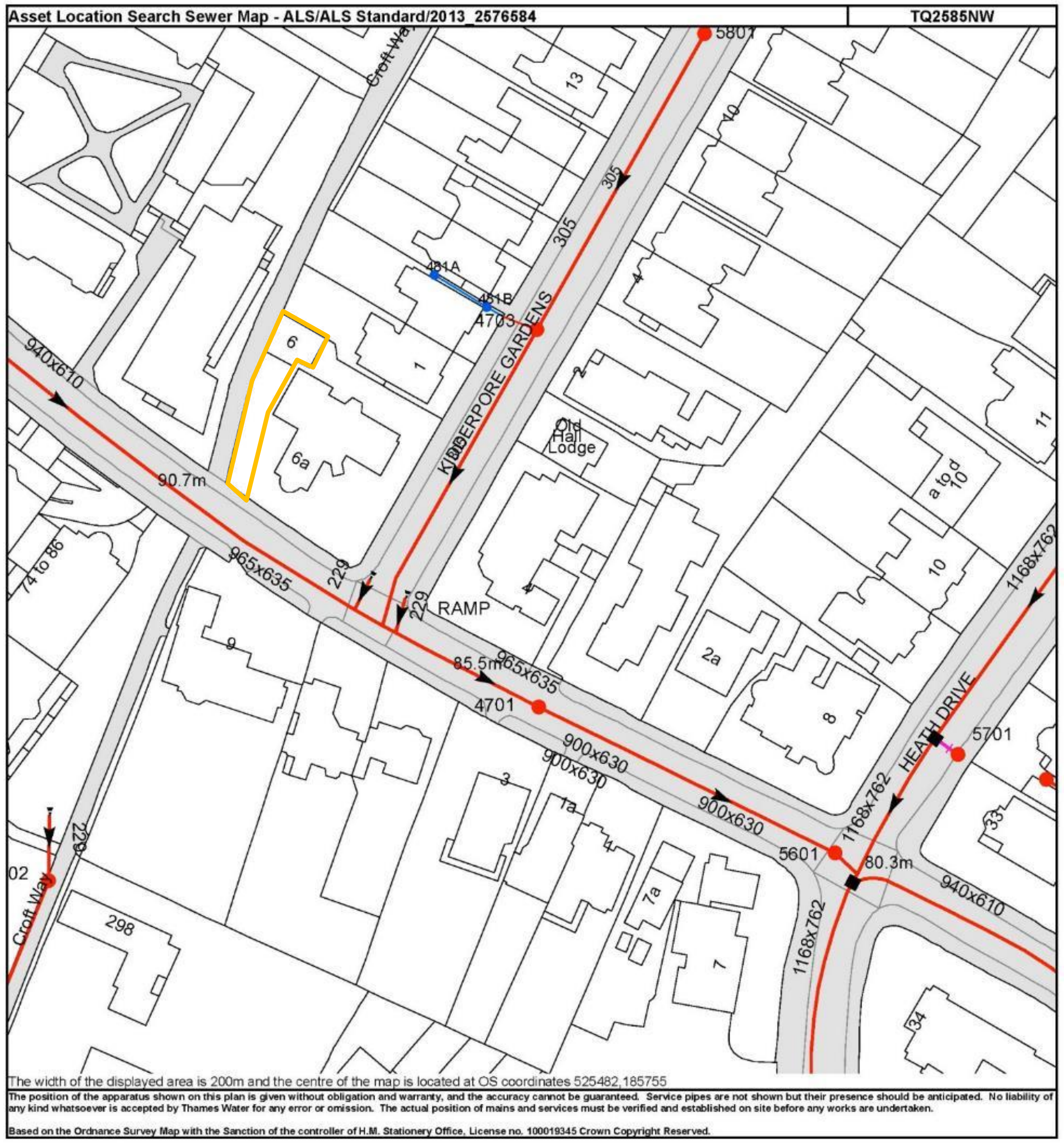


Figure B1 - Extract from Thames Water Asset Search showing a combined sewer

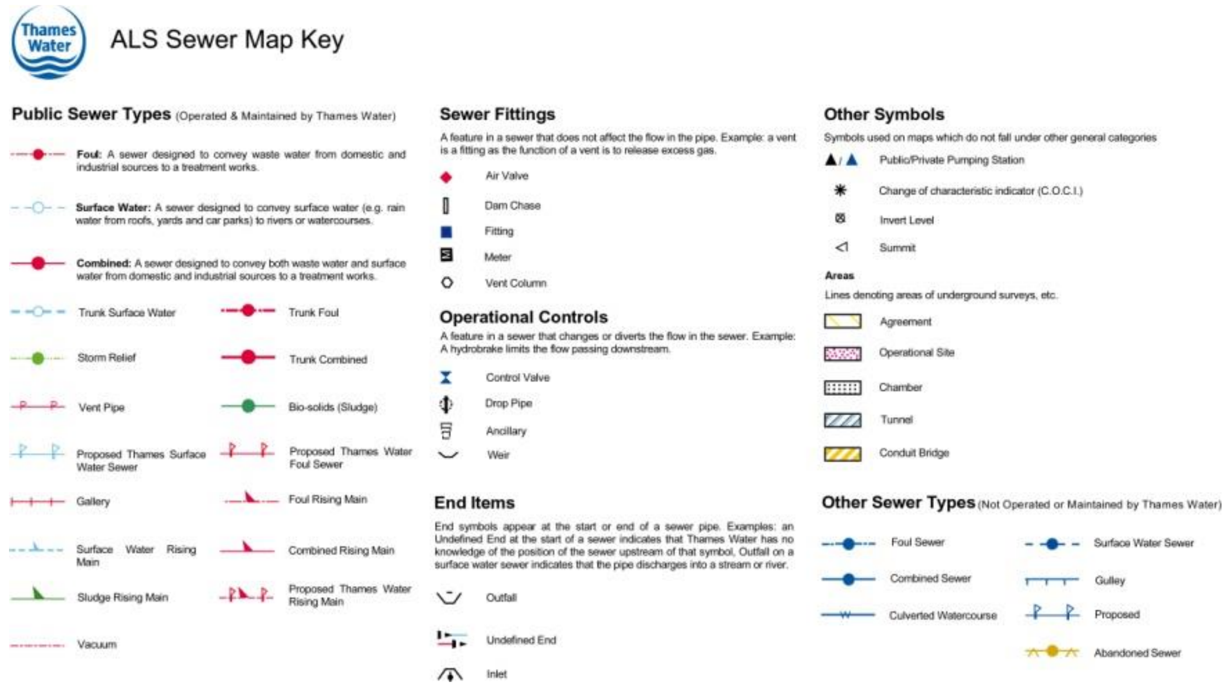


Figure B2 - Key to Thames Water Asset Search

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
481A	n/a	n/a
481B	n/a	n/a
3602	83.88	82.09
4703	87.94	85.04
4701	84.53	81.17
5801	89.6	85.83
5601	79.9	76.07
5701	n/a	n/a
-	-	-
57BG	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

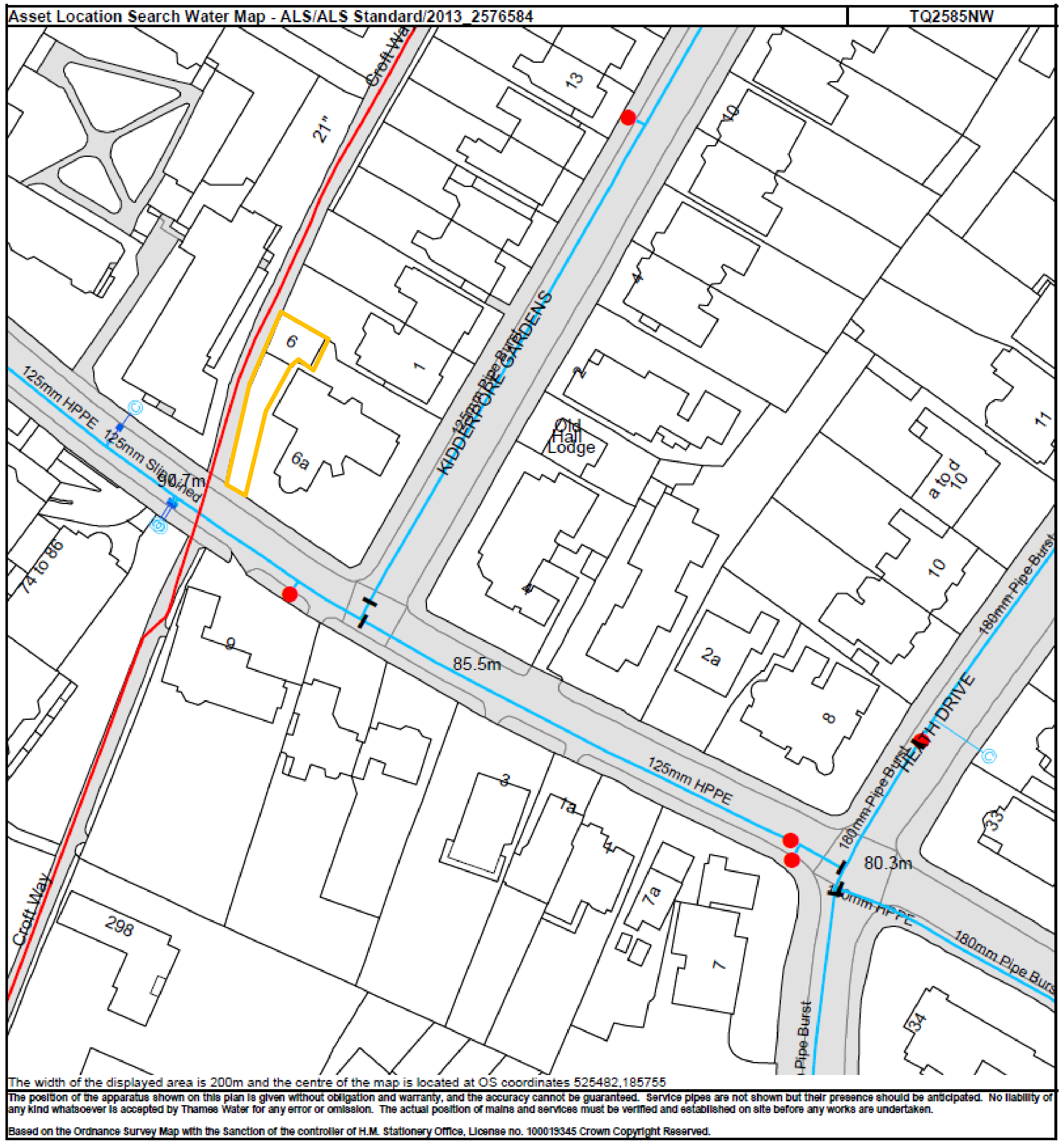


Figure B4 - Extract from Thames Water Asset Search showing the Water Map

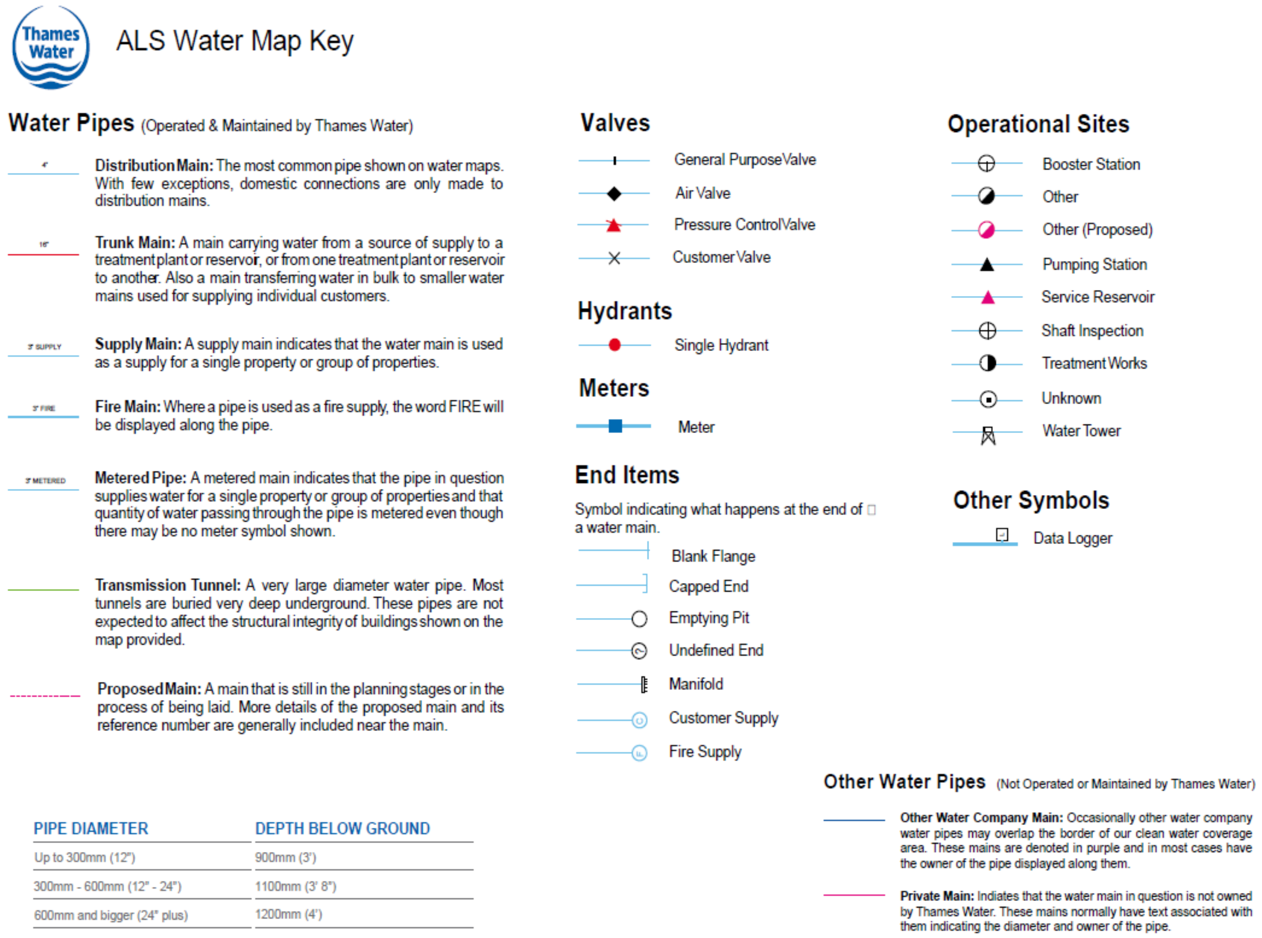


Figure B5 - Key to Thames Water Asset Search

Sewer Flooding

History Enquiry

Property Searches

Michael Alexander Consulting Engineers

Search address supplied The Coach House
6
Kidderpore Avenue
London
NW3 7SP

Your reference	P3439 6 Kidderpore Avenue NW3
Our reference	SFH/SFH Standard/2017_3563009
Received date	**8 May 2017**
Search date	**8 May 2017**

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

0845 070 9148

Sewer Flooding

History Enquiry

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

0845 070 9148

APPENDIX C

PHOTOGRAPHS

Photograph 1 – Aerial view

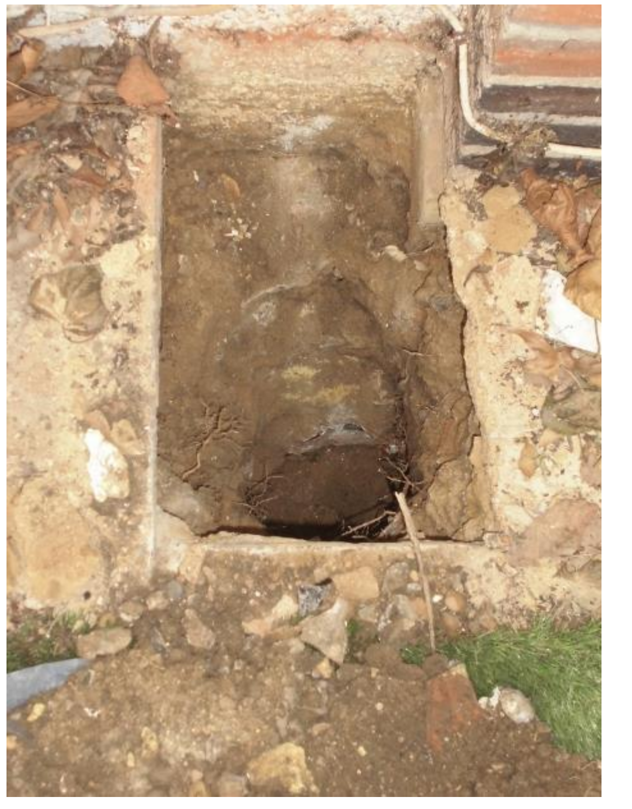
Photograph 2 – Aerial view

Photograph 3 – Front view

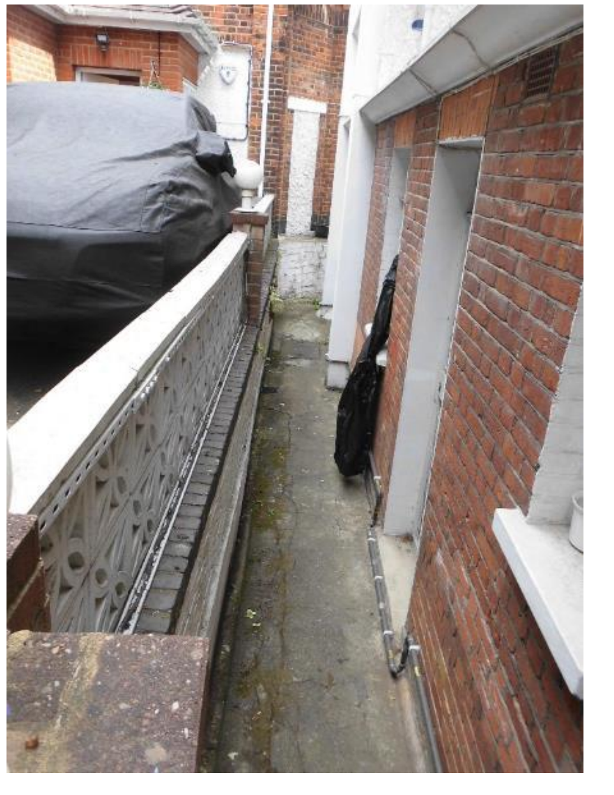
Photograph 4 – Front Elevation

Photograph 5 – Side/Front view

Photograph 6 – Side/Rear view



Photograph 7– Trial pit



Photograph 8 – Side view (6a Kidderpore Avenue boundary)

APPENDIX D

OUTLINE STRUCTURAL DRAWINGS

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 has to 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'. Additional targets will be added to the adjoining structure where these as showing signs of existing cracking. 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 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 existing perimeter walls. This will be carried out to an agreed sequence, to ensure there is at least 2m between any two open pins. A possible approach for the underpinning is shown on drawing P3439 BIA 20, which illustrates the propping that will be required during the excavation works. 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 existing ground floor foundation level.

E.07 Lateral props will be installed within the existing buildings close to ground and first floor levels 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.08 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.09 The remaining sections of retaining structure, outside the footprint of the house, can then be constructed in sections. To the pedestrian passage adjoining King's College London Hampstead campus side, temporary works will be installed to ensure the stability of the adjoining pavement. Internally the retaining structure will be a reinforced concrete wall cast in sections.

E.10 Bulk excavation will then commence. Any minor water inflows to the basement excavation will be collected in sumps and pumped. Temporary horizontal active propping will be installed as described previously to ensure immediate action can be taken in case the soil movements approach trigger values. Permanent propping will be achieved by the ground floor slab. Regular monitoring readings will be taken and compared with 'Red' and 'Amber' trigger levels.

E.11 When bulk excavation is complete to basement level, the bottom surface of the excavation will be immediately blinded.

E.12 The basement suspended 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.13 Works can then proceed with the construction of the ground floor slab.

E.14 Following completion of the ground floor slab, which acts as a permanent prop to the excavation, the propping can be removed.

E.15 The renovation of the superstructure of the new building can then be progressed. As the new first floor level is constructed and tied into the walls, the temporary lateral propping can be 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 **Roof**

Dead Load		
Finishes	0.60	kN/m^2
Battens and Insulation	0.20	kN/m^2
Roof rafters	0.25	kN/m^2
Ceiling and Services	0.35	kN/m^2
Total Dead Load	**1.40**	**kN/m^2**
Total Live Load	**0.60**	**kN/m^2**

New Ground Floor

Dead Load		
Finishes	0.15	kN/m^2
155mm Beam & Block floor	1.80	kN/m^2
75mm Screed	1.80	kN/m^2
Ceiling and Services	0.35	kN/m^2
Total Dead Load	**4.10**	**kN/m^2**
Total Live Load (+1.0 kN/m^2)	**2.50**	**kN/m^2**

New First Floor

Dead Load		
Timber Boards and Finishes	0.20	kN/m^2
Timber Joists	0.25	kN/m^2
Ceiling and Services	0.35	kN/m^2
Total Dead Load	**0.80**	**kN/m^2**
Total Live Load (+1.0 kN/m^2)	**2.50**	**kN/m^2**

Existing 330 thk External walls *(Solid brick wall)*

Dead Load		
330mm thk Brick wall	7.30	kN/m^2
Finishes	0.10	kN/m^2
Total Dead Load on elevation	**7.40**	**kN/m^2**

F4.00 CANTILEVERING RETAINING WALL

F4.01 <u>Line Load Imposed On The Retaining Wall by The Neighboring Property</u>

Assumed typical loading:

Roof: DL= 1.6 kN/m^2
LL= 0.6 kN/m^2

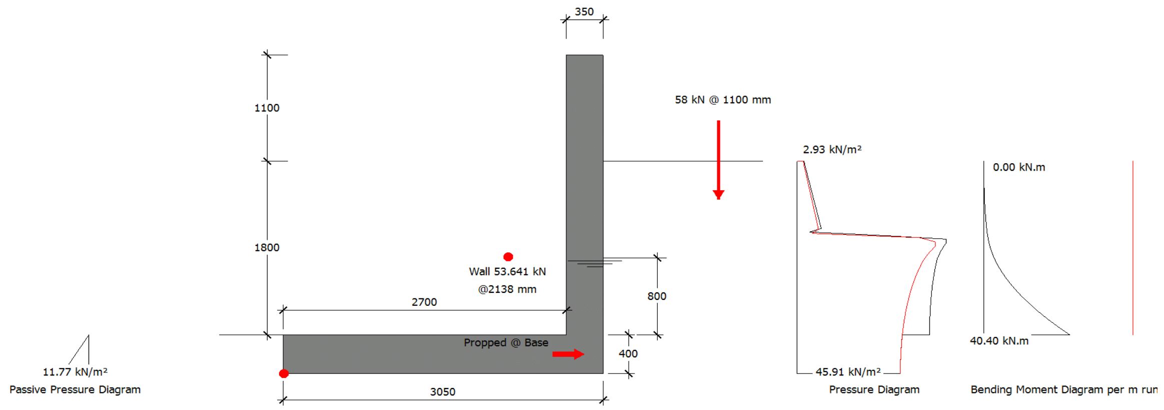
Floors: DL= 0.8 kN/m^2
LL= 2.50kN/m^2

Wall: DL= 4.9 kN/m^2

Assumed floors and roof tributary with: 3.8m
Assumed wall height: 5.0m

Total Dead Load= ((1.6 + 0.8 + 0.8) x 3.8) + (4.9 x 5.0) = 36.7 kN/m
Total Live Load= ((0.6 + 2.5 + 2.5) x 3.8) = 21.3 kN/m
Total Load= 36.7 + 21.3 = 58 kN/m

F4.02



Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Dry Soil 19.00, Saturated Soil 21.40, Submerged Soil 11.40, Concrete 24.0
Concrete grade	fcu 40 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 45 mm, Wall outer cover 45 mm, Base cover 50 mm
Reinforcement design	fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 5.00 kN/m², Water table level 800 mm
Unplanned excavation depth	Front of wall 1 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	58.0 kN/m @ X 1100 mm and Y 400 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 105.00 kN/m², @ back 105.00 kN/m²
Back Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(18)/1.2))) = 11.48°
Front Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°

Loading Cases

G_{Wall}- Wall & Base Self Weight, P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge, P_p- Passive Earth Pressure

Case 1: Geotechnical Design	1.00 G_{Wall}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p
Case 2: Structural Ultimate Design	1.40 G_{Wall}+1.00 P_a+1.00 $P_{surcharge}$+1.00 P_p

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	63.867/114.690	0.557	OK

Wall Sliding - Virtual Back Pressure

Fx/($Rx_{Friction}$+ $Rx_{Passive}$)	0.000/(10.893+2.355)	0.000	OK
Prop Reaction Case 2 (Service)	78.2 kN @ Base		

Soil Pressure

Virtual Back	37.744/105 kN/m², Length under pressure 2.842 m	0.359	OK
Wall Back	43.977/105 kN/m², Length under pressure 2.439 m	0.419	OK

Structural Design

Prop Reaction

Maximum Prop Reaction (Ultimate) 86.6 kN @ Base

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	299 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm²	284 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 51 mm, 16 mm, 0.05	69.9 kN.m	
Moment Capacity Check (M/Mr)	M 40.4 kN.m, Mr 69.9 kN.m	0.578	OK
Shear Capacity Check	F 68.2 kN, vc 0.456 N/mm², Fvr 136.4 kN	0.50	OK

Base Top Steel Design

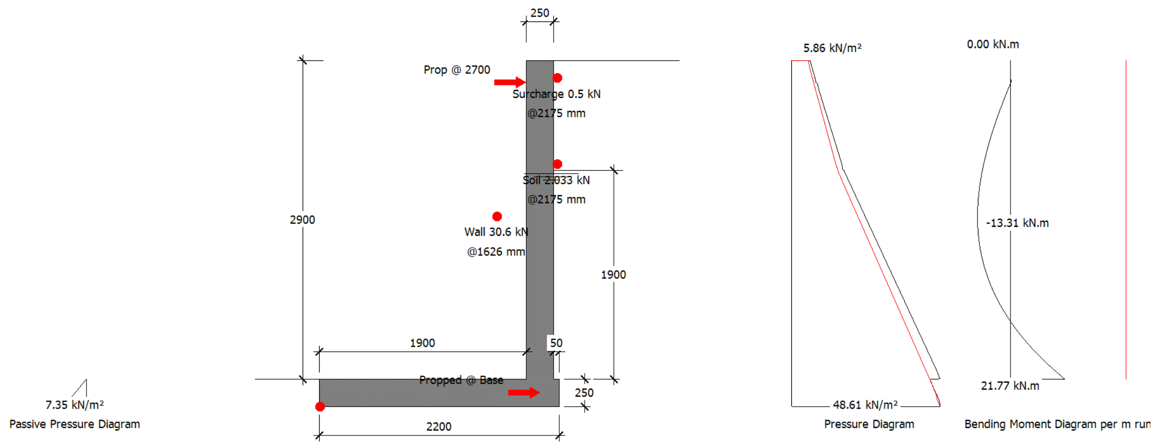
Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	344 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	327 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.05	80.4 kN.m	
Moment Capacity Check (M/Mr)	M 0.0 kN.m, Mr 80.4 kN.m	0.000	OK
Shear Capacity Check	F 0.0 kN, vc 0.420 N/mm², Fvr 144.6 kN	0.00	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	344 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	327 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.05	80.4 kN.m	
Moment Capacity Check (M/Mr)	M 64.9 kN.m, Mr 80.4 kN.m	0.807	OK
Shear Capacity Check	F 35.3 kN, vc 0.420 N/mm², Fvr 144.6 kN	0.24	OK

F5.00 BOUNDARY RETAINING WALL

F5.01



Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Dry Soil 19.00, Saturated Soil 21.40, Submerged Soil 11.40, Concrete 24.00
Concrete grade	fcu 40 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 45 mm, Wall outer cover 45 mm, Base cover 50 mm
Reinforcement design	fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Fully drained

† 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 @ 2.7 m
† Dimensions	All props are measured from the top of the base

Soil Properties

Soil bearing pressure	Allowable pressure @ front 105.00 kN/m², @ back 105.00 kN/m²
Back Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(18)/1.2))) = 11.48°
Front Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°

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	86.752/108.523	0.799	OK

Wall Sliding - Virtual Back Pressure

$Fx/(Rx_{Friction}+Rx_{Passive})$	0.000/(6.728+0.919)	0.000	OK
Prop Reactions Case 2 (Service)	60.7 kN @ Base, 18.1 kN @ 2.950 m		

Soil Pressure

Virtual Back	33.617/105 kN/m², Length under pressure 1.971 m	0.320	OK
Wall Back	39.065/105 kN/m², Length under pressure 1.696 m	0.372	OK

Structural Design

Prop Reactions

Maximum Prop Reactions (Ultimate)	65.2 kN @ Base, 20.2 kN @ 2.700 m

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	199 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm²	189 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 51 mm, 16 mm, 0.08	46.5 kN.m	
Moment Capacity Check (M/Mr)	M 21.8 kN.m, Mr 46.5 kN.m	0.468	OK
Shear Capacity Check	F 53.5 kN, vc 0.579 N/mm², Fvr 115.2 kN	0.46	OK

Wall Design (Outer Steel)

Critical Section	Critical @ 1482 mm from base, Case 2		
Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (45 mm) Dist. H12@200 (57 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	199 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm²	189 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 51 mm, 16 mm, 0.08	46.5 kN.m	
Moment Capacity Check (M/Mr)	M 13.3 kN.m, Mr 46.5 kN.m	0.286	OK
Shear Capacity Check	F 0.2 kN, vc 0.579 N/mm², Fvr 115.2 kN	0.00	OK

Base Top Steel Design

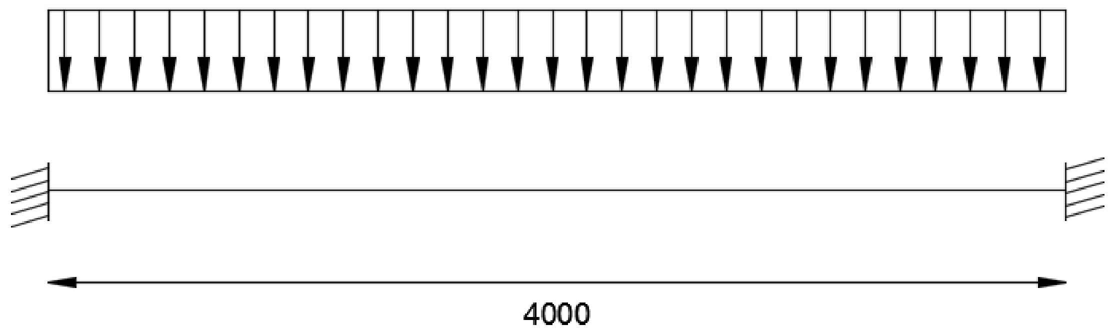
Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	194 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	184 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.08	45.3 kN.m	
Moment Capacity Check (M/Mr)	M 0.1 kN.m, Mr 45.3 kN.m	0.002	OK
Shear Capacity Check	F 3.6 kN, vc 0.587 N/mm², Fvr 113.9 kN	0.03	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	194 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	184 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.08	45.3 kN.m	
Moment Capacity Check (M/Mr)	M 32.5 kN.m, Mr 45.3 kN.m	0.718	OK
Shear Capacity Check	F 27.4 kN, vc 0.587 N/mm², Fvr 113.9 kN	0.24	OK

F5.02 The wall type is in reality a cantilevered wall; the propping action is provided by an RC beam/corbel integrated in top end of the wall which will span horizontally between return walls.

UDL = prop reaction = 20.2 kN/m



The actions on the rc beam therefore are:

$M = 1.6 \times w \times l^2 / 12 = 1.6 \times 20.2 \times 4^2 / 12 = 43.1$ kNm

$S = 1.6 \times w \times l / 2 = 64.6$ kN

ELEMENT DESIGN to BS 8110:2005
RECTANGULAR BEAMS
Originated from RCC11.xls v4.0 © 2006 - 2010 TCC
mpa The Concrete Centre

INPUT Location RC beam/corbel

Design moment, M	43.1	kNm	fcu	40 N/mm²	γc =	1.50
ßb	1.00		fy	500 N/mm²	γs =	1.15
Span	4000	mm	steel class	A		
Height, h	250	mm	Comp cover	45 mm to main reinforcement		
Breadth, b	300	mm	Tens cover	45 mm to main reinforcement		
Tens Ø	16	mm	Side cover	45 mm to main reinforcement		
Comp Ø	16	mm	Section location	CONTINUOUS SPAN		

OUTPUT RC beam/corbel
d = 250 - 45 - 16/2 = 197.0 mm
(3.4.4.4) K' = 0.156 > K = 0.093 ok
(3.4.4.4) z = 197.0(0.5 + (0.25 - 0.093/0.893)^½) = 174.1 < 187.2 mm
(Fig 3.3) fst = 434.8 N/mm²
As = 1E6 x 43.1 /173.9 /434.8 = 570 mm²
PROVIDE 3H16 tension steel = 603 mm²
(Equn 8) fs = 2/3 x 500 x 570 /603 = 315.1 N/mm²
(Table 3.11) Comp mod factor = 1 + 0.680 /(3 + 0.680) = 1.185 < 1.5
(Table 3.10) Tens mod factor = 0.55 + (477 - 315.1) /120 /(0.9 + 3.702) = 0.843 < 2
(3.4.6.3) Permissible L/d = 26.0 x 1.185 x 0.843 = 25.978
(3.4.6.1) Actual L/d = 4000 /197.0 = 20.305 ok

ELEMENT DESIGN to BS 8110:2005
BEAM SHEAR
Originated from RCC11.xls v4.0 © 2006 - 2010 TCC
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INPUT Location RC beam/corbel
fcu = 40 N/mm² γc = 1.50
fyl = 500 N/mm² γs = 1.15
steel class A

d	b
250	300

Main Steel		Link	Legs	Side cover	Shear V	UDL
6	16	10	2	45	64.6	20.2
No	mm Ø	mm Ø	No	mm	kN	kN/m

OUTPUT RC beam/corbel
As = 1206 N/mm² = 1.608%
(Eqn 3) v = 64.6 x 10³ /300 /250 = 0.861 N/mm²
(Table 3.8) vc = 0.974 N/mm², from table 3.8
(v - vc)bv = 120.0 N/mm = nominal
PROVIDE 2 legs H10 @ 175 = 128.6 N/mm
(nominal)

Provide 3- H16 to both faces in the top 300mm of the wall with H10 closed links at 175mm centers.

F6.00 UNDERPINNING TYPICAL

F6.01 **Line Load Imposed On The Underpinning**

Assumed typical loading:

Roof: DL= 1.6 kN/m^2
LL= 0.6 kN/m^2

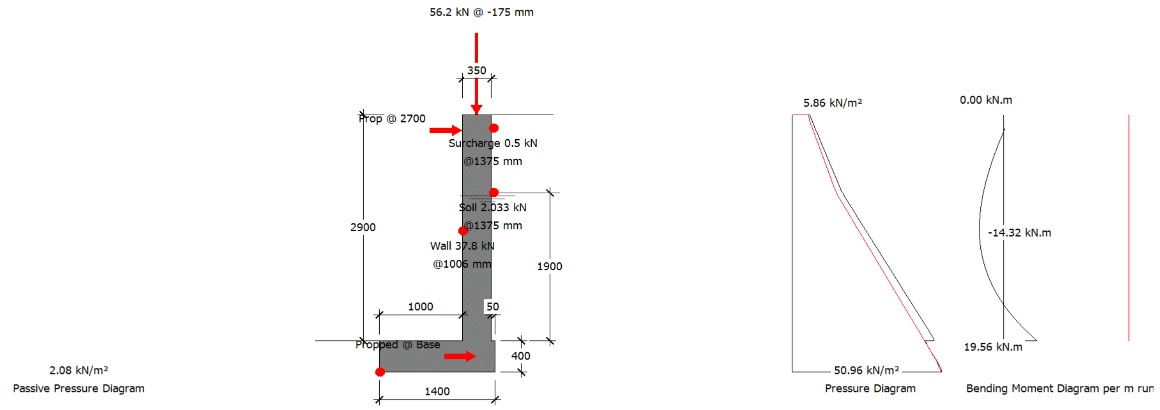
Floor: DL= 0.8 kN/m^2
LL= 2.50kN/m^2

Wall: DL= 7.4 kN/m^2

Assumed floors and roof tributary with: 7.5m / 2 = 3.75m
Assumed wall height: 4.8m

Total Dead Load= ((1.6 + 0.8) x 3.75) + (7.4 x 4.8) = 44.5 kN/m
Total Live Load= ((0.6 + 2.5) x 3.75) = 11.7 kN/m
Total Load= 44.5 + 11.7 = 56.2 kN/m

F6.02



Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Dry Soil 19.00, Saturated Soil 21.40, Submerged Soil 11.40, Concrete 24.00
Concrete grade	fcu 40 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 30 mm, Wall outer cover 50 mm, Base cover 50 mm
Reinforcement design	fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Fully drained

† 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 @ 2.7 m
Vertical Line Load	56.2 kN/m @ X -175 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 105.00 kN/m², @ back 105.00 kN/m²

Back Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°		
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(18)/1.2))) = 11.48°		
Front Soil Friction and Cohesion	ϕ = Atn(Tan(18)/1.2) = 15.15°		

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	99.170/165.866	0.598	OK

Wall Sliding - Virtual Back Pressure

$Fx/(Rx_{Friction}+ Rx_{Passive})$	0.000/(19.603+0.074)	0.000	OK
Prop Reactions Case 2 (Service)	67.5 kN @ Base, 18.8 kN @ 3.100 m		

Soil Pressure

Virtual Back (No uplift)	Max(71.638/105, 66.267/105) kN/m²	0.682	OK
Wall Back (No uplift)	Max(82.544/105, 55.360/105) kN/m²	0.786	OK

Structural Design

Prop Reactions

Maximum Prop Reactions (Ultimate)	71.9 kN @ Base, 21.0 kN @ 2.700 m

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main H12@200 (30 mm) Dist. H12@200 (42 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	314 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm²	298 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.05	73.4 kN.m	
Moment Capacity Check (M/Mr)	M 19.6 kN.m, Mr 73.4 kN.m	0.267	OK
Shear Capacity Check	F 52.7 kN, vc 0.443 N/mm², Fvr 139.3 kN	0.38	OK

Wall Design (Outer Steel)

Critical Section	Critical @ 1470 mm from base, Case 2		
Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (30 mm) Dist. H12@200 (42 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	294 mm, 1000 mm, 565 mm², 500 N/mm², 40.0 N/mm²	279 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 36 mm, 16 mm, 0.05	68.7 kN.m	
Moment Capacity Check (M/Mr)	M 14.3 kN.m, Mr 68.7 kN.m	0.208	OK
Shear Capacity Check	F 0.7 kN, vc 0.461 N/mm², Fvr 135.5 kN	0.01	OK

Base Top Steel Design

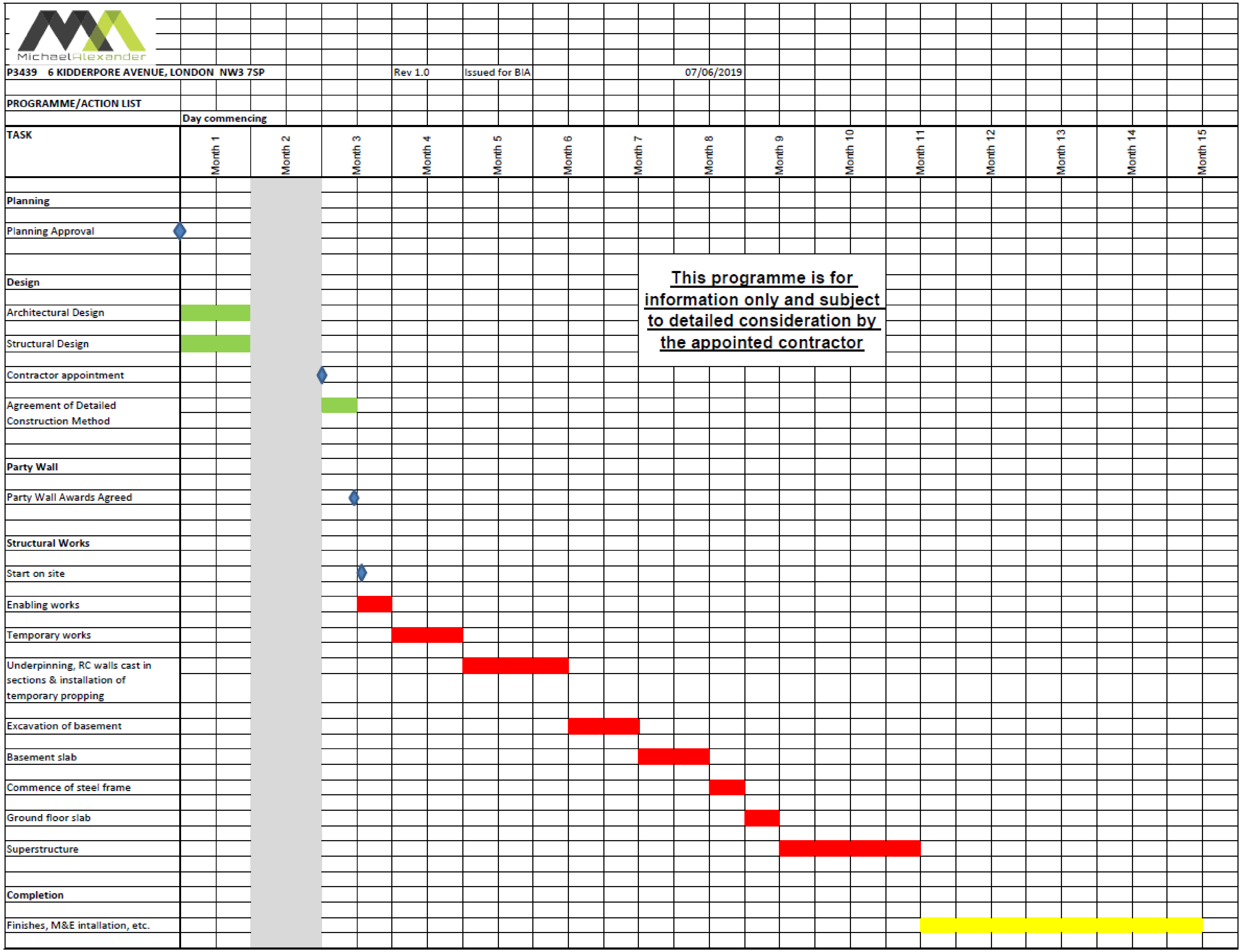
Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	344 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	327 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.05	80.4 kN.m	
Moment Capacity Check (M/Mr)	M 0.0 kN.m, Mr 80.4 kN.m	0.000	OK
Shear Capacity Check	F 0.0 kN, vc 0.420 N/mm², Fvr 144.6 kN	0.00	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	OK
Compression Steel Provided (Cover)	Main H12@200 (50 mm) Dist. H12@200 (62 mm)	565 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	344 mm, 1000 mm, 565 mm², 500 N/mm², 40 N/mm²	327 mm	
Mr=fn(above,As',d',x,x/d)	565 mm², 56 mm, 16 mm, 0.05	80.4 kN.m	
Moment Capacity Check (M/Mr)	M 32.0 kN.m, Mr 80.4 kN.m	0.398	OK
Shear Capacity Check	F 76.4 kN, vc 0.420 N/mm², Fvr 144.6 kN	0.53	OK

APPENDIX G

OUTLINE CONSTRUCTION PROGRAMME



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PROGRAMME/ACTION LIST
Day commencing
TASK
Month 1
Month 2
Month 3
Month 4
Month 5
Month 6
Month 7
Month 8
Month 9
Month 10
Month 11
Month 12
Month 13
Month 14
Month 15
Planning
Planning Approval
Design
Architectural Design
Structural Design
Contractor appointment
Agreement of Detailed Construction Method
Party Wall
Party Wall Awards Agreed
Structural Works
Start on site
Enabling works
Temporary works
Underpinning, RC walls cast in sections & installation of temporary propping
Excavation of basement
Basement slab
Commence of steel frame
Ground floor slab
Superstructure
Completion
Finishes, M&E intallation, etc.
This programme is for information only and subject to detailed consideration by the appointed contractor