
81 Avenue Road
London, NW8 6JD

Structural Engineering Report
& Subterranean Construction
Method Statement

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Non-Technical Summary

Elliott Wood Partnership Ltd. has worked on a number of projects in the area and is aware of both the underlying soil and groundwater; the basement extension has been designed with this in mind. The basement extension should have no adverse effect on the local hydrogeology and the site specific site investigation provides further evidence of this.

If the works noted above are properly undertaken by suitably qualified contractors, these works should pose no significant threat to the structural stability of the adjoining properties and infrastructure.

A construction management plan has been completed by Motion in August 2016 which gives advice on the likely programme, vehicular access and site set-up.

All reports have led to the same conclusion: the construction of the basement extension will not have any significant adverse effect on the property, neighbouring properties, groundwater, surface water or slope stability.

1.0 Introduction

- 1.1 Elliott Wood Partnership Ltd. is a firm of Consulting Structural Engineers approximately 120 strong operating from offices in central and south west London and Nottingham. Residential developments of all scales have been central to the workload of the practice with many in the Greater London area. In particular Elliott Wood Partnership Ltd. has been producing designs for basements to both existing and new buildings. To date this numbers approximately 500 sites, many of which have been in the London Borough of Camden. Our general understanding of the development of London, its geology and unique features together with direct experience on many sites puts us in a strong position to advise clients on works to their buildings and in particular the design and construction of their basement.
- 1.2 Elliott Wood Partnership Ltd. was appointed by the Client, B K Mirchandani, to advise on the structural implications of the construction of a new basement extension beneath a site containing 81 Avenue Road. The following report has been prepared to help ensure that the neighbouring properties are safeguarded during the works. The report provides information in accordance with the requirements outlined in the Supplementary Planning Document CPG4 "Basements and lightwells" dated July 2015, which supports Camden Development Policy DP27 "Basements and lightwells" and forms part of the wider Local Development Framework (LDF). It includes information on the site, the proposed alterations and their impact on the site, the building and neighbouring buildings, and provides information on how the basement will be constructed.
- 1.3 Elliott Wood Partnership Ltd. has extensive experience of projects of this type and has previously produced planning reports for other properties in the area. We also have a comprehensive understanding of the underlying ground conditions in the area gained from the numerous basement projects we have completed in the London Borough of Camden.

- 1.4 A preliminary desk study has been completed to establish the general ground conditions and history of the building. The ground conditions and ground water levels have also been confirmed by a site investigation.
- 1.5 The site specific site investigation was completed by Site Analytical Services Ltd. (SAS) in July 2016 and comprised of 3no. augered boreholes. SAS have also completed the Basement Impact Assessment in accordance with Supplementary Planning Document CPG4, which includes a Ground Movement Assessment produced by Applied Geotechnical Engineering (AGE) under the instruction of SAS.

2.0 Description of Existing Buildings and Site

- 2.1 No.81 Avenue Road is a three storey detached residential building on the South-Western side of Avenue Road. Historic maps suggest the property is likely to have been constructed in the 19th Century, with the earliest map studied dated 1871 showing the site to be developed with the existing building and those surrounding it.
- 2.2 The site of No.81 Avenue Road is bounded on each side by no.79 Avenue Road to the south and No.83 to the north. Avenue Road runs along the front of the site to the east, and there are garages located on St. John's Wood Park to the west at the rear of the site.
- 2.3 The building is not Listed, and does not appear to be located in any of the London Borough of Camden's Conservation Areas.
- 2.4 The overall stability of the buildings appears to be provided by the cellular layout of the masonry walls and diaphragm action of the timber floors at each level.
- 2.5 Access is gained to the site from the front of the property via Avenue Road.
- 2.6 Public sewer records have been obtained from Thames Water and these are included in the appendix.
- 2.7 A CCTV survey has been procured to determine the location, size and condition of the existing drainage network. The survey continues through to the connections to the public sewer network to prove connectivity.

3.0 Ground Conditions

- 3.1 Geological maps show that the site is situated in an area of London Clay. The maps available from the British Geological Survey indicate that the site lies directly on top London Clay with no superficial deposits, while historical borehole records from the surrounding area provide more detail, indicating that Made Ground is experienced down to depths of between 0.3m and 1.5m below ground level, with London Clay continuing down which becomes stiffer with depth.
- 3.2 A site investigation was carried out by SAS in July 2016 which comprised of 3no. boreholes. The boreholes drilled to the front of the property (BH1 and BH2) were taken from a ground level of approximately 46.40mSD

to 15m below ground level. The borehole drilled to the rear of the property (BH3) was also taken from a ground level of approximately 46.40mSD down to 15m below ground level.

- 3.3 Ground conditions recorded in BH1 consisted of a 1.6m thick layer of made ground, underlain by firm clay becoming very stiff as the borehole progressed down to the 15m depth at which it was terminated. BH2 indicated 1.2m of made ground underlain by firm clay becoming very stiff at the terminating depth of 15m. BH3 in the rear garden produced the same soil types, with the layer of made ground found to be 0.6m thick over the clay. Water was not encountered in any of the three boreholes at the time of drilling.

Standpipe monitoring has subsequently been carried out after a period of 3-4 weeks and water was still not found in either BH1 or BH2. However water was experienced at 2.30m below ground level in BH3. Given the ground conditions, SAS suggest that the water levels observed in BH3 are likely to be due to isolated pockets of groundwater that may be perched within less permeable material found at shallower depths, especially within any Made Ground.

The presence of water in the future could be subject to seasonal variation. However, at present, significant inflows of groundwater are unlikely to be experienced within the basement excavation.

- 3.5 The site investigation concludes that a safe bearing capacity of 295kN/m² can be safely used for the design of any conventional spread foundations below the proposed basement floor which is adequate for the proposed development and potential construction loads. Similarly, piled foundations may also be utilised safely to form the outermost layer of the retaining wall, with the allowable working loads to be determined by the type and size of pile, as well as the method of installation adopted.

Elliott Wood have produced a summary of the expected line loads for the proposed works and these have been inputted into the Ground Movement Assessment.

- 3.6 There are trees located in both the front and rear gardens, however these are not proposed to be removed as part of the works. Please refer to the Tree Survey, 'Arboricultural Impact Assessment and Tree Protection Plan' produced by Martin Dobson Associates in September 2015 for more details.

4.0 Desk Study Summary and Observations

- 4.1 The results of our desk study are as summarised below;

- The building appears to be in the vicinity of the historic Tyburn river (reference Lost Rivers of London, Nicholas Barton). However as stated in the "London Borough of Camden – Strategic Flood Risk Assessment" dated July 2014, historic 'lost rivers' were all culverted and incorporated into the sewer network in the 19th century, as such the site is at low risk of flooding due to surcharging of the River Tyburn.
- The site does not appear to be in the vicinity of any London Underground infrastructure or railway lines.

- There are no records of historical bomb damage to No.81 Avenue Road during World War II. However the neighbouring property (No.83) is marked on maps as having experienced "General blast damage – not structural", while four properties to the rear of the site situated on St. John's Wood Park are marked as being "Damaged beyond repair". (reference, The LCC London Bomb Damage Maps 1939-1945, LTS).
- The site is located within Flood Zone 1 as shown on the latest Environment Agency Flood Maps, which indicates that the property is at low risk from flooding (reference; www.environment-agency.gov.uk). The property appears to be located in one of the London Borough of Camden's critical drainage areas, as such a flood risk assessment is required. However Thames Water records indicate that there have been no historical incidents of flooding in this area as a result of surcharging public sewers. Elliott Wood Ltd. have completed the Flood Risk Assessment and this is included in the planning application as a separate document.
- Public Sewer records have been obtained from Thames Water and there does not appear to be any Thames Water assets within the proposed site.

5.0 Proposed Alterations

- 5.1 The proposed works involve the demolition of the existing property and construction of a new basement beneath the footprint of the proposed house partially extending out beneath the rear and front gardens. A new three storey building will be constructed above the new basement.
- 5.2 The majority of the basement slab to be formed down to approximately 4.5m below ground level beneath the footprint of the main house, stepping down to 6m below ground level to the rear of the main house. In its deepest location, the swimming pool, the formation level is approximately 7m below ground level.
- 5.3 The basement perimeter walls are proposed to be formed using contiguous piles and waterproof reinforced concrete lining walls. The contiguous pile and RC wall will resist lateral loads from any soil, hydrostatic and surcharge pressures. High and low-level horizontal props will be installed to resist the lateral pressures in the temporary state, with RC propping slabs then being constructed to perform the same task in the permanent case.
- 5.4 It is assumed the new superstructure will be constructed with load bearing masonry and RC floors. The vertical loads from the superstructure will be transferred by RC beams and slabs to the basement lining walls which are in turn supported on RC thickenings in the basement slab.
- 5.5 The founding slab will be a suspended RC slab spanning over a compressible void former, and will be designed to resist any residual uplift forces from heave, due to the release of the overburden and hydrostatic pressures.
- 5.6 The groundwater level has been monitored using standpipes and has been found to be at approximately 44.10mSD in BH3 to the rear of the property, while BH1 and BH2 did not indicate any presence of water within them. The proposed basement has an excavation level of approximately 39.15mSD at its deepest location which is below the level of the water recorded during standpipe monitoring. Given that the water seen

in BH3 is most likely to be due to isolated pockets of groundwater within the layer of made ground above, it is unlikely that inflows of groundwater will be experienced during excavation. Based on the standpipe monitoring to date, and assuming water levels remain consistent with those recorded to date, any inflows that do occur should not be significant and could be suitably controlled by sump pumping, and if required, a detailed method statement for this process will need to be prepared by the Contractor for comment by all relevant parties including party wall surveyors and their engineers.

Water levels in the standpipe will be periodically measured prior to start onsite.

6.0 Proposed Below Ground Drainage

6.1 Please refer to the Flood Risk Assessment and SUDS reports for details of below ground drainage.

7.0 Basement Waterproofing

7.1 The proposed basement will be designed to achieve a Grade 3 level of waterproofing protection as outlined in BS 8102:2009.

7.2 The reinforced concrete lining wall and basement slabs will be cast using water resistant concrete to form an initial barrier with an internal drained cavity system as a primary barrier against possible water ingress. As part of the system, any water that seeps through will be collected in a sump to be pumped up to high level where it will drain under gravity into the main drainage system.

8.0 Party Wall Matters

8.1 The proposed works development falls within the scope of the Party Walls Act 1996. Procedures under the act will be dealt with in full by the Employers Party Wall Surveyor. The Party Wall Surveyor will prepare and serve necessary notices under the provisions of the Act and agree Party Wall awards. The Contractor will be required to provide the Party Wall Surveyor with appropriate drawings, method statements and other relevant information covering the works that are notifiable under the Act. The resolution of matters under the Act and provisions of the Party Wall Awards will protect the interests of the owners.

8.2 The proposed works on the site of No.81 Avenue Road will be developed so as not to inhibit any works on the adjoining properties. This will be verified by the Surveyors as part of the process under the Act.

9.0 Hydrological Statement Summary

9.1 The ground investigation has indicated that water is not likely to be encountered during the excavation of the basement down to formation level. As previously discussed, water was not encountered in either of boreholes BH1 and BH2 during drilling at approximately 15.0m below ground level. The water level in BH3 has since

been found to have risen to 2.30m below ground level when reading standpipes during a programme of monitoring, but this is likely to be the result of isolated pockets of groundwater within the made ground above. Therefore although the depth of the proposed basement excavation is positioned below the level of this water, given the ground conditions within the proposed basement excavation consist of impermeable clay, it would appear that any impact on the groundwater regime is likely to be minimal and is unlikely to have any noticeable effect on groundwater flow.

9.2 Arup's Subterranean Development Scoping Study (para 5.1), June 2008, notes that the impact of subterranean development on groundwater flows is negligible as groundwater flows will find an alternative route if blocked by a subterranean structure.

10.0 Ground Movement Assessment

10.1 A Ground Movement Assessment has been completed by AGE which takes into account both the long and short term effects of the proposed basement, the results of which can be found within the Basement Impact Assessment completed by SAS in September 2016.

11.0 Conclusions

11.1 It is intended that the above measures and sequence of works are adopted for the eventual design and construction of the proposed works.

11.2 Detailed method statements and calculations for the enabling and temporary works will need to be prepared by the Contractor for comment by all relevant parties including Party Wall surveyors and their engineers. The Contractor will need to ensure that adequate supervision and monitoring is provided throughout the works particularly during the excavation and demolition stages. A specification and indication of monitoring requirements is given in section 14.0.

11.3 To this end, EWP will have an on-going role during the works on site to monitor that the works are being carried out generally in accordance with our design and specification. This role will typically involve fortnightly site visits during the main structural works. A written site report will be provided to the design team, Contractor and Party Wall Surveyor.

11.4 It is assumed that the above measures and sequence of works are taken into account in the eventual design and construction of the proposed works. If the works noted above are properly undertaken by suitably qualified contractors, these works should pose no significant threat to the structural stability of the house or the adjoining properties.

Construction Method Statement

12.0 Construction Method Statement (to be read in conjunction with drawings in Appendix 1.0)

Some of the issues that affect the sequence of works on this project are:

- The stability of adjoining and adjacent buildings and road;
- Forming sensible access onto the site to minimise disruption to the neighbouring residents; and
- Providing a safe working environment.

The proposed works involve the demolition of the existing property and construction of a new basement beneath the footprint of the proposed house partially extending out beneath the rear and front gardens. A new three storey building will be constructed above the new basement. It is expected that these works will be completed in a "bottom up" construction sequence.

The undertaking of such projects to existing buildings is specialist work and EWP will be involved in the selection of an appropriate Contractor with the relevant expertise and experience for this type of project.

Once the works commence EWP will have an on-going role on site to monitor that the works are being carried out generally in accordance with our design and specification. This role will typically involve weekly site visits at the very beginning of the Contract and fortnightly thereafter. A written report of each site visit is provided for the Design Team, Contractor and Party Wall Surveyor.

The Contractor is entirely responsible for maintaining the stability of all existing buildings and structures, within and adjacent to the works, and of all the works from the date of possession of the site until practical completion of the works.

A full set of temporary works drawings and calculations will be provided by the Contractor and will be reviewed by EWP prior to works starting on site.

Please refer to section 13.0 for noise, vibration and dust assessment with proposed associated mitigation methodologies.

Stage 1: Site Set-Up

Erect a fully enclosed painted plywood site hoarding.

The services within the site should be identified and isolated as necessary. All below ground obstructions should also be removed to allow the works to progress.

Stage 2: Enabling Works

All walls to be demolished as part of the works should be accurately surveyed prior to demolition with materials retained where possible.

A movement monitoring system will be installed to the adjoining buildings at No.79 and No.83 Avenue Road. A detailed specification for the monitoring is given in section 14.0.

The removal of spoil is described in the construction traffic management plan completed by Motion in August 2016

Tree Protection methods to be agreed and installed to all retained trees.

Stage 3: Demolition of Existing Structure and Internal Soft Strip

Complete soft strip of internal finishes within the building.

Carefully demolish the existing building down to ground floor level in a staged sequence (TBC by the Contractor).

Stage 4: Install Contiguous Piles

Complete contiguous piling from ground floor level around the perimeter of the proposed basement. These will resist the lateral forces from soil and surcharge pressures in both the temporary and permanent cases.

Stage 5: Bulk excavation

Reduce level dig down to approx. 1m below ground level.

Install steel waling beams around the perimeter of the excavation.

Install horizontal props spanning across the width of the basement between the waling beams.

Cut down contiguous piles to basement roof slab formation level in the front and rear garden areas, raking back the surrounding ground to a maximum of 45 degrees.

Install RC capping beam to pile tops.

Continue excavating down to formation level in stages installing further waling beams and horizontal propping as the excavation progresses. The levels at which propping is required is to be determined by the temporary works Engineer. The propping levels will take into account the permanent works design such that the RC slabs can be cast above/below the props whilst the props remain in place.

The ground in locations where there are level differences in the basement slab should be raked back at a 45 degree angle, in particular at the junction between the swimming pool and sump base slabs and the main basement floor slab.

Stage 6: Cast Pool Box and Sumps

Cast square mass concrete pad footings in RC column locations.

Install the below ground drainage as required.

Install compressible void former under areas of suspended slab (between thickenings in the base).

Install and tie reinforcement for the swimming pool and sump base slabs including starter bars for the perimeter lining walls and sump box walls.

Cast the RC swimming pool and sump base slabs, local thickenings and kickers.

Construct the RC lining walls to the perimeter of the the pool and sump walls. to form steps up to the main basement slab formation level. Once these have cured the raked back excavation around these areas can be backfilled with well compacted material arising.

Cast the RC basement slab under the rear garden (i.e. at the lower level), local thickenings and kickers, installing blinding and compressible void former as required.

Construct the retaining walls which form steps in the basement slab and backfill the raked back excavations with well compacted material arising. The main basement slab can now be cast under the main house and front garden.

Once all areas of the basement slab have cured, they will provide a permanent low level prop to the base of the lining walls/piles and hence, the lowest level of horizontal propping and waling beams can be removed.

Stage 7: Construct up to Ground Floor Level

After allowing the base slab to cure sufficiently, the internal basement RC walls, lining walls and columns can be constructed up to the underside of the proposed ground floor slab levels under the main house and in the garden areas. Ensure that the propping is retained at all times and hence the wall will be formed in a series of vertical lifts.

Once the RC walls and columns have cured sufficiently cast install the RC beams and any steelwork at ground floor level to be supported on them.

When all RC beams have cured sufficiently, cast the sections of ground floor slab supported between the walls, columns and beams. Once these have cured they will provide a permanent high level prop to the basement retaining walls and hence, the remaining horizontal propping and waling beams can be removed.

Stage 8: Construct superstructure

Once the ground floor slab has cured, the superstructure works can commence.

Noise, Vibration and Dust Mitigation

13.0 Noise, Vibration and Dust

The proposed works involve the demolition of the existing property and construction of a new basement beneath the footprint of the proposed house partially extending out beneath the rear and front gardens. A new three storey building will be constructed above the new basement.

The construction works involve the demolition of existing masonry walls and concrete floor slabs, the installation of contiguous piles, as well as excavation and the construction of the basement shell. A more detailed sequence of the works has been given in section 12.0. Those most likely to be affected by noise, dust and vibration will be the immediate neighbours at No.79 and No.83 Avenue Road. The properties opposite No.81 Avenue Road are remote from the proposed development and are therefore less likely to be affected, however need to be considered. There may be some impact on other residents on Avenue Road due to the related construction traffic but this should be minimal.

Below we have described the mitigation measures that are proposed to keep noise, dust and vibration to acceptable levels.

13.1 Mitigation Measures for Demolition of Existing Building

The breaking out of existing structures shall be carried out by diamond saw cutting and hydraulic bursting where possible to minimise noise and vibration to the adjacent properties. All demolition and excavation work will be undertaken in a carefully controlled sequence, taking into account the requirement to minimise vibration and noise. The contractor will need to utilise non-percussive breaking techniques where practicable.

Dust suppression equipment should be used during the demolition process to ensure that any airborne dust is kept to a minimum. Where practical, concrete should also be wetted down prior to and during breakout to further inhibit airborne dust.

13.2 Mitigation Measures for Piling

The contiguous piled wall will be formed using a continuous flight auger rig – this is a non-percussive technique and therefore produces significantly less noise and vibration than the alternative driven piles. Some of the contiguous piles will require breaking down to slab level during the basement works. The contractor should ensure that they use non-percussive pile reduction techniques which are much quieter than traditional breakers.

13.3 Mitigation Measures for Bulk Excavation

Due to the size of the basement it is likely that some mechanical plant will be required to complete the bulk excavation. The contractor should ensure that any mechanical plant is switched off when not in use and is subject to regular maintenance checks and servicing. An electrically powered conveyor will be used as detailed above.

13.4 Mitigation Measures for the Construction of the Concrete Basement Shell

The contractor should ensure that any concrete pours are completed within the permitted hours for noise generating works. The contractor should allow for a contingency period to ensure that concrete pours can be completed within these hours regardless of unforeseen circumstances such as batching plant delays and traffic congestion.

The fabrication and cutting of steelwork for the reinforced concrete elements of the works shall take place off site. If any rebar needs to be trimmed on site this should be completed using hydraulic or pneumatic tools instead of angle grinders.

13.5 Dust Control

In order to reduce the amount of dust generated from the site, the contractor should ensure that any cutting, grinding and sawing should be completed off site where practicable. If cutting, grinding and sawing is being carried out on site, surfaces are to be wetted down prior to and during these types of work whenever possible. Any equipment used on site should be fitted with dust suppression or a dust collection facility.

The contractor will be responsible for ensuring good practice with regards to dust and should adopt regular sweeping, cleaning and washing down of the hoardings and scaffolding to ensure that the site is kept within good order. The Contractor selected will be a member of the Considerate Contractors Scheme. Contact details of the contractor who will be responsible for containing dust and emissions within the site will be displayed on the site boundary so that the local residents can contact the contractor to raise any concerns regarding noise and dust.

The building will be enclosed within suitable scaffold sheeting and any stockpiles of sand or dust-generating materials will be covered. Cement, fine aggregates, sand and other fine powders should be sealed after use.

Structural Monitoring Proposals

14.0 Monitoring and limits on ground movements during excavation and construction

14.1 The Contractor shall provide monitoring on all the external retained elevation walls of No.81 Avenue Road throughout their height as well as the immediately adjacent flank and return walls of No.79 and No.83 Avenue Road during the basement construction.

14.2 Monitoring shall be completed as follows:

- 1) One month prior to any works being started to provide a base reading.
- 2) At the start and end of every shift during the excavation and until the basement slab and lining wall has been cast.
- 3) On a monthly basis thereafter for a 6 month period following completion of the notifiable works.

14.3 Cumulative movement of survey points must not exceed:

- a. Settlement
Code amber trigger values: +/-6mm
Code red trigger values: +/-10mm
- b. Lateral displacement
Code amber trigger values: +/-4mm
Code red trigger values: +/-8mm

14.4 Movement approaching critical values:

Code amber trigger value:

All interested parties, including the Adjoining Owner's Surveyor and his Engineer should be informed and further actions immediately agreed between two of the three Surveyors and implemented by the Building Owner. Notwithstanding the Party Wall requirements, the Contractor is to appoint, and to have permanently on site, a suitably qualified Structural Engineer who will be responsible for the reviewing of the movement monitoring results at the start and end of each day and provide immediate advice, remedial works and design as necessary in the event of movement being noted. The Contractor is to ensure that he has 24 hour/7 days a week access to emergency support provision including but not limited to additional temporary props, needles, waling beams and concrete supply at the start of the excavation and prior to any likelihood of this trigger value being reached. If this value is reached the Contractor, and his Engineer, must without delay provide all interested parties with his plan to implement any emergency remedial and supporting works deemed necessary. The Contractor must be ready to carry out these works without delay if the movement continues and approaches the trigger value above.

Code red trigger value:

All interested parties including Adjoining Owner's Surveyor and Engineer will be informed immediately. Works will stop and be made safe using methods and equipment agreed at the above stage. The Contractor is to ensure that the movement has stopped as a result of the implemented remedial works designed and installed at this stage. The requirements of

the Party Wall Act will also ensure that two of the three Surveyors and their advising Engineers shall then enter into an addendum Award, setting out whether or not the Building Owner's works can re-commence and when, and if so agree additional precautions or modifications to the proposals prior to re-commencement.

Appendices

Appendix 1.0 - Proposed Drawings

--- : LOAD-BEARING STRUCTURE UNDER

⊕ : 300mm THICK R.C. SLAB CAST OUT TO GROUND LEVEL FOR HEAVE PROTECTION

MIN. 400mm THICK R.C. LINING WALL IN POOL LOCATION

CONTINUOUS PILED WALL AROUND PERIMETER OF BASEMENT FOR TEMPORARY SUPPORT TO EXCAVATION. ALLOW FOR LATERAL PROPPING TO PILES (PILE DESIGN BY OTHERS)

ALLOW FOR MIN. 1.6x1.6m R.C. BOX FOR FOUL PUMPING STATION (SIZE + POSITION T.B.C. BY M/E ENGINEER/ARCHT)*

ASSUMED BOUNDARY LINE

83 AVENUE ROAD

81 AVENUE ROAD

ALLOW FOR 1m x 1m R.C. BOX FOR CAVITY DRAIN TO REAR OF BASEMENT (SIZE + POSITION T.B.C. BY M/E ENGINEER/ARCHT)*

R.C. SWIMMING POOL BOX TO BE COMPLETED BY SPECIALIST.

MIN. 350mm THICK R.C. LINING WALL AROUND BASEMENT PERIMETER PILED WALL.

ALLOW FOR 1m x 1m R.C. BOX FOR CAVITY DRAIN TO FRONT OF BASEMENT (SIZE + POSITION T.B.C. BY M/E ENGINEER/ARCHT)*

81 AVENUE ROAD

79 AVENUE ROAD

ASSUMED BOUNDARY LINE

R.C. EDGE THICKENING TO SLAB

SQUARE M.C. PAD FOOTINGS CAST BENEATH SLAB

THICKENINGS TO SLAB ALONG LINES OF LOAD BEARING WALLS SUPPORTING EXISTING STRUCTURE OVER.

*: ALL PUMPS TO HAVE NON-RETURN VALVES FITTED TO PREVENT BASEMENT FLOODING DUE TO SEWER SURCHARGE

This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.

rev	date	by	chk	description

PROPOSED BASEMENT PLAN

scale: 1:200 @ A3 date: SEP'16 drawn: EJM

drawing status: PRELIMINARY

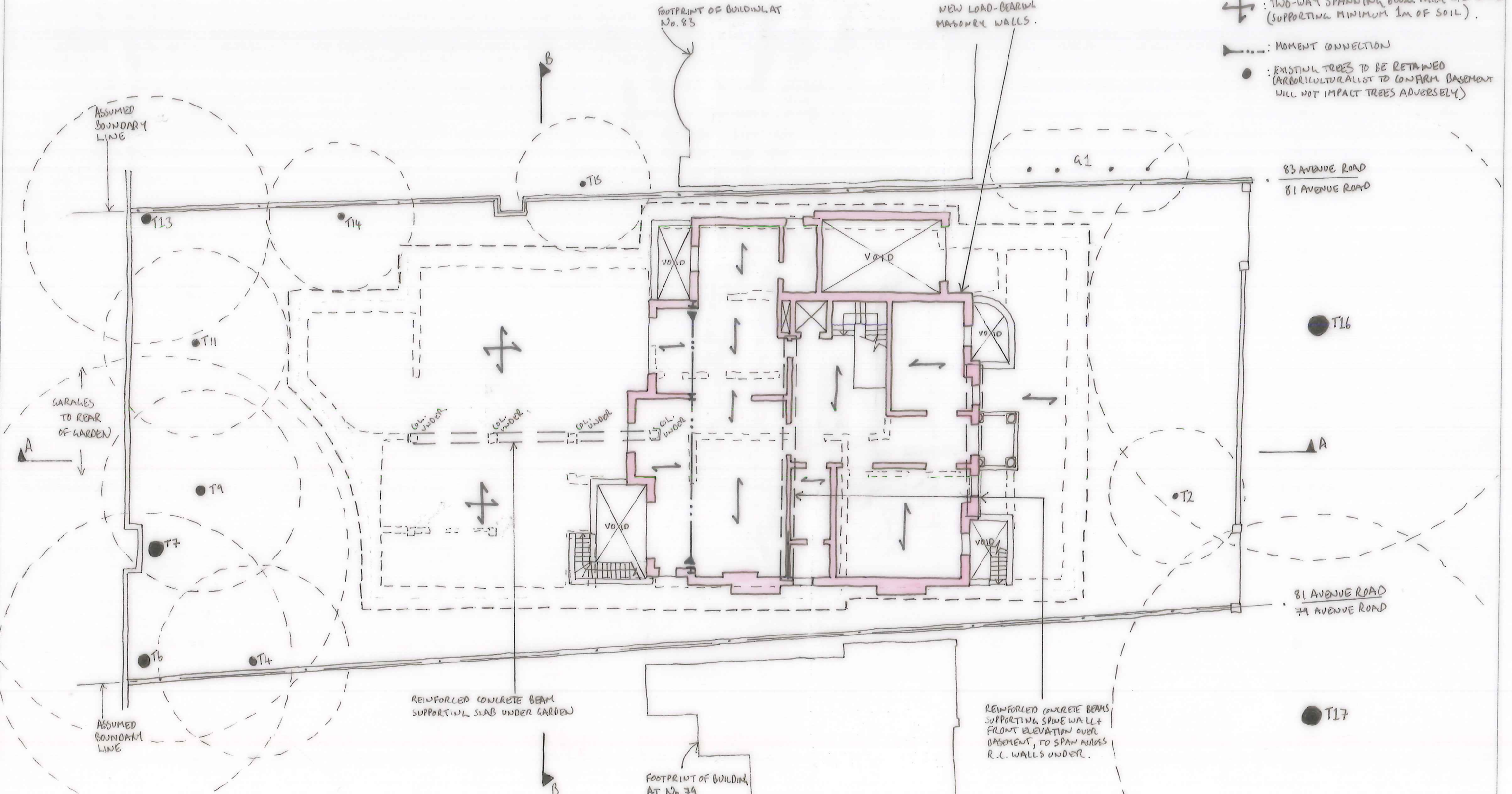
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81 AVENUE ROAD,
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job no: 2150623	drawing no: S.90	revision: P1
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- : LOAD BEARING STRUCTURE UNDER
- : ONE-WAY SPANNING 300mm THICK R.C. SLAB
- ↕ : TWO-WAY SPANNING 600mm THICK R.C. SLAB (SUPPORTING MINIMUM 1m OF SOIL).
- : MOMENT CONNECTION
- : EXISTING TREES TO BE RETAINED (ARBORICULTURALIST TO CONFIRM BASEMENT WILL NOT IMPACT TREES ADVERSELY)



This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
Do not scale from this drawing.

rev	date	by	chk	description

drawing title
PROPOSED GROUND FLOOR PLAN

scales(s) date drawn
1:200 @ A3 SEP'16 EJA

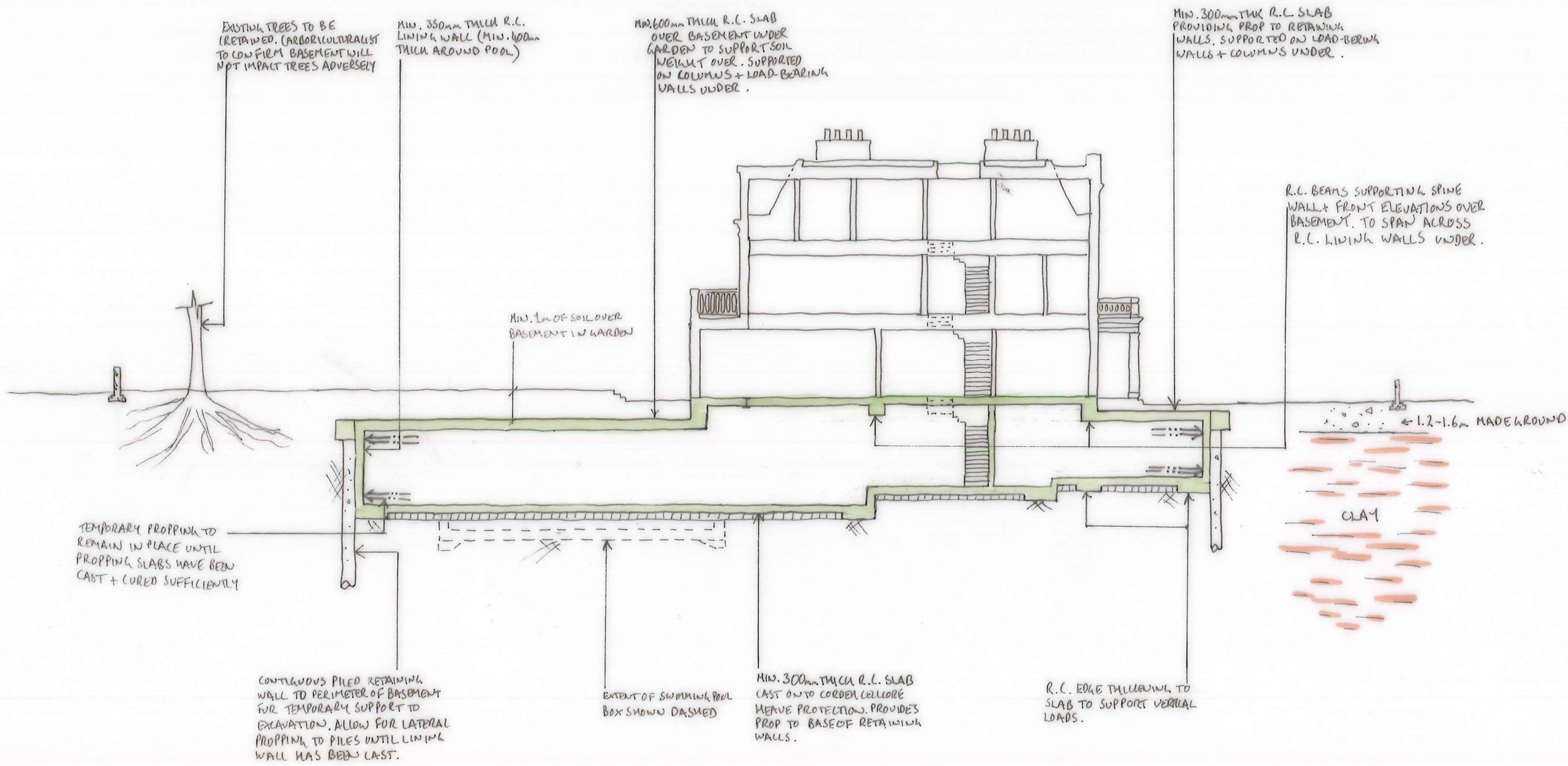
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drawing title
PROPOSED SECTION A-A

scale(s) 1:200 @ A3 date SEP '16 drawn KJA

drawing status
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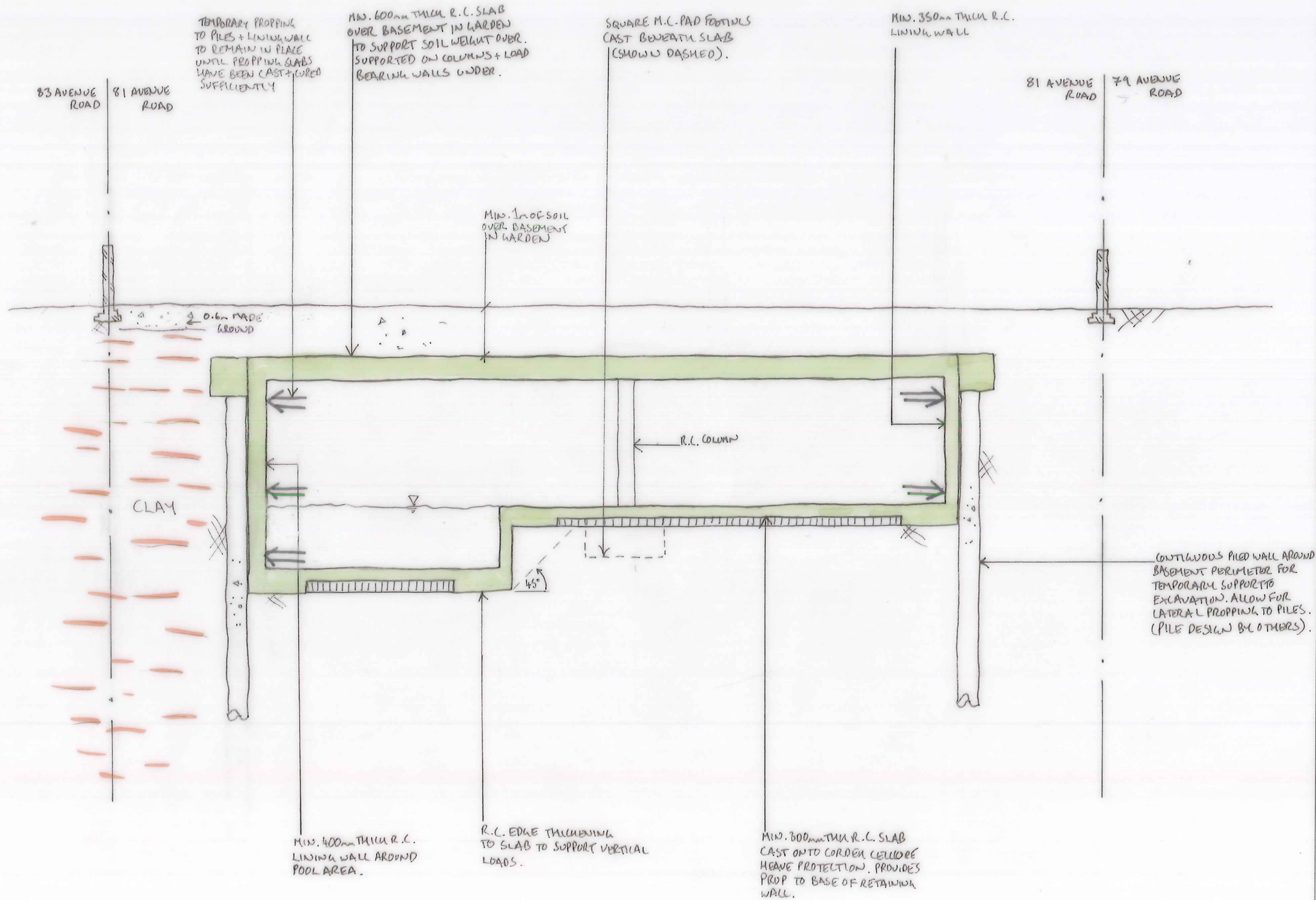
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job title
81 AVENUE ROAD, NW8 6JD

job no 2150623	drawing no S.200	revision P1
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This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.

Do not scale from this drawing.



rev	date	by	chk	description

elliottwood

Elliott Wood Partnership Ltd
Wimbledon • Central London • Nottingham
Consulting Structural and Civil Engineers
tel: (020) 7499 5888 www.elliottwood.co.uk

job title
**81 AVENUE ROAD,
NW8 6JD**

drawing title
PROPOSED SECTION B-B

scale(s) 1:100EA3 date SEP '16 drawn EJA

drawing status
PRELIMINARY

job no	drawing no	revision
2150623	S.201	P1

Appendix 2.0 – Thames Water Asset Search

Asset Location Search



Elliott Wood Partnership LLP
241The Broadway
LONDON
SW19 1SD

Search address supplied 81
Avenue Road
London
NW8 6JD

Your reference 2150623

Our reference ALS/ALS Standard/2016_3367215

Search date 6 July 2016

You are now able to order your Asset Location Search requests online by visiting
www.thameswater-propertysearches.co.uk



Asset Location Search



Search address supplied: 81, Avenue Road, London, NW8 6JD

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Asset Location Search



Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

Asset Location Search



pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Asset Location Search



Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vestern Road
Reading
RG1 8DB

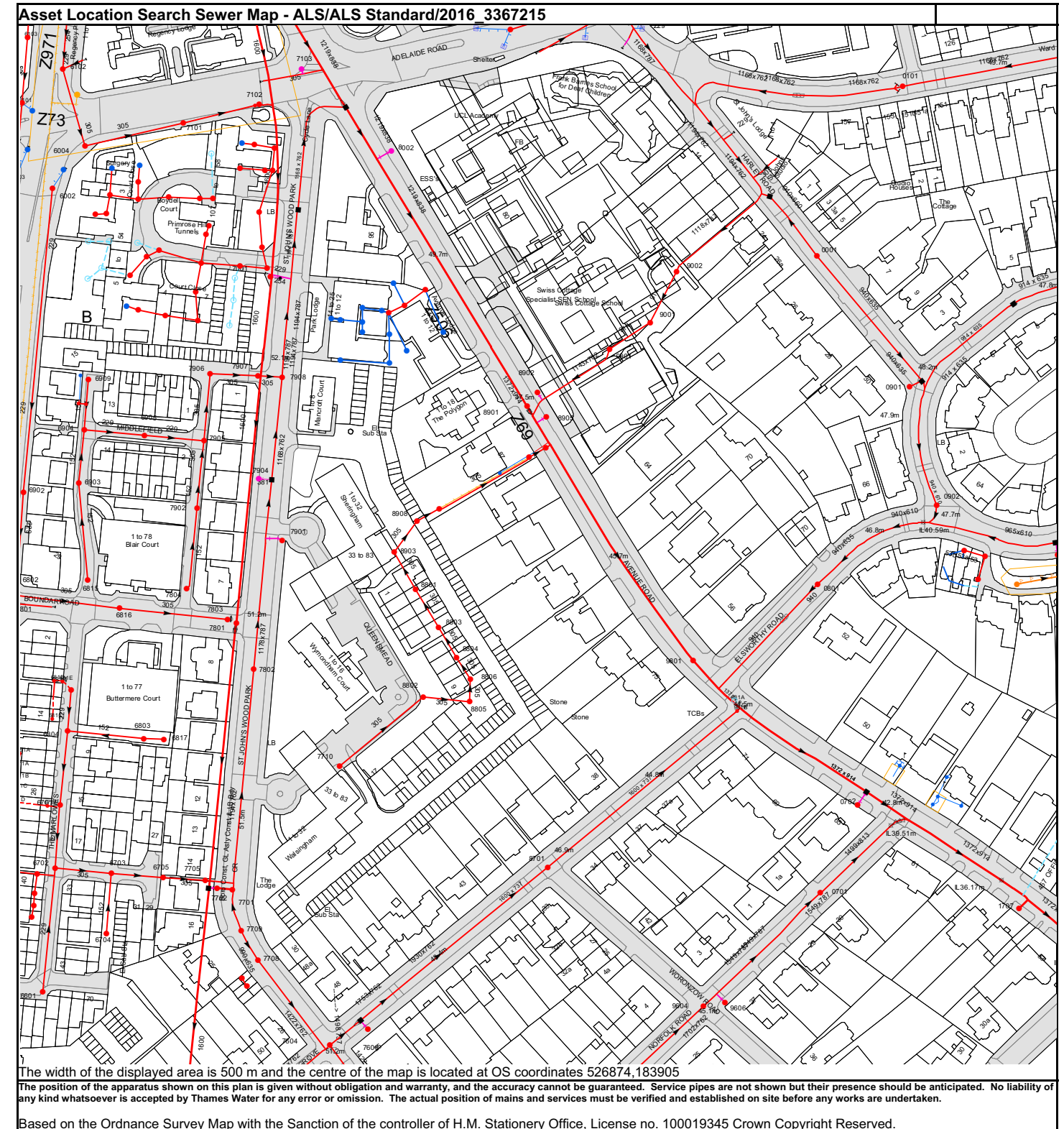
Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vestern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526874.183905
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.
Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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
7102	53.66	n/a
70BI	n/a	n/a
7103	53.21	51.36
8002	n/a	n/a
8101	50.39	47.68
0101	49.82	45.15
70DE	n/a	n/a
60BC	n/a	n/a
6004	53.74	48.7
70CC	n/a	n/a
70CD	n/a	n/a
7101	54.11	48.39
61BH	n/a	n/a
6101	52.97	50.02
6102	53.36	49.71
6103	53.52	50.22
70CI	n/a	n/a
60BD	n/a	n/a
60AI	n/a	n/a
70CF	n/a	n/a
60AJ	n/a	n/a
60CD	n/a	n/a
60CE	n/a	n/a
70CJ	n/a	n/a
70DA	n/a	n/a
60CC	n/a	n/a
60CB	n/a	n/a
70CE	n/a	n/a
60BG	n/a	n/a
70DC	n/a	n/a
70DB	n/a	n/a
60BF	n/a	n/a
60CA	n/a	n/a
6002	53.18	50.18
60BH	n/a	n/a
70CA	n/a	n/a
70BJ	n/a	n/a
60BB	0	0
60BJ	n/a	n/a
70CB	n/a	n/a
60BI	n/a	n/a
6909	52.51	51.58
60CF	n/a	n/a
6816	52.46	47.99
60CJ	n/a	n/a
60BE	n/a	n/a
60CI	n/a	n/a
6905	52.05	50.16
60CH	n/a	n/a
7804	51.75	50.86
70DH	n/a	n/a
7902	51.76	50.27
70DD	n/a	n/a
7905	51.76	49.56
7906	51.87	49.38
7803	51.32	n/a
70DG	n/a	n/a
70DF	n/a	n/a
70DI	n/a	n/a
7801	51.11	45.17
70CH	n/a	n/a
7802	51.15	48.26
7907	51.72	48.77
7904	n/a	45.21
70CG	n/a	n/a
7001	n/a	45.31
7908	n/a	47.56
7901	n/a	n/a
6902	52.79	48.7
681D	n/a	n/a
681E	n/a	n/a
6814	52.97	50.88
6903	52.5	51.1
691C	n/a	n/a
691A	n/a	n/a
6904	52.37	50.48
691B	n/a	n/a
6815	52.75	51.82
60CG	n/a	n/a
70BF	n/a	n/a
79BB	n/a	n/a
70BE	n/a	n/a
70BG	n/a	n/a
70AG	n/a	n/a
70BC	n/a	n/a
70BD	n/a	n/a
80AG	n/a	n/a
89CB	n/a	n/a
80AH	n/a	n/a
80AI	n/a	n/a
8903	48.31	44.58

Manhole Reference	Manhole Cover Level	Manhole Invert Level
80AF	n/a	n/a
89CA	n/a	n/a
8801	n/a	n/a
8908	48.12	44.22
8802	49.07	46.14
80AE	n/a	n/a
8803	n/a	n/a
891C	47.75	44.08
80BA	n/a	n/a
8804	n/a	n/a
8805	n/a	n/a
8806	n/a	45.47
891B	n/a	n/a
8901	47.37	42.69
891D	46.97	43.42
8902	n/a	n/a
891A	46.81	43.31
8905	n/a	n/a
9901	47.61	44.07
9001	47.81	44.29
9002	47.86	44.56
9801	44.68	39.4
981A	n/a	n/a
981B	n/a	n/a
0001	49.35	44.86
0801	46.29	40.07
0901	n/a	n/a
0902	n/a	n/a
09BA	n/a	n/a
08BB	n/a	n/a
08AJ	n/a	n/a
n/a	n/a	n/a
1901	n/a	n/a
6712	n/a	n/a
6711	n/a	n/a
6710	n/a	n/a
6709	n/a	n/a
6601	52.71	51.04
671E	n/a	n/a
681C	n/a	n/a
6702	51.76	50.07
6701	52.24	50.49
6804	52.67	50.66
6704	52.41	51.13
6703	51.99	49.84
6803	52.17	51.21
6705	52.26	n/a
6817	52.19	51.45
7705	51.65	49.46
7702	51.61	n/a
7701	51.47	49.65
7709	51.47	49.13
76AH	n/a	n/a
76AF	n/a	n/a
7708	51.29	48.2
071D	43.64	41.23
071E	42.69	39.54
071B	42.78	n/a
071A	42.73	40.86
071C	42.76	40.86
1707	n/a	n/a
7604	51.05	47.53
7710	49.99	48.01
7606	50.67	n/a
8701	47.08	43.67
9604	45.06	42.3
9606	n/a	n/a
0701	43.42	40.37
0702	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.

Public Sewer Types (Operated & Maintained by Thames Water)

- Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
- Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
- Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
- Trunk Surface Water
- Trunk Foul
- Storm Relief
- Trunk Combined
- Bio-solids (Sludge)
- Vent Pipe
- Proposed Thames Water Foul Sewer
- Proposed Thames Water Surface Water Sewer
- Gallery
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Sludge Rising Main
- Proposed Thames Water Rising Main
- Vacuum

Sewer Fittings

- A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.
- Air Valve
 - Dam Chase
 - Filling
 - Meter
 - Vent Column

Operational Controls

- A feature in a sewer that changes or diverts the flow in the sewer. Example: an hydrantake limits the flow passing downstream.
- Control Valve
 - Drop Pipe
 - Ancillary
 - Weir

End Items

- End symbols appear at the start or end of a sewer pipe. Example: an Undefined End at the start of a sewer indicates that Thames Water has no information on what is at the start of the sewer. Example: a surface water sewer indicates that the pipe discharges into a stream or river.
- Outfall
 - Undefined End
 - Inlet

Other Symbols

- Symbols used on maps which do not fall under other general categories
- Public/Private Pumping Station
 - Change of characteristic indicator (C.O.C.I.)
 - Invert Level
 - Summit
- Areas denoting areas of underground surveys, etc.
- Agreement
 - Operational Site
 - Chamber
 - Tunnel
 - Conduit Bridge

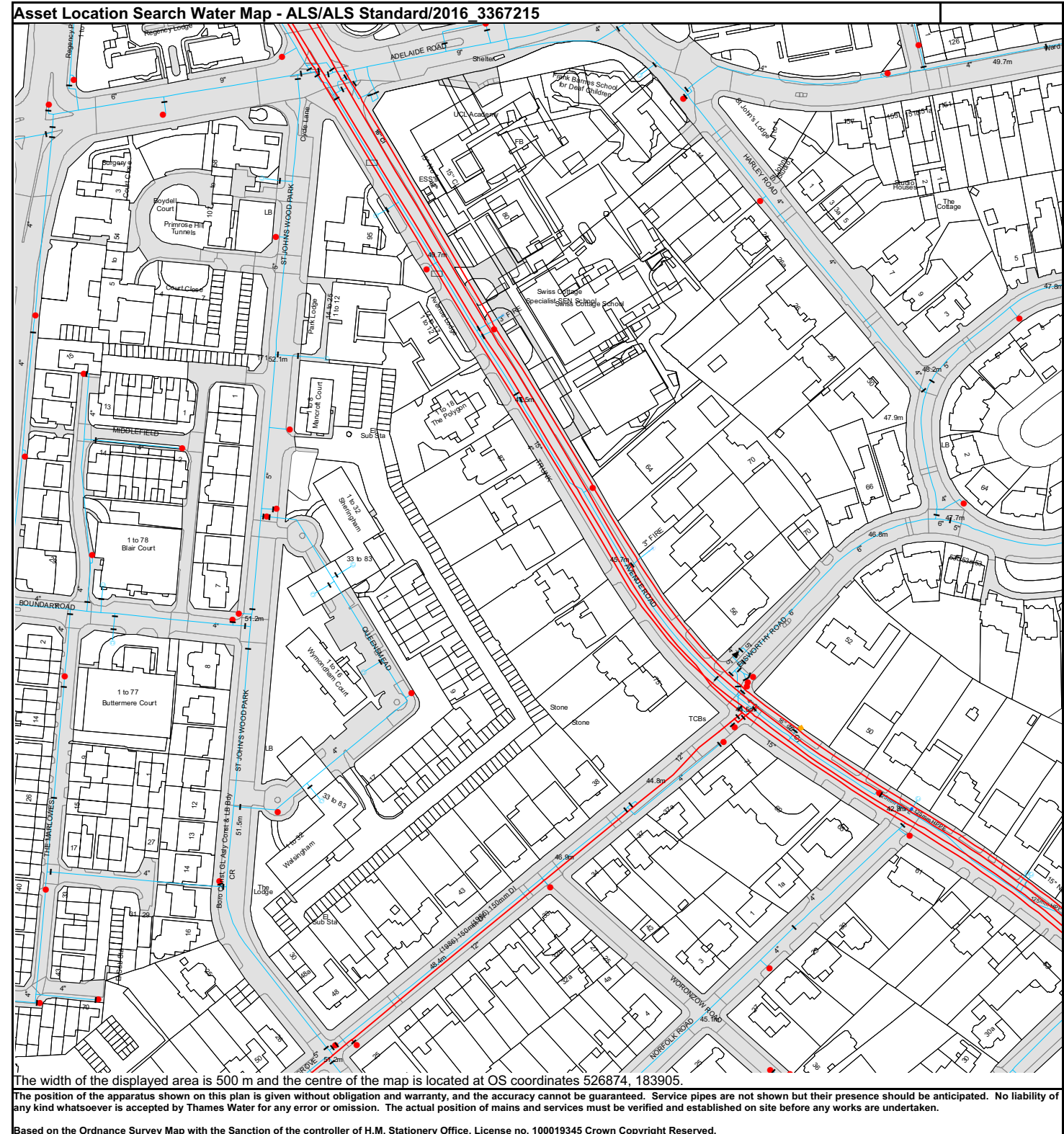
Other Sewer Types (Not Operated or Maintained by Thames Water)

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Culverted Watercourse
- Gully
- Proposed
- Abandoned Sewer

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'n' or 'o' on a manhole level indicates that data is unavailable.

Thames Water Utilities Ltd, Property Searches, PO Box 3189, Slough SL1 4W, DX 151280 Slough 13
T 0845 070 9148 E searches@thameswater.co.uk I www.thameswater-propertysearches.co.uk



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526874, 183905.
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.
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ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3)
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

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

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlie the border of our clean water coverage area. These pipes are not operated or maintained by Thames Water and in most cases have the owner of the pipe displayed along them.

Private Main: Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the damper and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

- All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
- Provision of service will be in accordance with all legal requirements and published TWUL policies.
- All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
- Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
- In case of dispute TWUL's terms and conditions shall apply.
- Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
- Interest will be charged in line with current Court Interest Charges, if legal action is taken.
- A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to him at: Thames Water Utilities Ltd, PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0845 070 9148 quoting your invoice number starting CBA or ADS.	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.



Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Sewer Flooding

History Enquiry



Elliott Wood Partnership LLP
The Broadway

Search address supplied 81
Avenue Road
London
NW8 6JD

Your reference 2150623
Our reference SFH/SFH Standard/2016_3367220
Received date 6 July 2016
Search date 6 July 2016

Thames Water Utilities Ltd
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I www.thameswater-propertysearches.co.uk
Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 9DB

Sewer Flooding

History Enquiry



Search address supplied: 81,Avenue Road,London,NW8 6JD

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched;
- (ii) any negligent or incorrect interpretation of the records searched;
- (iii) and any negligent or incorrect recording of that interpretation in the search report
- (iv) compensation payments

Thames Water Utilities Ltd
Property Searches
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Clearwater Court, Vastern Road
Reading RG1 9DB

Sewer Flooding

History Enquiry



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
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Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 5DS

Appendix 3.0 – Calculations

Project name:

81 AVENUE ROAD

Project number:

2150623

Date:

29/7/16.

Sheet:

Revision:

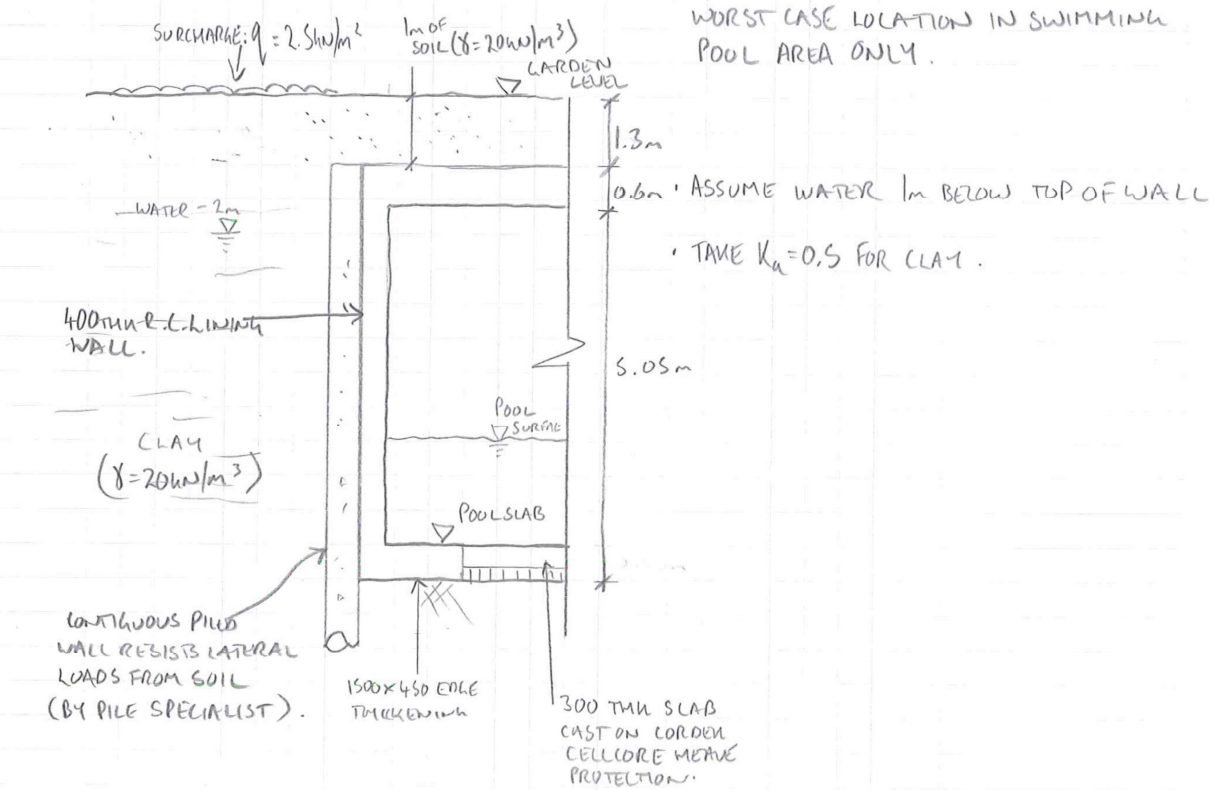
Engineer:

RPA

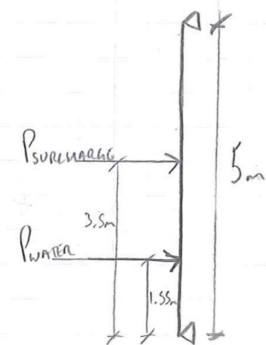
Checked:

elliottwood

R.C. LINING WALL ANALYSIS + DESIGN



R.C. LINING WALL RESISTS HYDROSTATIC LOADS ONLY (5.65m HEIGHT OF SOIL RETAINED BY PILED WALL).



$$P_{water} = \frac{1}{2} \gamma h^2 = 0.5 \times 10 \times 5^2 = 125 \text{ kN} @ \frac{h}{3} = 1.67 \text{ m}$$

$$P_{surcharge} = q K_a h = 2.5 \times 0.5 \times 7 = 8.75 \text{ kN} @ \frac{h}{2} = 3.5 \text{ m}$$

$$M_{ed} = 139.8 \text{ kNm}$$

Project name:

81 AVENUE ROAD

Project number:

2150623

Date:

29/7/16

Sheet:

Revision:

Engineer:

Checked:

elliottwood

R.C. DESIGN

400mm THICK R.C., 50mm COVER, ASSUME M10 DISTⁿ BARS / 16mm MAIN BARS
 C28/35 ($f_{ck} = 28 \text{ N/mm}^2$, $f_{yk} = 500 \text{ N/mm}^2$) $d = 332 \text{ mm}$

$$K = \frac{139.8 \times 10^6}{1000 \times 332^2 \times 2.8} = 0.045$$

$$Z = \frac{332}{2} \times \left[1 + \sqrt{1 - 3.53 \times 0.045} \right] = 318.2 \text{ mm} > 0.95d = 315.4 \text{ mm} \therefore \text{TAKE } 0.95d$$

$$A_{s,req} = \frac{139.8 \times 10^6}{0.87 \times 500 \times 315.4} = 1019 \text{ mm}^2/\text{m} \therefore \text{USE M20s @ } 200 \text{ c/c } (= 1571 \text{ mm}^2/\text{m}) \text{ IN POOL AREA}$$

(R.C. LINING WALL MAY BE BUILT 350mm THICK WITH M16s @ 200c/c AROUND REMAINING PERIMETER OF PILED WALL).

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