

# Appendix E

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Card Geotechnics Ltd Basement Impact Assessment and Supplementary Letter Report



GFZ Investments Limited

**4 Tavistock Place, Camden,  
London**  
*Screening and Scoping Study –  
Revision 1*

February, 2015



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4 TAVISTOCK PLACE, CAMDEN, LONDON  
SCREENING REPORT



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## 1. INTRODUCTION

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It is proposed to extend the existing lower ground floor of 4 Tavistock Place both in depth and laterally outside the footprint of the building into the rear garden.

Card Geotechnics Limited (CGL) has been instructed by Form Structural Design (the structural engineers for the project) to undertake a Screening Study (SS) in accordance with the requirements of Camden Planning Guidance document CPG4.

This report is intended to address the screening process set out in CPG4 and the Camden geological, hydrogeological, and hydrological study (CGHHS)<sup>1</sup>. It identifies key issues relating to land stability, hydrogeology and hydrology (Stage 1).

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<sup>1</sup> Ove Arup and Partners, Camden geological, hydrogeological, and hydrological study. Guidance for subterranean development, November 2010.

## 2. SITE CONTEXT

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### 2.1 Site location

The site is situated along Tavistock Place in Camden, northwest London. The Ordnance Survey grid reference for the approximate centre of the site is 530034N, 182320E.

A site location plan is presented as Figure 1.

### 2.2 Site description

The site is a terraced property, approximately rectangular in shape and is bordered by Tavistock Place to the north, numbers 6 and 8 Tavistock Place to the east, an ambulance station to the south and number 2 Tavistock Place to the west. The site currently comprises six above ground storeys and a lower ground floor. It is understood that the neighbouring property of no.2 Tavistock Place has already completed a similar extension and therefore no underpinning will be required at this party wall. It is also understood that the property of no.6 Tavistock Place has a lower ground floor at the same level as that of the proposed development. Therefore, earth will be retained around the rear garden only.

The site layout plan is presented within Figure 2.

### 2.3 Proposed development

It is proposed to lower the current lower ground floor by approximately 0.70m to 20.82mOD and to extend laterally beyond the footprint of the building into the rear garden. Garden perimeter walls will be underpinned to lower the garden level to the new depth in the rear.

Proposed development plans are presented in Appendix A.

### 2.4 Site history

It is understood that the site has been developed residential land since c.1870 and remained relatively undeveloped until c.1950 when the properties of 2 – 6 Tavistock Place became 'Avondale Hotel'.

## 2.5 Unexploded Ordnance

London bomb maps<sup>2</sup> indicate that the site itself was not struck during The Second World War, however, it is understood that a V2 long range rocket struck an area approximately 350m northeast of the site. Due to the development at the site post-war and the fact that neighbouring properties both have basements to the same depth, it is considered that the site is at negligible to low risk from unexploded ordnance (UXO).

## 2.6 Topography

Information from the 1:50,000 OS map for the area indicates that the site is relatively flat with a level of approximately 25mOD located 40m west and 50m northeast. The land appears to slope very gently towards the northeast, dropping to 23.6mOD over 150m, equating to a slope gradient of 0.7%.

## 2.7 Published geology

According to British Geological Survey (BGS) map sheet 256<sup>3</sup> the site is underlain by the Lynch Hill Gravel Member over the London Clay Formation. In this area, it appears that the London Clay Formation is relatively thin (approximately 10-12m), and is underlain by the Lambeth Group at approximately 12mOD. The Lambeth Group is recorded to be approximately 15m thick and is underlain by the Thanet Sand Formation at approximately -5mOD, which in turn is underlain by the Chalk Group.

### 2.7.1 Lynch Hill Gravel Member

The Lynch Hill Gravel Member is part of the River Terrace Deposits associated with the historic course of the River Thames and consists of sand and gravel, locally with lenses of silt and clay. The Member is typically reported to be up to 5 to 7m thick, however local boreholes report thicknesses of between 3.2m to 4.6m. In parts of London it can locally deepen where the surface of the London Clay Formation has been scoured by river action.

### 2.7.2 London Clay Formation

The London Clay Formation is an over consolidated firm to very stiff fissured blue to grey clay of low to very high plasticity. The upper and lower parts may contain silty or fine-grained sand partings and laminated, structured, and nodular claystone bands as well as disseminated pyrite crystals. The London Clay in this area is recorded to be approximately 10-15m in thickness.

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<sup>2</sup> London Topographical Society (2005). The London County Council bomb damage maps 1939 – 1945.

<sup>3</sup> British Geological Survey. (1994) North London. Sheet 256. Solid and Drift Geology 1:50,000.

## 2.8 Unpublished geology

The BGS holds records of a number of historical ground investigations within 200m of the site. Selected logs are summarised in Table 1 and details are included in Appendix B.

**Table 1 - Summary of BGS historical borehole records**

BH record reference	Distance (m)	Direction	Base of BH (mbgl)	Ground water level (mbgl)	Depth to top of stratum (mbgl)					
					Made Ground	Lynch Hill Gravel Member	London Clay Formation	Lambeth Group	Thanet Sand	Chalk
TQ28SE374	70m	W	39.6	3, 9.8	0.0	0.2	3.2	16.6	30.6	38.9
TQ28SE697	130m	W	18.7	5.2	0.0	2.4	5.9	18.7	-	-
TQ28SE698	170m	SW	18.6	5	0.0	1.9	4.9	17.8	-	-
TQ38SW2850	150m	S	168	79	-	0.0	4.6	16.5	32	39.6

The historical borehole records generally recorded Made Ground ranging in thickness from absent to between 0.2m and 2.4m over the Lynch Hill Gravel Member which was found to be between 3m to 4.6m thick. The surface of the London Clay was encountered between 3.2 to 5.9 metres below ground level (mbgl) and the Lambeth Group was encountered at between 16.5 and 18.7mbgl underlain by the approximately 8m thick Thanet Sands encountered at 30.6 to 32mbgl. The logs are generally consistent with each other and confirm the geology originally suggested by the BGS map sheet.

Generally shallow groundwater was encountered within the Lynch Hill Gravel Member resting above the top of the impermeable London Clay Formation. This concurs with CGL's previous experience in the area. Deep groundwater was encountered within the London Clay Formation in one borehole, most likely relating to a sandy band within the stratum.

## 2.9 Hydrogeology

The Environment Agency has produced an aquifer designation system consistent with the requirements of the Water Framework Directive. The designations have been set for superficial and bedrock geology and are based on the importance of aquifers for potable water supply and their role in supporting surface water bodies and wetland ecosystems.

The underlying London Clay Formation is classified as 'Unproductive Strata' and the site is not within a Groundwater Source Protection Zone (SPZ). The underlying Lynch Hill Gravel member is designated as a Secondary A Aquifer with a 'Minor Aquifer High' vulnerability.

## 2.10 Hydrology

Figure 11 of the Hampstead Heath Surface Water Catchments and Drainage of the Camden Geological, Hydrogeological and Hydrological report produced by Arup<sup>4</sup> presents a copy of the 'Lost Rivers of London' map produced by Barton. A number of springs outcrop at the base of the Bagshot Formation to the north, flowing through various drainage channels and in various directions into the watercourses of the district (most of which are now diverted underground) including the *River Westbourne*, *Tyburn* and *River Fleet*. The map indicates that the *River Fleet* runs approximately 200m north of the site boundary and continues west. An additional tributary of the *River Fleet* is located approximately 300m east / southeast of the site boundary and flows southeast towards the *River Thames*.

With reference to the Arup report<sup>4</sup>, the site is approximately 4.5km south of the catchment for the pond chains on Hampstead Heath.

With reference to the EA website, the site is not within a Flood Risk Zone.

Current mapping (Figure 15 CPG4) indicates that roads impacted by flooding in 1975 are located approximately 2000m north of the site. The site is not within a region that was impacted by 2002 flooding or areas with potential to be at risk of surface water flooding.

<sup>4</sup> Ove Arup and Partners Limited (2010). *London Borough of Camden. Camden geological, hydrogeological and hydrological study. Guidance for subterranean development*. Issue 01, November 2010.

### 3. SCREENING – STAGE 1

#### 3.1 Introduction

A screening assessment has been undertaken in accordance with CPG4, based on the flowcharts presented in that document. Responses to the questions posed by the flowcharts are presented below, and where ‘yes’ or ‘unknown’ may be simply answered, with no analysis required, these answers have been provided.

#### 3.2 Subterranean (Groundwater) flow

This section answers questions posed by Figure 1 of CPG4.

Table 2. Responses to Figure 1 of CPG4

Question	Response	Action Required
1a. Is the site located directly above an aquifer?	Yes However the proposed development is unlikely to affect, or be affected by the proposed development. (See text below)	None
1b. Will the proposed basement extend beneath the water table surface?	Maybe The proposed basement may extend beneath the water table, however the impact is likely to be minimal.	None (See Text below)
2. Is the site within 100m of a watercourse, well, or potential spring line?	No	None
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No	None
4. Will the proposed basement development result in a change in the proportion of hard surfacing?	No	None
5. As part of site drainage, will more surface water than at present be discharged to ground (e.g. via soakaways and/or SUDS)?	No All surface water is likely to be discharged to the sewer network through existing connections.	None
6. Is the lowest point of the proposed excavation close to, or lower than, the mean water level in any local pond or spring lines?	No	None

In summary, the site is underlain by the Lynch Hill Gravel Member followed by the relatively impermeable London Clay Formation. Regional groundwater flow is likely to be to the south towards the *River Thames*, evidenced by the spring lines shown on Barton’s

‘Lost Rivers of London’. Groundwater is likely to be encountered towards the base of the gravels, resting above the top of the London Clay which.

It is anticipated that the proposed basement could cause a minor increase in the groundwater level to the north of the property beneath Tavistock Place. The risk associated with such an increase is considered to be negligible given the distance to the closest properties beyond Tavistock Place, and the presence of free-draining gravels which would not be susceptible to the very low effective stress reduction that may potentially occur.

#### 3.3 Slope/land stability

This section answers questions posed by Figure 2 of CPG4.

Table 3. Responses to Figure 2 of CPG4

Question	Response	Action required
1. Does the site include slopes, natural or man-made, greater than about 1 in 8?	No The site is relatively flat.	None
2. Will the proposed re-profiling of the landscaping at site change slopes at the property boundary to greater than about 1 in 8?	No	None
3. Does the development neighbour land including railway cuttings and the like with a slope greater than about 1 in 8?	No	None
4. Is the site within a wider hillside setting in which the general slope is greater than about 1 in 8?	No The topography of the surrounding region is relatively flat.	None
5. Is the London Clay Formation the shallowest stratum on site?	No The Lynch Hill Gravel Member is the shallowest stratum in nearby historical boreholes located within 200m of the site boundary.	None
6. Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	No There are trees in the rear garden of the property, however, current drawings do not indicate the removal of any vegetation.	None
7. Is there a history of shrink/swell subsidence in the local area and/or evidence of such at the site?	No The shallowest stratum beneath the site is the Lynch Hill Gravel Member which is not prone to seasonal effects of shrink swell behaviour. The underlying high plasticity London Clay Formation is susceptible to seasonal variations, however, it is considered unlikely to pose a risk to the property at 3mbgl.	None

Question	Response	Action required
8. Is the site within 100m of a watercourse or a potential spring line?	No	None
9. Is the site within an area of previously worked ground?	No	None
10. Is the site within an aquifer?	Yes The Lynch Hill Gravel Member is designated as a Secondary A Aquifer under the Water Framework Directive by the Environment Agency.	None
11. Is the site within 50m of the Hampstead Heath Ponds?	No The site is more than 4km downslope of the Hampstead Chain Catchment.	None
12. Is the site within 5m of a highway or pedestrian right of way?	Yes The site is adjacent to Tavistock Place pedestrian walkway. However, the proposed basement excavation is located 12.3m away from the pedestrian carriageway and no other infrastructure is to be underpinned.	None
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No The neighbouring properties have basements at or close to the same depth as the proposed lower ground floor extension. Foundation depths are likely to become less differential as part of the development.	None
14. Is the site over (or within the exclusion zone of) any tunnels?	No Information from LUL has indicated that the underground Piccadilly Line may run within 120m of the site.	None (see text below)

In summary, it is noted that whilst it is proposed to deepen the basement, the new development matches foundation depths with its neighbours and therefore no underpinning will be required. A geotechnical analysis could be undertaken to determine heave movements, however in the experience of CGL, it is the action of underpinning which is most likely to cause damage, which is a construction control measure and is not appropriate in this case. We would therefore note that as there is to be no underpinning then there is minimal/negligible risk caused by the proposed development.

Information from London Underground Limited (LUL) has indicated that there are no LUL assets within 50m of the site boundary. Given the presence of existing basements, and the very small footprint area of the proposed development, the new basement would not be

expected to have an impact on any LUL infrastructure. It is further noted that there are to be no piles or deep foundations which could affect underground tunnels.

### 3.4 Surface flow and flooding

This section answers questions posed by Figure 3 of CPG4.

**Table 4. Responses to Figure 3 of CPG4**

Question	Response	Action required
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No	None
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off), be materially changed from the existing route?	No It is understood all surface water will be discharged to the sewer network through existing connections.	None
3. Will the proposed development result in a change in the proportion of hard surfaced/paved external areas?	No Current development plans propose the excavation of the rear garden; however, appropriate SUDS will be included.	None
4. Will the proposed basement result in a change to the profile of the inflows of surface water being received by adjacent properties or downstream watercourses?	No	None
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	None
6. Is the site in an area known to be at risk from surface flooding... or is it at risk from flooding because the proposed basement is below the static water level of a nearby surface water feature?	No Current flood mapping (Figure 15 CPG4) indicates that the roads impacted by the 1975 flooding are at least 2km north of the site and the site is not within an area identified to be at risk of surface water flooding.	None

Given that both neighbouring properties have already developed lower ground floors that come close to or actually penetrate the London Clay, the inclusion of a new lower ground floor could have cumulative effects as water is effectively 'backed up' upstream of the properties. However, given the relatively high permeability of the surrounding gravels and the limited groundwater flow (between 0.2m and 0.7m of head in historical boreholes) it is considered that groundwater will continue to flow in a southward direction around the properties towards the *River Thames* and not get 'backed up'. Therefore, groundwater flow on a local and regional scale is considered to be altered by the proposed development.

Additionally, the site was not impacted by recent 2002 flooding events in the region and is not within an area identified to be at risk of surface water flooding.

#### 4. NON-TECHNICAL SUMMARY AND CUMULATIVE IMPACTS

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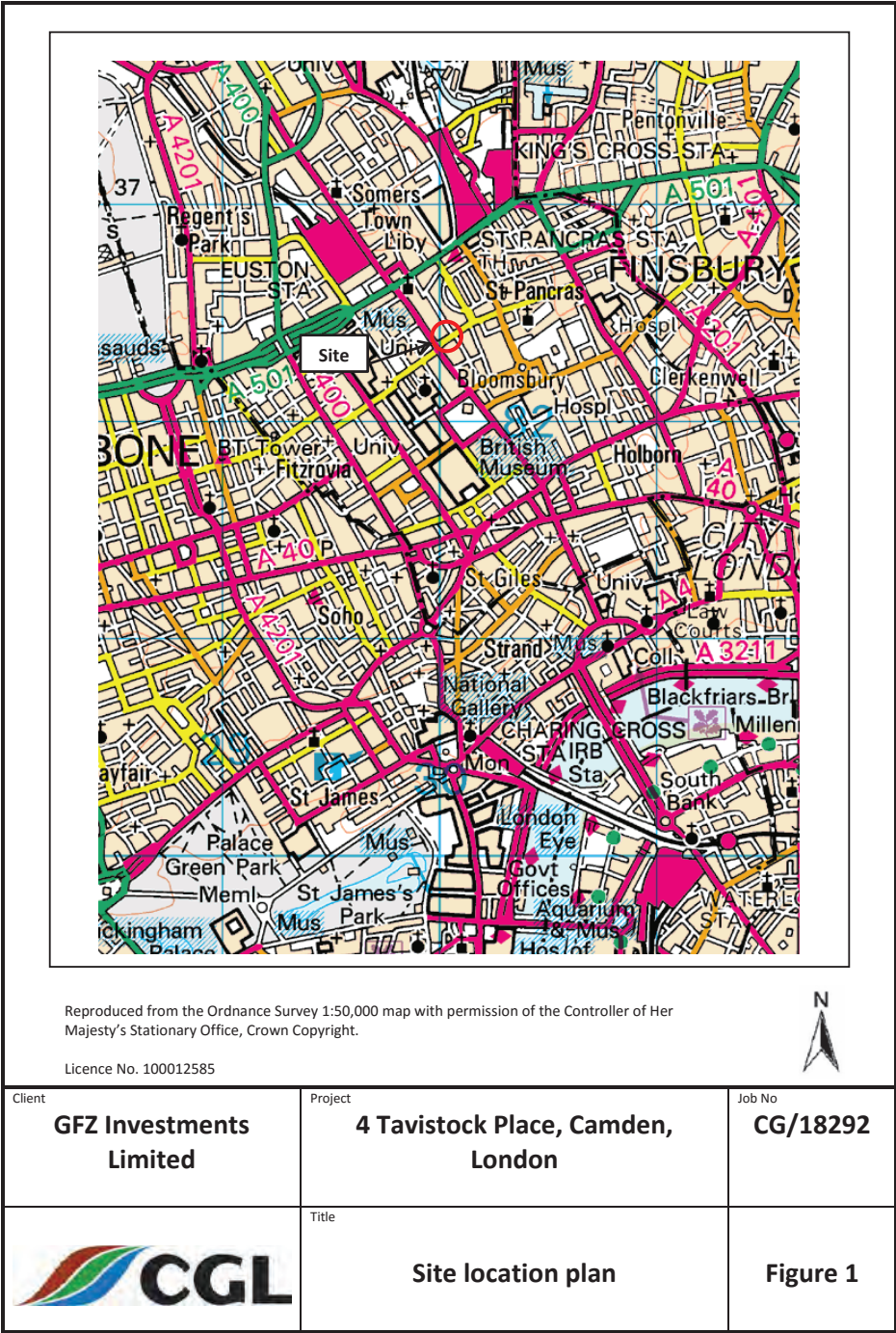
The proposed development is small in scale, and will reduce foundation depths to match those of its neighbours. Underpinning is therefore not required and the risks to neighbouring properties, assuming good construction control, are very low.

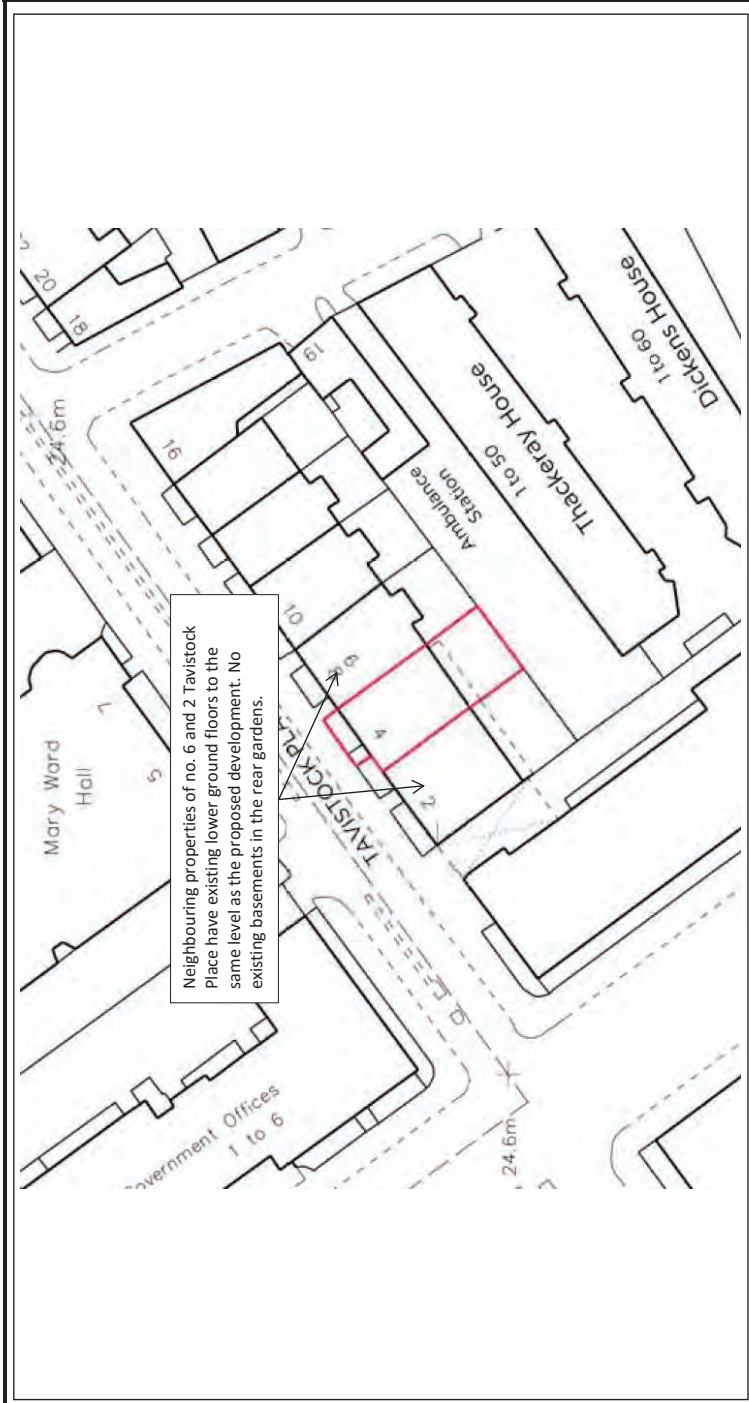
The new development will occupy the rear garden however the minor loss of attenuation with regard to surface water flow and flooding will be mitigated through appropriate SUDS design. Any minor increase in groundwater level is not likely to be noticeable, taking into account the cumulative effect of the new basement between the two existing basements. Any increase in flow due to this effect would be expected to be very minor and to result in slightly increased flow rates beneath the road of Tavistock Place.

It is considered, that with good construction practices and control, the proposed development will not present a risk to party wall structures or to local hydrology/hydrogeology.



FIGURES





Client

GFZ Investments Limited

Project

4 Tavistock Place, Camden, London

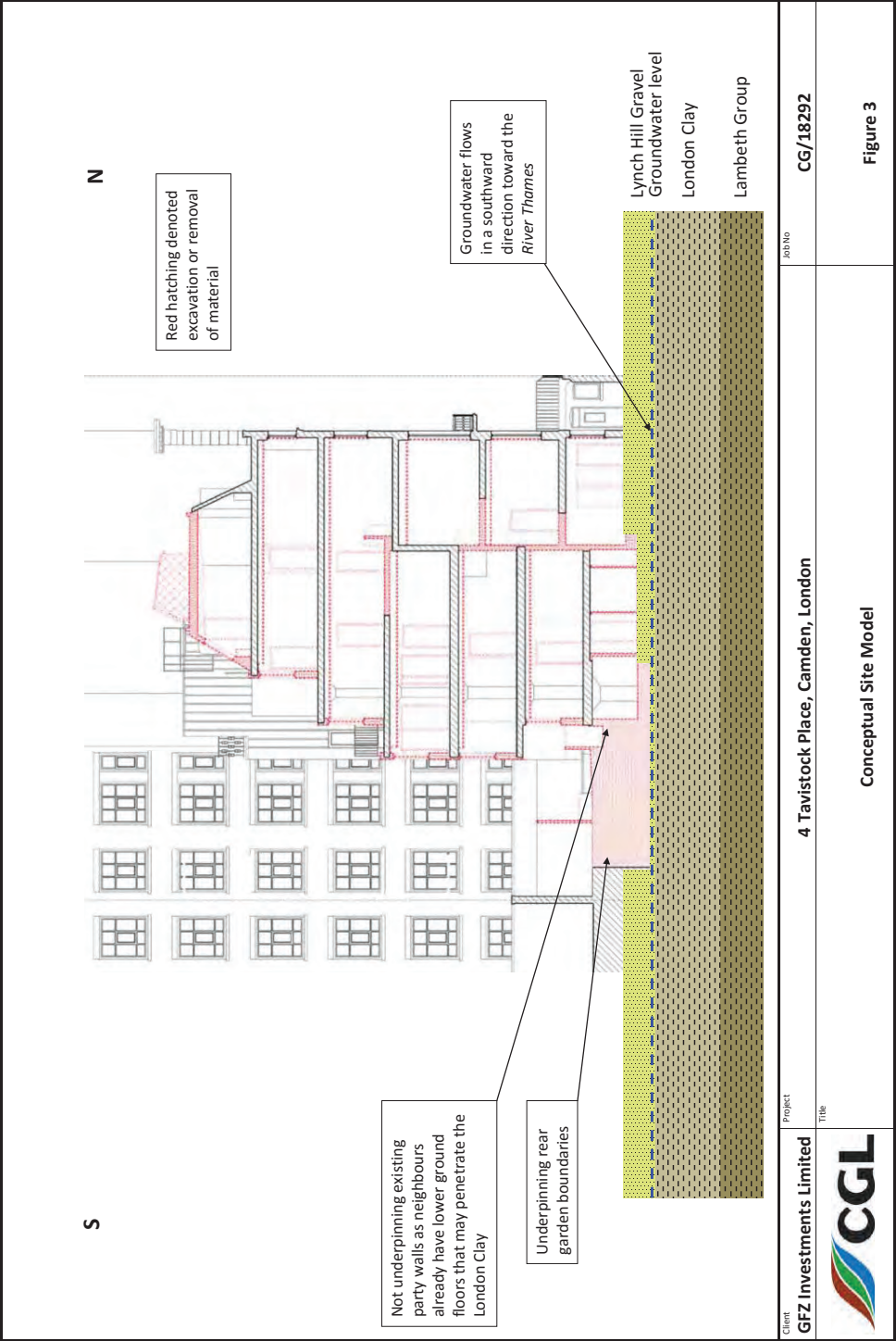
Job No

CG/18292

Title

Site layout plan

Figure 2



Client

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4 Tavistock Place, Camden, London

Job No

CG/18292

Title

Conceptual Site Model

Figure 3

APPENDIX A

Proposed development plans



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# PLANNING

Project No: 13052

Client: GFT Development Ltd

Date: January 2015

Scale: 1:1000

Project: 4 Tavistock Place

Drawing Title: Site Location Plan

Drawing No: P\_00

Rev: 1

Drawn: DI

Approved: MW

Signat: [Signature]



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