St Edmunds Terrace NW1

Planning Submission - Structural Concept

Ref No: 22689

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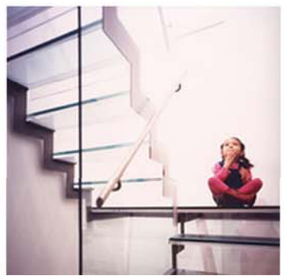


FLUID.STRUCTURES
ENGINEERS AND TECHNICAL DESIGNERS

Introduction

The proposal is to construct 3no. new 5/6 storey high quality residential blocks each approximately 20m x 35m in plan at the St Edmunds Terrace site. All the blocks are built off a single stepped ground floor slab which covers a part single and part double storey basement plant and parking area. These notes provide a brief description of the key structural engineering issues that have been identified and developed during the planning phase of the project.

The Site

The site is located adjacent to Primrose Hill Park and the Barrow Hill Reservoir. It is approximately 80m long x 50m wide and slopes steeply away from the north western corner. There is a 11m difference in level from the northwest to the southeast corner of the site. There are 3no. existing buildings on the site that will need to be demolished prior to commencement of the new development.

The development is highly constrained by existing Thames Water assets. In addition there is a requirement to maintain two access routes across the site, along the western edge to the reservoir, and along the eastern edge to an abstraction borehole. A series of construction details are being developed with respect to the agreed Thames Water parameters. The sections on the following pages describe the boundary details to each side of the site.

A comprehensive Geotechnical Site Investigation has just been concluded on site. The desktop exercise confirmed that since 1871 the site has been barely developed, and has no contaminative history. The risk therefore of contaminated soils and hazardous waste is minimal. Further site tests are though currently being carried out to identify any potential areas of contamination. Records from the boreholes that have been drilled across the site confirm that:

- London Clay extends to a depth of 68m.
- A 12m layer of mottled clay (Reading & Woolwich Beds) lies below the clay, to a depth of 80m.
- This is underlain by a 10m layer of grey, silty sand (Thanet Sand).
- The chalk aquifer extends 110m below this to a depth of 200m.

Hydro – Geology Influencing Structural Design

The following summary is based on the initial ground water assessment carried out during the desk based study by the Engineering Scientifics Group and the subsequent site investigations.

- The site is not within a flood risk zone, and Figure 1 shows that it is zoned as a non-aquifer.
- Groundwater on site was encountered at various levels in the different boreholes. The main water table associated with the London Clay is at a depth of over 15m below ground level. The others are small perched water tables associated with local pockets of made ground on top of the London Clay.
- Local pockets of perched water associated with the reservoir embankment that sits to the north of the site, approximately 60m from St Edmunds Terrace have also been recorded.
- The very low hydraulic conductivity associated with the London Clay means that any groundwater movement and infiltration will be very slow. (in the order of $5x10^{-5}$ m/day) This in combination with the steep nature of the site means that virtually all the surface water will run off in to the sewer system. The small amount which is retained will be within vegetated topsoil layers, and will disburse via evapo-transpiration. There will be no significant interaction between surface-water and the main water table via infiltration.
- Furthermore due to low hydraulic conductivity, there will be no significant lateral groundwater flows. The net result is that the proposed works will have no measurable impact on the groundwater regime between the surface and the bottom of the foundations.

Based on the findings to date groundwater within the London Clay will not be affected by the proposed works given that they will be founded several meters above the water table. The highest reading to date of groundwater recorded in a piezometer is approximately 18m below ground level. As the maximum depth of the proposed basement is 10m below ground level at most, due to the sloping site, and even allowing for the depth of the piled retaining wall, the development will not be founded deep enough to affect the main water table.

Six standpipes/piezometers have been installed on the reservoir embankment and across the development site. Higher water levels ranging from 1m to 3m were recorded. These readings though are variable and suggest that any water tables are not continuous across the development site or for that matter beneath the reservoir embankments and are therefore thought to be simply localised pockets of perched groundwater.

The embankments are being monitored as part of the current site investigation and will continue to be monitored for at least one year. Thames water have advised that there is an old land drain at the base of the reservoir embankment and this will be checked and renewed as part of the development works if analysis indicates that this is required. This work will help to disable any perched water within the reservoir embankment, and thereby maintain its structural stability.

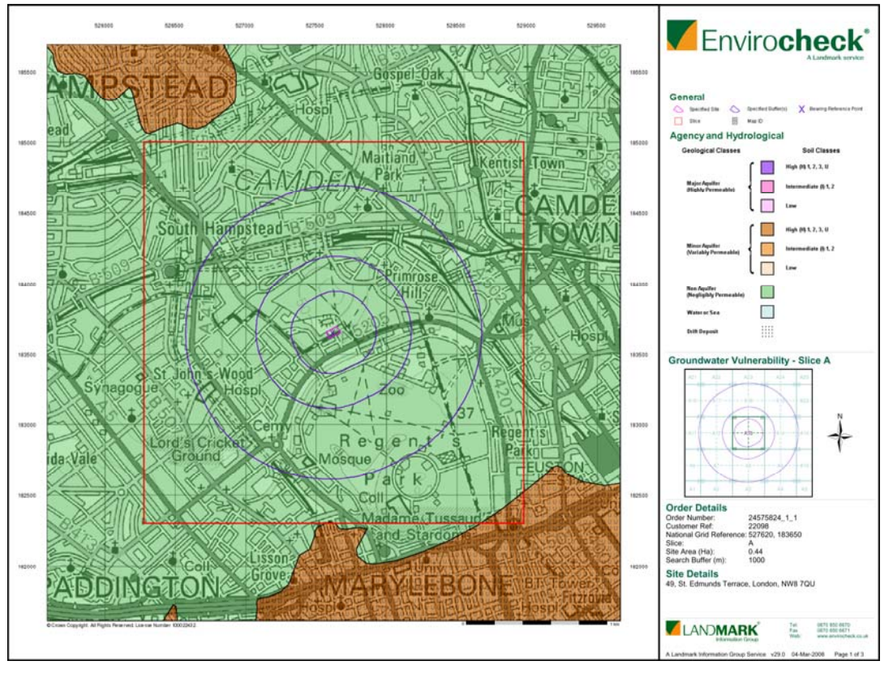


Fig 1: Extract from desktop site investigation study.

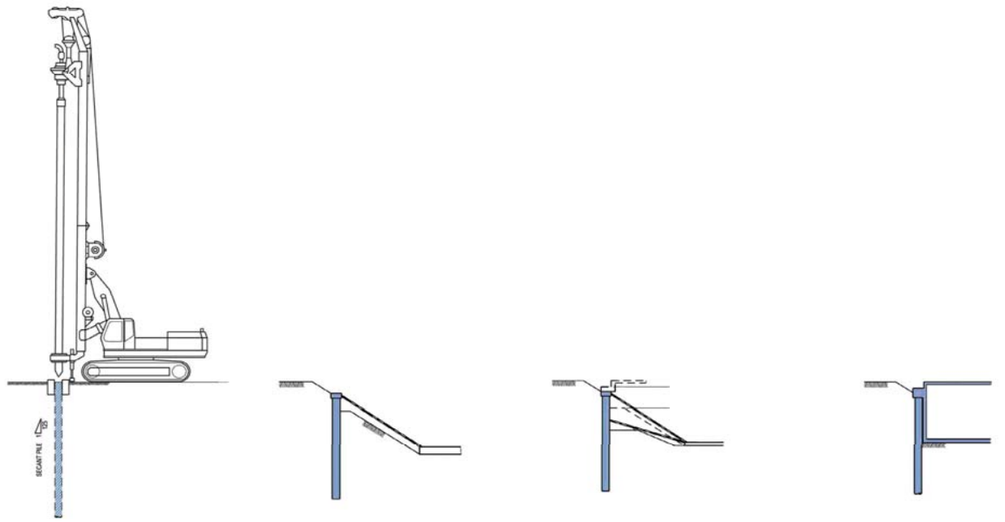
Construction of the Basement

It has been agreed that some of the Thames Water assets will be relocated as part of the basement works, whilst this introduces further complexity the excavation of deep basements is not unusual in London and Fluid Structures has extensive geotechnical and construction expertise built up through projects such as:

- Westheath Road. £20 Million residential development with 3 storey deep basement.
- Wellgarth Road. £10 Million project with basement constructed adjacent to Northern line.
- Huttons Farm. £30 Million project with 10m deep basement.
- Barrett Street. £15 Million project with basement constructed adjacent to post office tunnel shaft.

A piled reinforced concrete raft is proposed for the foundations. This solution is the most appropriate for the high lateral loads generated by the retained earth and for maintaining stability at all stages of construction during excavation.

A secant piled wall is proposed around the full perimeter of the basement to retain the ground including the sloping earth up to the Barrow Hill reservoir. A piling mat will need to be installed to allow the piling rig to work on the site. Once the piling mat is complete the secant piled wall can be installed to allow excavation of the new basement and the main piles can also be installed to support the raft slab. The above details have been agreed with Thames Water.



Stage 1
- Install guide wall
- Install piles

Stage 2
- Remove guide wall
- Excavate along slope

Stage 3
- Cast portion of slab
- Install raking props
- Cast remainder of slab

Stage 4
- Cast ground slab
- Remove props

Fig 2: Proposed basement construction sequence

Superstructure

- Reinforced concrete frames are typically proposed for each of the 3no. blocks. Efficient flat slab solutions have been analysed which avoid downstand beams and allows a distinct services zone.
- During the further stages of design the use of void former technologies and recycled aggregates will be investigated as a means of reducing the embodied energy within the structure.
- An integrated steel frame is proposed for the cantilevering front section of Block 1. This solution will allow us to better control the anticipated deflections and achieve the architectural aspiration for consistent façade detailing.
- Stability for the building is provided by the reinforced concrete core walls enclosing the lifts, stairs, and risers. Lateral loads from the retained earth and the wind are transferred to the slabs at each level. The floor plates act as a diaphragm, transferring these loads into core walls at each level where they are then transferred into the foundations.

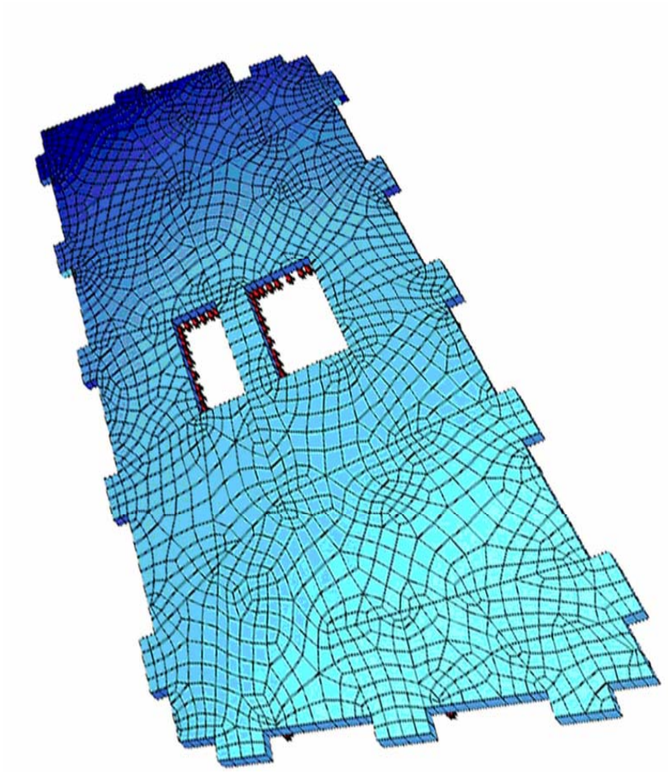
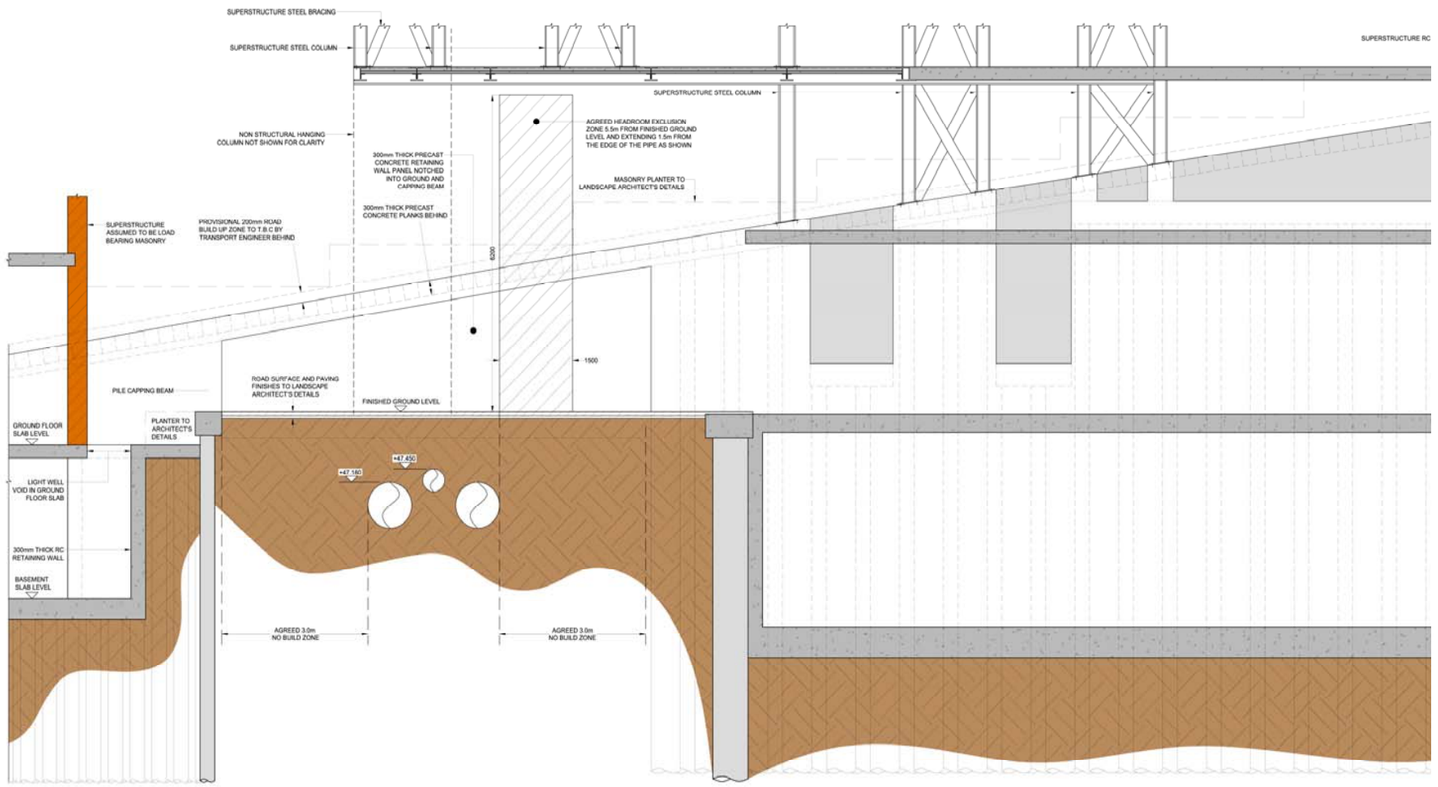


Fig 3: RC slab computer analysis output

Site Constraints

Southern Boundary

There are currently considerable Thames Water assets on the site. Through ongoing meetings and discussions we now have agreement to which will be diverted and which can be built around. Some of the agreed restrictions are indicated on the section below.



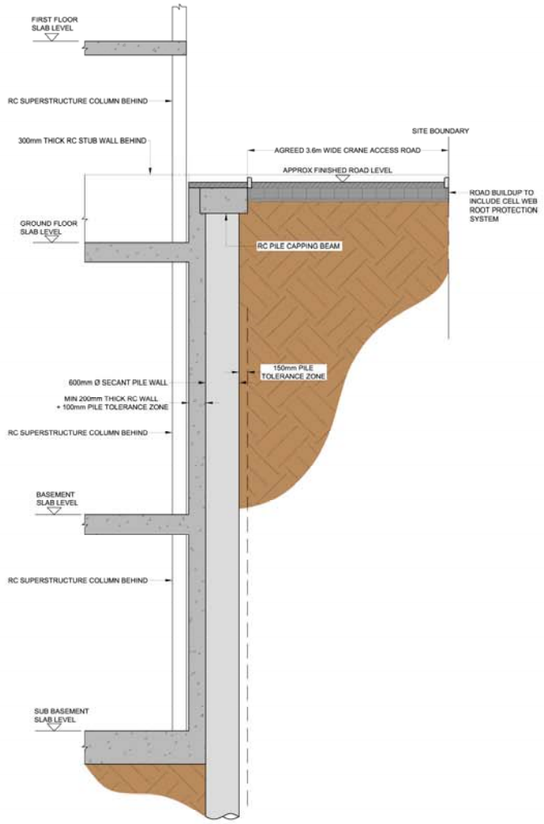
SECTION A - A

KEY PLAN

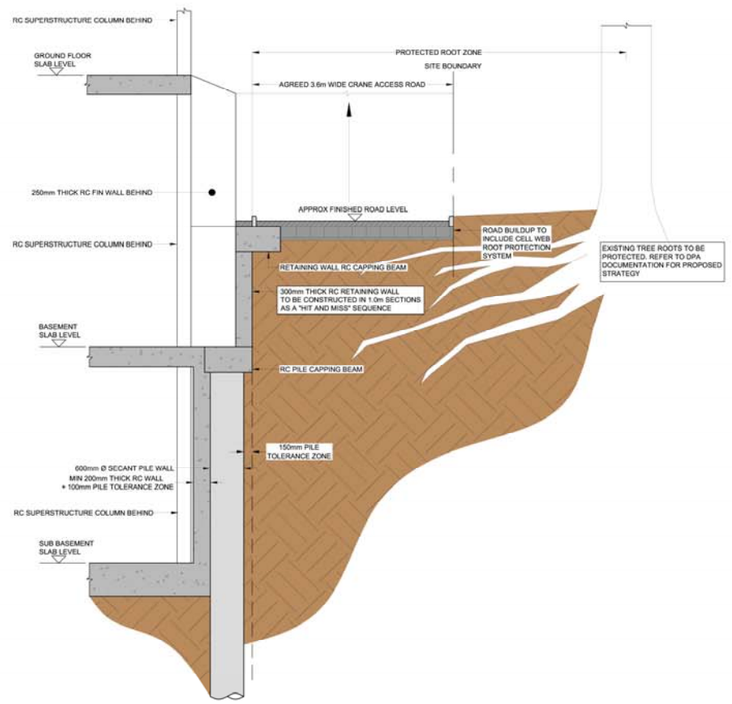
Site Constraints

Eastern Boundary

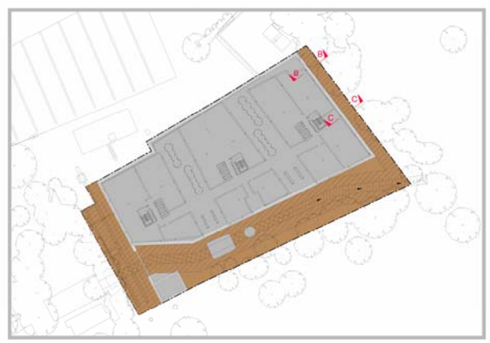
The proposed basement piled wall will be located outside of the root protection area for the trees within Primrose Hill. A Cellweb root protection system is shown on the sections below to form the foundation of the abstraction borehole access road.



SECTION B - B



SECTION C - C

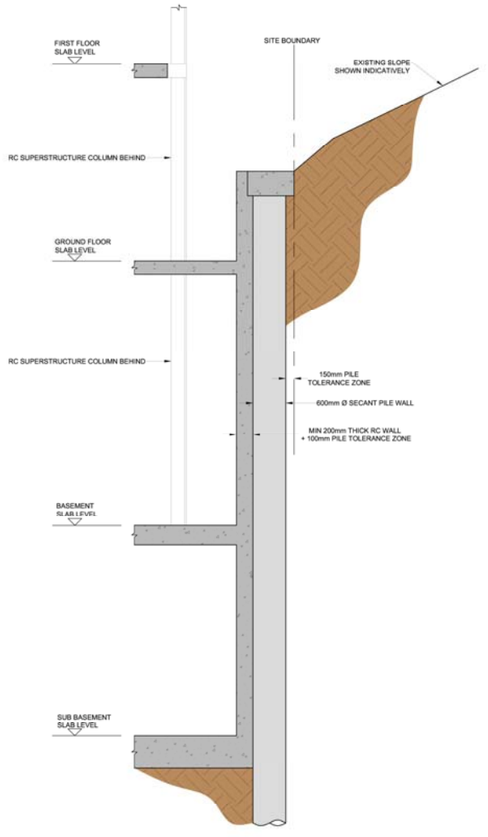


KEY PLAN

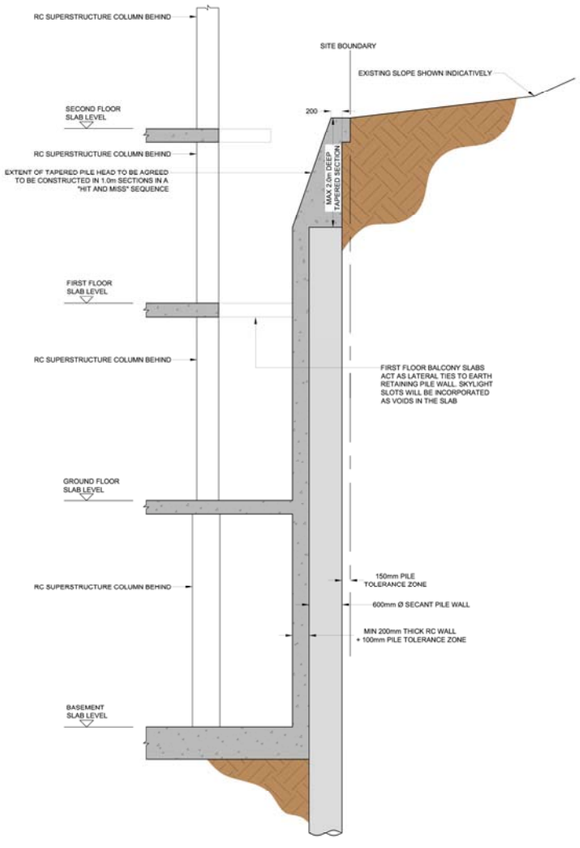
Site Constraints

Northern Boundary

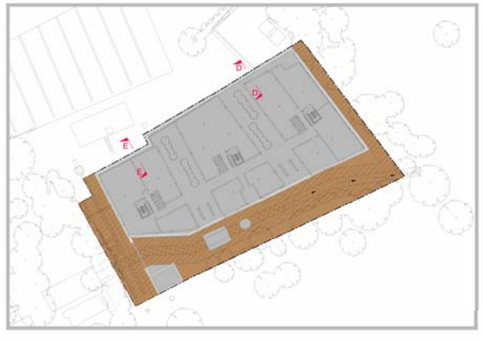
The stability of Barrow Hill reservoir to the North of the site will need to be fully maintained at all stages of construction. We have now begun monitoring the current stability of the slope shown on the sections below.



SECTION D - D



SECTION E - E

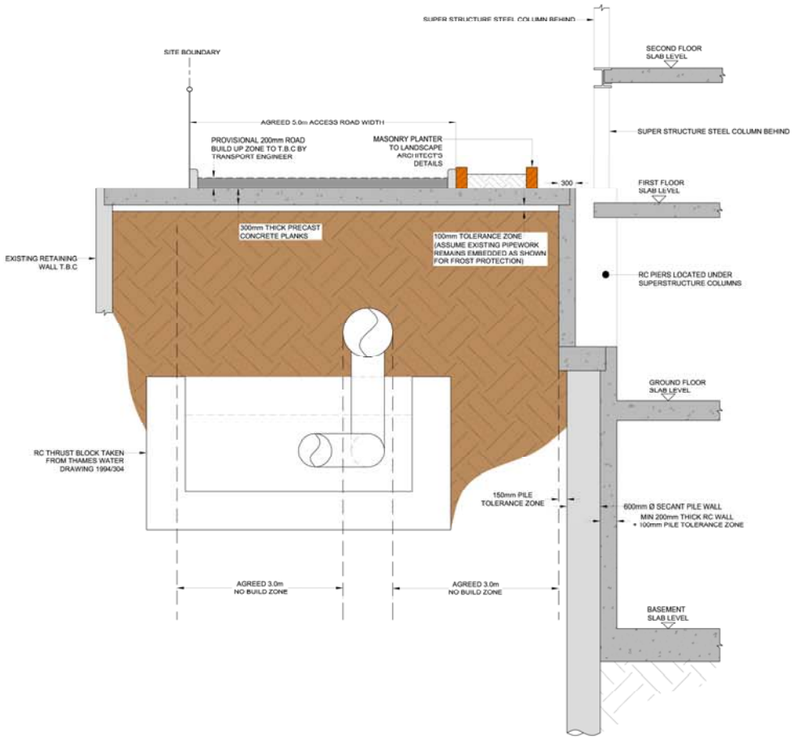


KEY PLAN

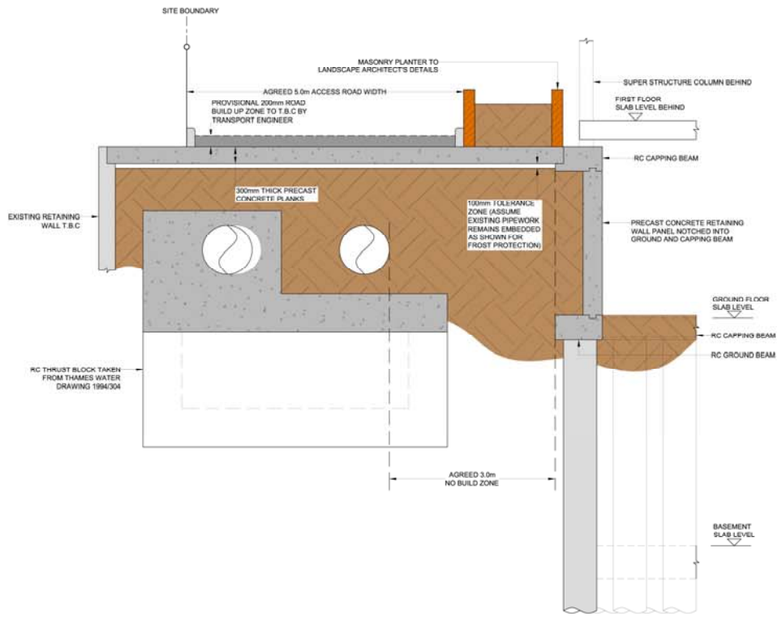
Site Constraints

Western Boundary

The access route along the Western boundary of the site is required for ongoing maintenance to the reservoir. A precast concrete plank solution which avoids loading the pipes and provides easy access has been agreed.



SECTION F - F



SECTION G - G

KEY PLAN