53 Fitzroy Park
London

Supporting Documentation for Planning Application

Structural Engineering Notes

January 2012

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Contents

Prepared by	Checked by	Revision	Notes	Issue date
HSa		P1	Issued for information	11-11-2009
PHu	GG	P2	Issued for Planning	04-10-2010
GG		P3	Re-Issued for Planning	21-09-2011
GG		P4	Re-Issued for Planning	27-09-2011
PHu	GG	P5	Re-Issued for Planning	20-01-2012

This report was updated in September 2011 to reflect comments made by Haycock, Bayham Meikle and to incorporate the findings of the RSK geotechnical report carried out since the last issue of this document.

The report has subsequently been amended in January 2012 to reflect comments made in the third hydrologist's report relating to temporary drainage for dealing with water within the basement excavation. The proposed drainage sumps have been moved into the basement excavation to avoid additional temporary works outside the basement construction. The drawings have also been updated to show possible sump locations, although the final positions and sizes will be agreed with the contractor.

Below are our responses to the Haycock and Baynham Meikle reports.

Responses to Haycock Report, 18/07/11

How the pond derives its water

Refer to Paulex response dated 05/06/11

Nature and extent of groundwater flow beneath the site

The final design for the foundations will allow for a hydrostatic pressure as both uplift and as a lateral load on the foundations. We do not understand the comment regarding two hydrostatic pressures needing to be considered for structural purposes.

Geotechnical properties of the soils beneath the site

We have updated our report to reflect the data given in the RSK report, and have also revised our drawings to indicate lateral support to the road.

Suitability of the soils for SUDs soakaway design

A drainage design would be produced for approval by an Approved Inspector/Building Control before proceeding with works on site.

Responses to Baynham Meikle report, 01/06/11

2.0 Temporary condition during construction

We have updated our drawings to reflect a proposed solution to provide restraint to the road. CBR tests were carried out by RSK, results given in their report.

3.0 Installation of contiguous piles

3.1 GEA report (3/11/09) indicates underlying ground to London Clay. The findings from RSK report also indicates the underlying ground to be London Clay. Note Claygate beds are mentioned as they are indicated on the geological map as being in close proximity to the London Clay. Refer to Paulex response to Haycock report for further comments.

3.2 to 3.4 Boreholes were carried out to depths of 6m by GEA, and to 15m by RSK. The piling contractor will confirm their requirements for borehole information before final design proceeds for this element.

4.0 Basement and Sub-Basement impact on the passage of groundwater

We believe our proposals deal with the temporary and permanent conditions of ground water flow.

6.0 Further Comments on Structural Engineering Notes

6.1, 6.2 We have now updated our report to include the findings of the RSK report, particularly to indicate a method for dealing with heave, and to provide temporary support to the road.

6.3 A drainage design would be produced for approval by an Approved Inspector/Building Control before proceeding with works on site.

6.4 We believe the final methodology for sump/pumping of excavations would be provided by the contractor before commencement of the works. However, we have indicated a suggested methodology in our assumed sequence of works in section 6.0 of this report, and also indicated possible sump locations on drawings SK-01, SK-10 and SK-11.

6.5 CBR values have been included in the RSK report, but again we do not see the relevance of this at planning stage.

6.6 The external site levels are expected to be retained in the proposed scheme.

6.7 A drainage design would be produced for approval by an Approved Inspector/Building Control before proceeding with works on site.

Planning Report

1. Introduction

1.1. Elliott Wood partnership have been appointed by the developer of this site to provide supporting documentation for the proposed Planning application for a new building on this site relating to the potential effect of the proposed development on adjoining properties and land, including hydrology.

1.2. Elliott Wood Partnership have been involved with a number of projects in the immediate vicinity of this site. Previous projects include The Wallace House and Annex, The Water House, 49 Fitzroy Park and The Elms. All of these have involved excavation to create subterranean development of varying extent.

2. Geology and Hydrogeology

GEA Report Summary – November 2009

2.1. An initial site investigation was undertaken at the site by GEA Ltd. which included four small diameter boreholes to a depth of 6m.

2.2. The ground conditions found during the site investigations appear to align with published geological data. The site is shown to be underlain by London Clay from the surface (with the exception of varying quantities of made ground) with the Claygate member overlying the London Clay to the North East of the site. The London Clay is defined as a non-aquifer and the Claygate member is defined as a minor aquifer. The London Clay effectively acts as a barrier to flow to the lower chalk major aquifer. Perched water is therefore likely to occur at the surface in the form of springs at the boundary between the Claygate member and the impermeable London Clay. London Clay has been proved directly below the made ground on this site and therefore springs associated with the boundary condition noted above should not occur on this site, although near surface flows are likely to be present in the made ground.

2.3. Ground water flow will be in a down slope direction Westerly or South-Westerly towards the Highgate ponds and the pond in the garden of 55 Fitzroy Park. Ground water flow within the London Clay is likely to be very slow, whereas flows in the made ground directly overlying the London Clay may occur at a greater rate. The made ground on the site varies in thickness from a maximum of 1.1 metres in BH 4 to 0.5 m in BH 1.

RSK report summary – December 2010

2.4. A further more detailed site investigation was carried out by RSK Group PLC. This included 9 boreholes (4 to a depth of 4m, 4 at 10m, 15m).

2.5. The ground conditions were confirmed as made ground overlying London Clay across the site. This was found to be of very high plasticity, and is desiccated.

2.6. Perched water was confirmed in the made ground, and flows are expected to be slow. Some seepage was noted in the clays, again at low rates.

2.7. Chemical testing of the site and pond water indicates that the pond water levels are not related to ground water flows, and are related to surface water flows.

3. Proposed Works at 53 Fitzroy Park

3.1. The development comprises the construction of a new four storey residential building. One storey of this building will be located below ground level as a single storey basement at an anticipated level of 78.2m AOD. However, the pool area will extend lower to a depth of 76.8m AOD. The proposed ground levels at to the front of the new building will be at approximately 84.2 m AOD. The ground slopes down from Fitzroy Park road each side of the new building (from the north east and south east corners of the site), with the ground to the rear at a level of approximately 81.2m AOD. These levels closely follow the existing levels and have been set to minimise the amount of earth movement around the building itself. It is proposed that the basement will be constructed in reinforced concrete with a piled raft to support the vertical loads and deal with any tensile forces that might occur as a result of the hydrostatic pressures and heave that are likely to develop around the building. The basement will be located fully within the London Clay.

4. Proposed Construction Method.

4.1. The most reliable approach for dealing with the possibility of ground water flow around a building or basement is to provide the necessary means for the water to continue to flow before, during and after construction without being impeded. This will avoid the build up of water due to the damming effect of retaining walls, or the diversion of water into other areas or strata previously not affected by near surface water flow.

4.2. The main concern in terms of water flows on the site is therefore considered to be the near surface flows in the made ground overlying the London Clay. As already noted the flows through the London Clay will be at a very slow rate. This is also our experience of other adjoining sites particularly following heavy rainfall. In all cases the underlying clay has been dry and stable during the excavation and only becomes problematic during or shortly after rainfall. The proposed temporary contiguous piles and permanent gabion walls will maintain the stability of the slopes during rainfall. Therefore, there needs to be a strategy in place to allow the near surface flows to continue down slope during construction and after completion.

4.3. This can be facilitated by providing free draining or permeable zones both vertically and horizontally to allow the water to flow. The attached Basement Strategy Schematic sketches SK01, SK10 & SK11 show how this would work in principle in the permanent and temporary conditions. The permeable zones will comprise a hardcore type material or no fines concrete that both have reliable levels of porosity. Geotextiles may be used to prevent silting up of the voids. Water will be able to flow around and under the building from the uphill East side to the lower West side where it would rejoin the natural strata. It is proposed that the temporary works piles would be formed using contiguous piles with spaces between them to allow the passage of water. In order to avoid loss of fines in the made ground it is proposed that the made ground would be excavated immediately behind the upstream piled wall to allow the insertion of a geotextile membrane which will allow water to continue to flow but would prevent the fines from being washed out. Should water flows be high then a series of counterfort type drains could also be incorporated within the porous layer.

4.4. The vertical layer can be formed by using a proprietary form voiding material that is then removed following construction of the permanent reinforced concrete wall. The void between the temporary piles and the permanent retaining wall can be backfilled with a free draining material. The temporary piled wall would be left in place.

4.5. Clearly this form of construction is likely to develop hydrostatic pressures to the perimeter walls and basement raft of the building as ground water will remain around the building until sufficient head of water is built up on the upstream side to effectively allow the water to continue to the downstream side. This replicates the existing condition and will prevent water from being displaced laterally. The basement construction will therefore need to be designed with this in mind. It is likely that the basement will therefore be designed as a water retaining structure in accordance with BS8007, design of concrete structures for retaining aqueous liquids, with a secondary means of defence such as an internal drained cavity system and associated sumps and pumps.

4.6. The new building will be set in from the boundaries to allow the temporary works wall and permeable layer to be formed.

4.7. During construction, ground water will be allowed to flow in to the excavation through the contiguous piled wall, in the same manner as the permanent condition. The proposed basement level will be below the level of the London Clay / made ground interface. In the temporary condition, water in the excavation will need to feed into sumps formed below the temporary formation level. This water will then be pumped back in to the fill material through a series of land drains which will aid the distribution of the ground water back in to the fill. Further in-situ testing is required to establish permeability of the made ground and this will be used to design the land drains for adequate distribution of the ground water back in to the 'down slope' made ground.

4.8. On the basis that the water flows almost entirely exist within the made ground which is at a very shallow depth, contamination due to the introduction of wet concrete construction of the basement should be no more onerous than would occur for traditional foundations bearing through the fill in to the London Clay. Indeed, because the basement raft will be cast fully within the London Clay and all retaining walls will be shuttered on all sides there is actually less risk of contamination than for a traditional foundation where the concrete is simply cast against the made ground. Furthermore this method of construction actually allows water to continue to flow under the building whereas a more traditional strip foundation would act as a barrier to water flows within the made ground. Consequently the construction of the basement may actually allow more flow down the slope once the existing building and foundations are removed.

4.9. The London clay layer has been found to have a high plasticity and was extremely desiccated, and therefore the basement raft will need to be suspended to prevent heave affecting the building. This is to be achieved by utilizing a heave protection board on the formation level, with the permeable layer above, and the concrete structure built over this. Vertical loads would then only be transferred via a piled raft into the ground.

5. Construction Generally

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

The ground conditions
The hydrogeology conditions on the site
The stability of the adjoining highway
Potential heave issues from the London Clay
Vertical and lateral hydrostatic pressures from ground water acting on the basement.
Forming sensible access onto the site to minimise disruption to the neighbouring residents
Providing a safe working environment

6. Preliminary Assumed Sequence of Construction

6.1. Erect a fully enclosed site hoarding. All works are to take place within the hoarded zone. Tree and root protection zones should be established and maintained to satisfy the Arboriculturalist. Any vulnerable services within the site and adjacent footpath should be identified and isolated if required.

6.2. Demolish existing building and level site over footprint of lower ground floor slab to a level of approximately 80.8 AOD.

6.3. Lay piling mat of 300mm crushed concrete. Install contiguous piles around the perimeter of the proposed basement slab, ensuring there is adequate spacing between piles to facilitate the flow of water.

6.4. Install piles for the basement, pool and lower ground floor rafts.

6.5. Excavate from 80.8, down approximately 1.5m within the area of the new basement slab defined by the contiguous piles. Ensure suitable temporary sumps are excavated within the excavation to allow groundwater to be collected and pumped out of the main excavation.

6.6. Install temporary waling beams to face of piles at the top of excavation to form a stiff ring beam. Install diagonal lateral props in corners to provide lateral propping without compromising working space.

6.7. Continue excavation down to formation level of basement slab, ensuring the depth for the free draining material and clay board is also excavated. Excavate suitable temporary sumps within the excavation to allow groundwater to be collected and pumped out of the main excavation.

6.8. Install the second set of temporary waling beams to form a ring beam at mid-height of the excavation (mid height between top of excavation and basement slab formation level).

6.9. Continue excavation local to the new pool, down to the formation level for the pool slab (accounting for free draining material layer and clay board underneath). Excavate sumps below basement slab formation level to allow groundwater to be collected and pumped out of the main excavation. The form of construction for the sumps would be decided by the main contractor but could consist of either insitu reinforced concrete or precast concrete rings.

6.10. Lay clay board for heave protection on blinding, and then 500 thk (TBC) layer of free draining material (either no fines concrete or hardcore) to underside of pool slab.

6.11. Fix reinforcement and cast pool slab.

6.12. Install void former between contiguous piles and pool RC walls. Cast RC walls against void former.

6.13. Once concrete is cured, remove void former and backfill with free draining material between pool wall and contiguous piles.

6.14. Lay clay board on blinding, and then the mat of free draining material beneath basement slab. Fix reinforcement and cast basement slab and kicker for RC retaining walls.

6.15. Install void former between back face of new RC walls and contiguous piles. Cast RC retaining wall against void former and cast RC retaining wall to just below the first set of waling beams. Remove void former and backfill between retaining wall and contiguous piles with free draining material.

6.16. Install void former and cast RC retaining wall to underside of lower ground floor slab in max 1.5m lifts. Backfill between retaining wall and contiguous piles with free draining material.

6.17. Allow concrete RC walls to cure and install temporary steel props at top of new basement walls but below new lower ground floor slab level.

6.18. Remove top waling beam from contiguous piles.

6.19. Cast RC columns up to underside of lower ground floor.

6.20. Erect formwork, fix reinforcement and cast lower ground floor slab above footprint of main basement. Once concrete is cured, remove lateral props from top of basement retaining walls.

6.21. Excavate back from contiguous piles towards road and install gabion walls in 1m sections, providing a geotextile membrane between the gabion wall and soil in each case.

6.22. Fix reinforcement, erect formwork and cast lower ground floor slab in area beyond line of contiguous piles.

6.23. Fix reinforcement, erect formwork and cast RC retaining walls from lower ground floor to upper ground floor.

6.24. Install temporary props to top of retaining wall and backfill behind wall with well compacted fill.

6.25. Cast RC columns up to underside of upper ground floor

6.26. Erect formwork, fix reinforcement and cast upper ground floor.

6.27. Continue construction of RC frame to roof level.

7. Summary

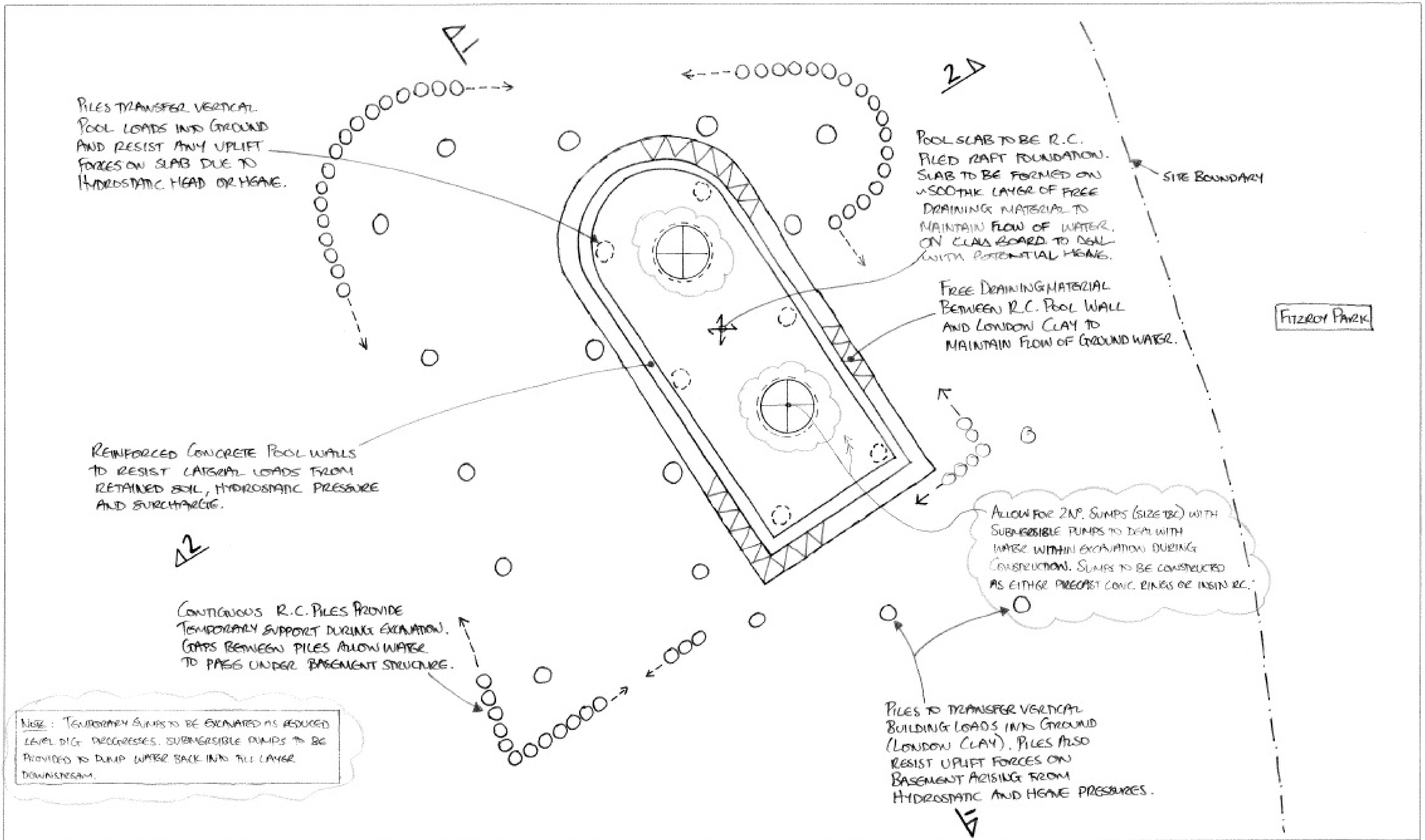
7.1. The proposed development is for the demolition of an existing building and replacement with a four storey building including a single storey basement.

7.2. The underlying ground conditions comprise made ground over London Clay.

7.3. There are ground water flows within the made ground overlying the London Clay. The approach adopted accepts that near surface water flows are likely to exist both during construction and after completion.

7.4. The proposals allow for water flows to be able to pass either around or under the new basement. This can be achieved relatively easily on this site by constructing a wall with permeable layers. As a result of this type of approach there should be no significant impact on the hydrogeology in the area of this development.

Proposed Drawings



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

Do not scale from this drawing.

ALL PILE POSITIONS INDICATIVE.

rev	date	by	chk	description
P4	17/1/12	PH	GG	SUMPS ADDED
P3	27/9/11	GG		HEAVE PROT. NOTE ADDED
P2	15/9/11	GG		ISSUED FOR PLANNING
P1	1/10/10	PH	GG	ISSUED FOR PLANNING

drawing title: **PROPOSED SUB-BASEMENT PLAN**

scale(s): 1:100@A3 date: 30/9/10 drawn: PH

drawing status: PRELIMINARY

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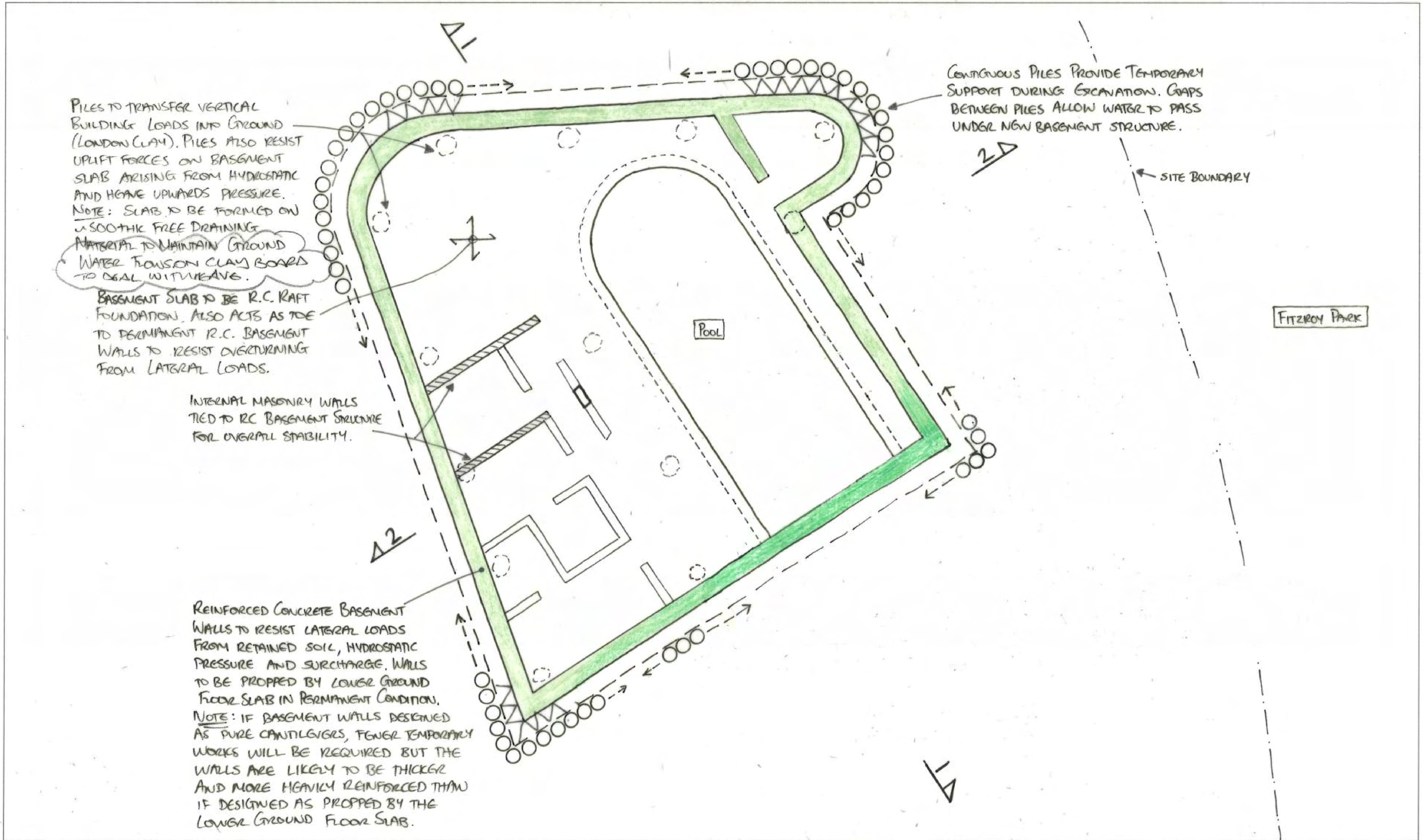
job title: **53 FITZROY PARK N6 6JA**

job no: 209483 drawing no: SK-01 revision: P4



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rev	date	by	chk	description

drawing title: **PROPOSED BASEMENT PLAN**

scale(s)	date	drawn
1:100@A3	24/9/10	PH

drawing status: PRELIMINARY

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job title: **53 FITZROY PARK N6 6JA**

job no	drawing no	revision
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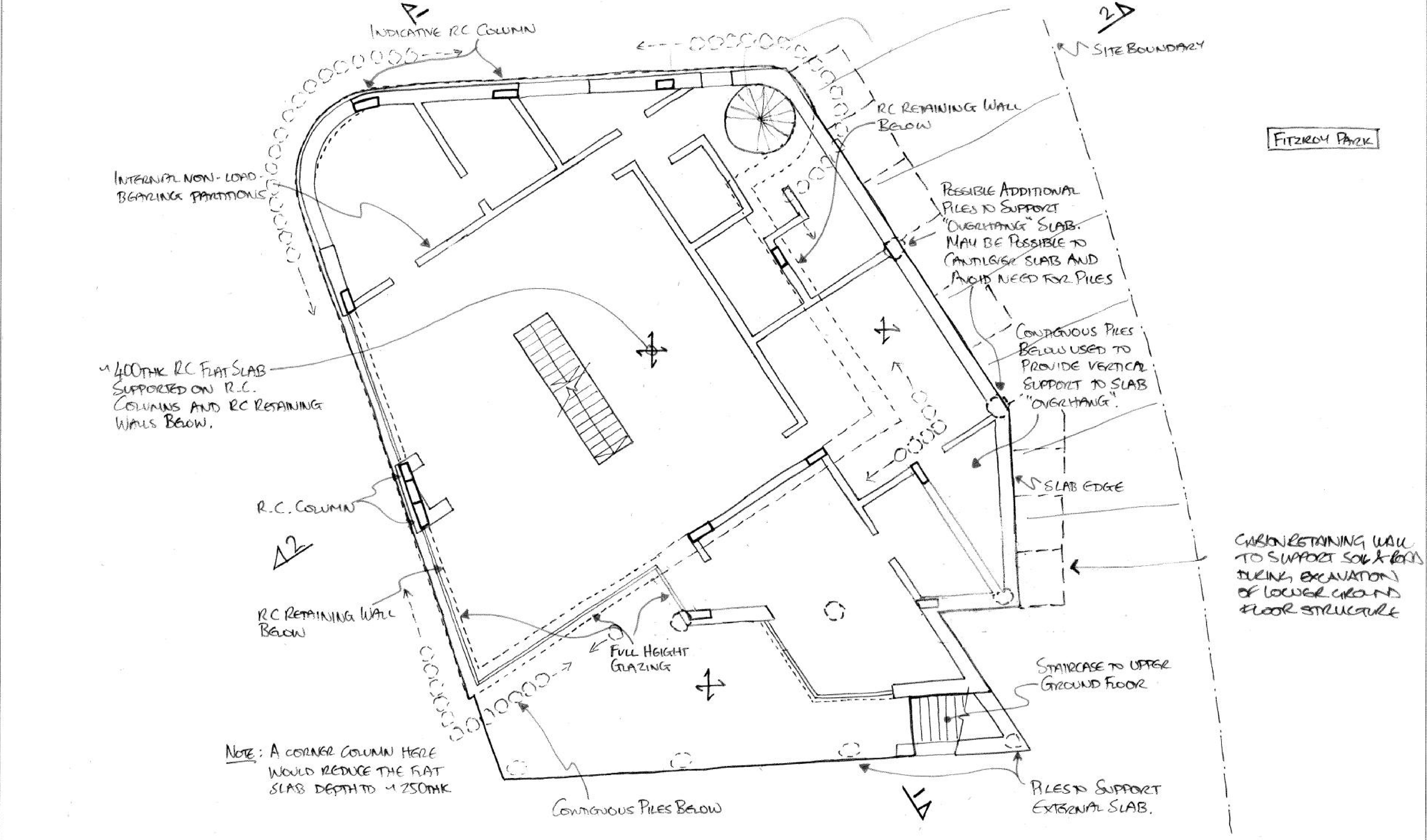

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rev	date	by	chk	description

drawing title
PROPOSED LOWER GROUND FLOOR PLAN

scale(s)	date	drawn
1:100@A3	24/9/10	PH

drawing status
PRELIMINARY

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job title
53 FITZROY PARK N6 6JA

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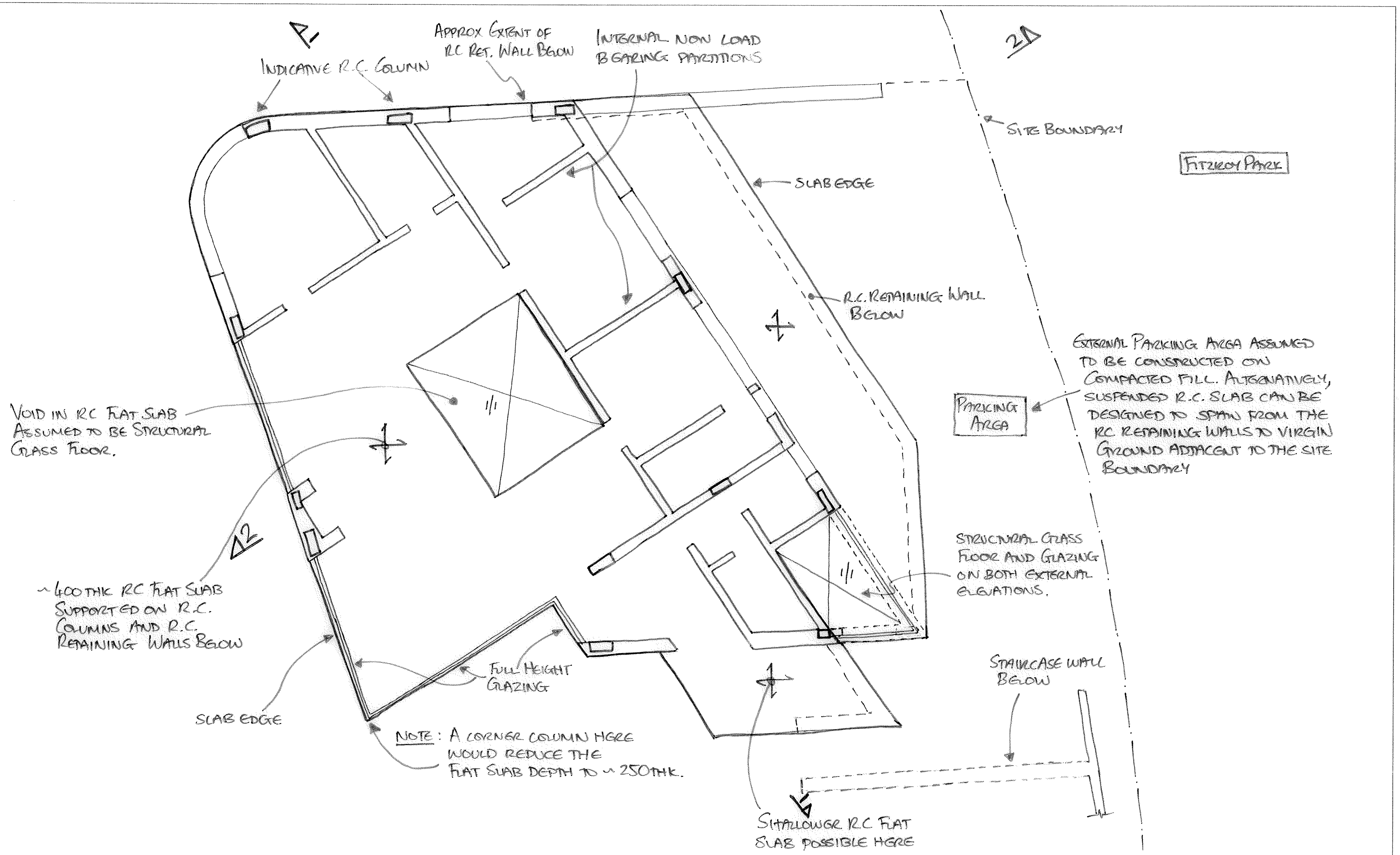

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rev	date	by	chk	description

drawing title
Proposed Upper Ground Floor Plan

scale(s): 1:100@A3 | date: 24/9/10 | drawn: PH

drawing status: Preliminary

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job title
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job no	drawing no	revision
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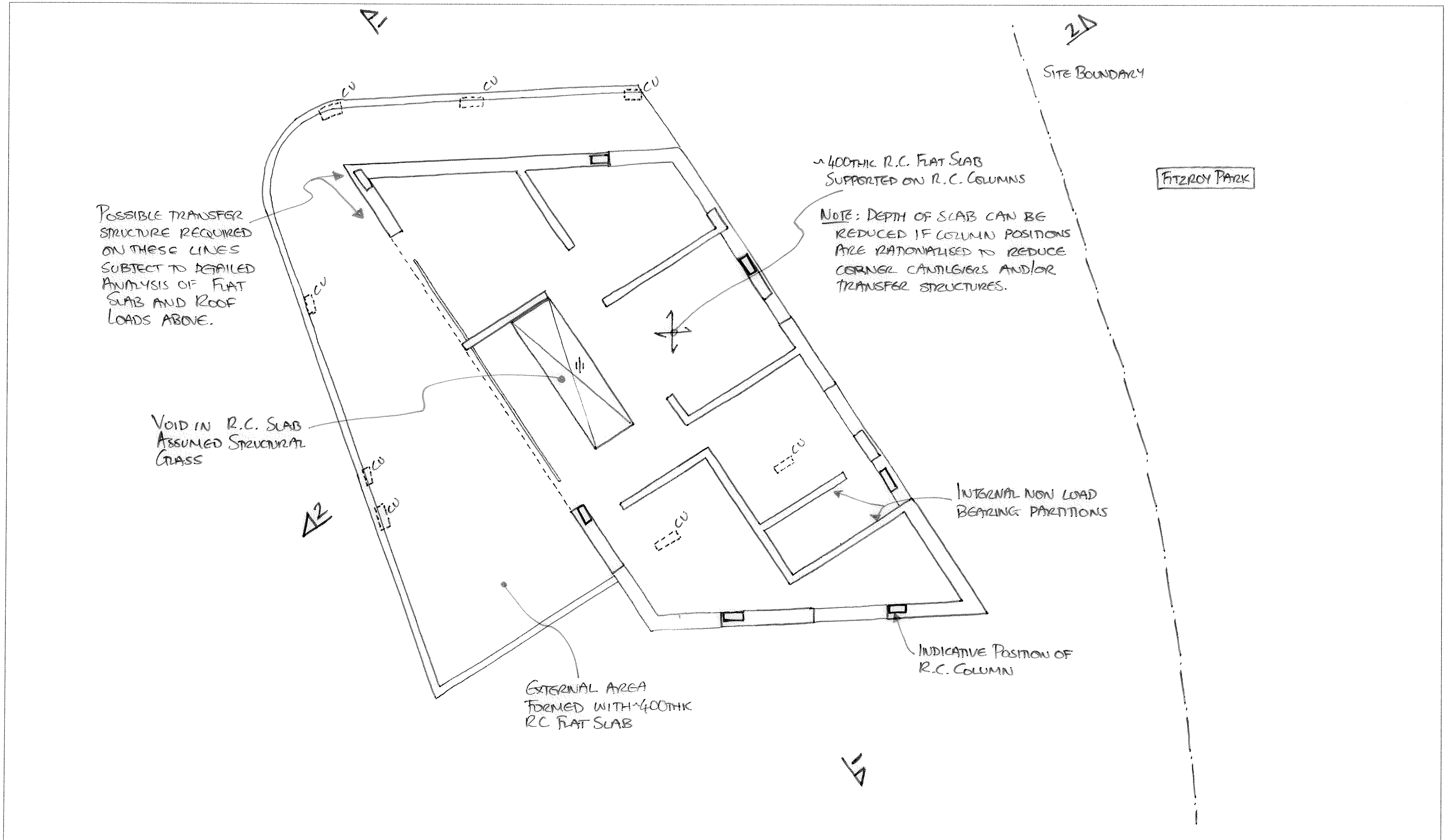

CU – COLUMN UNDER

rev	date	by	chk	description

drawing title: PROPOSED FIRST FLOOR PLAN

scale(s): 1:100 @A3 | date: 24/9/10 | drawn: PH

drawing status: PRELIMINARY

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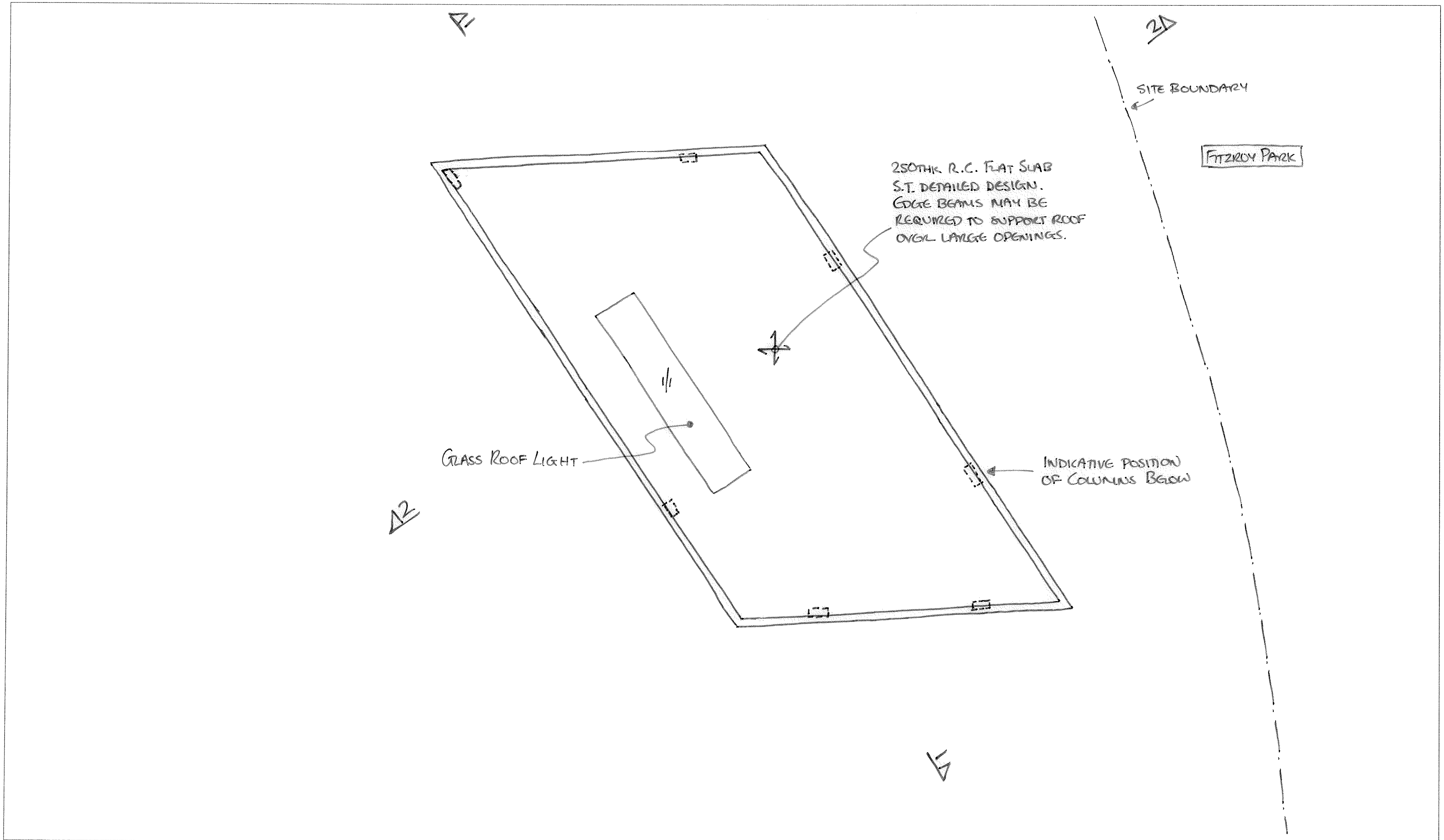
job title: 53 FITZROY PARK N6 6JA

job no	drawing no	revision
209483	SK-05	P1



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drawing title

PROPOSED ROOF PLAN

scale(s)	date	drawn
1:100@A3	24/9/10	PH

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job no	drawing no	revision
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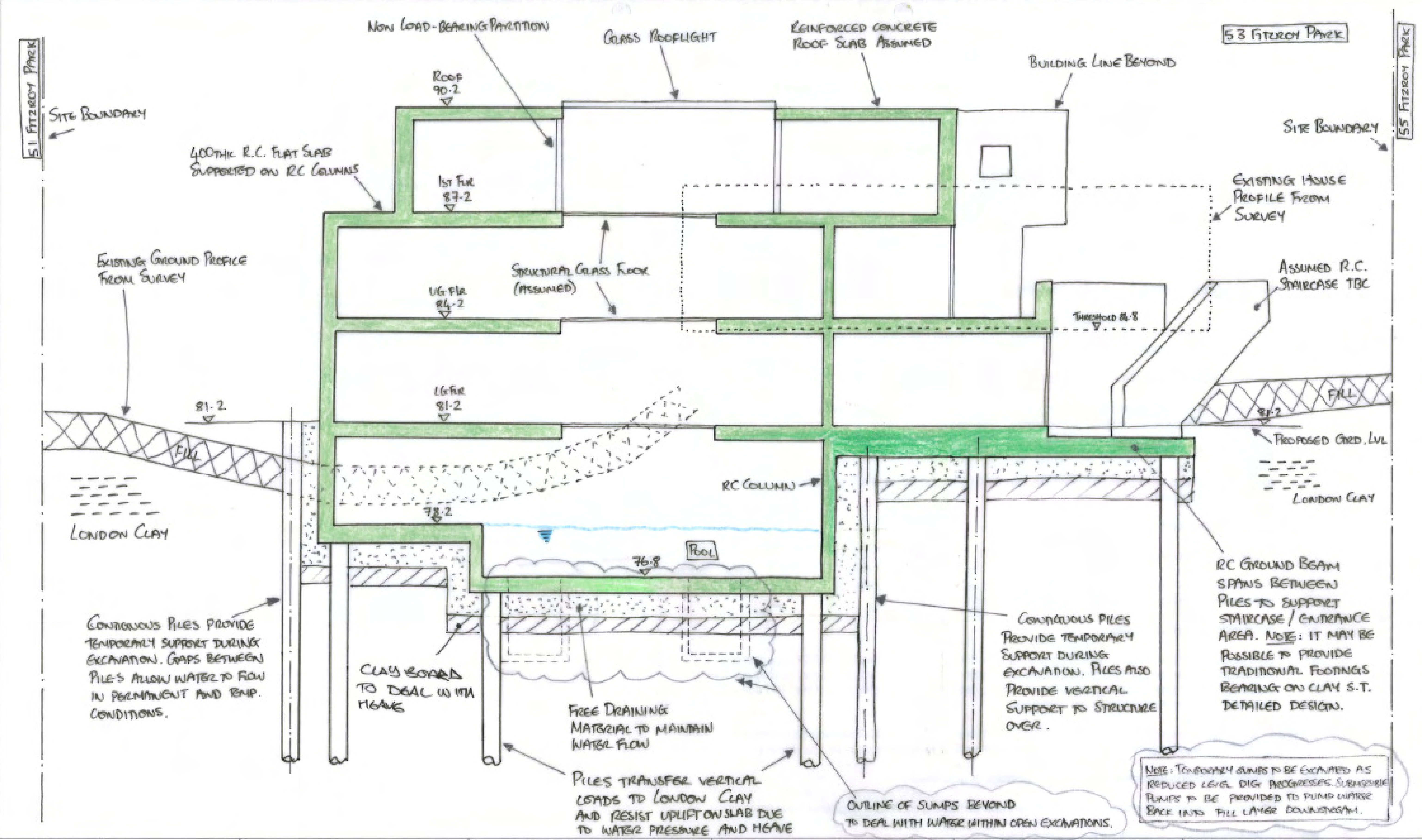

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rev	date	by	chk	description
P4	17/1/12	PH	GG	Sumps Added.
P3	27/9/11	GG		Heave Prot. Note Added
P2	13/9/11	GG		Issued for Planning
P1	1/10/10	PH	GG	Issued for Planning

drawing title
Proposed Section 1-1

scale(s) 1:100@A3 | date 27/9/10 | drawn PH

drawing status
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job title
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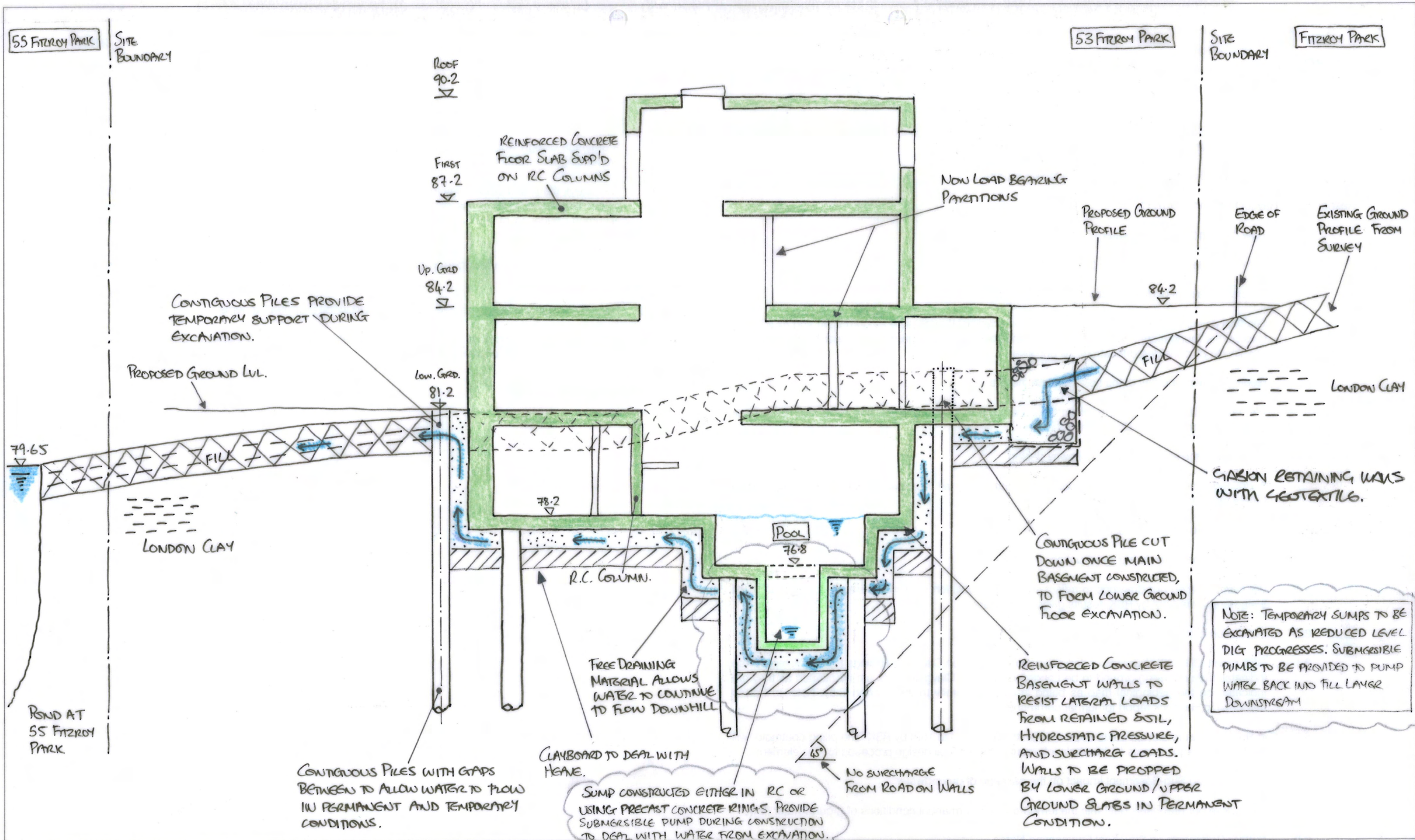
job no 209483 | drawing no SK-10 | revision P4



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P3	17/1/12	PH	GG	SUMP AMENDED
P2	27/9/11	GG		GABIONS ADDED
P1	01/10/10	PH	GG	ISSUED FOR PLANNING

drawing title

PROPOSED SECTION 2-2

scale(s)	date	drawn
1:100@A3	27/9/10	PH

drawing status: PRELIMINARY

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job title

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job no	drawing no	revision
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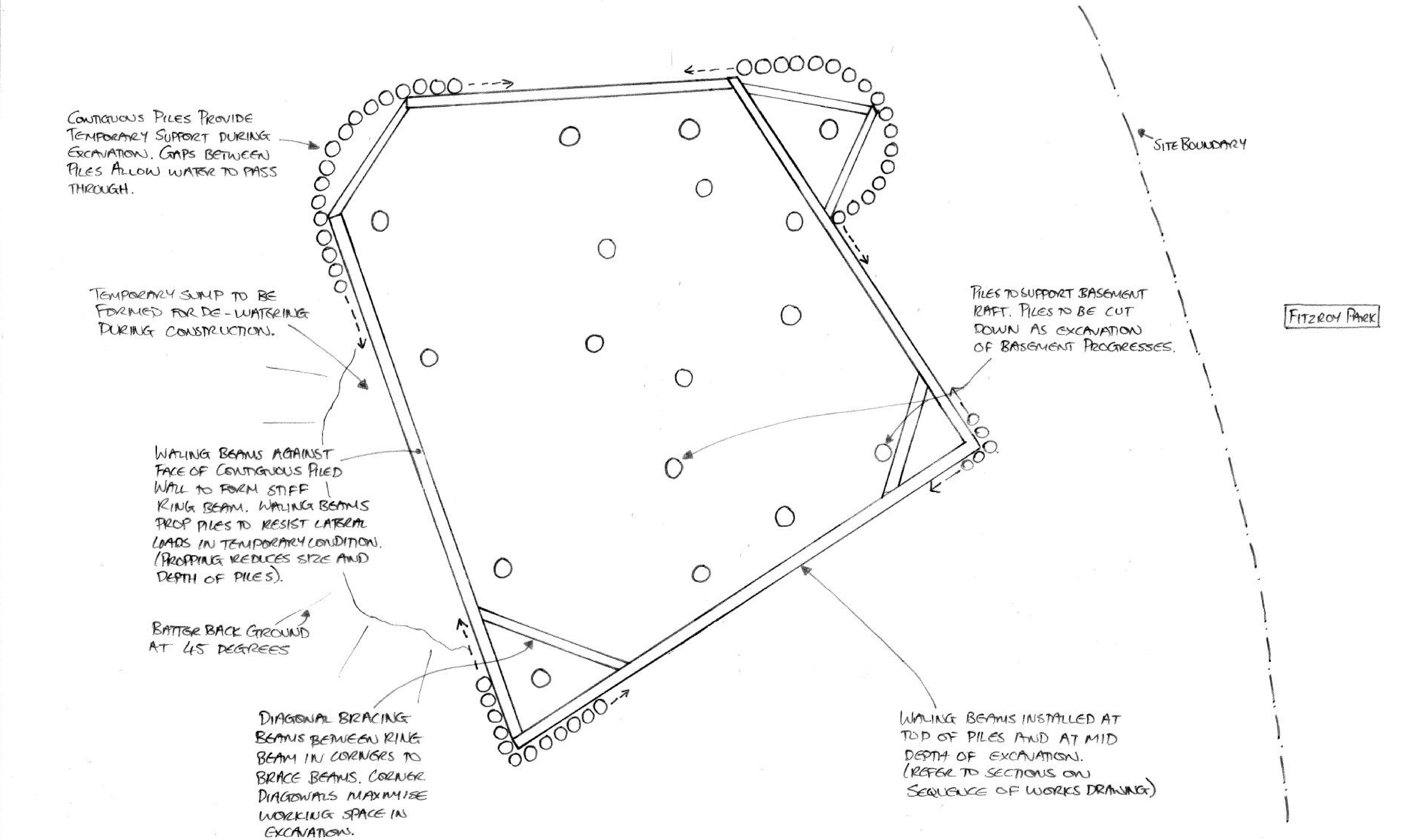

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rev	date	by	chk	description

drawing title: TEMPORARY WORKS - BASEMENT

scale(s): 1:100@A3 | date: 01/10/10 | drawn: PH

drawing status: PRELIMINARY

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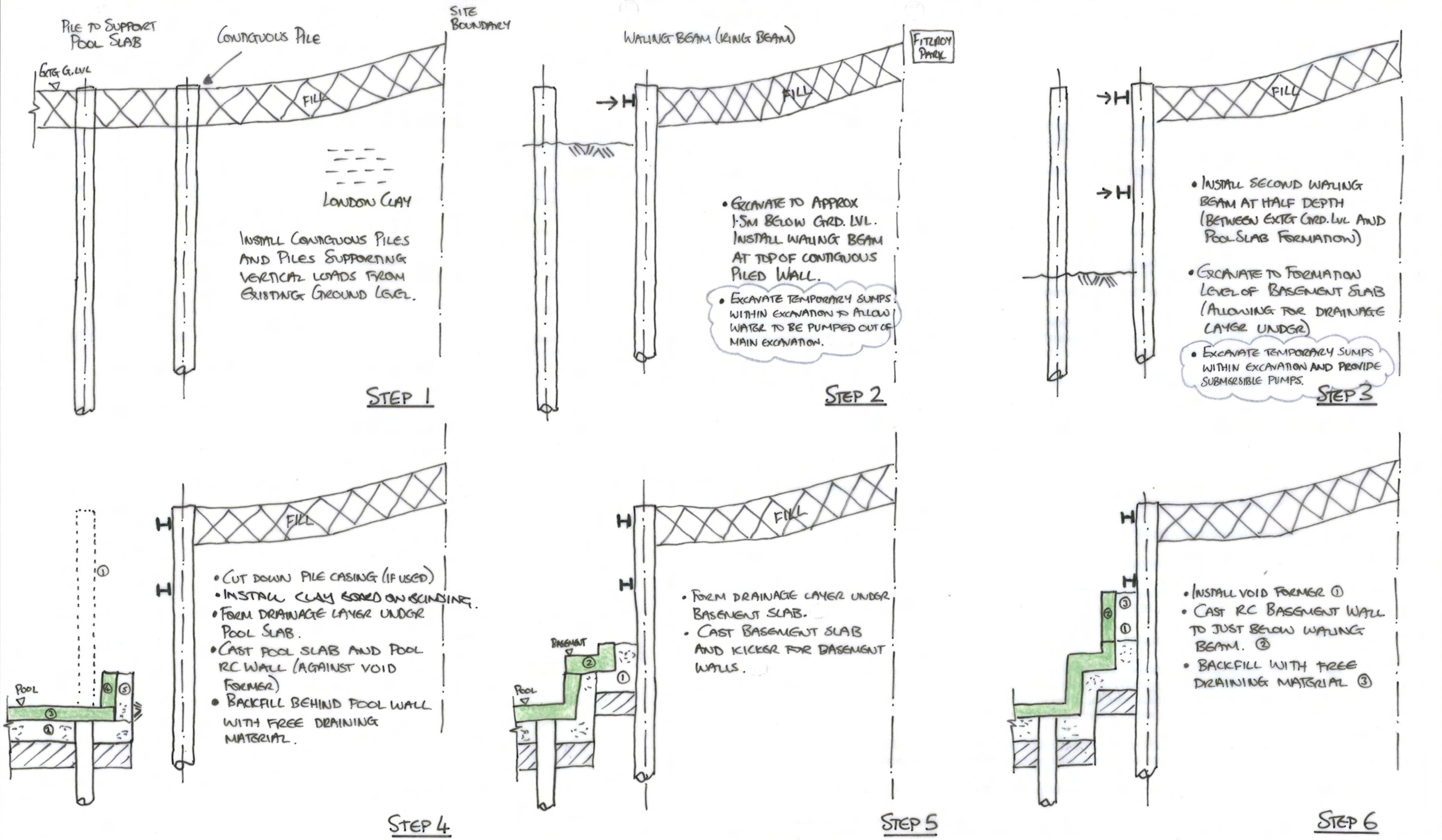
job title: 53 FITZROY PARK N6 6JA

job no: 209483 | drawing no: SK-100 | revision: P2



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P2	19/01/12	PH	GG	SUMP NOTES ADDED
P1	01/10/10	PH	GG	ISSUED FOR PLANNING

drawing title
ASSUMED SEQ OF WORKS SHEET 1 OF 2

scale(s): 1:100@A3 | date: 01/10/10 | drawn: PH

drawing status: PRELIMINARY

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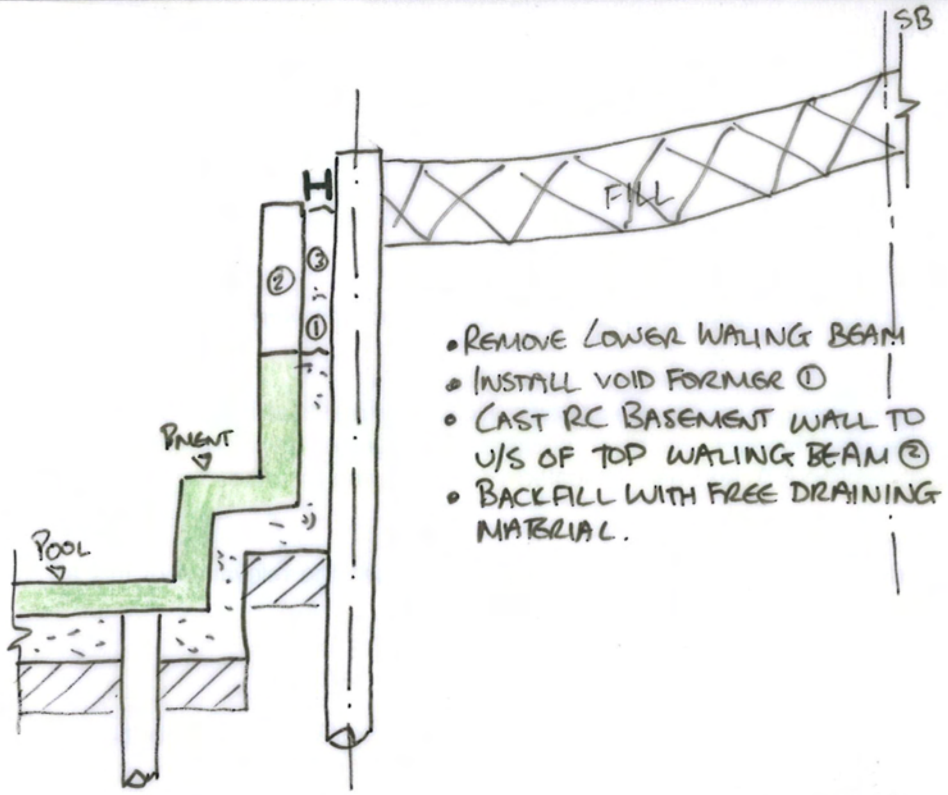
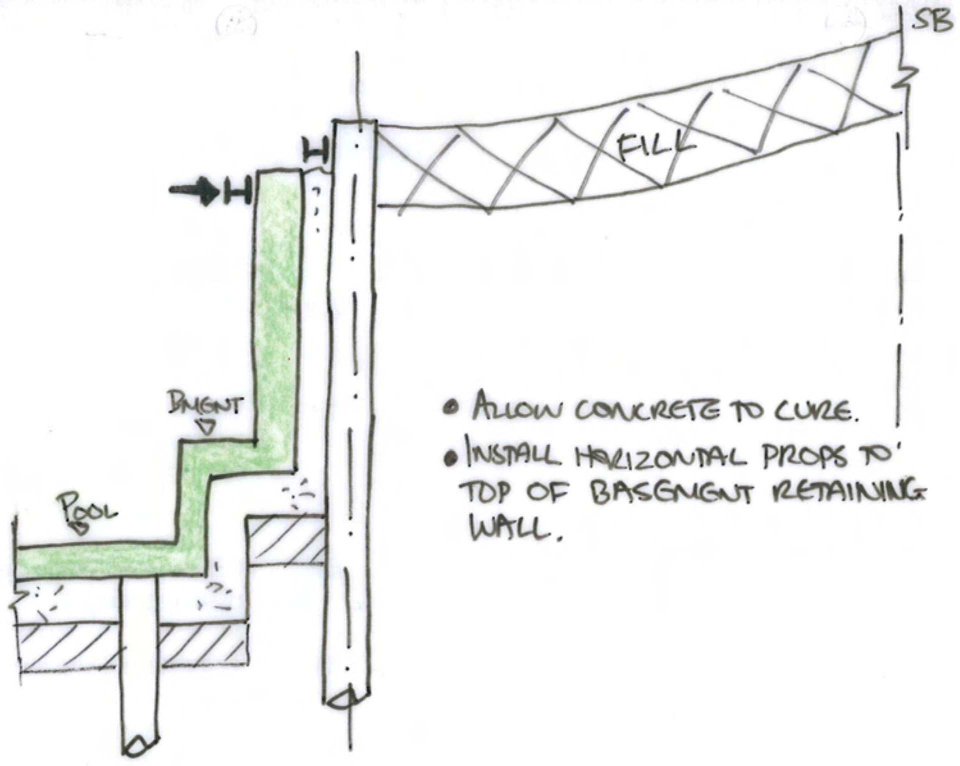
job title
53 FITZROY PARK N6 6JA

job no: 209483 | drawing no: SK-110 | revision: P2



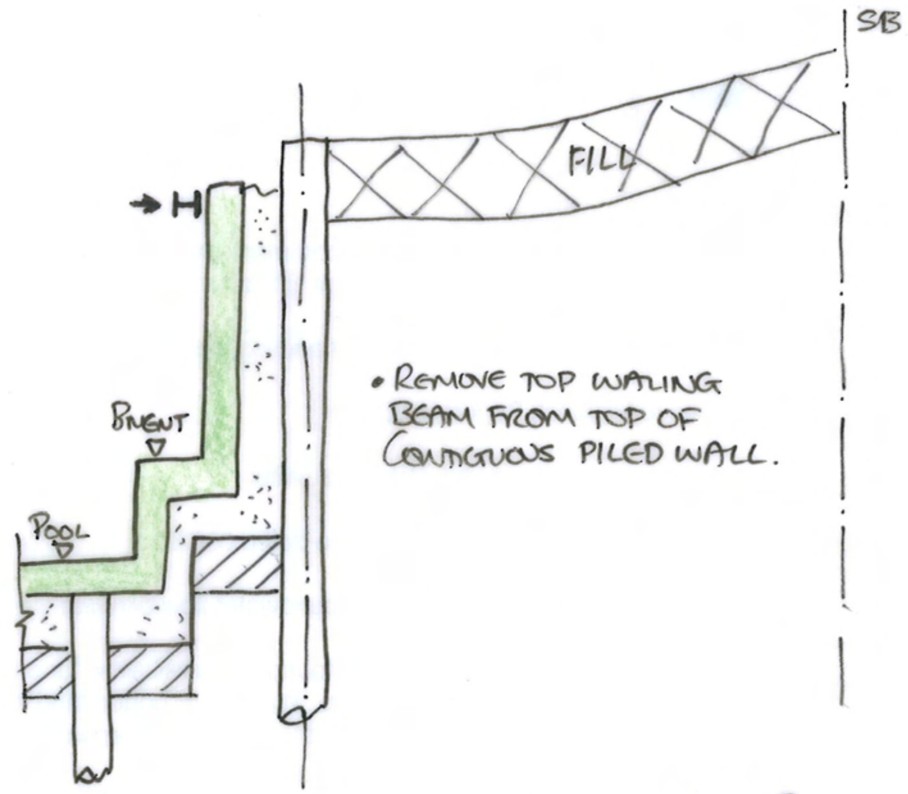
- Remove Lower Waling Beam
- Install void former ①
- Cast RC Basement wall to u/s of top waling beam ②
- Backfill with free draining material.

STEP 7



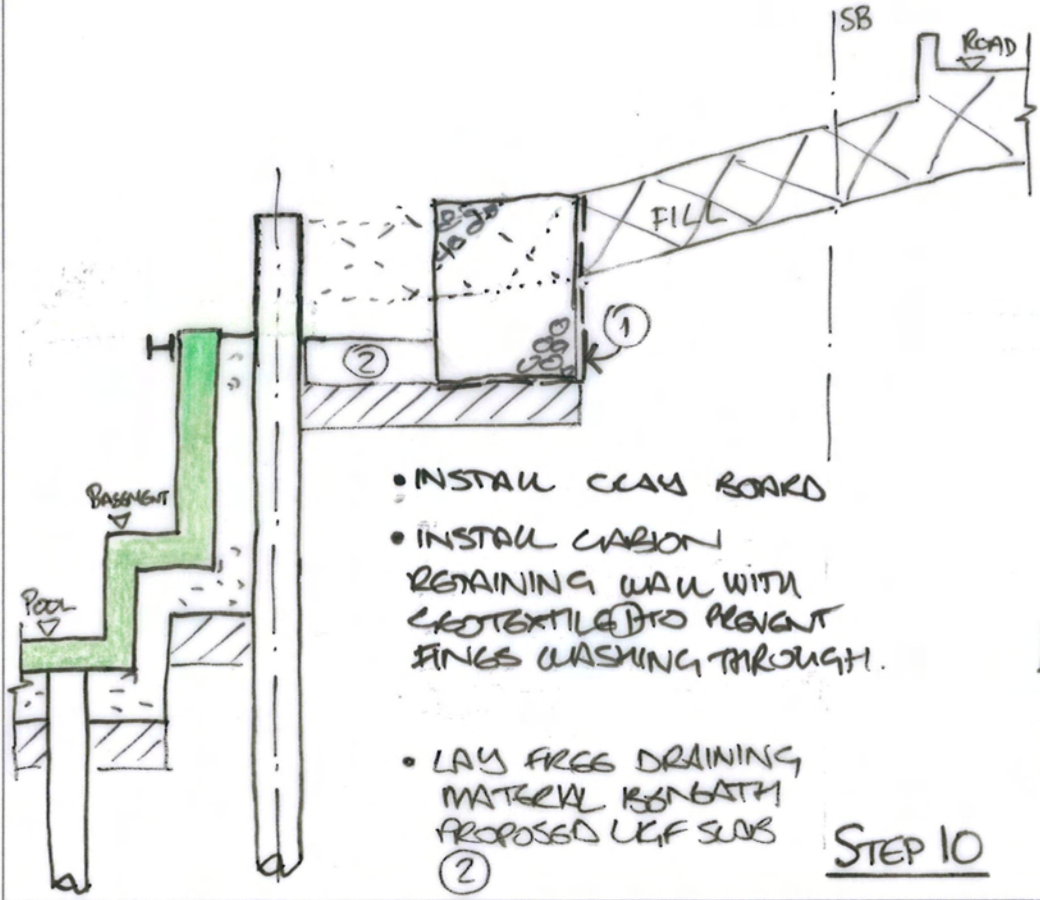
- Allow concrete to cure.
- Install horizontal props to top of basement retaining wall.

STEP 8



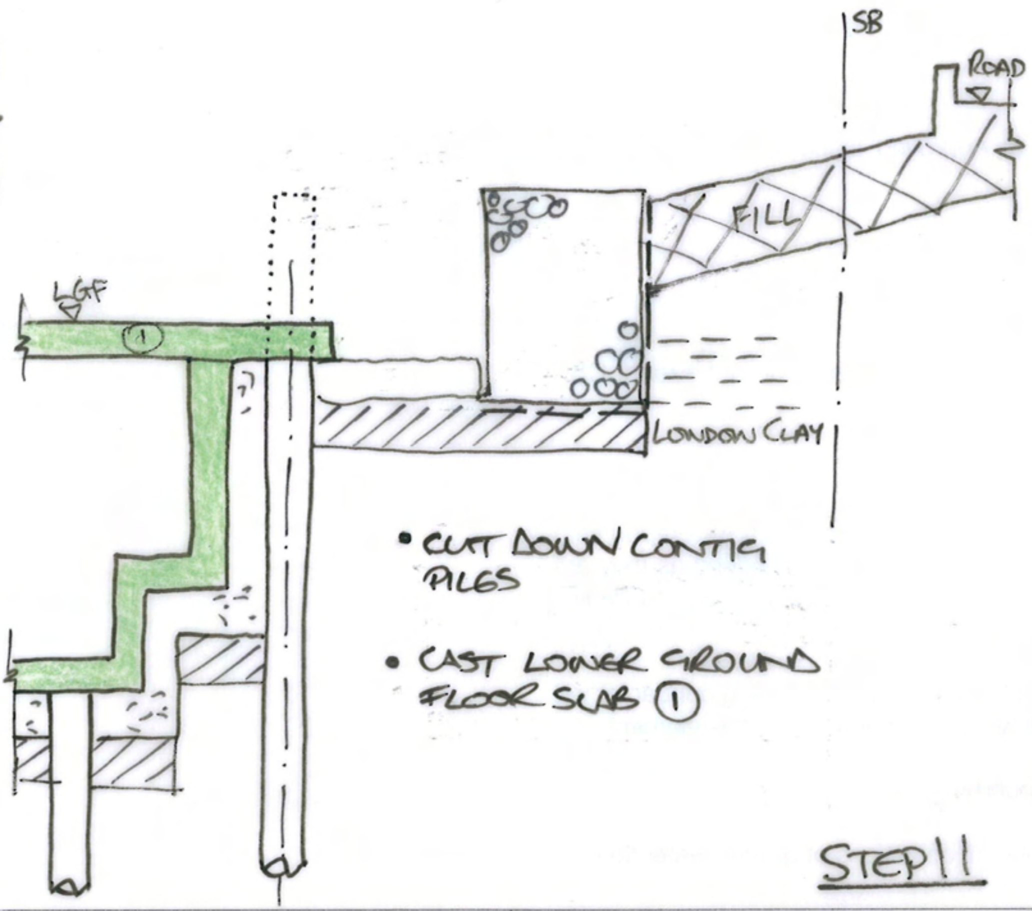
- Remove top waling beam from top of contiguous piled wall.

STEP 9



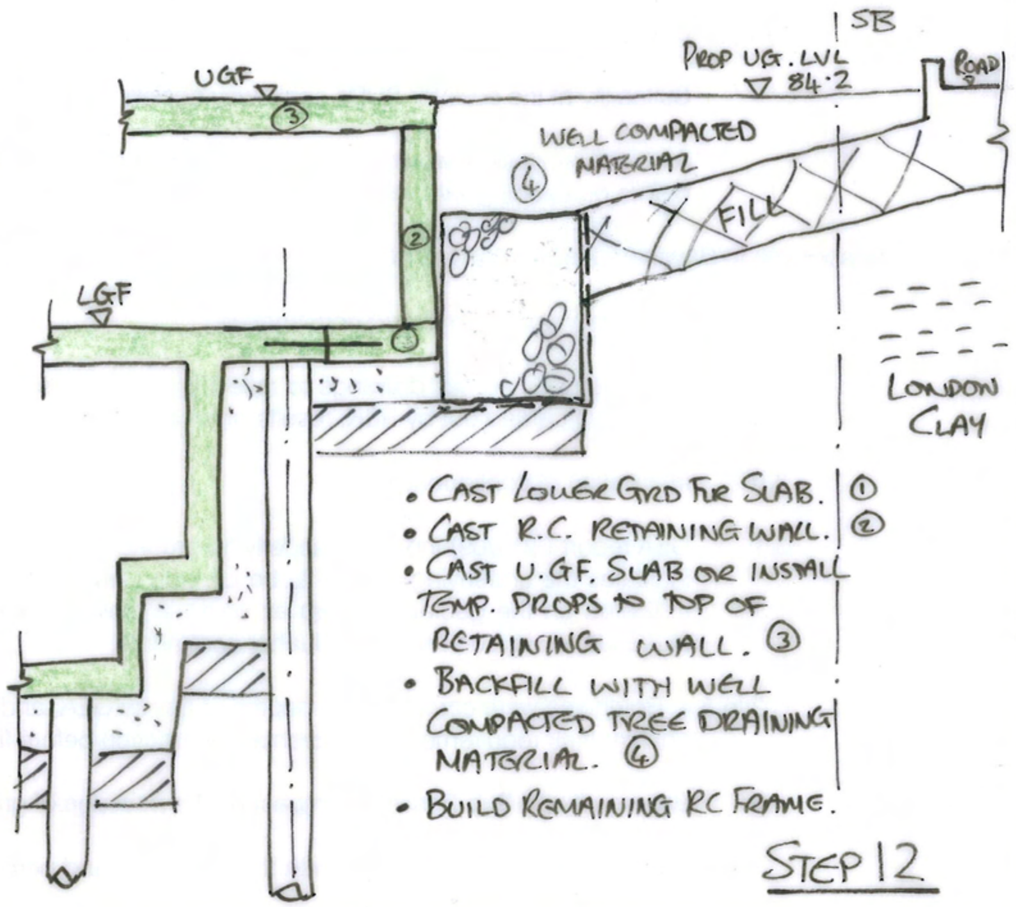
- Install clay board
- Install gabion retaining wall with geotextile ① to prevent fines washing through.
- Lay free draining material beneath proposed LGF slab ②

STEP 10



- Cut down contig piles
- Cast lower ground floor slab ①

STEP 11



- Cast Lower Grd Flr Slab. ①
- Cast R.C. Retaining wall. ②
- Cast U.GF. Slab or install temp. props to top of retaining wall. ③
- Backfill with well compacted free draining material. ④
- Build remaining RC frame.

STEP 12

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
P2	29/9/11	GG		Gabions + Clayboard Added
P1	01/10/11	PH	GG	Issued for Planning

drawing title: ASSUMED SEQ OF WORKS SHEET 2 OF 2

scale(s): 1:100 @ A3 | date: 01/10/10 | drawn: PH

drawing status: PRELIMINARY

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job title: 53 FITZROY PARK N6 6JA

job no: 209483 | drawing no: SK-111 | revision: P2