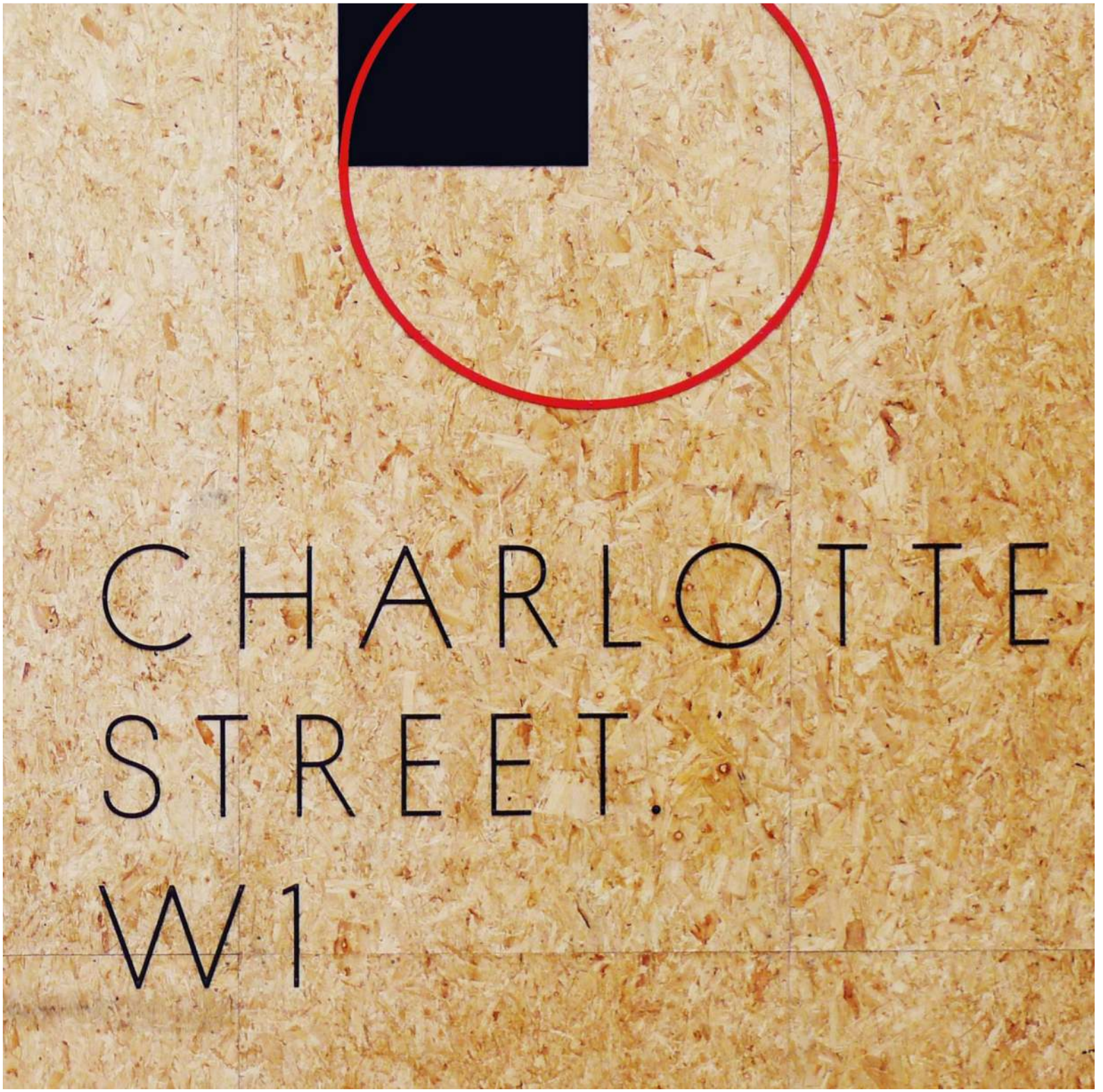
80 Charlotte Street & 65 Whitfield Street:

Minor Material Amendment –

Ground Contamination Risk Assessment and Remediation Strategy

Date
December 2015



West London and Suburban Property Investments Ltd

80 Charlotte Street Amendments

Ground contamination risk assessment and remediation strategy

Issue 2 | 8 December 2015

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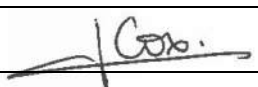
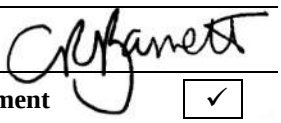
		Signature			
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1 Introduction

1.1 General

West London & Suburban Property Investments Ltd (WLSPIL) (as Derwent London) is redeveloping 80 Charlotte Street and 65 Whitfield Street, located to the west of Tottenham Court Road in the London Borough of Camden (LBC). Planning permission for the redevelopment scheme was granted in March 2012 (application no. 2010/6873/P). Make Architects has been engaged as the project architects. Ove Arup & Partners Ltd (Arup) has been appointed to provide structural, geotechnical engineering and ground contamination advice for the approved development. This report focuses specifically on the results of a ground contamination investigation at the development collectively known as 80 Charlotte Street (the site). The results of the ground investigation at 65 Whitfield Street are provided in a separate report [15].

1.2 Background

A number of conditions were attached to the planning permission for the development. This includes condition 6 which states that:

"No development shall take place until:

a) The applicant has submitted a programme of ground investigation for the presence of soil and groundwater contamination and landfill gas for approval by the Council; and

b) The investigation has been carried out in accordance with the approved details and the results and remediation measures (if necessary) have been submitted to and approved by the Council. All approved remediation measures shall be implemented strictly in accordance with the approved details.

c) All approved remediation measures shall be implemented strictly in accordance with the approved details and a verification report shall be submitted and approved by the Council."

An initial ground geotechnical investigation (Phase 1) was undertaken at the site during May and June 2012. The extent of ground contamination testing in that investigation was limited due to an assumed low potential for contamination based on the desk study. The desk study identified on-site fuel storage tanks and specific exploratory holes were located close to these tanks. Elevated concentrations of hydrocarbons were reported in the soil and water samples of a borehole which was located approximately 3m north of the Chitty Street tank. The initial study was submitted to LBC in September 2012, to discharge the requirements relating to Condition 6, part a (reference 2012/5283/P). The ground investigation strategy was approved by LBC after some initial queries made by the contaminated land officer (CLO) regarding ground gas vapour. Arup responded to the initial queries in an addendum note as provided in Appendix A.

Following this submission, LBC formally discharged the obligations under Condition 6, part a, on the 29th October 2012.

An additional ground investigation (Phase 2) was carried out in October 2012 to delineate the extent of the contamination. The second phase of investigation focused on the area around the Chitty Street tank, with one exploratory hole location focused on the Charlotte Street tank. The assessment report was issued in February 2013 [16].

At the time of the Phase 2 investigation, one borehole could not be completed due to access restrictions. As a result, a third phase of investigation was undertaken in March 2013 to advance the final borehole in the vicinity of the Whitfield Street tank. An addendum report [17] was produced to capture the results of this last phase of investigation.

The findings and recommendations of the investigation, and general approach to remediation was agreed in writing with LBC. LBC formally discharged the obligations under Condition 6, part b, on the 2nd May 2013 (reference 2013/1877/P), to allow for some initial enabling and demolition works. This condition was discharged on the condition that Arup liaise with the appointed remediation contractor to ensure that the remediation proposals concur with the developer's construction methodology. It was agreed that a remediation method statement will need to be agreed with LBC prior to the works starting.

The present report seeks to update all of the results obtained for the 80 Charlotte Street site, given the amendments now proposed to the approved scheme.

1.3 Report objectives

The primary objective of the initial and subsequent ground investigation work undertaken and presented in this report, is to characterise the extent and nature of the ground contamination at the 80 Charlotte Street site to partially meet the requirements of Condition 6, part b. In addition, this report will:

- Describe the findings of the ground investigation and evaluate the data; based on the data evaluation, the report will update the contamination risk assessment;
- Assess the risk to potential receptors arising from contaminated soil and water at the site;
- Characterise the ground gas regime at the site and assess the potential risk arising from it;
- Characterise the potential waste classification of soils including waste acceptance criteria testing;
- Identify whether remedial measures are required to mitigate any potential residual risks from ground contamination or ground gas, in accordance with planning condition 6, part b; and
- Provide sufficient information in the form of a remediation and verification strategy to satisfy the local authority that the requirements of planning condition 6, part b will be met.

The scope of the investigation is described in Section 3 of this report.

1.4 Information sources

The information sources used to inform this strategy include desk studies, ground investigation data and site walkover notes as follows:

- Arup (June 2010), Saatchi & Saatchi; 80 Charlotte Street, Geotechnical desk study [1];
- Arup (October 2010), 80 Charlotte Street and 65 Whitfield Street, Contamination risk assessment [2];
- Geotechnical Engineering (December 2012), Fitzrovia redevelopment ground investigation draft factual report [3];
- Geotechnical Engineering (December 2012), Fitzrovia redevelopment additional ground investigation draft factual report [4];
- Arup (13th August 2012), Site walkover notes and photos taken by an Arup environmental and geotechnical specialist [5];
- Arup (24th September 2012), Ground contamination investigation strategy [6];
- Arup (15th February 2013), 80 Charlotte Street redevelopment, ground contamination investigation interpretative report and risk assessment [16]; and
- Arup (16th August 2013), 80 Charlotte Street redevelopment, addendum to ground contamination investigation interpretative report and risk assessment [17].

1.5 Report structure

A description of the existing current site uses, an overview of the proposed development and a description of the site history and environmental setting are provided in Section 2. A review of the ground investigation results and a summary of the ground conditions, based on a previous ground investigations are provided in Sections 3 and 4, respectively. A conceptual site model is provided in Section 5 and a risk assessment methodology for the proposed development is provided in Section 6. A data evaluation and a contamination risk assessment are provided in Sections 7 and 8, respectively. A preliminary waste classification assessment is provided in Section 9. Conclusions and recommendations, including an outline remediation strategy, are provided in Section 10. Figures and appendices are provided at the end of this report.

1.6 Use of the report and limitations

This report has been produced by Arup for use by West London & Suburban Property Investments Ltd in connection with the proposed redevelopment of 80 Charlotte Street. It is not intended for, and should not be relied upon by any third party except as provided for in Arup's agreement with West London & Suburban Property Investments Ltd.

Reasonable skill and care has been exercised in the preparation of this report in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking this contamination assessment, it is possible that the ground conditions other than those potentially indicated by this report may exist at the site.

This report has been prepared based upon information collected by other parties. Arup has assumed that the factual information provided by others is reliable but does not take any responsibility for the validity of those data.

2 The site

2.1 Location and topography

The site is located in the LBC, at the approximate National Grid Reference TQ293818. The site is bounded by Howland Street to the north west, Whitfield Street to the north east, Charlotte Street to the south west and Chitty Street to the south east, as shown on Figure 1. The site, although collectively known as 80 Charlotte Street, comprises of several addresses on Charlotte Street, Chitty Street and Whitfield Street. A plan showing the different blocks is shown on Figure 2.

The site slopes gently north to west. The courtyard area is lowest on the western side, with a ramp connecting it to the higher eastern side. The topography varies from 25.06m above ordnance datum (AOD) in the southern corner, to 25.29mAOD in the western corner, 27mAOD in eastern corner, and 26.45mAOD in the northern corner.

2.2 Current site use

The site is currently occupied by an office building made up of four blocks arranged around a central courtyard. An employee bar is located within the courtyard.

There are three underground tanks on site, located within the courtyard, as shown on Figure 2. All three are still in use. The Chitty Street tank can store up to 6,000 litres of oil and the other two tanks have a capacity of 35,000 litres. The oil stored is 35 Second gas oil (also referred to as red diesel) and is used for heating in the associated buildings. It is understood the tanks were installed when the buildings were constructed in the late 1950s.

2.3 Site history

A summary of the site history is presented below. Further information is provided in the Geotechnical desk study [1] and related appendices.

Historical plans show that the northern part of the site lay within an old quarry. It is likely that this quarry extended over a larger portion of the site and could have possibly extended across the whole of the site. Urban development occurred on the site during the mid-1700s to early 1800s and was mostly residential.

From 1900 to 1927, the use of the area changed to predominantly commercial. Post-World War II maps show some demolished buildings on site, possibly due to bomb damage. The buildings present at that time had various uses, including small scale metal works, welding facilities, rubber tyres storage, garages, electrical fittings, residential and offices.

By 1957, the buildings present on site were mostly commercial in nature. Some buildings were merged or refurbished by adding one or two floors and a basement level. Ordnance Survey maps dating from the mid-1960s show the site was redeveloped at that time. It has remained unchanged since.

The site is currently leased as office space, with the basements used for car parking. Some units are currently vacant.

2.4 Proposed development

The approved development includes the refurbishment of some of the existing buildings and the demolition and replacement of others. The majority of the site was to be occupied by offices, with retail space on the ground floor. Some residential development was also planned above ground floor level. The previously proposed basements for the buildings were to be at approximately the same levels as the existing basement, except for a new 2m deep basement at 67-69 Whitfield Street (1m lower than current basement level).

The amended development is broadly similar in terms of building use (offices, retail and some residential properties). Most buildings are to be demolished and replaced by new ones, and basement levels are to be deeper than current ground levels by approximately 2m.

The soft landscaping proposals remain unchanged. Soft landscaping is to be included in the area of 10-15 Chitty Street. The area, referred to as the Pocket Park, will be constructed above a basement level.

2.5 Environmental setting

The site is located in a commercial area in central London. There are no designated ecological receptors within 1km of the site.

The site is not located in a source protection zone (SPZ) for groundwater and no groundwater abstractions are located on the site. There are no groundwater abstractions within 250m of the site.

The site is underlain by a shallow aquifer in the River Terrace Deposits (RTD) gravel which is classed as a secondary A aquifer (controlled waters). The gravel deposits in the strata have been extensively truncated or removed by local basement construction or historic extraction industries.

3 Ground investigation

3.1 Phase 1

A geotechnical ground investigation of 80 Charlotte Street and 65 Whitfield Street (referred to as Asta House) was carried out between the 12th May and 11th July 2012 by Geotechnical Engineering Ltd and supervised by Arup. The scope included ground contamination testing at five locations. The extent of the contamination testing was limited, based on the desk study which suggested a low potential for contamination at the site. As fuel tanks were identified in the desk study, some contamination testing was specified in the vicinity of those tanks.

The contamination scope of the investigation consisted of six boreholes located in the courtyard area. The location of the boreholes is presented in Figure 3. The borehole logs from this investigation are provided in Appendix B.

Twelve soil samples from five boreholes (BH113a, BH113c, BH104, BH121 and BH122) were tested for metals, asbestos, cyanide, chloride, phenols, polycyclic aromatic hydrocarbons (PAH), benzene, toluene, ethyl benzene, and xylenes (BTEX), polychlorinated biphenyls (PCB), total petroleum hydrocarbons (TPH) and total organic carbon (TOC).

Ground gas and groundwater monitoring installations were installed in three boreholes (BH114, BH121 and BH122). Six rounds of ground gas monitoring were carried out between the 18th July and 30th August 2012. Two rounds of groundwater monitoring were carried out on the 17th July and 6th August 2012.

3.2 Phase 2

In response to the findings of the Phase 1 investigation, Phase 2 was undertaken by Geotechnical Engineering Ltd between the 24th October and 10th November 2012 to delineate the extent of contamination. This investigation focused on the three tanks and comprised six boreholes located in close proximity to the Chitty Street tank and one borehole near Charlotte Street tank. Borehole locations are shown on Figure 3. All boreholes were installed with monitoring standpipes with response zones within the gravels. The borehole logs from this investigation are provided in Appendix B.

Locations were moved in response to the findings of the early boreholes. The original theory was to demonstrate that there was no significant contamination north of the Chitty Street tank. A number of boreholes were located to the south west to investigate the likely ‘downstream’ conditions and potential plume of hydrocarbons. However, the first borehole to the north (BH203) provided significant visual/ olfactory evidence of contamination. Based on this, another borehole was relocated further north to provide information in that direction.

BH202 to the south west was completed in the early stages of the investigation and displayed no visual/ olfactory evidence of contamination. Consequently, it was decided to move BH205, which was further west, closer to the tank. This also gave no indication of visual/ olfactory contamination. BH204, located to the east of the tank, provided an indication of contamination, so BH208 was moved to a position further east to facilitate delineation.

Sixteen soil samples from seven boreholes were tested for TPH, and twelve samples were tested for BTEX, heavy metals and PCBs.

Four rounds of ground gas monitoring were carried out between the 16th November and 5th December 2012. Two rounds of groundwater monitoring were carried out on the 10th November and 7th December 2012.

3.3 Phase 3

During the second phase of ground investigation, the contractor was unable to advance a borehole in the vicinity of the Whitfield Street tank due to obstructions. This borehole, BH207, was advanced during March 2013. A further two boreholes (BH129 and BH130) were also advanced during the investigation in the north of the site.

Three soil samples from two boreholes were tested for metals, TPH, BTEX, PAH and asbestos.

BH207 was installed with a monitoring standpipe with a response zone in the Made Ground. Four rounds of groundwater and ground gas monitoring were carried out between 2nd and 29th May 2013.

3.4 Observations during ground investigation

Olfactory and visual signs of contamination were noted during all three phases of the ground investigation. A summary of these is presented in Table 1 below.

Table 1 Summary of olfactory and visual evidence of potential contamination

Borehole	Depth (m)	Strata	Description
BH101	0.4 – 0.6	Made Ground	Rare black organic flecks and slight organic odour
	1.85 – 1.05	Made Ground	Cobble sized pockets of black organic silt
	3.5 – 4.5	Made Ground and Gravel	Faint organic odour
BH102	1.8 – 3.5	Made Ground	Frequent black staining and organic odour
BH103	1.25 – 2.5	Made Ground	Frequent black staining and faint organic odour
BH105	0.5 – 1.55 1.85 – 2.00	Made Ground	Organic odour
	2.00 – 3.45	Clay	Organic odour
BH107	1.95 – 3.2	Made Ground	Organic odour
BH108	1.2 – 2.2 3.0 – 4.5	Made Ground	Slight organic odour Organic odour
BH109	1.3 – 3.5	Made Ground	Black organic material and organic odour
BH109A	1.3 – 2.5	Made Ground	Organic odour
BH110	1.8 – 2.5 2.5 – 4.0	Made Ground	Faint organic odour Organic odour
BH113C	3.0 – 2.0	Made Ground	Organic odour
BH114	2.0 – 3.1	Made Ground	Faint organic odour

Borehole	Depth (m)	Strata	Description
BH122	2.6 – 3.05	Made Ground	Faint organic odour
	3.05 – 3.2	Made Ground	Strong hydrocarbon odour
	3.2 – 3.7	Gravel	Strong hydrocarbon odour
BH129	0.3 – 1.6	Made Ground	Organic odour
	1.6 – 4.0	Made Ground	Strong organic odour
BH130	0.8 – 2.0	Made Ground and gravel	Organic odour
	2.0 – 3.5	Made Ground	Strong organic odour
	3.5 – 5.0	Made Ground and sand	Faint organic odour
BH201	0.5 – 2.0	Made Ground	Faint organic odour
BH202	1.75 – 2.8	Made Ground	Organic odour
BH203A	0.4 – 1.65	Made Ground	Faint organic odour
	3.25 – 3.5	Gravel	Strong hydrocarbon odour
	3.5 – 5.2	Sand	Heavy black staining and hydrocarbon odour
	5.2 – 6.0	Gravel	Faint hydrocarbon odour
BH204	1.3 – 1.9	Made Ground	Faint organic odour
	5.2 – 6.9	Sand	Strong hydrocarbon odour
	6.9 - 8.2	Gravel	Faint hydrocarbon odour
BH205	0.5 – 3.0	Made Ground	Organic odour
BH206	2.7 – 5.0	Sand	Faint hydrocarbon odour
BH208	2.95 – 3.45	Made Ground	Slight organic odour

4 Ground conditions

4.1 Stratigraphy

Existing borehole information for all three phases of the ground investigation has been used to prove the approximate ground conditions across the site. Typical descriptions and observations made of the strata from the borehole logs are provided in Table 2 below.

Table 2 Summary of site stratigraphy

Stratum	Typical description	Elevation to top of stratum (mAOD)[a]	Likely stratum thickness (m)
Made Ground	Concrete, tarmac and gravel over a variable mixture of clay, ash, brick rubble, gravel, flint, and fragments of glass and stones.	24.46 to 27.45	1.75m to 5.50
River Terrace Deposits (Terrace Gravel)	Gravelly sand, sandy clay and coarse flint.	20.65 to 23.40	1.90 to 3.80
London Clay	Stiff fissured blue-grey silty clay with fine grained sand. Logs indicate gravelly/ sandy clay present at the top of the London Clay in some locations.	16.15 to 19.47	27
Lambeth Group (Woolwich and Reading Beds)	Very stiff multi-coloured silty sandy clay with layers of fine, medium sand.	-6.2 (encountered in one borehole only)	~20 to 23[b]

[a] Elevation estimates are based upon Geotechnical Engineering Ltd

[b] Thickness based upon Phase 1 Ground investigation

mAOD = metres above ordnance datum

4.2 Perched groundwater

Unlike during the first and second phase of investigation, perched groundwater was encountered in Made Ground during the third phase of investigation, at approximately 3.5mbgl.

4.3 Groundwater

Groundwater in the RTD (secondary A aquifer) was encountered in all boreholes during the rounds of monitoring which took place following the end of the various phases of investigation.

5 Conceptual site model

5.1 Introduction

A conceptual site model was set out in the Arup 2010 contamination risk assessment. The conceptual site model identified the sources of contamination on site, the likely receptors and whether plausible pollutant linkages were likely to be present. A brief summary of the sources, receptors and pathways discussed in that report is presented below.

Based on historical uses of the site, the model identified the potential contamination sources as follows:

- Material used to backfill the old gravel pit;
- Contamination from light industrial processes on site;
- Asbestos-containing material in demolition rubble; and
- Fuel tanks used for heating.

The receptors were identified as humans (site workers, residents and employees), groundwater in the secondary aquifer and building materials and services.

Pollutant linkages were identified between potential contamination and:

- Human health, through dermal contact, ingestion and inhalation;
- Secondary aquifer (RTD), through lateral migration through soils (piles will not penetrate the deeper aquifer); and
- Materials and services, through aggressive soil conditions.

5.2 Plausible pollutant linkages

Table 3 below provides an analysis of potential contamination sources, pathways and receptors which was previously agreed with LBC. Potential linkages that are considered not to be plausible are faded. The site will not be soft landscaped apart from the new Pocket Park created above basements with imported growing media. As such exposure pathways for end users including ingestion and dermal contact with contaminated soils have not been included.

Table 3 Preliminary conceptual site model (with no mitigation in place)

Source		Pathway		Receptor		Pollutant Linkage
Hydrocarbon contamination in the Terrace Gravels surrounding the Chitty Street Tank.	**Human Health**					
	→	Dermal contact with contaminated soils/ dust	→	<u>During development</u> Construction workers	→	Potential harm to human health
	→	Ingestion of contaminated soils/ dust	→	Site visitors	→	
		Inhalation of vapours, gases or contaminated dust				
	→	Inhalation of vapours, gases or contaminated dust	→	Neighbours	→	

Source		Pathway		Receptor		Pollutant Linkage
	→	Inhalation of vapours and gases	→	<u>After development</u> Maintenance workers	→	Potential harm to human health
	→	Migration of hazardous gases and vapours to confined spaces	→	Neighbours of the development Office worker/users	→	
	→	Ingestion of potable water	→	Visitors	→	
	X	Inhalation of gases and vapours	X	<u>After development</u> Residents of development	X	No PPL
	X	Ingestion of home grown produce	X			
Hydrocarbon contamination in the Terrace Gravels surrounding the Chitty Street Tank.	**Controlled Water**					
	→	Migration of free phase product (lateral/ vertical)	→	<u>During & after development</u> Secondary A aquifer	→	Potential migration of hydrocarbon contamination into secondary A aquifer when disturbed during construction.
	→	Lateral migration of dissolved phase contaminants	→		→	
	→	Migration of free phase product (lateral/ vertical)	→	<u>During & after development</u> Lambeth Group and Thanet Sands secondary A aquifers Chalk principal aquifer	→	Potential migration of hydrocarbon contamination during piling which penetrate the London Clay in the eastern area of the leak.
	→	Lateral migration of dissolved phase contaminants	→		→	
	X	Contaminant leaching directly to groundwater from overlying soils	X		X	No PPL
Potential ground contamination	**Building Materials and Services**					
	→	Direct contact of building materials with soil and groundwater	→	<u>After development</u> Building foundations Buried services	→	Potential damage to building materials
	→	Permeation of potable water supply	→	<u>After development</u> Potable water supply and human health	→	Potable supply and human health
Potential ground contamination	**Ecological**					
	X	Uptake of contaminants	X	No designated ecological receptors	X	No PPL
	X	Uptake of phytotoxic contaminants	X	No new landscaping (grass, trees and shrubs etc) in direct contact with current site soils	X	Potential harm to new plants

In order to evaluate the potential risks from contamination to the various receptors, an assessment of the source characteristics (data evaluation) is presented in the following sections of this report.

6 Risk assessment methodology

6.1 Introduction

The UK framework for the assessment of contaminated land endorses the principle of risk assessment and a "suitable for use" approach to contaminated land. Remedial action is only required if there are unacceptable risks to human health or the environment, taking into account the use of the land, the form of construction and its environmental setting. The assessment of the impacts arising from potentially contaminated land is based upon considerations of pollution linkages between contamination sources and sensitive receptors.

6.2 Human health

The evaluation of the ground investigation data has been updated since the first issue of this report and is now carried out in accordance with the risk assessment methodology outlined in Appendix F. Appendix F describes the background and context of the assessment and defines the criteria used to assess soils.

LQM 'suitable 4 use levels' (S4UL) (copyright Land Quality Management Limited reproduced with permission [publication number S4UL3227]) have been used in the assessment, where available. In addition, category 4 screening levels (C4SLs), recently released by Defra for some determinands, have been considered in the assessment where appropriate, but mostly to benchmark the results above S4ULs in some cases. The S4ULs use C4SL exposure parameters but maintain the traditional minimal risk toxicological benchmarks, whereas the C4SL are based on a new toxicological benchmark termed a 'low level of toxicological concern' (LLTC), or 'low risk' rather than 'minimal risk'.

As an initial screening of the results, the concentrations of chemical determinands in soil have been compared against criteria derived for a generic commercial end use development, initially considering a soil organic matter (SOM) content of 1% (Appendix F). Comment has also been provided if the results are also very low and below residential levels simply to benchmark the low results.

There are no published generic assessment criteria for asbestos in soils in the UK and currently it is not possible to generate them. The results have been assessed using multiple lines of evidence as to the potential significance during and after construction, based on the latest guidance from CIRIA [18]. Further details on the background and methodology are provided in Appendix F.

Summary tables of the results and relevant assessment criteria (human health) used in the assessment are provided in Appendix F (soil human health). The results of the three phases of investigation have been assessed together. Results in excess of the relevant screening criteria are highlighted in the relevant table. Results exceeding the assessment criteria do not necessarily represent an unacceptable risk, rather that a more detailed assessment is required.

6.3 Controlled waters

Laboratory results from water samples have been screened against the UK Drinking Water Standards (DWS) in accordance with EA advice to third parties [7]. Where no DWS values are available, the results have been compared against

the Environmental Quality Standards (EQS). In addition, the outcome of investigation has been considered conceptually as to whether the results represent, or might represent in the future, pollution of controlled waters.

6.4 Ground gas

The ground gas regime at the site has been assessed by considering both the concentrations of landfill gases (methane and carbon dioxide) in the ground, the quantity and variability of surface emission rates (which is related to on-going biodegradation and further production of gases) and short-term variations (especially peaks) in surface emissions.

The following published guidance on the assessment of ground gases has been used:

- CIRIA Report C665 Assessing risks posed by hazardous ground gases to buildings **[8]**;
- BS 8485: Code of practice for the characterisation and remediation from ground gas in affected developments **[9]**; and
- The Chartered Institute of Environmental Health (CIEH) 2009 The Ground Gas Handbook **[10]**.

CIRIA report C665 and BS 8485 describe a process of deriving gas screening values (GSV) for hazardous ground gases. The method uses both ground gas concentrations and borehole flow rates to define a range of characteristic situations (CS1 to CS6) based on limiting borehole gas volume flow for methane and carbon dioxide. The GSV (in litres per hour) is calculated by multiplying the borehole flow rate (litres per hour) by the hazardous ground gas concentration (%). CIRIA report C665 suggests protection measures for two classes of building (either residential or office/ commercial/ industrial) for each characteristic situation. BS 8485 provides a scoring system for different types of buildings under each characteristic situation. The scores assist the assessor in selecting an appropriate level of gas protection.

6.5 Hydrocarbon spill dating

The age of hydrocarbon spills can be tentatively derived using the Christensen Larson calculation which uses the ratio between n-C_{17} and the isoprenoid C_{1}s-pristine. This ratio was derived from a large scale experiment over a period of 20 years, and has an experimental error of ±2 years. A high ratio (>1 .8) is indicative of a recent/ fresh spill, whereas a ratio of <0.5 is indicative of an old spill. This calculation is only suitable for diesel spillages (which is suggested in the case of the present site by fingerprinting) and preferably where the spillage is below ground (which is appropriate in this case). Surface spillages may incorporate leaching and evaporation effects enhancing the weathering which may invalidate the result.

7 Data evaluation

7.1 Introduction

Soil, groundwater and ground gas results from Phases 1, 2 and 3 of the ground investigation have been collated, analysed and assessed.

7.2 Soil data

7.2.1 Scope of soil data

A general description of the testing that was undertaken on the soil samples collected during both phases of the ground investigation is provided below:

- A total of 31 soil samples collected from the site were submitted for laboratory analysis (12 in Phase 1, 16 in Phase 2, three in Phase 3) from 14 exploratory hole locations within the site footprint;
- Soil samples were tested for a range of contaminants including heavy metals, cyanides, phenols, BTEX, TPH, PAH, PCB, and VOC;
- Testing in Phase 2 focused on BTEX and TPH testing in order to delineate the hydrocarbon contamination around the Chitty Street tank. Hydrocarbon spill dating tests were also carried out on samples that displayed a visual or olfactory sign of contamination; and
- A total of 17 soil samples were tested for the presence of asbestos (eight in Phase 1, six in Phase 2, 3 in Phase 3).

7.2.2 Soil testing results

The results of the soil chemical testing data obtained during all three phases of investigation have been compared to the commercial assessment criteria described in Section 6 and are described below. Results above the initial assessment criteria are summarised in tables 4 to 6, and provided in full in Appendix C.

7.2.3 Metals

Concentrations of metals were consistently below the relevant commercial assessment criteria. Concentrations were generally low, except in one sample taken from BH203A in which elevated concentrations of copper, lead and zinc were recorded and one sample from BH207 where elevated lead was recorded. These were below the commercial assessment criteria.

7.2.4 TPH

TPH results exceeded the assessment criteria set at saturation limit in three locations, all of which are located in the vicinity of the Chitty Street tank. The results at all other locations were below method detection limits. All data was below the commercial assessment criteria, but many were above the saturation limit. A summary of the elevated results mentioned above is provided in table 4.

Table 4 Summary of TPH results

Borehole location	Sample depth	Determinand	S4ULs (mg/kg)	Saturation limit (mg/kg)	Result (mg/kg)
BH122	3.1mbgl (22.21m AOD)	TPH aliphatic >C_8-C_{10}	2000	78	1100
		TPH aliphatic >C_{10}-C_{12}	9700	48	3800
		TPH aliphatic >C_{12}-C_{16}	59000	164	15000
		TPH aromatic >C_{10}-C_{12}	3800	364	1100
		TPH aromatic >C_{12}-C_{16}	36000	164	5900
BH203A	3.4mbgl (22.07m AOD)	TPH aliphatic >C_8-C_{10}	2000	78	130
		TPH aliphatic >C_{10}-C_{12}	9700	48	880
		TPH aliphatic >C_{12}-C_{16}	59000	164	1800
		TPH aromatic >C_{12}-C_{16}	36000	164	660
	3.6mbgl (21.87m AOD)	TPH aliphatic >C_8-C_{10}	2000	78	120
		TPH aliphatic >C_{10}-C_{12}	9700	48	700
		TPH aliphatic >C_{12}-C_{16}	59000	164	2000
		TPH aromatic >C_{12}-C_{16}	36000	164	1100
BH204	4.1mbgl (21.98m AOD)	TPH aliphatic >C_8-C_{10}	2000	78	750
		TPH aliphatic >C_{10}-C_{12}	9700	48	2200
		TPH aliphatic >C_{12}-C_{16}	59000	164	4700
		TPH aromatic >C_{10}-C_{12}	3800	364	840
		TPH aromatic >C_{12}-C_{16}	36000	164	2700

Hydrocarbon dating analysis indicates that the hydrocarbon contamination found in the area of the Chitty Street tank is a weathered diesel, dating between 18 years old in BH204 at 4.10mbgl, 16 years old in BH203A at 3.6mbgl and 9 years old in BH203A at 3.4mbgl. This type of hydrocarbon dating is not exact and subject to various caveats. Whilst the laboratory suggests the resolution is ±2 years, it may be wider than that. It is known that the type of fuel used in the Chitty Street tank is 35 Second oil gas, otherwise known as red diesel. This description therefore confirms that the tank is the likely source of hydrocarbon contamination in that area.

The previous issue of this report included a comparison of volatile hydrocarbon concentrations to site-specific assessment criteria (SSAC). These SSAC were generated at the time using the CLEA v1.06 software (now superseded), in order to take into account site particularities and establish whether assessment criteria for vapour compounds would significantly change as a result. Items which were altered to suit the site included the removal of ingestion, dermal and dust inhalation pathways and the inclusion of site-specific data for the building footprint, foundation thickness and London air dispersion factors. Exceedances of the SSAC were recorded in samples which have already been highlighted as exceeding the screening criteria set at the saturation limit, namely BH122 (3.1m), BH203A (3.4m and 3.6m) and BH204 (4.1m). It is considered unlikely that newly generated site-specific criteria based on the latest guidance and S4ULs would lead to different conclusions although this will be assessed in the remediation method

statement (RMS) in order to inform the remediation objectives. The elevated results were recorded in boreholes in the vicinity of the Chitty Street tank, and details of the proposed remediation of this area is included in Section 10.1.2.

7.2.5 BTEX

A summary of the BTEX results that exceeded the assessment criteria are provided in table 5 below. BTEX concentrations exceeded the commercial assessment criteria at two locations, both of which are located in the vicinity of the Chitty Street tank. The results from BH204 were significantly above the commercial GAC. Concentrations of BTEX were very low or below method detection limit at all other locations.

The previous issue of this report included SSAC for BTEX as described above. The SSAC thus generated (based on inhalation only) are significantly higher than the saturation limit for all compounds. Values above the SSAC were recorded in samples which have already been highlighted as exceeding the assessment criteria, namely BH203A (3.6m) and BH204 (4.1m). It is considered unlikely that newly generated site-specific criteria based on the latest guidance and S4ULs would lead to different conclusions as it is likely that free product (weathered diesel) is present. The exceedances were recorded in boreholes in the vicinity of the Chitty Street tank, and details of the proposed remediation of this area is included in Section 10.1.2. SSAC will be developed to support the remediation method statement.

Table 5 Summary of BTEX results

Borehole location	Sample depth (mAOD)	Determinand	S4ULs (mg/kg)	Saturation limit (mg/kg)	Result (mg/kg)
BH203A	3.6mbgl (21.87mAOD)	o-xylene	6600	478	8500
BH204	4.1mbgl (21.98mAOD)	ethyl benzene	5700	518	23000
		m- & p-xylene	5900	576	70000
		o-xylene	6600	478	59000

7.2.6 Speciated PAH

All concentrations of speciated PAH are significantly below the assessment criteria and in most cases, below the method detection limits.

7.2.7 Phenols

All phenol concentrations are below the method detection limit.

7.2.8 PCB

All PCB concentrations are below method detection limits.

7.2.9 Asbestos

Seventeen soil samples were tested for asbestos. Asbestos fibres were detected in two samples, both from the same location (BH121), which is located in the vicinity of the Whitfield Street tank. A summary of the findings is presented in table 6 below.

Table 6 Summary of asbestos results

Exploratory hole	Sample depth (mAOD)	Type of asbestos	Proportion by weight of asbestos fibres (%)
BH121	0.5mbgl (25.49mAOD)	Chrysotile, amosite; free fibres	0.001
	1.5mbgl (24.49mAOD)	Amosite; free fibres	0.001

7.3 Groundwater data

7.3.1 Scope of groundwater data

Four samples of groundwater were taken from two locations in the vicinity of the Chitty Street tank, BH114 and BH122, on two occasions following Phase 1. Seven samples were taken from seven locations on two occasions following Phase 2. Six of those were in the vicinity of the Chitty Street tank, with the other by the Charlotte Street tank further to the north. One sample of groundwater was taken from BH207 on four occasions following Phase 3.

Samples from the rounds of monitoring post-Phase 1 and the first round of monitoring post-Phase 2 were tested for metals, TPH, BTEX and PAH. Samples from the second round of monitoring post-Phase 2 were tested for TPH, BTEX and PAH only. Samples from Phase 3 were tested for metals, pH, cyanide, TPH, BTEX, PAH, PCB and phenols. A summary table presenting groundwater test results is provided in Appendix D.

7.3.2 Metals

Concentrations of heavy metals in most samples were below detection limits and where present, concentrations were below UK drinking water standards. However, concentrations of selenium marginally exceeded the assessment criteria in two samples (BH114 and BH122, first round of monitoring) and elevated concentrations of zinc were recorded in the first sample taken from BH122. Concentrations of chromium above the UK DWS were recorded in BH114 during the second monitoring round.

7.3.3 Organics

Elevated concentrations of TPH, BTEX and PAH (particularly naphthalene) above environmental quality standards were recorded in several locations in the vicinity of the Chitty Street tank, namely BH114, BH122, BH203A, BH204 and BH208. Up to 6,100µg/l of PAHs and 43,000µg/l of m- and p-xylenes were recorded in BH122, which is many orders of magnitude higher than the EQS for these two contaminants (0.2µg/l and 30µg/l, respectively). TPH results were

highest in BH122, which recorded up to 2,500µg/l of aliphatic >C_{16} to C_{21} (nearly ten times the criteria).

The results indicate the presence of free product in the groundwater. However interface probe measurements taken during the Phase 2 investigation did not report LNAPL on the groundwater surface.

7.4 Ground gas data

Up to 5.5m of Made Ground were recorded during the site investigation. Up to 172ppm hydrocarbons vapours were recorded during Phase 1 in BH122 at 3.05m depth, and up to 259ppm were recorded during Phase 2 in BH203A at 3.6m depth. Both exploratory holes are located in the vicinity of the Chitty Street tank. These are both high vapour readings. No PID readings were taken during Phase 3. Full vapour (PID) readings taken during Phases 1 and 2 are included in Appendix E.

Elevated concentrations of volatile hydrocarbons have been identified. Hydrocarbons themselves can break down to form methane and carbon dioxide, and may release vapours.

The gas monitoring results are described below, with a summary table and the calculated GSV provided in Appendix E:

- The majority of gas flow readings were <0.1 litres per hour (l/hr), with a maximum flow rate of 0.4 l/hr recorded in BH207 (2nd May 2013).
- Methane was detected in all but two monitoring locations. Elevated concentrations above 1% were recorded in four locations (all in the close vicinity to the Chitty Street tank) on ten occasions, with a maximum concentration of 20.1% recorded in BH204 on 16th November 2012.
- Elevated concentrations of carbon dioxide above 5% were recorded in five locations (all in the close vicinity to the Chitty Street tank) on ten occasions, with a maximum concentration of 14.9% recorded in BH204 on 16th November 2012.
- Up to 3ppm hydrogen sulphide were detected.
- Ground gas samples were taken from BH203A and BH204 during the first and last monitoring rounds and from BH207 during the third and last monitoring rounds. Laboratory results were generally consistent with the field results.

The maximum calculated GSV is 0.0426 (BH114, carbon dioxide) which is in the CS1classification. However, the typical maximum concentrations for CS1 for both carbon dioxide and methane were exceeded on several occasions. The guidance suggests that in such circumstances, the assessor should consider increasing the assessment to CS2. In addition, elevated concentrations of volatile hydrocarbons have been identified, above the assessment criteria and previous SSAC for xylenes. Almost 100% of the generated SSAC is a result of the vapour pathway. The results of the soil, water and gas analysis indicate that some form of remediation (treatment, removal or pathway intervention) is necessary to protect future users of the development.

Further comment is provided in the risk assessment.

8 Contamination risk assessment

8.1 Introduction

The development proposals are set out in Section 2.4 and a summary of the potential plausible pollutant linkages (PPL) requiring assessment is presented in Section 5.2, based on the conceptual model set out in the Arup desk study. Arup has undertaken detailed assessment of the data obtained from both phases of the ground investigation undertaken at the site. The potential risks have been considered below in the context of PPLs identified for the development, in accordance with the current UK approach to contaminated land assessment.

The risk characterisations provided below have been assessed in a scale from very high/high/moderate/low to very low. The risk classifications of very low, low, medium or high risk have been based on the CIRIA guidance C552 [8]. A brief summary of each risk classification is provided below:

- **very high risk:** there is a high probability that severe harm could arise to a designated receptor from an identified hazard, or there is evidence that severe harm to an identified receptor is currently happening. Remediation is likely to be required;
- **high risk:** harm is likely to arise to a designated receptor from an identified hazard. Remedial works may be necessary in the short term and are likely over the longer term;
- **moderate risk:** it is possible that harm could arise to a receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur, it is likely to be relatively mild. Some remedial works may be required or be regarded as beneficial;
- **low risk:** it is possible that harm could arise to a receptor from an identified hazard but it likely that this harm, if realised, would at worst be mild. Some further risk management action may be identified; and
- **very low risk:** there is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

If there are no PPL or the data has confirmed the absence of a potential particular source of contamination, then this has been assessed as a negligible risk.

8.2 Summary of ground investigation results

A summary of findings relevant to the risk assessment of the PPLs previously identified is set out below:

1. Made Ground was encountered in all exploratory hole locations across the site, with a maximum recorded thickness of 5.5m;
2. Strong hydrocarbon odours were recorded in soils in three boreholes surrounding the Chitty Street tank, as well as in one adjacent to the Charlotte Street tank. Organic odours and occasional black staining were also recorded in all Phase 1 boreholes. These odours were mostly within the natural sands and gravels of the RTD (BH122, BH203A, BH204, BH206 and BH130) and occasionally within the bottom of the Made Ground.

3. Groundwater was recorded during monitoring rounds at depths between 21.26mAOD and 23.10mAOD, within the gravel deposits.
4. Concentrations of metals and PAH in soils were consistently below the relevant commercial assessment criteria, although elevated concentrations of copper, lead and zinc in one sample and elevated lead in another were recorded.
5. Concentrations of phenols and PCB in soils were consistently below the method detection limits.
6. Elevated concentrations of BTEX above the commercial assessment criteria and diesel-range organics above the saturation limit assessment criteria were recorded in several soil samples taken in the vicinity of the Chitty Street tank.
7. Analysis showed that the elevated TPH concentrations related to a diesel spill, dated between 9 and 18 years old (although this is tentative). Results further from the tank were reported in the older range.
8. Asbestos was detected in two of seventeen (14%) samples of Made Ground tested. Both were taken in the vicinity of the Whitfield Street tank and reported very low concentrations (0.001%) of free fibres (amosite and/ or chrysotile).
9. Selenium and zinc marginally exceeded UK DWS in some groundwater samples.
10. More significantly, elevated concentrations of petroleum hydrocarbons were recorded, with concentrations of TPH, BTEX and PAH above EQS in several locations in the vicinity of the Chitty Street tank. The highest proportion of hydrocarbons has been reported in the diesel and heavier oil range. Results indicate the presence of light non-aqueous phase liquids (LNAPL) in the groundwater. Results also suggest the diesel contained in the Chitty Street tank may have leaked out into the gravels and migrated laterally to the north, east and west of the tank. No data is available to the south of the tank due to restrictions within the building (Block K).
11. Elevated concentrations of methane and carbon dioxide were recorded in the area around the Chitty Street tank on several occasions. This was confirmed by laboratory analysis. Flow rates were generally very low. The calculated GSV all fell within the CS1 classification. However, typical maximum concentrations for CS1 were frequently exceeded and elevated levels of VOCs were recorded during the site investigation. Consequently, it would be recommended that the site classification be increased to CS2, in order to reflect the potential risks to future site users. Hydrocarbon vapours are present and it may be necessary to specify vapour protection, depending on the end point of the remediation. Further recommendations are provided in Section 8.3.2.
12. No elevated concentrations of hydrocarbons were recorded in the soil and groundwater samples taken from BH202 and BH205 to the west of the Chitty Street tank. No elevated ground gas concentrations were recorded in those two locations either.
13. The results identify a zone of contamination around the Chitty Street tank (refer to Figure 4).

8.3 Harm to human health

8.3.1 During construction

The three underground fuel tanks will be decommissioned and removed prior to the start of construction on site. The development will comprise basement excavations over the majority of the site footprint. These excavations are expected to be generally around 2m below current basement levels, and will therefore not remove the full depth of Made Ground and the identified contaminated RTD. New piles will be constructed to support the proposed buildings.

Site workers may come into contact with elevated petroleum hydrocarbon contamination in the soil and groundwater during the excavation and construction works in the vicinity of the Chitty Street tank mostly through exposure to contaminated pile arisings. They are likely to be exposed to ground gases and hydrocarbon vapours (and odours). The dermal exposure, ingestion and inhalation of contaminated soil/ groundwater should be minimised by appropriate control and personal protective equipment (PPE). Specific measures are provided in the recommendations.

Asbestos was identified in two samples of Made Ground in the vicinity of the Charlotte Street tank. However, the very low concentrations recorded are unlikely to result in any significant exposure to respirable fibres. Additional measures are provided in the recommendations.

Without mitigation measures, there would be a short-term **moderate to low risk** to construction workers and a **low risk** to site neighbours during the excavation and construction works.

8.3.2 After development

The development will comprise entirely of buildings and hardstanding, to be mostly occupied by commercial properties and offices. Cycle parking, plant rooms, offices and a gallery will occupy basement areas (identified as ‘lower ground floor’ on the architect’s drawings). Residential properties will be present at levels above ground floor levels in certain parts of the site.

As the development currently stands, the Made Ground will not be entirely removed from site and the elevated contamination, free product and hydrocarbon soils will remain in-situ below the Made Ground. Current development plans mean hydrocarbons present in the RTD and groundwater around the Chitty Street tank would remain. The ground gases and vapours emanating from the contamination in the RTD would create a **moderate** risk of harm to all site users without mitigation. In addition, hydrocarbons may migrate with time, resulting in risks to off-site human receptors. Recommendations are provided in Section 10.2.

8.4 Risks to controlled water

The hydrocarbon contamination emanating from the Chitty Street tank is currently impacting the RTD secondary A aquifer. The aquifer is clearly polluted locally due to leakage from the tank. The current risk of pollution to the wider aquifer is **moderate to high** without mitigation (due to potential mobilisation and migration of the plume off-site), although there are no groundwater abstractions in the

vicinity of the site and the gravels are known to be absent from the footprint of several surrounding buildings. Recommendations are provided in Section 10.2.

The low permeability London Clay currently inhibits downward movement of this contamination. All new piles will terminate at a depth of 5mAOD, ie within the London Clay and therefore will not create a new PPL into the deeper aquifers underlying the site. The new pile layout has not yet been finalised so the proposed location of piles in relation to the Chitty Street tank is currently unknown. Recommendations for remediation are included in Section 10.

9 Waste characterisation

9.1 Introduction

The development will result in the excavation and removal of some of the Made Ground from the site. In addition, it is recommended that the hydrocarbon contaminated soils in the vicinity of the Chitty Street tank are removed (see Section 10.2) or as a minimum remediated in situ with free product removal and treatment. Made Ground and impacted natural ground will require characterisation for waste disposal purposes.

9.2 Classification

The final classification of the materials will depend on where they were excavated from and how they are handled and treated on site. Some soils may be suitable for recycling or off-site beneficial re-use or treatment. It is a legal requirement to treat wastes before disposal.

There are three types of permitted landfill (inert, non-hazardous and hazardous) and four principal types of waste, as outlined below:

- Inert: generally uncontaminated natural soils, clean demolition materials or uncontaminated, non-leaching and inorganic/uncontaminated Made Ground. Natural soils material may be classified as inert without testing unless suspected of being contaminated. Made ground and suspect natural soils may be sent off-site as inert waste, if they satisfy the inert waste acceptance criteria (WAC). Inert wastes are often 'recovered' and may also be used as construction material in other sites, given the appropriate waste management permits are in place;
- Hazardous: defined by the analysis of 'total' chemical parameters to assess the hazard properties. The classified waste may only be disposed of (following treatment) if it satisfies the hazardous WAC for the relevant classification of landfill;
- stable non-reactive hazardous waste: defined in a similar manner to hazardous waste, but satisfying stricter WAC. Following treatment, it may be disposed of in specifically designed separate cells in non-hazardous landfills (if the operator has obtained a permit to operate these cells); and
- non-hazardous waste: if the waste is not classified as inert or hazardous, then it is non-hazardous. There is currently no WAC for non-hazardous waste.

It is noted that waste may also be classified as either "active" or "inactive" with regards to the tax liability paid. Inert wastes are typically inactive. Non-hazardous wastes may be either active or inactive, depending on the destination of the waste and the concentrations of potential contaminants and organic materials.

Due to the cost of landfill, and increasing tax burden each year for disposal of active wastes, there are increased facilities for the treatment and subsequent recycling/ re-use of non-hazardous and hazardous soils. If soils are treated in this manner and not landfilled, or a lower proportion is sent to landfill, the tax liability decreases.

9.3 Hazardous waste

9.3.1 Assessment methodology

The following documents were used to carry out the initial waste classification and disposal assessment of Made Ground and natural soil arisings generated by the development:

- Environment Agency, Hazardous Waste, Technical guidance WM3 [12];
- Table 3.2 of Annex VI to Regulation (EC) No. 1272/2008 [13]; and
- The Hazardous Waste (England and Wales) Regulations [14].

Metals may be classified as hazardous based on a number of potential hazardous properties including carcinogenic (HP7 and HP11 lowest threshold 1,000mg/kg), toxic for reproduction (HP10 lowest threshold 5,000mg/kg), harmful (HP5 lowest threshold 250,000mg/kg) and toxic (HP6 lowest threshold 30,000mg/kg). With the exception of HP7, the other classifications are additive i.e. the concentrations are converted to the worst case (for harm) compound and added together before comparison with the thresholds.

Hydrocarbons in contaminated soils are generally categorised against the hazardous properties carcinogenic (HP7), mutagenic (HP11) and ecotoxic (HP14). Two PAH compounds have compound specific thresholds related to HP14 of 25mg/kg. For HP7, waste would be defined as hazardous if category 1 or 2 carcinogenic compounds (e.g. benzene) exceeded 0.1% (1,000mg/kg), or category 3 compounds (e.g. diesel) exceeded 1% (10,000mg/kg). TPH is an aggregate parameter that includes a range of category 1, 2 and 3 compounds, along with other elements not classified as carcinogenic. In most circumstances TPH contaminating soil and stones should be assessed as ‘unknown oil’ (unless there is a specific documented record or a consistent hydrocarbon profile to indicate diesel or weathered diesel being the contaminating oil) and a worst case should be assumed.

For an unknown oil if the concentration of TPH is ≥ 0.1% the waste will be HP7 Carcinogenic and HP11 Mutagenic unless the concentration of benzo[a]pyrene is <0.01% of the TPH concentration.

The hazardous waste threshold for asbestos is 0.1% w/w. It is noted that the quantification weight percentage of asbestos is difficult to achieve as asbestos can be present in a wide range of forms. While it is likely that ACM, such as cemented asbestos, board or lagging, will exceed such a threshold, the quantity of ACM in a bulk sample will often be below this level. WM3 [9] states that where a waste contains identifiable pieces of ACM (that can be identified as potentially being asbestos by a competent person if examined by the naked eye) then these pieces must be assessed separately. If the ACM cannot be segregated the waste is regarded as hazardous if the concentration of asbestos in the ACM pieces alone is greater than 0.1%.

9.3.2 Evaluation of data

Data from all three phases of the ground investigation have been analysed and conclusions are provided below:

- Concentrations of copper, lead and zinc in BH203A (2.0m) and lead and zinc in BH207 (0.3m) exceeded the threshold values for the hazard property H14 ecotoxic.
- Asbestos was identified in two soil samples. The concentration of asbestos in the samples (0.001%) was well below the hazardous waste threshold of 0.1% by mass.
- Four of the 31 samples (13%) reported a total petroleum hydrocarbon concentration above 1,000mg/kg and so are potentially classed as hazardous waste.

Five of the six samples which exceed the hazardous thresholds are located in the vicinity of the Chitty Street tank. It is therefore recommended that an allowance be made to dispose of all the Made Ground and contaminated natural ground in this area as hazardous waste.

9.4 Inert waste

The inert waste category generally applies to natural soils or clean demolition arisings. Natural soils and stones (not suspected to be contaminated or not including topsoil and peat) may be disposed of as inert waste without testing. In addition, clean crushed concrete, brick, glass etc. may also be classed as inert waste without testing. Other soils such as Made Ground, topsoil, peat or potentially impacted natural soils may be disposed of as inert if they are sampled and analysed and the results pass the inert WAC. The inert WAC is a strict set of criteria based on both "total" and "leachable" concentrations. The spirit of the regulations is that inert waste is sent to inert landfill sites (with little or no environmental protection) or re-used on construction sites, and therefore it should not in any way degrade and produce a leachate or gas.

In addition to the “leachable” WAC, the inert “total” WAC is for measured soil concentrations. It comprises total organic carbon (TOC 3%), mineral oils (TPH ≤500mg/kg), BTEX (<6mg/kg), PCB (≤1mg/kg) and PAH (≤100mg/kg).

Evaluation of both the “total” and “leachable” WAC has been undertaken. The results are summarised below:

- The six samples tested for WAC analysis did not record any leachable concentrations above the inert criteria.
- Eleven of 24 soil samples (46%) exceeded the inert WAC due to total organic carbon; and
- A further seven soil samples (29%) exceeded the inert WAC due to BTEX, of which four (17%) also exceeded the inert WAC due to hydrocarbons.

The testing suggests that excavated Made Ground from the site is likely to be a mix of inert and non-hazardous waste. A simplistic assessment of the data suggests this might be a 20/80 split, although this will depend very much on how soils are handled and treated.

10 Conclusions and recommendations

10.1 Conclusions

10.1.1 General conclusions

Three phases of investigation have been carried out on site. They have enabled the collection of information regarding the site ground conditions. Results generally show that limited contamination is present in both the soil and groundwater. However, significant contamination has been found in the vicinity of the Chitty Street tank in the southern part of the site, in the form of free phase hydrocarbons, vapours and ground gases. It is thought the tank may have been leaking for a number of years, impacting surrounding soils (both Made Ground and underlying natural ground) and groundwater.

10.1.2 Chitty Street tank remediation

It is considered likely that some remediation of the area around the Chitty Street tank will be necessary following the tank removal for the following reasons:

- The contaminated sand/ gravel is a shallow aquifer (RTD controlled water). It is of a low sensitivity, and highly truncated in this area, due to surrounding and on-site basement excavation. However, the amount of contamination is extensive and concentrations of hydrocarbons are very high. It is likely that free product is present. It is possible that this contamination may be disturbed or mobilised either during construction or at a later date. It may also impact off-site developments, for instance if dewatering were to be undertaken nearby. Risks of pollution of controlled waters have been rated as moderate to high.
- The contamination includes free product and dissolved hydrocarbons. All piles will terminate in the London Clay and therefore will not create a new PPL into the deeper aquifers underlying the site.
- The elevated hydrocarbons are a source of gas and hydrocarbon vapours. It may be possible to specify specific protection barriers. However, source removal may be preferred, given that parts of the proposed site will include residential properties. Risks to future site users have been rated as moderate and risks to construction workers have been rated as moderate to low. If significant concentrations of hydrocarbons are left below occupied buildings, then vapour intrusion may occur. There is also a risk the vapours could migrate off-site into neighbouring buildings. Other potential issues include odour (during construction and operation) and damage to building materials.
- Voluntary remediation during development is an efficient way of dealing with these conditions in a proactive manner. Dealing with residual issues at an unspecified time in the future after development may be more difficult.

Figure 4 shows the area which is likely to require remediation. Elevated hydrocarbon contamination has been identified in all the boreholes located within this area, but the full extent of the contamination is currently unknown due to restrictions on borehole locations. Indeed, there is an absence of exploratory hole locations to the immediate south of the Chitty Street tank, due to restrictions

within the building (Block K). There is therefore a potential for the hydrocarbon contamination to have spread beneath this part of the building, although the foundations and building may have prevented such migration. In fact, the plume appears to spread out laterally as if this is the case. It is understood that the building to the south contains the oil-fired boilers fed by the tank being investigated.

10.1.3 Waste classification

The hydrocarbon contaminated material excavated in the area of the Chitty Street tank is likely to be classified as hazardous. Made Ground in the rest of the site which will be excavated as part of the new basement construction is likely to be classified as inert or non-hazardous.

10.2 Outline remediation strategy

10.2.1 Chitty Street tank remediation

It is understood the proposed excavations to reach formation levels in the area of the Chitty Street tank are approximately 2m below current basement levels, which will not remove the contamination in the gravels. An options appraisal may be undertaken to determine the most appropriate method of remediating the remaining contamination. NAPL recovery and /or chemical treatment may be considered suitable, should there be sufficient time available before the start of the construction works. This will need to take account of the form of development and future constraints.

Dependent on programme or other drivers it may be necessary to fully or partially excavate the hydrocarbon impacted soils in that area prior to construction. It may be possible to do a mixture of excavation and treatment. The remediation activities that would be required would include:

- Initial careful removal of the tank and associated pipe-work and any immediately obvious contamination;
- Removal of soils down to formation level (estimated to be approximately 2m below current levels);
- Either over excavation in the area identified as impacted by hydrocarbons to the top of the London Clay (approximately 5m below current levels), or alternatively (or in combination) a form of in situ remediation may be developed to lower concentrations and remove free product;
- Over excavation (or remediation) in the area to the south of the tank, should it appear to be contaminated. Figure 4 shows the additional area which may need to be excavated;
- Soil sampling from the surfaces left exposed by the over excavation to confirm no heavily contaminated material is still present. An appropriate number of samples should be taken from the base and sides of the excavation. Concentrations of hydrocarbons should not exceed the commercial assessment criteria. Alternatively, if treatment is selected, then testing or other lines of evidence to demonstrate remediation objectives have been met should be carried out;

- Handling and removal of hydrocarbon contaminated soil for off-site treatment or disposal. It will be necessary to deal with liquids as well; and
- Backfill to formation level using suitably clean material (see Section 10.2.2).

Consideration will need to be given to current groundwater levels. Remediation efforts will need to accommodate for the presence of groundwater. Therefore, temporary cut-off walls and dewatering may be necessary to ensure the complete removal of contaminated material in the area of the tank.

In addition, it will be necessary to have a water treatment plant on site to deal with contaminated water arising from the excavation before it is recharged to the ground or disposed to sewer for instance.

A remediation method statement will be developed considering excavation and/ or remediation options. The RMS will be agreed with LBC.

10.2.2 Other recommendations

Further recommendations for the site include the following points:

- Asbestos was identified in two samples of Made Ground at a very low concentration. Nonetheless, the works shall be undertaken in a fashion to prevent the creation of dusts. All Made Ground/ contaminated soils shall be kept damp when being handled or when exposed at the surface. Sufficient wetting procedures shall be in place, such as misters or sprays, depending on the prevailing weather conditions and proposed activities. Dust prevention should be proactive. Sheeting and other preventative measures should be applied.
- Sufficient hygiene and PPE shall be provided for works within Made Ground and contaminated natural soils. In particular, the practise and procedures should be sufficient to mitigate risks to construction workers from free product in soil and water due to dermal contact, ingestion and/ or, for instance, splashing to eyes etc.
- Odour control measures may need to be implemented during the remediation of the Chitty Street tank area, to avoid hydrocarbon odours from dissipating and impacting on site neighbours. The use of an odour suppression system may be considered.
- Vapour control measures may need to be put in place. These should include appropriate PPE for ground workers and site visitors, and monitoring instruments (PID readings taken at regular intervals during working hours, passive static monitors such as carbon tubes).
- If residual hydrocarbon impacted soils remain then some form of hydrocarbon vapour and gas barrier may be required. This will be addressed in the RMS.
- The site has been investigated in three phases. However, there is the potential for as yet unidentified contamination. A watching brief shall be maintained through the excavation works for unexpected conditions and to ensure the various recommendations provided are implemented and recorded. The watching brief will be documented, reported on during progress meetings and compiled in a verification report. The watching brief shall not necessarily involve specialist personnel (although staff will be specifically briefed and competent to carry out the brief), and it will be defined on site, communicated

to staff involved in the ground works (through toolbox talks etc) and reported on.

- Any imported material will be demonstrated, through adequate testing, to be free of significant contamination and suitable for its proposed use.
- If it is proposed that vehicles entering or leaving the site come into contact with potentially contaminated Made Ground, then a robust wheel wash system shall be in place to prevent the spread of contamination off-site.
- Thames Water will be consulted regarding the pipe material specification of potable water supply pipes. It is possible that they will require precautions associated with the contaminants identified on site.

10.3 Verification plan

In accordance with condition 6, a verification report shall be prepared following completion of development and remediation works, which should include the following details:

- Site details and background, details of the various parties involved in the work;
- A summary of the original site conditions with reference to relevant reports including the original risk assessment(s) for the site;
- Development/ remediation objectives;
- A summary of processes data such as emission control data, volumes and characteristics of material handled, waste consignment notes, compliance with permit requirements and variations etc;
- Documentation detailing the decommissioning of the three oil tanks and associated pipework present on site;
- Documentation detailing the Chitty Street tank remediation works.
- Colour photographs of key stages of the development work;
- Details of communications held with the EA, CLO and other regulatory bodies during implementation;
- Reference to the Health and Safety File, assuming that the remedial activities were performed in accordance with the Construction Design and Management (CDM) Regulations;
- Details of any unexpected contamination encountered and how it was dealt with;
- Laboratory and in-situ test results confirming all grossly contaminated materials in the area of the Chitty Street tank were excavated;
- Waste management documentation, details of waste classification undertaken, quantities of waste sent off site and the destination of all waste soils. The report shall include copies of all exemptions, permits and other duty of care documentation; and
- Supporting information, such as plans showing extent of remediation, test results and monitoring data, health and safety and quality management documentation.

Removing the contaminated soils in the vicinity of the Chitty Street tank will remove the source of the ground gases and vapours recorded during the site investigation. Should excavation of this material go ahead as recommended, no further ground gas and vapour protection measures will need to be put in place on site.

All the information will be retained by the Contractor for inclusion within the verification report. The local authority CLO should confirm whether additional information requirements are necessary for the verification report prior to the commencement of the site works.

References

[1] Arup (2010). Saatchi & Saatchi. 80 Charlotte Street, Geotechnical desk study. June 2010.

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[3] Geotechnical Engineering (2012). Fitzrovia redevelopment ground investigation draft factual report. December 2012.

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[19] The LQM/CIEH (2009) Generic Assessment Criteria for Human Health Risk Assessment, second edition

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Figures

528800 529000 529200 529400 529600 529800

182400 182200 182000 181800 181600

Legend

site boundary

Issue	Date	By	Chkd	Appd
P1	20-12-12	EF	LT	CB

Metres

0 50 100 200

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Client

West London and Suburban Property Investments Ltd

Job Title

80 Charlotte Street Amendments

Drawing Title

Site Location Plan

Scale at A3

1:3,600

Drawing Status

Issue

Job No	Drawing No	Issue
207329	Figure 1	P1

oFileLocation

529400

Block G

Whitfield St. tank

Block H

71 - 81 Whitfield St.

Charlotte St. tank

67- 69 Whitfield St.

Block H

Chitty St. tank

Block K

Legend

Tanks

Issue	Date	By	Chkd	Appd
P1	20-12-12	EF	LT	CB

Metres

0 5 10 20

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Job Title

80 Charlotte Street Amendments

Drawing Title

Site Layout Plan

Scale at A3

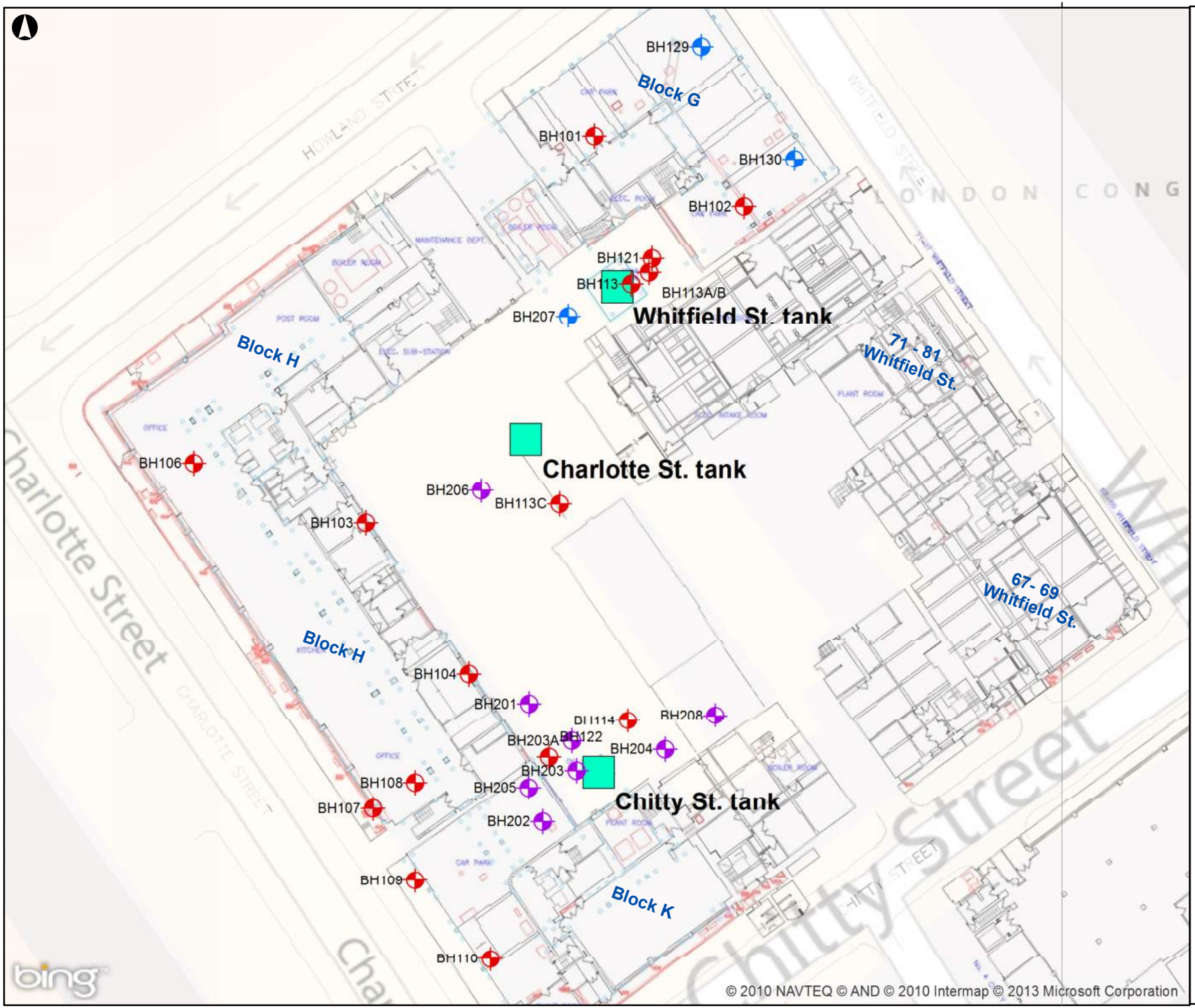
1:400

Drawing Status

Issue

Job No	Drawing No	Issue
207329	Figure 2	P1

oFileLocation



Legend

- Phase 3 BH locations (March 2013)
- Phase 2 BH locations (Oct 2012)
- Phase 1 BH locations (June 2012)
- Tanks

Issue	Date	By	Chkd	Appd
P1	08-08-13	EF	LT	CB

Metres
0 2.5 5 10

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Job Title

80 Charlotte Street Amendments

Drawing Title

Borehole Location Plan Phases 1, 2 and 3 80 Charlotte Street

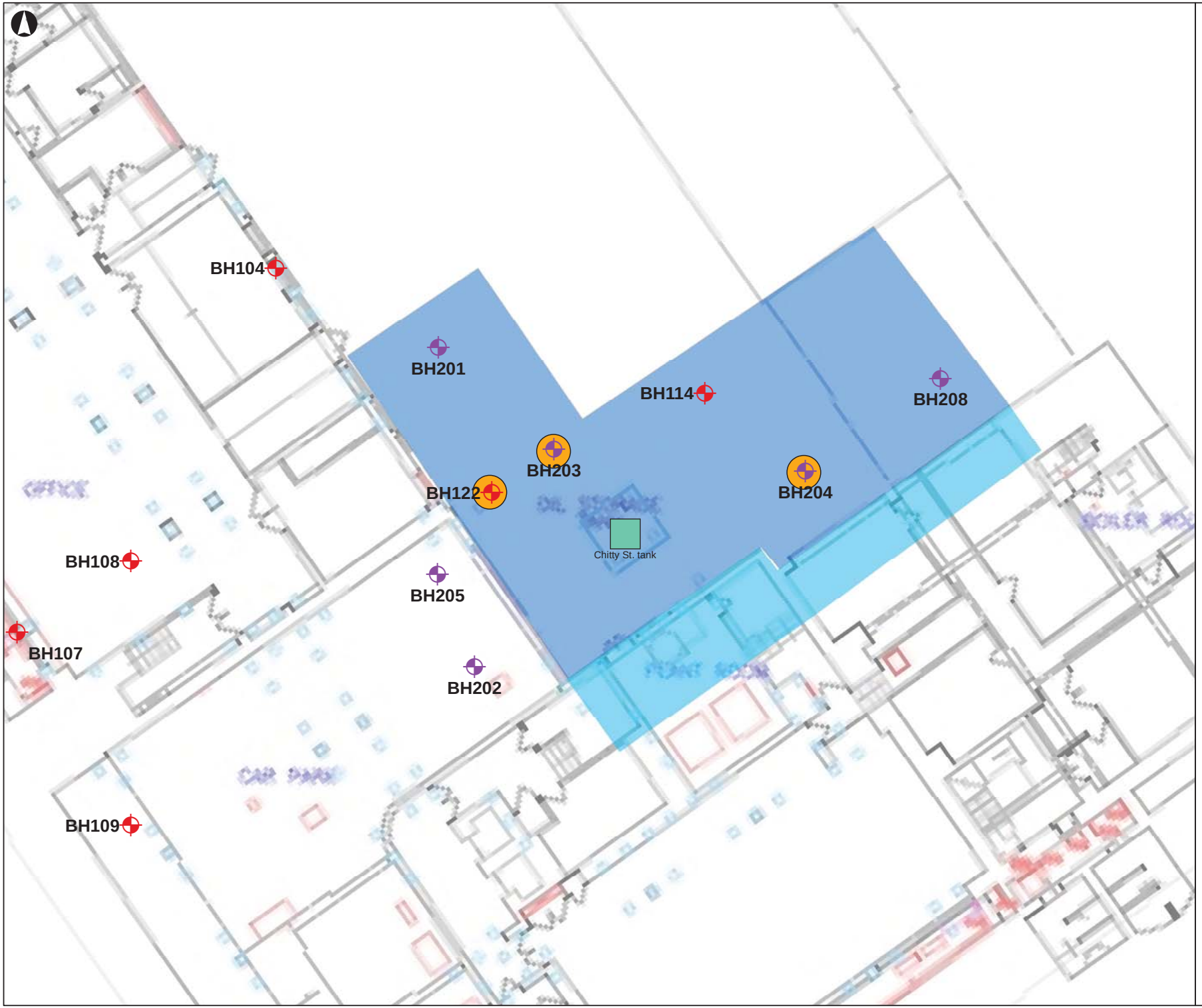
Scale at A3

1:476

Drawing Status

Issue

Job No	Drawing No	Issue
207329	Figure 3	P1



Legend

- BH location (2nd phase)
- BH Locations (1st phase)
- Tanks
- Estimated remediation area (175m2)
- Scenario 2 remediation area (46m2)
- Visual hydrocarbon contamination

Issue	Date	By	Chkd	Appd
P1	07-11-12	EF	CB	CB

Metres
0 1.75 3.5 7

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Client

West London and Suburban Property Investments Ltd

Job Title

80 Charlotte Street Amendments

Drawing Title

Estimated remediation areas

Scale at A3

1:125

Drawing Status

Issue

Job No	Drawing No	Issue
207329	Figure 4	P1

Appendices

Appendix A

Ground investigation strategy and addendum

West London and Suburban Property Investments Ltd

80 Charlotte Street and 65 Whitfield Street Redevelopment

Ground Contamination Investigation Strategy

REP/207329/C/S001

Issue 2 | 24 September 2012

Job number 207329

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ARUP

Document Verification

ARUP

Job title		80 Charlotte Street and 65 Whitfield Street Redevelopment			**Job number** 207329
Document title		Ground Contamination Investigation Strategy			**File reference**
Document ref		REP/207329/C/S001			
Revision	**Date**	**Filename**	Fitzrovia additional GI development strategy.docx		
Draft 1	4 Sep 2012	**Description**	First draft		
			Prepared by	Checked by	Approved by
		Name	Emma Fromant	Chris Barrett	Chris Barrett
		Signature			
Issue	13 Sep 2012	**Filename**	Fitzrovia GI strategy Issue 1.docx		
		Description	First issue to client and DP9 for review		
			Prepared by	Checked by	Approved by
		Name	Emma Fromant	Chris Barrett	Chris Barrett
		Signature			
Issue 2	24 Sep 2012	**Filename**	Fitzrovia GI strategy Issue 2.docx		
		Description	Issue 2 including amendments following Derwent comments		
			Prepared by	Checked by	Approved by
		Name	Emma Fromant	Chris Barrett	Chris Barrett
		Signature	E. Fromant	C Barrett	C Barrett
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

Figures

Appendices

1 Introduction

1.1 Background

West London & Suburban Property Investments Ltd (WLSPIL) (as Derwent London) is redeveloping 80 Charlotte Street and 65 Whitfield Street located to the west of Tottenham Court Road in the Borough of Camden. Make Architects has been engaged as the project architects. Ove Arup & Partners Ltd (Arup) has been appointed to provide structural, geotechnical engineering and ground contamination advice for the development.

An initial ground geotechnical investigation was undertaken at the site during May to June 2012. The extent of ground contamination testing in that investigation was limited due to an assumed low potential for contamination based on desk study. The desk study had identified on-site fuel storage tanks and specific exploratory holes were located close to these tanks. Elevated concentrations of hydrocarbons were reported in the soil and water samples in BH122.

The planning consent conditions (application No: 201 0/6873/P) for the development includes condition 6 which states *"No development shall take place until: a) The applicant has submitted a programme of ground investigation for the presence of soil and groundwater contamination and landfill gas for approval by the Council; and b) The investigation has been carried out in accordance with the approved details and the results and remediation measures (if necessary) have been submitted to and approved by the Council. All approved remediation measures shall be implemented strictly in accordance with the approved details. c) All approved remediation measures shall be implemented strictly in accordance with the approved details and a verification report shall be submitted and approved by the Council."*

This report has been written to describe the scope of the proposed additional ground contamination investigation and to provide the London Borough of Camden with sufficient information to approve the scope of works in accordance with condition 6 part (a).

1.2 Information sources

The information sources used to inform this strategy include desk studies, ground investigation data and site walkover notes as follows:

- Arup (June 2010), Saatchi & Saatchi – 80 Charlotte Street, Geotechnical desk study;
- Arup (October 2010), 80 Charlotte Street and 65 Whitfield Street, Contamination risk assessment;
- Geotechnical Engineering (June 2012), Ground investigation factual report; and
- Arup (August 13th 2012), Site walkover notes and photos taken by an Arup environmental and geotechnical specialist.

1.3 Limitations

This report has been produced by Arup for use by West London & Suburban Property Investments Ltd in connection with the proposed redevelopment of 80 Charlotte Street. It is not intended for, and should not be relied upon by any third party except as provided for in Arup's agreement with West London & Suburban Property Investments Ltd.

Reasonable skill and care has been exercised in preparation of this report in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking this contamination assessment, it is possible that the ground conditions other than those potentially indicated by this report may exist at the site.

This interpretative report has been prepared based upon information collected by other parties. Arup has assumed that the factual information provided by others is reliable but does not take any responsibility for the validity of those data.

2 Summary of site conditions

2.1 Site history

A summary of the site history is presented below, which is an extract from the Geotechnical desk study (Arup, 2010) and related appendices.

Historical plans show that the northern part of the site lay within an old quarry. It is likely that this quarry extended over a larger portion of the site and could have possibly extended across the whole of the site. Urban development occurred on the site during the mid 1700s to early 1800s and was mostly residential.

From 1900 to 1927 the use of the area changed to predominantly commercial buildings. Post World War 2 maps show some demolished buildings on site, possibly due to bomb damage. The buildings present at that time had various uses, including small scale metal works, welding facilities, rubber tyres storage, garages, electrical fittings, residential and offices.

By 1957 the buildings present on site are mostly commercial in nature. Some buildings were merged or refurbished by adding one or two floors and a basement level. Ordnance Survey maps dating from the mid 1960s show the site was redeveloped and the site has remained unchanged. The site is currently leased as office space, using the basements for car parking.

2.2 Environmental setting

2.2.1 Environmental context

The site is located in a commercial area in central London. There are no designated ecological receptors such as sites of Sites of Special Scientific Interest, Special Areas of Conservation, Areas of Outstanding Natural Beauty or Local Nature Reserves located within 1km of the site.

2.2.2 Controlled waters and abstractions

The site is not located in a source protection zone (SPZ) for groundwater and no groundwater abstractions are located on the site. There are no groundwater abstractions within 250m of the site recorded in the Envirocheck report. It should be noted that the Envirocheck report does not include unregistered abstractions.

The site is underlain by a shallow aquifer in the River Terrace Deposits (RTD) gravel which is classed as a secondary A aquifer (controlled waters). The gravel deposits in the strata have been extensively truncated or removed by local basement construction or historic extraction industries.

There are no discharge consents within 250m of the site. There is one recorded pollution incident to controlled waters within 250m of the site (dated 1998), which relates to pollution by unknown chemicals. This was from Middlesex hospital which lies 247m southwest of the site.

2.2.3 Environmental permitting and registers

There are no contaminated land register entries and notices, or recorded landfill sites located within 500m of the site. There is one local authority pollution prevention and controls (PPC) permit located within 250m of the site. This is located 239m west of the site and is registered as a petrol filling station.

There are no control of major accident hazards sites or notification of installations handling hazardous substances sites located within 250m of the site.

There are three sites which are registered as storing/using radioactive substances within 250m of the site. The closest is 69m northeast of the site, registered at University College London.

3 Previous risk assessment

3.1 Conceptual model and assessment

A conceptual model was set out in the Arup 2010 contamination risk assessment. The conceptual model identified the sources of contamination on site, the likely receptors and if a plausible pollutant linkages were likely to be present. A brief summary of the sources, receptors and pathways discussed in that report is presented below.

Based on historical uses of the site the model identified the potential contamination sources as follows:

- Material used to backfill the old gravel pit;
- Contamination from light industrial processes on site;
- Asbestos containing material in demolition rubble; and
- Fuel tanks used for heating.

The receptors were identified as humans (site workers, residents and employees), groundwater in the secondary aquifer and building materials and services.

Pollutant linkages were identified between potential contamination and:

- Human health through dermal contact, ingestion and inhalation;
- Secondary aquifer (RTD) through lateral migration through soils (piles will not penetrate to deeper aquifer); and
- Materials and services through aggressive soil conditions.

A preliminary risk assessment was presented based on the Arup 2010 report. In summary it stated:

- No large scale industrial potentially contaminating site use has been identified on site or in its vicinity.
- Some minor/small scale commercial or light industrial activities have been identified. The northern part of the site lay within an old quarry. The material used to backfill the gravel pit is unknown origin and was therefore regarded as a potential source of ground contamination, although of relatively low significance. Organic fill deposits may produce hazardous ground gases.
- The report suggested that if fuel tanks were present there is a potential that these tanks may have leaked or that spills occurred.
- The site was extensively redeveloped in the 1960s which included basement excavation. This will have removed much of the potentially contaminated ground associated with previous use.
- The previous buildings may have contained asbestos containing materials (ACM) which may not have been handled appropriately during demolition of former buildings. Bomb damage from the war may have resulted in building materials containing ACM to be used as backfill for subsequent development.
- The potential for significant contamination at the site was assessed to be low.

- Exposure to contaminated soil and groundwater by site workers may occur during site redevelopment when intrusive works are carried out. The associated issues can be mitigated by appropriate construction practices and design measures based on the results from the ground investigations.
- The results of the ground investigation will be used to select the right mitigation measures required to reduce risk to groundwater and materials and services.

A summary of the findings is presented below.

Pollutant Linkage	Qualitative Assessment
Potential for significant contamination	Low
Sensitivity of development	Low
Risk of harm to human health during development	Low to Very Low
Risk of harm to human health following development	Low to Very Low
Risks of pollution to controlled waters	Low
Risks of harm to building materials and services	Very low
Risk of harm to ecological receptors	Negligible

3.2 2012 Ground investigation

3.3 Scope of recent investigation

A geotechnical ground investigation of 80 Charlotte Street and Asta House was carried out in June 2012 by Geotechnical Engineering Ltd and supervised by Arup. The scope included ground contamination testing at five locations. The extent of the contamination testing was limited based on the desk study which suggested in general a low potential for contamination at the site (refer to section 3). As fuel tanks were identified in the desk study some additional contamination testing was specified in the vicinity of those tanks.

The contaminated land scope of the investigation consisted of six boreholes located in the courtyard area. The location of the boreholes is presented in Figure 1. The borehole logs from this investigation are provided in Appendix A. 12 soil samples from five boreholes (BH113a, BH113c, BH113d, BH104 and BH122) were tested for metals, asbestos, cyanide, chloride, phenols, polyaromatic hydrocarbons (PAH), benzene, toluene, ethylbenzene, and xylenes (BTEX), polychlorinated biphenyls (PCB), total petroleum hydrocarbons (TPH) and total organic carbon (TOC).

Ground gas and groundwater monitoring installations were installed into two boreholes (BH122 and BH114). Six rounds of ground gas monitoring and two rounds of groundwater monitoring were carried out.

3.3.1 Soil results

The soil test results have been initially assessed by comparing them to national published generic assessment criteria for assessing risks to human health in a

residential (without the consumption of home grown produce) setting. A short summary of the results is provided below:

- The majority of the metal concentrations are well below the residential human health assessment criteria. Arsenic and lead concentrations have exceeded the assessment criteria in six samples, at four locations (BH122, BH104, BH113d and BH113c). The exceedances are marginal in most cases, although arsenic levels in BH122 and lead levels in BH104 are roughly double the residential assessment criteria.
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations are below detection limit at in all soil samples, with the exception of BH122 3.10m bgl, where concentrations were elevated although not exceeding the assessment criteria for ethylbenzene (4200µg/kg, m- & p- Xylene 7300µg/kg and o-Xylene 5800µg/kg).
- PAH concentrations were mostly below the detection limit and where present concentrations were mostly very low and almost all were also below residential assessment criteria, with the exception of benzo[a]pyrene in BH113c, 1m bgl, recorded concentration of 1.8mg/kg.
- Concentrations of aliphatic and aromatic petroleum hydrocarbon (TPH) compounds were mostly below the detection limit and where present concentrations are below residential assessment criteria. However concentrations recorded in BH122 3.1m bgl are elevated well above the residential assessment criteria (a summary table of the elevated result is provided below). This sample was taken at the base of the Made Ground/ top of the RTD and indicates free product is present at this depth. The elevated results were accompanied by strong hydrocarbon odours noted during drilling when the borehole reached this depth.

BH122 (3.1m bgl) soil sample TPH results		
Determinants	**Residential assessment criteria**	**Recorded concentration (mg/kg)**
TPH aliphatic >C8-C10	19	1100
TPH aliphatic >C10-C12	93	3800
TPH aliphatic >C12-C16	745	15000
TPH aliphatic >C16-C35	8360	23000
TPH aromatic >C8-C10	33	220
TPH aromatic >C10-C12	177	1100
TPH aromatic >C12-C16	1240	5900
TPH aromatic >C16-C21	971	7000
TPH aromatic >C21-C35	1330	2100
Total Petroleum Hydrocarbons	n/a	59000
Benzene	0.27	0.01
Ethylbenzene	167	4.2
m-&-p-xylene	53.3	7.3
o-Xylene	59.5	5.8

- Asbestos was detected in BH113d, at 0.5m and 1.5m bgl. It was identified as chrysotile and amosite (amphiboles in fines), at a concentration of 0.001%

w/w. This is a low concentration and it is not unusual to occasionally encounter very low concentrations of asbestos fibres in Made Ground

- All phenol concentrations were recorded as below detection limit.

3.3.2 Groundwater

Four samples of groundwater, from two locations (BH114 and BH122), were tested for metals, TPH, BTEX and PAH. Results from BH114 were below detection limit and where present concentrations were below UK Drinking water standards. However concentrations of BTEX, PAH (particularly naphthalene) and TPH in the two samples taken from BH122 were elevated above Environmental Quality Standards. A summary table presenting groundwater test results is provided in Appendix A. The results indicate the presence of free product in the groundwater.

3.3.3 Ground gas

Elevated ground gases were reported in BH122 and BH114. This included methane up to 14.6 % v/v, carbon dioxide up to 14.2% v/v and hydrocarbon vapours up to 96ppm.

3.3.4 Stratigraphy

The site specific investigation shows the following stratigraphy

Stratum	Thickness (m)	Top surface (mOD)
Made Ground	2.0 to 4.5	+25.2 to +25.6
River Terrace Deposits	1.3 to 5.0	+19 to +23.4
London Clay	15.6 to 16.0	+19.9 to + 18.1
Lambeth Group & Thanet Sands	21.7	+2.8 to +3.0
Chalk	unproven	-18.7

3.3.5 Summary

While many results were low the testing of soil and water at BH122 indicates that elevated hydrocarbon contamination is present at depth. The location of BH122 is shown on Figure 1. It was purposely located close to the above ground storage tank in that area. The results indicate that hydrocarbons may have leaked from this tank and be present in deep soils and groundwater in the area; there was no indication of such contamination in the soil and water from shallow depths (top 3m) at this location.

All the existing results will be assessed in more detail in accordance with nationally published guidance when the additional investigation is completed and that data is also available.

4 Proposed investigation strategy

4.1 Site walkover

In response to the ground investigation findings a site walkover was carried out by an Arup Environmental Consultant and Geotechnical Engineer on 13th August 2012. A summary note is presented in Appendix B. The tank closest to BH122 is referred to as the Chitty Street tank. The key findings from the site walkover are summarised below:

- There are three tanks on site (locations shown in Figure 2), all of which are still in use.
- The Chitty Street tank can store up to 6000 litres of oil and the other two tanks store up to 35,000 litres of oil.
- The oil stored is 35 Second gas oil (also referred to as red diesel) and is used for heating in the associated buildings.
- The tanks would have been installed when the buildings were constructed in the late 1950s. The tanks were last emptied and cleared approximately 12 years ago.

4.2 Proposed investigation strategy

4.2.1 80 Charlotte Street

In order to assess the extent of the contamination at BH122 an additional six exploratory hole locations are suggested focused on the Chitty Street tank. This will consist of two close to the tank (BH203 and BH204), and four further away (BH202, BH205, BH201 and BH208) to demonstrate that the contamination is limited in extent, or assist in the delineation if the hydrocarbon plume if it is more substantial.

Two additional locations, BH206 and BH207 (i.e. a total of eight) have been located to the south of the two other tanks identified on site (to the north of Chitty Street tank.

A plan of the proposed exploratory hole locations is provided as Figure 2. It is proposed to construct the boreholes using a compact rotary “pioneer rig” to provide flexibility, minimise disturbance and allow drilling into the RTD gravels. The exploratory holes are scheduled for an 8m depth, which will provide information of the conditions of the Made Ground and Gravels, and will prove the level of London Clay beneath the gravels.

Soil samples will collected during exploratory hole excavation, and at every location at least two samples will be tested for a range of determinands including metals, inorganic and hydrocarbon compounds.

A standpipe will be installed at each location with the response zone within the gravels in order to carry out water monitoring, sampling and analysis which will be undertaken after construction and following purging of the standpipe. At least two further rounds of groundwater monitoring will be undertaken at each location.

An interface probe will be used during each monitoring round to identify the depth of potential free product on the water (if present).

A review of existing GI information and other studies carried out by Arup in the area suggests that groundwater is likely to flow in a north south direction. Therefore most locations have been located to the south of BH122. One of these locations is proposed for the pavement area outside of Block K (BH208), to the south of the Chitty Street tank, however this exploratory hole is subject to permission from the Local Authority, which will require a detailed method statement for approval that will be submitted prior to ground investigation commencement. Permission for BH208 as a provisional borehole will be sought although if findings from the locations within the site boundary, especially the locations to the south of BH122, do not reveal any visual or olfactory evidence of contamination it will not be necessary to proceed with BH208. This decision will be reviewed by a contaminated land specialist whilst the ground investigation is taking place.

4.2.2 65 Whitfield Street

A major refurbishment is planned of 65 Whitfield Street including addition of two storeys, relocation of the existing cores and a lower level extension in plan. This will involve excavations of the Made Ground and possibly gravels beneath the site.

A geotechnical ground investigation is currently being planned and will take place within 65 Whitfield Street in October 2012. The scope comprises four trial pits, intended to extend 2m deep and two borehole locations, intended to extend 7m deep (top of the London Clay).

The ground investigation will incorporate contaminated land testing on soil samples taken from all the trail pit locations. It is expected that eight soils samples will be tested in the manner, up to two from each location depending on what is encountered. If water is encountered in the pits and/or boreholes then this will be sampled and tested. It is also possible that two standpipes will be installed into the Gravels, in which case two rounds of groundwater sampling and four rounds of gas sampling will take place. However this provision based on what is identified and potential restrictions as the locations are currently active offices.

A review of existing plans for this site indicates that an oil storage tank may be present in southern corner of Asta House. Access to this area didn't occur during the site reconnaissance. This area will be inspected during the ground investigation works and one trial pit and a borehole will be located in this area.

5 Conclusion

The existing information obtained from ground investigation at the site has indicated that a fuel tank may have leaked and there are elevated concentrations of hydrocarbons at one location on top of the RTD (which is classed as a Secondary A aquifer) local to one tank. The RTD are highly truncated in this area due to neighbouring basement construction and historic extraction activities. It is quite possible that the hydrocarbons are limited in extent; alternatively there may be a wider plume.

The planning consent planning conditions require approval from the local authority for a programme of site investigation. This report sets out a summary of previous work and a strategy for further investigation of the potential contamination at the site in order for the authority to provide such approval.

On completion of the proposed investigation the groundwater monitoring and chemical test results (and existing results) will be assessed using a risk based assessment in accordance with Environment Agency guidance. If the contamination appears to be limited it is unlikely that a remediation scheme will be required due to the proposed form of development which includes further basement excavation etc. The assessment and recommendations will be provided to the London Borough of Camden for approval. If the contamination is more extensive a remediation strategy will be submitted to the London Borough of Camden before development commences. Following the remediation/development process a verification report will be submitted to the London Borough of Camden.

Figures


529400
BH101
BH102
BH121
BH113
BH113A
Whitfield St. tank
Charlotte St. tank
BH106
BH113C
BH103
BH104
BH114
BH122
BH108
BH107
Chitty St. tank
BH109
BH105
Charlotte Street
Whitfield Street
Chitty Street
LONDON CONGESTIO

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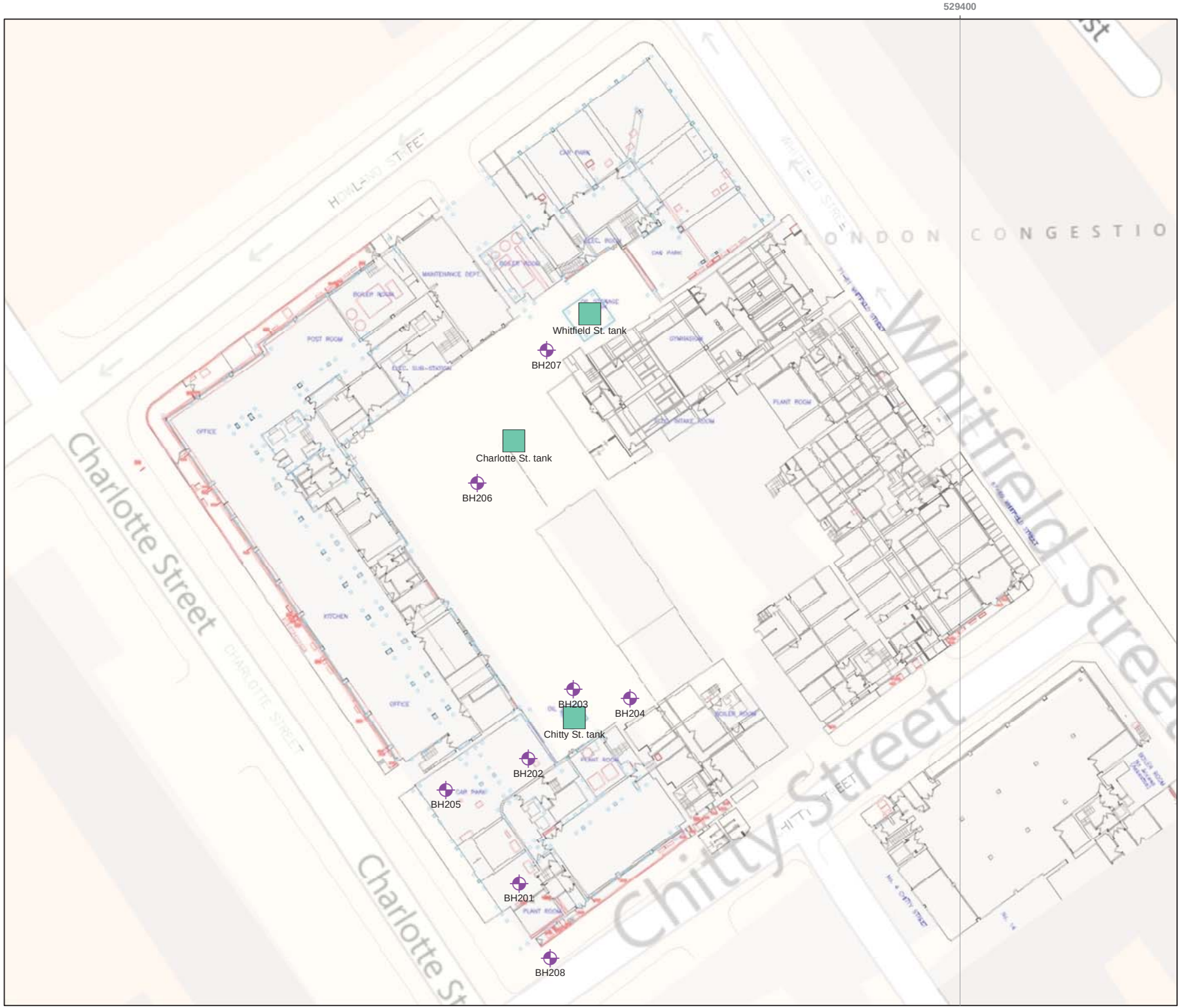

529400
Whitfield St. tank
BH207
Charlotte St. tank
BH206
BH203
BH204
Chitty St. tank
BH202
BH205
BH201
BH208
Charlotte Street
Whitfield Street
Chitty Street

ARUP

Appendix A

Existing ground investigation data

Appendix B

Site walkover note

Record of Site Visit

ARUP

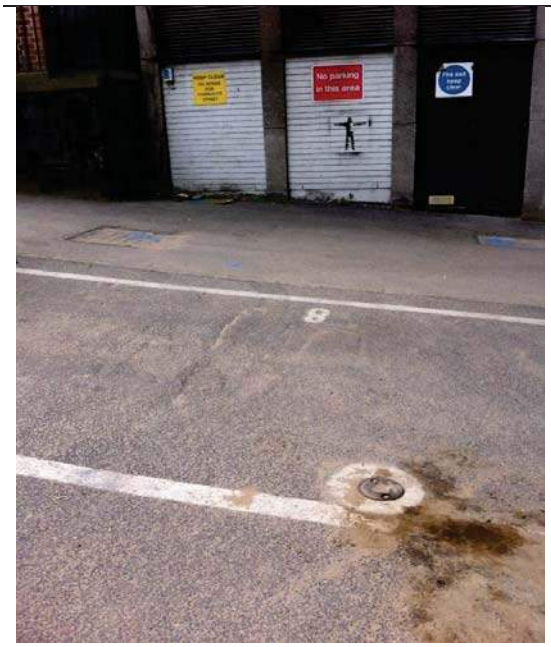
Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
~14:00 – 14:30 Met with Richard Cage, Saatchi maintenance supervisor, on site to discuss tank status and conditions. **Chitty Street tank (Southern corner of courtyard)** (Photograph 1)**:** • Tanks is still in use, it stores 6000 litres of oil. • The oil used is called 35 Seconds Gas Oil. • The oil in this tank is used for heating the Chitty Street portion of the building (Block K) • The tank is filled at a separate filling point (**Error! Reference source not found.**). • The tank would have been installed when the building was constructed in the late 1950s. • About 12 years ago the tank was emptied for inspection as it was thought water was infiltrating into the tank. • BH122 is located 3.9m south-west of the tank (Photograph 3).	

Photograph 1: Chitty Street tank

Record of Site Visit

Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
 **Photograph 2: Oil fill point**	
 **Photograph 3: BH122 (3.9m south west of tank**	

Record of Site Visit

Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
Charlotte Street Tank (North-west in court yard) Photograph 4 • This tank stores 35,000 litres of 35 second gas oil. It is still in use. • The oil of this tank generates heating for the largest proportion of the Saatchi building (Block H). • The boiler room generated by this tank if located on the Howland Road side of the building. • There will be extensive pipe work connecting this tank to the boiler room. • It was emptied 12 years ago as it was thought the tank was losing oil. • The filling point is separate and is located behind a car park separator wall Photograph 5.	
 **Photograph 4: Charlotte Street Tank**	

Record of Site Visit

Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
 **Photograph 5: Filling point for Charlotte Street tank**	
Whitfield Street Tank (Northern corner of courtyard) Photograph 6 • This tank has a 35,000 litre capacity and is still in use. • The oil is 35 second gas oil. • The oil from this is used to generate heat for the buildings in the northern corner (Block G). • The boiler room this tank supplies is close to the tank and the connector pipe is shown by a metal over ground cover. • It was also emptied about 12 years ago during the tank maintenance. • Several attempts were made for an exploratory hole near to this tank but were discarded due to obstructions Photograph 7. • There is an installation nearby BH121, Photograph 8. • Photograph 8 also shows an overflow pipe located in the corner next to the car park. This pipe would indicate if the tank was ever over filled.	

Record of Site Visit

Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
 **Photograph 6: Whitfield street tank, and connecting pipe metal cover**	

Record of Site Visit

Project title	Fitzrovia Redevelopment			Job number 207329
Visit made by	Emma Fromant, Rena Maguire and Alex Chen	Place visited	Saatchi building - courtyard area	File reference
Copy to	Chris Barrett	Person visited		Date of visit 13th August 2012
Purpose of visit	Site walkover to look at courtyard tanks Plan of Tank locations is attached as Figure 1			

Notes	Action by
 **Photograph 7: Aborted attempts of exploratory hole locations**	
 **Photograph 8: BH121 installation cover**	

ARUP

Subject **80 Charlotte Street and 65 Whitfield Street redevelopment. Ground contamination investigation strategy addendum**

Date 19 October 2012 Job No/Ref REP/207329/C/S002

1 Introduction

West London & Suburban Property Investments Ltd (WLSPIL) (as Derwent London) is redeveloping 80 Charlotte Street and 65 Whitfield Street located to the west of Tottenham Court Road in the Borough of Camden.

The planning consent conditions (application No: 201 0/6873/P) for the development includes condition 6 which states *"No development shall take place until: a) The applicant has submitted a programme of ground investigation for the presence of soil and groundwater contamination and landfill gas for approval by the Council; and b) The investigation has been carried out in accordance with the approved details and the results and remediation measures (if necessary) have been submitted to and approved by the Council. All approved remediation measures shall be implemented strictly in accordance with the approved details. c) All approved remediation measures shall be implemented strictly in accordance with the approved details and a verification report shall be submitted and approved by the Council."*

Ove Arup and Partners Ltd (Arup) prepared a report[1] to describe the scope of the proposed additional ground contamination investigation and to provide the London Borough of Camden (LBC) with sufficient information to approve the scope of works in accordance with condition 6 part (a). This report was submitted to the Council for approval on 27 September 2012. It was formally validated on 2 October 2012 under the reference 2012/5283/P.

Following a review of the report, Arup received initial comments and queries from Rob Ivens, the contaminated land officer (CLO) for LBC. Arup provided answers to the queries and subsequently confirmed that the CLO was satisfied with the response. This addendum summarises that exchange of emails in order that it can be submitted formally to LBC.

2 Initial queries

The initial email response of 16 October 2012 from LBC is set out below. Small edits have been made for the purpose of presenting the conversation in this addendum, although no meaning or specific requests have been altered.

1. Given the nature of the development and the identified historical uses, the site investigation is not far short of what might be reasonable but we would want some of the broader suggestions implemented.
2. In view of the elevated gas levels: i.e. elevated ground gases were reported in BH122 and BH114, included methane up to 14.6 % v/v, carbon dioxide up to 14.2% v/v and hydrocarbon vapours up to 96ppm, I would ask what your evidence is to suggest this is isolated to that

[1] Arup (September 2012) 80 Charlotte Street and 65 Whitfield Street Redevelopment Ground Contamination Investigation Strategy REP/207329/C/S001

particular tank, and if you have considered whether it is a more widespread issue. Regardless of this I would want you to implement the suggested additional gas testing- as a precaution for the residential receptors (*Arup note; as discussed in section 4.2.2 reproduced below*):

4.2.2 The ground investigation will incorporate contaminated land testing on soil samples taken from all the trail pit locations. It is expected that eight soils samples will be tested in the manner, up to two from each location depending on what is encountered. If water is encountered in the pits and/or boreholes then this will be sampled and tested. It is also possible that two standpipes will be installed into the Gravels, in which case two rounds of groundwater sampling and four rounds of gas sampling will take place. However this provision based on what is identified and potential restrictions as the locations are currently active offices.

These sample locations must be representatively placed to the satisfaction of the supervising engineer.

3. In relation to the proposed extra trial pit locations for residential; I can't see the locations but I guess that is because they are geotechnically based. In view of the type of development this is fine but we would be reliant on the proposed vapour wells to assess risk to the residential units.

4. We want regular photoionisation detector (PID) records in the inspection locations and the final report must carry out a specific assessment of potential migrating surface fuel contamination from the fuel sources.

5. I am not sure if the fuel is petrol based. The high vapour readings seem suggestive of the possibility of something other than fuel oil.

3 Arup response

Arup provided a response by email on 16 October 2012. Small edits have been made for the purpose of presenting the conversation in this addendum, although no meaning or specific requests have been altered.

a. We have undertaken six rounds of ground gas monitoring at two locations. We propose to undertake further gas monitoring during the next phase of GI in the standpipes we install. We will undertake gas/vapour monitoring in the standpipes installed in the 80 Charlotte Street locations to provide increased coverage.

b. The text you (CLO) extracted on gas (in the mail dated 16 October) is for 65 Whitfield Street which is over the road from 80 Charlotte Street. This is a separate building (although covered by same application) and comprises the refurbishment and extension of a small existing basement. It doesn't seem to have the same risk status. We are looking at doing some standpipes but it may not be possible in this location as we are boring in a basement that is currently active offices and meetings rooms. It may be impossible to install a standpipe. We should at least get some hand dug pits in to look at foundations. We will keep you informed on progress in that area. We didn't include a plan of the separate investigate (in our report) which may have resulted in confusion. Attached is an updated plan (see end of addendum) which shows the investigation locations for the 65 Whitefield Street building. There is a very small storage tank (referred to as oil storage) in the south corner of the basement of Whitfield Street. We have positioned a borehole and trail pit in that area. The extra trial pits are shown on the attached for the Whitfield Street GI. Hope that helps.

c. We have included PID readings in the specification. We have also included hydrocarbon fingerprinting and degradation tests (on top of the speciated petroleum hydrocarbon testing method) to identify fuel type. The aim of the investigation at 80 Charlotte is to attempt to delineate hydrocarbon plume (if it exists). We will report on this and it will inform the development/remediation strategy (if required).

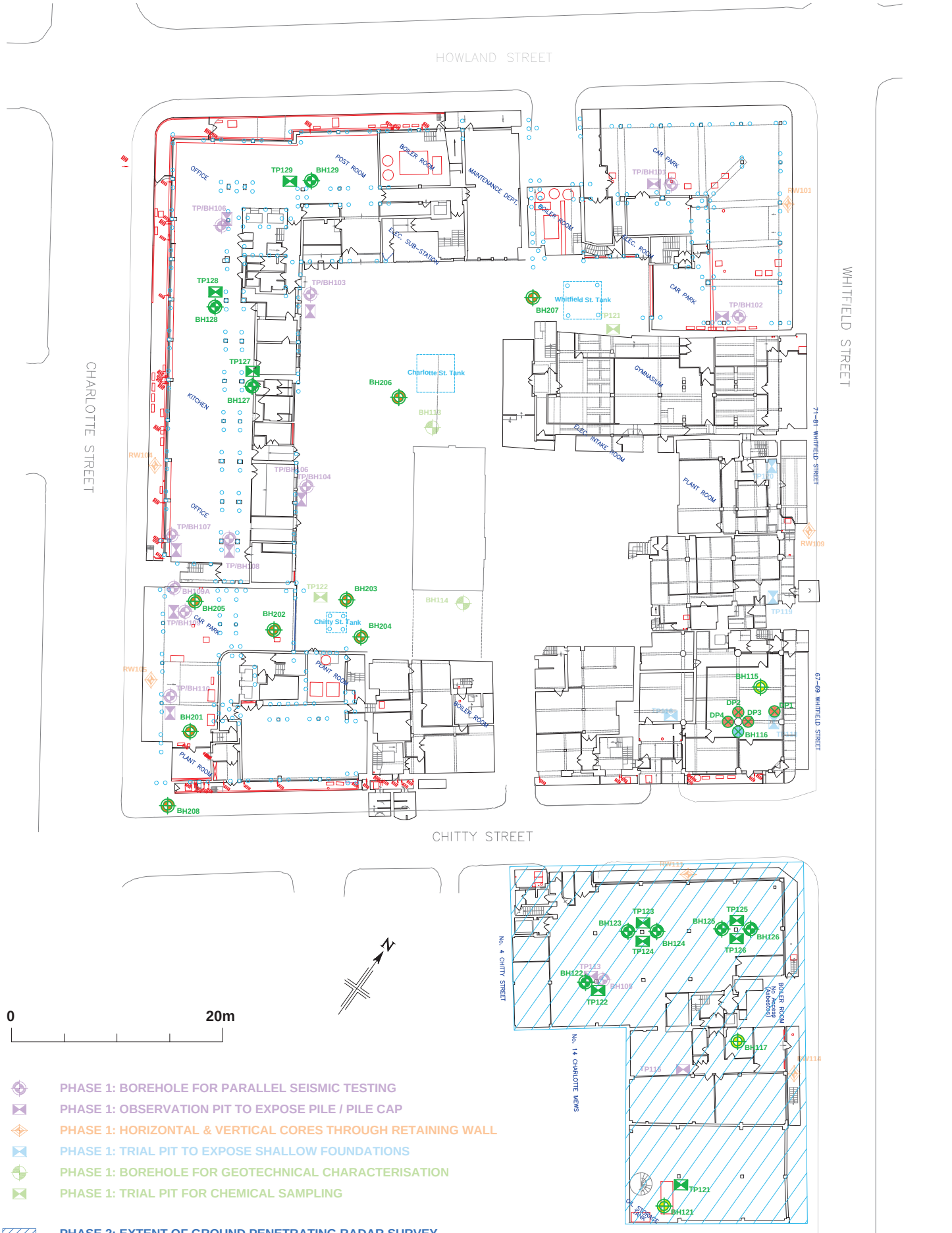
4 Second response from CLO

On 18 October the CLO responded as follows:

In summary I would be happy; my one provision would be that in the residential section we get at least two locations to 2-3m down or 0.5m into the underlying clean strata (probably clay) to show we have no lateral migration. The site engineer can then determine if vapour monitoring is needed.

5 Conclusion

Following discussions with LBC and further to the incorporation of the requests and clarifications provided in Sections 3 and 4 above, the CLO has confirmed that he is satisfied with the proposed ground contamination investigation strategy which relates to condition 6 part a. We confirm that the requirements requested by the CLO as outlined in this report will be incorporated into the ground investigation strategy submitted to the Council for approval under reference 2012/5283/P.



PHASE 1: BOREHOLE FOR PARALLEL SEISMIC TESTING
PHASE 1: OBSERVATION PIT TO EXPOSE PILE / PILE CAP
PHASE 1: HORIZONTAL & VERTICAL CORES THROUGH RETAINING WALL
PHASE 1: TRIAL PIT TO EXPOSE SHALLOW FOUNDATIONS
PHASE 1: BOREHOLE FOR GEOTECHNICAL CHARACTERISATION
PHASE 1: TRIAL PIT FOR CHEMICAL SAMPLING

PHASE 2: EXTENT OF GROUND PENETRATING RADAR SURVEY OF EXISTING PILE CAPS & SHALLOW FOUNDATIONS
PHASE 2: BOREHOLE FOR GEOTECHNICAL CHARACTERISATION
PHASE 2: BOREHOLE FOR PARALLEL SEISMIC TESTING
PHASE 2: TRIAL PIT
PHASE 2: PROBE HOLE TO ESTABLISH FOUNDATION EXTENT
PHASE 2: PROBE HOLE WITH CORE THROUGH FOUNDATION

SERVICES (INDICATIVE ONLY, SEE OTHER PLANS FOR FULL SERVICES)
ASSUMED PILE LOCATIONS (INDICATIVE ONLY)

ARUP

FITZROVIA REDEVELOPMENT
SITE INVESTIGATION: PHASE 2
EXPLORATORY HOLE LOCATIONS
01/10/2012
SCALE 1:400 @A3

207329

FIGURE 1

Appendix B

Borehole logs

KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed sample	B	Bulk disturbed sample	D*	Contamination sample
LB	Large bulk disturbed sample	W	Water sample	P	Piston sample
X	Dynamic sample	C	Core sample	Cs	Core subsample (prepared)
U	Undisturbed sample open drive				
UT	Thin wall open drive tube sample				

Test type

S SPT - Split spoon sampler followed by SPT 'N' value
C SPT - Solid cone followed by SPT 'N' value
*250 - Where full test drive not completed, linearly extrapolated N value reported
** - No effective penetration

H Hand vane – direct reading in kPa – not corrected for BS1377 (1990). Re* denotes refusal.
M Mackintosh probe result – number of blows to achieve 100mm penetration.
PP Pocket penetrometer result – direct reading in kg/sq.cm.
Vo Headspace vapour readings, uncorrected peak values in ppm, using a PID (calibrated with Isobutylene, using a 10.6 eV bulb).

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

X = Total Core Recovery (TCR) as percentage of core run.

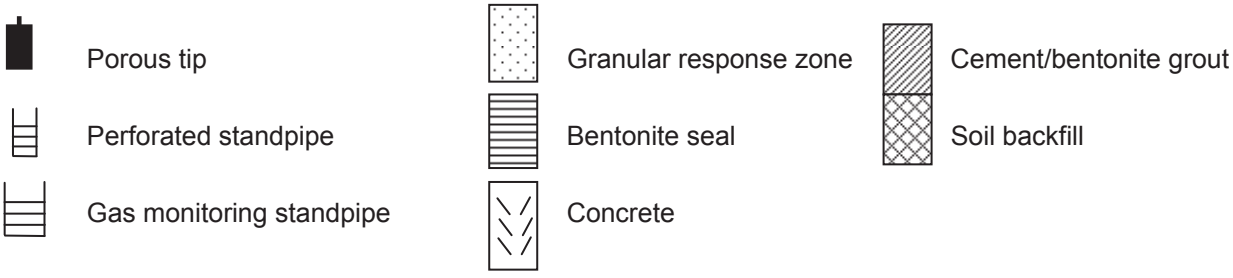
Y = Solid Core Recovery (SCR) as percentage of core run. Note: assessment of solid core is based on full diameter.

Z = Rock Quality Designation (RQD). The amount of solid core greater than 100mm expressed as percentage of core run.

Where SPT has been carried out at beginning of core run, disturbed section of core excluded from SCR and RQD assessment.

I_f - fracture spacing – the average fracture spacing (in millimetres) over the indicated length of core. Where spacing varies significantly, the minimum, average and maximum values are given.
NI = non-intact core NA = not applicable

Instrumentation



Stratum boundaries

Estimated boundary Grading boundary

KEY TO EXPLORATORY HOLE LOGS

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:1999 incorporating Amendment 1 (2006) & 2 (2010). Amendment 1 removes text superseded by BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003, and makes reference to the relevant standard for each affected sub clause. Amendment 2 removes text superseded by BS EN 22475-1:2006 and makes reference to the relevant standard for each affected sub clause.

Chalk is logged in general accordance with Lord et al (2002) Ciria C574. Where possible, dynamic samples in chalk have been logged in broad accordance with Ciria C574; descriptions and gradings should be treated with caution given the potential for sample disturbance.

For mixed soils the proportions of secondary constituents have been described using the following terms:

Description before SOIL NAME	SOIL NAME	
	SAND or GRAVEL	CLAY or SILT
slightly *	< 5%	< 35%
*	5 – 20%	35 – 65%
very *	> 20%	> 65%

* clayey, silty, sandy or gravelly as appropriate

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of the fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

General Comments

The process of drilling and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

Indicated water levels are those recorded during the progress of drilling in open or cased boreholes and may not represent standing water levels.

Legends are drawn in accordance with BS 5930:1999 incorporating Amendment No. 2

All depths are measured along the axis of the borehole and are related to ground level at the point of entry.

Made Ground is readily identifiable when, within the material make up, man made constituents are evident. Where the Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

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BOREHOLE LOG

BH101

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 6 June 2012 — Easting 529355.5 — Scale 1 : 50

End Date 8 June 2012 — Northing 181945.7 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
06/06/12 2000hrs								Light grey CONCRETE. (MADE GROUND)	0.27	25.14	
	1D*	0.50			Vo 0.00			Brown and reddish brown clayey sandy angular and subangular fine to coarse brick, charcoal, concrete and flint GRAVEL with frequent subangular brick and concrete cobbles and occasional fine to coarse gravel sized bone, wood and metal fragments. (MADE GROUND) 0.40 - 0.60m: Rare black organic flecks and a slight organic odour present.	1.05	24.36	
	2D*	1.10			Vo 0.00						
	3D*	1.60			Vo 0.00			Brown clayey gravelly fine to coarse SAND with occasional coarse gravel sized and cobble sized pockets of black organic silt and rare subangular brick cobbles and rare medium gravel sized bone fragments. Gravel is angular to subrounded fine to coarse brick, charcoal, concrete, flint. (MADE GROUND)	1.85	23.56	
	4B	2.00	2.50								
	5D*	2.50			Vo 0.60			Soft dark grey stained black slightly gravelly locally gravelly sandy CLAY with faint organic odour. Gravel is angular to subrounded fine to coarse flint, brick and concrete. (MADE GROUND)			
		2.50	2.95	2.00	C 4						
	6B	2.50	3.00								
	7D*	3.50			Vo 11.8				3.50	21.91	
		3.50	3.95	2.00	C 17			Medium dense dark brownish grey slightly clayey very sandy angular to subrounded fine to coarse flint GRAVEL with faint organic odour. (Possible loss of fines).			
	8B	3.50	4.00								
	9D*	4.50			Vo 10.5				4.50	20.91	
		4.50	4.95	4.50	C 24			Medium dense dark orangish brown slightly clayey gravelly fine to coarse SAND. Gravel is angular to subrounded fine and medium with rare coarse flint.			
	10D	4.50									
	11B	4.50	5.00								
	12D	5.50							5.80	19.61	
	13U	6.00	6.45	6.00				Stiff extremely closely and very closely fissured dark orangish brown tending to dark brownish grey slightly sandy CLAY.			
	14D	6.50									
	15D	7.50	7.95	6.00	S 18				7.50	17.91	
								Stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with rare fine gravel sized shell fragments and randomly orientated lenses (<1mm) of	{8.00}		

Continued Next Page

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.85m. Cable percussion (150mm) 1.85-20.00m.

CASING: 150mm diam to 6.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 1.85- 20.00m, cement:bentonite grout 20.00-1.85m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
4.00	2.00	3.60	20	

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Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 6 June 2012 — Easting 529355.5 — Scale 1 : 50

End Date 8 June 2012 — Northing 181945.7 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	16D	8.00		H 121			dark grey silt.			
	17U	9.00 - 9.45	6.00							
	18D	9.50		H Re*						
							10.00m: With rare fine and medium sand sized selenite crystals.			
	19D	10.50 - 10.95	6.00	S 26						
	20D	11.00								
		12.00		H Re*				12.00	13.41	
07/06/12 0200hrs Dry	21U	12.00 - 12.45	6.00				Very stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine to coarse sand sized selenite crystals and rare randomly orientated lenses (<1mm) of dark grey silt.			
07/06/12 1830hrs Dry	22D	12.50					12.00m: Selenite becomes frequent and fine to coarse sand sized.			
		13.00		H Re*						
	23D	13.50 - 13.95	6.00	S 33			13.50 - 14.00m: With rare fine gravel sized shell fragments.			
	24D	14.00		H 111			14.00 - 20.00m: With rare randomly subhorizontal lenses (<3mm) of selenite.			
	25U	15.00 - 15.45	6.00							
	26D	15.50		H Re*						
	27D	16.50 - 16.95	6.00	S 31			16.50 - 18.50m: Selenite lenses become frequent. Rare coarse gravel sized pockets of black carbonaceous material.			
	28D	17.00		H 121						
		18.00		H Re*						
							Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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Geotechnical Engineering Limited

BOREHOLE LOG

BH101

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 6 June 2012 — Easting 529355.5 — Scale 1 : 50

End Date 8 June 2012 — Northing 181945.7 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	29U	18.00	18.45	6.00							
	30D	18.50						19.00 - 20.00m: Silt lenses become <3mm.			
08/06/12 0100hrs Dry	31D	19.50	19.95	6.00	S 32						
	32D	20.00			H Re*			Borehole completed at 20.00m.	20.00	5.41	
									{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH102

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 28 May 2012 — Easting 529369.7 — Scale 1 : 50

End Date 29 May 2012 — Northing 181939.0 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
28/05/12 1830hrs								Grey and off white CONCRETE. (MADE GROUND)	0.28	25.13	
	1D*	0.50			Vo 0.00			Brown locally greyish brown clayey sandy angular to subrounded fine to coarse brick, ceramic, concrete, flint and charcoal GRAVEL with frequent brick and concrete cobbles and rare medium gravel sized bone and metal fragments. (MADE GROUND)	0.85	24.56	
	2D*	1.00			Vo 0.00			Brown locally dark brown clayey gravelly fine to coarse SAND with occasional subangular brick and concrete cobbles and occasional medium gravel sized bone and shell fragments. Gravel is angular to subrounded fine to coarse brick, charcoal, concrete, flint and chalk. (MADE GROUND)	1.80	23.61	
	3D*	1.50			Vo 0.00						
	4B	2.00 - 2.50						Soft dark brownish grey frequently stained black slightly gravelly locally gravelly sandy CLAY with organic odour and frequent medium and coarse gravel sized fragments of bone. Gravel is angular to subrounded fine to coarse brick and concrete. (MADE GROUND)			
		2.50 - 2.95		2.50	C 3						
	6D*	2.50			Vo 1.40						
	7B	2.50 - 3.00									
	8D	3.50							3.50	21.91	
		3.50 - 3.95		3.50	C 19			Medium dense dark greyish brown and orangish brown slightly clayey very sandy angular to subrounded fine to coarse flint GRAVEL with rare coarse gravel sized pockets of light brown slightly sandy clay. (Possible loss of fines).			
	9D*	3.50			Vo 2.70						
	10B	3.50 - 4.00									
	11D	4.50									
		4.50 - 4.95		4.50	C 22						
	12D*	4.50			Vo 5.00						
	13B	4.50 - 5.00									
									5.50	19.91	
	14D	5.50						Soft dark orangish brown slightly gravelly slightly sandy locally sandy CLAY. Gravel is subangular and subrounded fine to coarse flint.	6.00	19.41	
		6.00 - 6.45		6.00	C 17			Medium dense dark orangish brown slightly clayey very sandy angular to subrounded fine to coarse flint GRAVEL. (Possible loss of fines).			
	15D*	6.00			Vo 1.30						
	16B	6.00 - 6.50									
									7.00	18.41	
	17D	7.00			H 110			Stiff dark greyish brown slightly sandy CLAY with rare fine sand sized selenite crystals and rare randomly orientated lenses (<3mm) of dark grey silt.			
	18U	7.50 - 7.95		7.00	Blows 50						
									8.00 {8.00}	17.41	
								Continued Next Page			

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.10m. Cable percussion (150mm) 2.10-20.00m.

CASING: 150mm diam to 7.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.10-18.50m, cement:bentonite grout 20.00-2.10m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.50	2.50	3.20	20	

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Geotechnical Engineering Limited

BOREHOLE LOG

BH102

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 28 May 2012 — Easting 529369.7 — Scale 1 : 50

End Date 29 May 2012 — Northing 181939.0 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	19D	8.00		H Re*			Stiff very closely fissured dark greyish brown slightly sandy CLAY with rare fine sand sized selenite crystals, randomly orientated lenses (<3mm) of dark grey silt and fine gravel sized shell fragments.			
	20D	9.00 - 9.45	7.00	S 23			9.00 - 11.00m: With frequent angular and subangular fine to coarse gravel sized mudstone lithorelicts (?)			
	21D	9.50								
	22U	10.50 - 10.95	7.00	Blows 50						
	23D	11.00		H Re*			11.00m: Selenite crystals become frequent.			
								12.00	13.41	
	24D	12.00 - 12.45	7.00	S 28			Very stiff extremely closely fissured brownish grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals, rare randomly orientated lenses (<1mm) of dark grey silt and coarse sand sized shell fragments.			
	25D	12.50		H Re*			12.00 - 12.50m: With rare angular and subangular fine to coarse gravel sized mudstone lithorelicts (?).			
	26U	13.50 - 13.95	7.00	Blows 35						
								14.00	11.41	
	27D	14.00		H Re*			Very stiff dark brownish grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals and randomly orientated lenses (<2mm) of dark grey silt and selenite.			
29/05/12 0230hrs Dry	28D	15.00 - 15.45	7.00	S 30						
29/05/12 1830hrs 3.70m	29D	15.50								
	30U	16.50 - 16.95	7.00	Blows 42						
	31D	17.00		H 130						
								18.00	7.41	
							Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 28 May 2012 — Easting 529369.7 — Scale 1 : 50

End Date 29 May 2012 — Northing 181939.0 — Ground level 25.41mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	32D	18.00	18.45	7.00	S 32			Very stiff extremely closely and very closely fissured dark brownish grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<2mm) of selenite.			
	33D	18.50									
29/05/12 2230hrs Dry	34U	19.50	19.95	7.00	Blows 45						
	35D	20.00			H Re*				20.00	5.41	
								Borehole completed at 20.00m.			
									{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 30 May 2012 — Easting 529333.8 — Scale 1 : 50

End Date 2 June 2012 — Northing 181908.9 — Ground level 25.33mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
30/05/12 1830hrs								Black TARMACADAM (MADE GROUND)	0.05	25.28	
								Light grey and off-white CONCRETE. (MADE GROUND)	0.37	24.96	
	1D*	0.50			Vo 0.00			Brown locally reddish brown clayey gravelly fine to coarse SAND with occasional subangular medium gravel sized bone, metal and shell fragments and occasional subangular brick and concrete cobbles. Gravel is angular to subrounded fine to coarse flint, charcoal, brick and concrete. (MADE GROUND)	1.25	24.08	
	2D*	1.00			Vo 1.10						
	3D*	1.50			Vo 0.00			Soft locally firm dark greyish brown frequently stained black slightly gravelly sandy CLAY with faint organic odour and rare medium and coarse gravel sized shell fragments. Gravel is subangular and subrounded fine to coarse brick, concrete, flint, and charcoal. (MADE GROUND)			
	4B	2.00	2.50								
	5D*	2.50			Vo 0.80				2.50	22.83	
		2.50	2.95	2.00	C 5			Loose dark brownish orange frequently stained brownish red slightly gravelly fine to coarse SAND with frequent pockets of dark purplish grey clay. Gravel is subangular to rounded medium and coarse flint. (MADE GROUND?)			
	6B	2.50	3.00								
	7D*	3.50			Vo 11.5						
		3.50	3.95	2.00	C 10			3.50 - 4.00m: Locally gravelly.			
	8D	3.50									
	9B	3.50	4.00								
	10D*	4.50			Vo 6.70				4.50	20.83	
		4.50	4.95	4.50	C 9			Loose tending to medium dense dark greyish brown tending to dark orangish brown slightly clayey very sandy subangular to rounded fine to coarse flint GRAVEL. (Possible loss of fines).			
	11D	4.50									
	12B	4.50	5.00								
	13D	5.50						5.50 - 6.80m: Gravel becomes fine and medium sized.			
		6.00	6.45	6.00	C 16						
	14B	6.00	6.50								
	15D	6.80						Stiff extremely closely and very closely fissured dark orangish brown rarely mottled dark greyish brown slightly sandy CLAY with rare brownish red staining.	6.80	18.53	
									7.50	17.83	
	16D	7.50	7.95	7.00	S 23			Stiff extremely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses	{8.00}		

Continued Next Page

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.00m. Cable percussion (150mm) 2.00-20.00m.

CASING: 150mm diam to 7.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.00-18.50m, cement:bentonite grout 20.00-2.00m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
4.00	2.00	3.60	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 30 May 2012 — Easting 529333.8 — Scale 1 : 50

End Date 2 June 2012 — Northing 181908.9 — Ground level 25.33mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	17D	8.00			H 134			(<2mm) of dark grey silt.			
	18U	9.00	9.45	7.00	Blows 35						
	19D	9.50			H Re*						
	20D	10.50	10.95	7.00	S 21			10.50 - 11.00m: With frequent angular and subrounded fine to coarse gravel sized mudstone lithorelicts (?).			
	21D	11.00			H Re*			11.00 - 12.50m: Selenite crystals become rare.			
									12.00	13.33	
	22U	12.00	12.45	7.00	Blows 32			Very stiff dark grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals.			
	23D	12.50			H Re*						
	24D	13.50	13.95	7.00	S 27						
	25D	14.00									
31/05/12 0200hrs 3.60m	26U	15.00	15.45	7.00	Blows 35						
02/06/12 0830hrs 15.50m	27D	15.50			H 100			15.50 - 20.00m: Selenite becomes fine to coarse sand sized.			
	28D	16.50	16.95	7.00	S 29			16.50 - 20.00m: With rare subhorizontal lenses (<1mm) of fine sand sized selenite crystals and rare randomly orientated lenses (<2mm) of dark grey silt.			
	29D	17.00									
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 30 May 2012 — Easting 529333.8 — Scale 1 : 50

End Date 2 June 2012 — Northing 181908.9 — Ground level 25.33mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	30U	18.00	18.45	7.00	Blows 37						
	31D	18.50			H 133						
02/06/12 1130hrs Dry	32D	19.50	19.95	7.00	S 34						
	33D	20.00			H Re*				20.00	5.33	
								Borehole completed at 20.00m.			
									{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 24 May 2012 — Easting 529343.6 — Scale 1 : 50

End Date 27 May 2012 — Northing 181894.5 — Ground level 25.29mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
24/05/12 2100hrs								Black TARMACADAM (MADE GROUND)	0.15	25.14	
								Light grey and off-white CONCRETE. (MADE GROUND) 0.30m: Steel re-bar grid (5mm diam) 0.50m: 100mm OD ceramic drain running N-S (redundant). 0.60m: 2 no. 100mm steel re-bar across N edge of pit.	0.75	24.54	
	1D*	0.80			Vo 0.00						
	2D*	1.00			Vo 0.00			Brown locally reddish brown clayey gravelly fine to coarse SAND with occasional subangular medium gravel sized bone, metal and shell fragments and occasional subangular brick and concrete cobbles. Gravel is angular to subrounded fine to coarse flint, charcoal, brick and concrete. (MADE GROUND)	1.75	23.54	
	3D*	1.50			Vo 0.00				2.00	23.29	
	4B	2.00 - 2.50						Soft dark brown and greyish brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse brick and concrete. (MADE GROUND)	2.50	22.79	
		2.50 - 2.95		2.00	C 5			Soft dark brown and greyish brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse brick and concrete. (MADE GROUND)			
	5D*	2.50			Vo 0.00						
	6B	2.50 - 3.00									
25/05/12 0200hrs Dry								Loose dark greyish brown clayey gravelly locally very gravelly fine to coarse SAND with rare brick cobbles. Gravel is angular to subrounded fine to coarse brick, concrete and flint. (MADE GROUND)	3.50	21.79	
25/05/12 1830hrs Dry		3.50 - 3.95		3.50	C 2						
	7D*	3.50			Vo 0.00			Very loose dark orangish brown and greyish brown slightly clayey sandy locally very sandy subangular to rounded fine to coarse flint GRAVEL with occasional cobble sized pockets of fine and medium sand.			
	8B	3.50 - 4.00							4.50	20.79	
		4.50 - 4.95		4.50	C 24			Medium dense dark orangish brown slightly clayey sandy locally very sandy subangular to rounded fine to coarse flint GRAVEL.			
	9D*	4.50			Vo 0.00						
	10D	4.50									
	11B	4.50 - 5.00									
	12D	5.50									
		6.00 - 6.45		6.00	C 58			6.00m: Becomes very dense.			
	13B	6.00 - 6.50							6.80	18.49	
	14D*	7.00			Vo 0.00			Stiff rarely extremely closely fissured dark orangish brown tending to dark brownish grey frequently mottled orange slightly sandy CLAY.			
	15D	7.00			H 117						
	16U	7.50 - 7.95		7.00	Blows 22				8.00	17.29	
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.00m. Cable percussion (150mm) 2.00-20.00m.

CASING: 150mm diam to 7.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.00-20.00m, cement:bentonite grout 20.00-2.00m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.50	2.50	3.20	20	

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 24 May 2012 — Easting 529343.6 — Scale 1 : 50

End Date 27 May 2012 — Northing 181894.5 — Ground level 25.29mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	17D	8.00		H Re*			Stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with rare fine and medium sand sized selenite crystals.			
	18D	9.00 - 9.45	7.00	S 24						
	19D	9.50		H 125						
		10.00		H Re*				10.00	15.29	
							Very stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals and randomly orientated lenses (<3mm) of dark grey silt.			
26/05/12 0230hrs Dry	20U	10.50 - 10.95	7.00	Blows 44						
26/05/12 1830hrs Dry	21D	11.00								
	22D	12.00 - 12.45	7.00	S 30						
	23D	12.50					12.50m: Rare fine gravel sized shell fragments.			
	24U	13.50 - 13.95	7.00	Blows 50						
	25D	14.00		H Re*						
	26D	15.00 - 15.45	7.00	S 29						
	27D	15.50								
	28U	16.50 - 16.95	7.00	Blows 50						
	29D	17.00						17.00	8.29	
							Very stiff locally extremely closely and very closely fissured dark grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<2mm) of dark grey silt.			
							Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 24 May 2012 — Easting 529343.6 — Scale 1 : 50

End Date 27 May 2012 — Northing 181894.5 — Ground level 25.29mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
	30D	18.00	18.45	7.00	S 31							
	31D	18.50			H 109							
26/05/12 2330hrs Dry	32U	19.50	19.95	7.00	Blows 50							
	33D	20.00								20.00	5.29	
									Borehole completed at 20.00m.			
										{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH106

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 24 June 2012 — Easting 529317.5 — Scale 1 : 50

End Date 26 June 2012 — Northing 181914.6 — Ground level 25.58mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
24/06/12 2230hrs								CONCRETE. (MADE GROUND)	0.33	25.25	
	1D*	0.50						Brown sandy clayey locally very clayey very angular to rounded fine to coarse brick, concrete and siliceous GRAVEL with occasional bricks and cobbles. (MADE GROUND)			
	2D*	1.00							1.40	24.18	
	3D*	1.50						Brown sandy clayey angular to rounded fine to coarse brick and concrete GRAVEL. (MADE GROUND)	1.90	23.68	
	4D*	2.00						Orangish brown and yellowish brown slightly clayey locally clayey sandy angular to rounded fine to coarse siliceous GRAVEL. (MADE GROUND?)			
	5D*	2.50			Vo 3.10				2.60	22.98	
		2.50 - 2.95		2.50	C 11						
	6B	2.50 - 3.00						Medium dense dark reddish brown and orangish brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse flint. (MADE GROUND?)			
	7D*	3.50			Vo 11.6				3.50	22.08	
		3.50 - 3.95		3.50	C 17						
	8D	3.50						Medium dense dark orangish brown slightly gravelly locally gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint.			
	9B	3.50 - 4.00									
	10D*	4.50			Vo 50.7				4.50	21.08	
		4.50 - 4.95		4.50	C 17						
	11D	4.50						Medium dense dark orangish brown very sandy angular to subrounded fine to coarse flint GRAVEL tending locally to a very gravelly fine to coarse sand.			
	12B	4.50 - 5.00									
	13D	5.50									
	14B	6.00 - 6.45		6.00	C 26						
		6.00 - 6.50									
25/06/12 0200hrs 3.40m	15D	7.00							7.50	18.08	
25/06/12 1830hrs 5.80m	16D	7.50 - 7.95		7.00	S 21			Stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine sand sized selenite crystals.			
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.50m. Cable percussion (150mm) 2.50-20.00m.

CASING: 150mm diam to 7.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.10-16.00m, cement:bentonite grout 20.00-2.50m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.50	3.50	3.40	20	

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 24 June 2012 — Easting 529317.5 — Scale 1 : 50

End Date 26 June 2012 — Northing 181914.6 — Ground level 25.58mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	17D	8.00									
	18D*	8.00			Vo			8.00 - 9.00m: With rare subangular and subrounded fine to coarse extremely weak and very weak mudstone gravel.			
	19U	9.00	9.45	7.00							
	20D	9.50									
	21D	10.50	10.95	7.00	S 21						
	22D	11.00			H Re*						
	23U	12.00	12.45	7.00				12.00m: With frequent fine and medium sand sized selenite crystals.			
	24D	12.50									
		13.50			H Re*						
	25D	13.50	13.95	7.00	S 25						
	26D	14.00						14.00m: With rare randomly orientated lenses (<5mm) of dark bluish grey rarely light bluish grey silt.			
	27U	15.00	15.45	7.00				15.00 - 15.45m: Very stiff.			
	28D	15.50									
	29D	16.50	16.95	7.00	S 27						
	30D	17.00						Stiff extremely closely and very closely fissured dark brownish grey slightly sandy silty CLAY with frequent fine sand sized selenite crystals.	17.00	8.58	
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 24 June 2012 — Easting 529317.5 — Scale 1 : 50

End Date 26 June 2012 — Northing 181914.6 — Ground level 25.58mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	31U	18.00 - 18.45	7.00				18.00 - 18.45m: Very stiff. 18.50m: With rare randomly orientated lenses of fine and medium sand sized selenite.			
								19.50	6.08	
26/06/12 0230hrs Dry	32D	19.50 - 19.95	7.00	S 31			Very stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine sand sized selenite crystals.			
	33D	20.00						20.00	5.58	
							Borehole completed at 20.00m.			
								{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 2

Start Date 20 June 2012 — Easting 529334.5 — Scale 1 : 50

End Date 21 June 2012 — Northing 181881.7 — Ground level 25.59mOD — Depth 12.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
20/06/12 0100hrs								Grey CONCRETE. (MADE GROUND)	0.38	25.21	
	1D*	0.50			Vo 0.00			Brown clayey sandy angular to rounded fine to coarse brick, concrete, flint, chalk and charcoal GRAVEL with frequent subangular brick and concrete cobbles and rare subangular medium and coarse bone and ceramic fragments. (MADE GROUND)			
	2D*	1.00			Vo 0.00						
	3D*	1.50			Vo 0.00				1.95	23.64	
		2.50	2.95	2.50	C 3			Soft dark greyish brown slightly sandy gravelly CLAY with organic odour. Gravel is angular and subangular fine to coarse brick and flint. (MADE GROUND)			
	4D*	2.50			Vo 5.60						
	5B	2.50	3.00						3.20	22.39	
	6D	3.50						Medium dense dark orangish brown slightly clayey very sandy angular to subrounded fine to coarse flint GRAVEL. (Possible loss of fines).			
		3.50	3.95	3.50	C 21						
20/06/12 0230hrs 3.40m	7D*	3.50			Vo 1.10						
	8B	3.50	4.00								
20/06/12 1830hrs 3.40m									4.50	21.09	
	9D	4.50						Medium dense dark orangish brown very gravelly fine to coarse SAND. Gravel is angular and subangular fine and medium with rare coarse flint.			
		4.50	4.95	4.50	C 15						
	10D*	4.50			Vo 8.70						
	11B	4.50	5.00								
	12D	5.50									
		6.00	6.45	6.00	C 25						
	13B	6.00	6.50						6.50	19.09	
	14D	7.00						Stiff extremely closely and very closely fissured dark greyish brown locally brownish grey slightly sandy CLAY with rare fine and medium sand sized selenite crystals.			
									7.50	18.09	
	15D	7.50	7.95	6.50	S 26			Stiff extremely closely fissured dark brownish grey slightly sandy CLAY with rare fine sand sized selenite crystals.			
	16D*	7.50			Vo 5.90						
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.50m. Cable percussion (150mm) 2.50-12.00m.

CASING: 150mm diam to 6.50m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.50-12.00m, cement:bentonite grout 12.00-2.50m.

REMARKS: Water added to assist boring throughout borehole. Hole abandonned due to potential burried service at 12.00m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
1.80				Slight seepage.
3.50	3.50	3.40	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 2

Start Date 20 June 2012 — Easting 529334.5 — Scale 1 : 50

End Date 21 June 2012 — Northing 181881.7 — Ground level 25.59mOD — Depth 12.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	17D	8.00			H Re*			8.00 - 11.00m: With rare subangular fine to coarse mudstone gravel.			
	18U	9.00	9.45	6.50	Blows 28						
	19D	9.50									
	20D	10.50	10.95	6.50	S 20			10.50 - 12.00m: With rare coarse sand and fine gravel sized shell fragments.			
	21D	11.00			H Re*						
21/06/12 0045hrs 11.50m	22B	11.60	12.00					11.60 - 12.00m: Becomes slightly gravelly. Gravel is angular and subangular fine and medium (locally clean) flint. 11.80 - 12.00m: Cement odour noted in extruded clay.	12.00	13.59	
								Borehole completed at 12.00m.	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 17 June 2012 — Easting 529338.5 — Scale 1 : 50

End Date 19 June 2012 — Northing 181884.2 — Ground level 25.59mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
17/06/12 2230hrs								Grey CONCRETE. (MADE GROUND)	0.31	25.28	
	1D*	0.50			Vo 0.00			Brown clayey sandy angular to rounded fine to coarse brick, concrete, flint, chalk and charcoal GRAVEL with frequent subangular brick and concrete cobbles and rare subangular medium and coarse bone and ceramic fragments. (MADE GROUND)			
	2D*	0.90			Vo 0.10			0.80m: Subangular concrete boulder.	1.20	24.39	
	3D*	1.25			Vo 0.10			Dark brown and blackish grey slightly gravelly clayey fine and medium SAND with occasional medium and coarse gravel sized bone, metal and ceramic fragments and rare medium gravel sized pockets of ash. Slight organic odour present. Gravel is angular to subrounded fine to coarse brick,			
	4D*	1.80			Vo 0.30						
	5B	2.20	2.50					concrete, flint and charcoal. (MADE GROUND)	2.20	23.39	
	6D*	2.20			Vo 0.00			Dark grey locally brownish grey slightly gravelly clayey fine and medium with rare coarse SAND. Gravel is angular to subrounded fine to coarse flint with rare brick. (MADE GROUND)	2.50	23.09	
		2.50	2.95	2.50	C 6						
	7B	2.50	3.00								
	8D*	2.50			Vo 0.00				3.00	22.59	
	10D	3.50						Soft dark brownish grey slightly gravelly sandy CLAY with organic odour and frequent coarse sand and fine gravel sized coal and charcoal fragments. Gravel is angular to subrounded fine to coarse brick, flint and rare concrete. (MADE GROUND)			
		3.50	3.95	2.50	C 14						
	9B	3.50	4.00								
	11D*	3.50			Vo 0.00			Medium dense dark brownish grey locally yellowish grey gravelly clayey locally very clayey fine to coarse SAND with organic odour. Gravel is angular to subrounded fine to coarse flint and rare brick. (MADE GROUND)			
	12D	4.50							4.50	21.09	
		4.50	4.95	4.50	C 14			Medium dense light yellowish brown slightly clayey slightly gravelly locally gravelly fine to coarse SAND. Gravel is angular to subrounded fine and medium with rare coarse flint. (Possible loss of fines).			
	13B	4.50	5.00								
	14D*	4.50			Vo 0.30						
	15D	5.50									
		6.00	6.28	6.00	C*120						
	16B	6.00	6.50						6.30	19.29	
18/06/12 0230hrs Dry	17D	6.50						Stiff locally extremely closely fissured dark brown frequently mottled dark orangish brown slightly sandy CLAY.			
18/06/12 1830hrs Dry?	18D*	7.00			Vo 0.00			Stiff very closely fissured dark brownish grey slightly sandy CLAY with rare fine sand sized selenite crystals. 7.10 - 7.20m: With frequent subangular and subrounded fine to coarse mudstone gravel lithorelicts.	7.00	18.59	
	19U	7.50	7.95	6.50	Blows 28						
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.20m. Cable percussion (150mm) 2.20-20.00m.

CASING: 150mm diam to 6.50m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed to 18.50-2.20m, cement:bentonite grout 20.00-2.20m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
4.30	2.50	4.10	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 17 June 2012 — Easting 529338.5 — Scale 1 : 50

End Date 19 June 2012 — Northing 181884.2 — Ground level 25.59mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	20D	8.00			H Re*			8.00m: Becomes extremely closely and very closely fissured. With rare coarse gravel sized pockets of carbonaceous material.			
	21D	9.00	9.45	6.50	S 23			9.00m: With rare randomly orientated lenses (<2mm) of dark grey silt.			
	22D	9.50									
	23U	10.50	10.95	6.50	Blows 30						
	24D	11.00			H Re*						
	25D	12.00	12.45	6.50	S 26			12.00 - 14.00m: Locally tends to silty clay.			
	26D	12.50									
		13.00			H Re*			13.00 - 14.00m: Frequent fine and medium sand sized selenite crystals.			
	27U	13.50	13.95	6.50	Blows 44						
									14.00	11.59	
	28D	14.00			H Re*			Stiff dark brownish grey slightly sandy locally silty CLAY with frequent fine and medium with rare coarse sand sized selenite crystals.			
	29D	15.00	15.45	6.50	S 29						
	30D	15.50						15.50 - 16.00m: Becomes extremely closely fissured.			
									16.00	9.59	
		16.00			H Re*			Very stiff extremely closely fissured dark brownish grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<2mm) of dark grey silt and selenite.			
	31U	16.50	16.95	6.50	Blows 44						
	32D	17.00									
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 17 June 2012 — Easting 529338.5 — Scale 1 : 50

End Date 19 June 2012 — Northing 181884.2 — Ground level 25.59mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	33D	18.00	18.45	6.50	S 31			18.00m: Fissures become rare.			
19/06/12 0200hrs Dry	34U	19.50	19.95	6.50	Blows 50						
	35D	20.00							20.00	5.59	
								Borehole completed at 20.00m.			
									{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 21 May 2012 — Easting 529338.5 — Scale 1 : 50

End Date 23 May 2012 — Northing 181874.9 — Ground level 25.16mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
21/05/12 1830hrs								Light grey CONCRETE. (MADE GROUND)	0.28	24.88	
	1D*	0.50			Vo 0.60			Brown and reddish brown locally dark grey clayey gravelly fine to coarse SAND with occasional subangular brick and concrete cobbles and rare medium gravel sized bone and wood fragments. Gravel is angular to subrounded brick, charcoal, flint and concrete. (MADE GROUND)			
	2D*	1.00			Vo 2.00				1.30	23.86	
	3D*	1.50			Vo 1.80			Soft dark greyish brown tending to dark brownish grey slightly gravelly locally gravelly sandy CLAY with rare coarse gravel sized pockets of black organic material and organic odour. Gravel is angular to subrounded fine to coarse brick, concrete and flint (MADE GROUND)			
	4B	2.10	2.50								
		2.50	2.95	2.50	C 16						
	5D*	2.50			Vo 2.10						
	6B	2.50	3.00						3.50	21.66	
		3.50	3.95	3.50	C 9			Loose light orangish brown and grey clayey very gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint.			
	7D*	3.50			Vo 5.90						
	8D	3.50							4.00	21.16	
								Firm light orangish brown rarely mottled dark orangish brown locally slightly gravelly very sandy CLAY with rare coarse sand sized shell fragments. Gravel is subangular and subrounded fine and medium flint.			
	9U	4.50	4.95	4.50	Blows 50						
	10D	4.50									
	11D*	4.50			Vo 8.00						
	12D	5.00							5.50	19.66	
	13D*	5.50			Vo 7.00			Stiff dark orangish brown and brown locally slightly gravelly sandy CLAY. Gravel is angular to subrounded fine and medium flint.			
	14D	5.50							6.00	19.16	
	15D	6.00	6.45	6.00	S 18			Stiff rarely extremely closely and very closely fissured brownish grey locally slightly sandy silty CLAY with rare medium and coarse sand sized selenite crystals.			
	16D	7.00			H 120						
	17U	7.50	7.95	6.00	Blows 30						
									8.00 {8.00}	17.16	
								Continued Next Page			

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-2.10m. Cable percussion (150mm) 2.10-20.00m.

CASING: 150mm diam to 6.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed 2.10-20.00m, cement:bentonite grout 20.00-2.10m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.70	3.50	3.20	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 21 May 2012 — Easting 529338.5 — Scale 1 : 50

End Date 23 May 2012 — Northing 181874.9 — Ground level 25.16mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	18D	8.00			H Re*			Stiff dark grey slightly sandy CLAY with rare medium and coarse sand sized selenite crystals and coarse sand to medium gravel sized shell fragments.			
	19D	9.00	9.45	6.00	S 26						
	20D	9.50									
		10.00			H 130						
	21U	10.50	10.95		Blows 50						
									11.00	14.16	
	22D	11.00						Weak light grey MUDSTONE recovered as clayey angular and subangular fine to coarse gravel with rare cobbles.			
									11.50	13.66	
	23D	11.50						Stiff rarely extremely closely fissured dark brownish grey slightly sandy CLAY with frequent fine and medium gravel sized mudstone lithorelicts (?), rare coarse gravel sized fragments of carbonaceous material and rare fine and medium sand sized selenite crystals.			
	24D	12.00	12.45	6.00	S 23						
									12.50	12.66	
		12.50			H Re*			Very stiff rarely extremely closely fissured dark brownish grey slightly sandy CLAY with frequent fine to coarse sand sized selenite crystals and rare randomly orientated lenses (<2mm) of selenite and light bluish grey silt.			
	25U	13.50	13.95	6.00	Blows 50						
									14.00	11.16	
	26D	14.00						Very stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with frequent fine to coarse sand sized selenite crystals and randomly orientated lenses (<2mm) of selenite and light bluish grey silt.			
22/05/12 0200hrs Dry											
22/05/12 2000hrs 14.50m	27D	15.00	15.45	6.00	S 36						
	28D	15.50						16.00 - 16.50m: Locally slightly sandy silty clay.			
	29U	16.50	16.95	6.00	Blows 50						
	30D	17.00			H Re*						
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 21 May 2012 — Easting 529338.5 — Scale 1 : 50

End Date 23 May 2012 — Northing 181874.9 — Ground level 25.16mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
	31D	18.00	18.45	6.00	S 34							
	32D	18.50										
23/05/12 0130hrs Dry	33U	19.50	19.95	6.00	Blows 50							
	34D	20.00								20.00	5.16	
									Borehole completed at 20.00m.			
										{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 2 June 2012 — Easting 529337.5 — Scale 1 : 50

End Date 3 June 2012 — Northing 181876.5 — Ground level 25.15mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
02/06/12 1430hrs								Light grey CONCRETE. (MADE GROUND)	0.28	24.87	
								Brown and reddish brown locally dark grey clayey gravelly fine to coarse SAND with occasional subangular brick and concrete cobbles and rare medium gravel sized bone and wood fragments. Gravel is angular to subrounded brick, charcoal, flint and concrete. (MADE GROUND)	1.30	23.85	
								Soft dark greyish brown slightly gravelly sandy CLAY with organic odour and rare coarse gravel sized pockets of organic clay material. Gravel is angular to subrounded fine to coarse flint, brick and concrete. (MADE GROUND)			
	1D*	2.00			Vo 0.10						
	2B	2.00	2.50								
	3D*	2.50			Vo 0.40				2.50	22.65	
		2.50	2.95	2.50	C 20			Medium dense dark orangish brown slightly clayey sandy angular to subrounded fine and medium with rare coarse flint GRAVEL. (Possible loss of fines). (MADE GROUND?)			
	4B	2.00	3.00								
	5D*	3.50			Vo 0.00				3.50	21.65	
		3.50	3.95	3.50	C 11			Medium dense dark orangish brown gravelly clayey fine to coarse SAND with frequent coarse gravel sized pockets of soft sandy clay. Gravel is subangular and subrounded fine and medium with rare coarse flint. (Possible loss of fines),			
	6D	3.50									
	7B	3.50	4.00								
		4.50	4.95	4.50	C 29						
	8D	4.50									
	9B	4.50	5.00								
02/06/12 1700hrs Dry									5.50	19.65	
03/06/12 0830hrs Dry	10D	5.50			Vo 2.10			Stiff extremely closely fissured dark orangish brown tending to dark brownish grey frequently mottled brownish orange locally slightly gravelly slightly sandy CLAY. Gravel is subangular and subrounded fine flint.			
	11D*										
	12D	6.00	6.45	5.50	S 20						
	13D	6.50			H 127			6.50m: With rare fine and medium sand sized selenite.			
	14U	7.50	7.95	5.50	Blows 21						
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.80m. Cable percussion (150mm) 1.80-20.00m.

CASING: 150mm diam to 5.50m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed to 2.10-18.50m, cement:bentonite grout 20.00-1.80m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
4.00	3.50	3.60	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 2 June 2012 — Easting 529337.5 — Scale 1 : 50

End Date 3 June 2012 — Northing 181876.5 — Ground level 25.15mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	15D	8.00			H 116						
									9.00	16.15	
	16D	9.00	9.38	5.50	S*68			Very stiff extremely closely and closely fissured dark brownish grey slightly sandy CLAY with rare fine and medium sand sized selenite crystals.			
	17D	9.50						9.00 - 9.50m: With frequent fine to coarse gravel sized mudstone lithorelicts (?).			
	18U	10.50	10.95	5.50	Blows 25						
	19D	11.00									
	20D	12.00	12.45	5.50	S 30			12.00m: Selenite crystals become frequent.			
	21D	12.50			H Re*			12.50m: With rare fine gravel sized pockets of selenite crystals and randomly orientated lenses (<3mm) of dark grey silt.			
	22U	13.50	13.95	5.50	Blows 35						
	23D	14.00									
									15.00	10.15	
	24D	15.00	15.45	5.50	S 33			Very stiff dark grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals.			
	25D	15.50									
	26U	16.50	16.95		Blows 50						
	27D	17.00						17.00m: Locally extremely closely fissured with rare randomly orientated lenses (<1mm) of dark grey silt.			
									18.00	7.15	
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT

Sheet 3 of 3

Start Date 2 June 2012 Easting 529337.5 Scale 1 : 50

End Date 3 June 2012 Northing 181876.5 Ground level 25.15mOD Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
	28D	18.00	18.45	5.50	S 34				Very stiff dark grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals.			
	29D	18.50										
03/06/12 1700hrs Dry	30U	19.50	19.95	5.50	Blows 50							
										20.00	5.15	
	31D	20.00		H Re*					Borehole completed at 20.00m.			
										{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 3

Start Date 22 May 2012 — Easting 529342.4 — Scale 1 : 50

End Date 24 May 2012 — Northing 181868.6 — Ground level 25.15mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
22/05/12 2330hrs								Grey CONCRETE. (MADE GROUND)	0.24	24.91	
	1D*	0.50			Vo 0.30			Brown locally reddish brown clayey gravelly fine to coarse SAND with occasional subangular medium gravel sized bone, metal and shell fragments and occasional subangular brick and concrete cobbles. Gravel is angular to subrounded fine to coarse flint, charcoal and concrete. (MADE GROUND)			
	2D*	1.00			Vo 0.30						
	3D*	1.50			Vo 0.00				1.80	23.35	
	4B	1.80 - 2.50						Light yellowish brown slightly silty gravelly fine to coarse SAND with faint organic odour and rare coarse gravel sized pockets of sandy clay and brick cobbles. Gravel is angular to subrounded fine to coarse brick, concrete and flint. (MADE GROUND)	2.50	22.65	
23/05/12 0200hrs Dry											
23/05/12 2000hrs Dry		2.50 - 2.95		2.50	C 19						
	5D*	2.50			Vo 0.10			Medium dense dark grey gravelly locally very gravelly fine to coarse SAND with organic odour, rare flint cobbles and rare coarse gravel sized pockets of clay. (MADE GROUND)			
	6B	2.50 - 3.00									
	7D*	3.00			Vo 2.80						
		3.50 - 3.95		3.50	C 29						
	8B	3.50 - 4.00							4.00	21.15	
								Soft dark orangish brown locally brown slightly gravelly sandy CLAY. Gravel is subangular and subrounded fine to coarse flint. (MADE GROUND?)	4.50	20.65	
		4.50 - 4.95		4.50	C 27			Medium dense light yellowish brown clayey sandy locally very sandy angular and subangular fine to coarse flint GRAVEL. (Possible loss of fines).			
	9D*	4.50			Vo 18.00						
	10B	4.50 - 5.00									
	11D	4.50							5.30	19.85	
	12D	5.30						Stiff very closely fissured dark brownish grey rarely mottled brownish orange slightly sandy CLAY.			
	13D*	5.30			Vo 4.00				6.00	19.15	
	14U	6.00 - 6.45			Blows 30			Stiff dark brownish grey slightly sandy CLAY with rare locally frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<1mm) of light grey silt and selenite.			
	15D	6.50			H Re*						
	16D	7.50 - 7.95		6.00	S 23						
								Continued Next Page	{8.00}		

EQUIPMENT: Concrete cutter, hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.80m. Cable percussion (150mm) 1.80-20.00m.

CASING: 150mm diam to 6.00m.

BACKFILL: On completion, a plain pipe (50mm ID) was installed to 2.10-18.50m, cement:bentonite grout 20.00-1.80m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.50	3.50	3.30	20	

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 3

Start Date 22 May 2012 — Easting 529342.4 — Scale 1 : 50

End Date 24 May 2012 — Northing 181868.6 — Ground level 25.15mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	17D	8.00			H Re*						
	18U	9.00	9.45		Blows 25						
	19D	9.50									
								Stiff dark grey slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse mudstone lithorelicts (?).	10.00	15.15	
	20D	10.50	10.95	6.00	S 25						
	21D	11.00			H Re*						
								Very stiff very closely fissured dark grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals, rare fine and medium gravel sized shell fragments and rare randomly orientated lenses (<1mm) of light grey silt.	11.50	13.65	
	22U	12.00	12.45		Blows 40						
	23D	12.50									
		13.00			H Re*						
	24D	13.50	13.95	6.00	S 33						
	25D	14.00									
24/05/12 0300hrs Dry	26U	15.00	15.45		Blows 50						
24/05/12 1830hrs Dry	27D	15.50			H Re*						
								Very stiff dark grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<3mm) of light grey silt.	16.00	9.15	
		16.50			H Re*						
	28D	16.50	16.95	6.00	S 37						
	29D	17.00									
								Very stiff dark grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<3mm) of light grey silt.	17.00	8.15	
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 3

Start Date 22 May 2012 — Easting 529342.4 — Scale 1 : 50

End Date 24 May 2012 — Northing 181868.6 — Ground level 25.15mOD — Depth 20.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	30U	18.00	18.45		Blows 50						
	31D	18.50			H Re*						
24/05/12 2330hrs Dry	32D	19.50	19.95	6.00	S 31			19.50 - 20.00m: With rare fine to coarse gravel sized mudstone lithorelicts (?).			
	33D	20.00			H Re*				20.00	5.15	
								Borehole completed at 20.00m.			
									{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 1

Start Date 11 June 2012 — Easting 529359.0 — Scale 1 : 50

End Date 12 June 2012 — Northing 181931.6 — Ground level 26.26mOD — Depth 1.10 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
11/06/12 2310hrs									Tarmacadam. (MADE GROUND)	0.05	26.21	
	1B	0.30							Concrete comprising 60% angular to subrounded fine to coarse flint gravel and 40% light grey concrete matrix with frequent re-bar (5mm and 10mm diameter.) at 100mm spacings and rare coarse sand and fine gravel sized vesicles. (MADE GROUND)	0.20	26.06	
12/06/12 0230hrs Dry	2B	0.50										
	3B	1.00							Light brownish grey slightly silty gravelly fine to coarse SAND with rare red brick cobbles and fragments (<200mm length) of corroded cast iron. Gravel is subangular and subrounded fine to coarse brick, concrete, flint and rare bone. (MADE GROUND)	1.10	25.16	
									1.10m: Concrete obstruction.			
									Borehole completed at 1.10m.	{8.00}		

EQUIPMENT: Hydraulic breaker and hand tools.

METHOD: Hand dug inspection pit 0.00-1.10m.

REMARKS: Inspection pit terminated upon encountering concrete obstruction at 1.10m (Possible oil storage tank). Borehole relocated 2.00m 70° East.

BACKFILL: On termination, hole backfilled with materials arising and the surface reinstated with coldlay tarmacadam.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
				Groundwater not encountered.

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 1

Start Date 12 June 2012 — Easting 529360.7 — Scale 1 : 50

End Date 12 June 2012 — Northing 181932.7 — Ground level 26.05mOD — Depth 2.10 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
12/06/12 1830hrs									Tarmacadam. (MADE GROUND)	0.05	26.00	
	1B	0.40							Concrete comprising 60% angular to subrounded fine to coarse flint gravel and 40% light grey concrete matrix with frequent re-bar (5mm and 10mm diameter.) at 100mm spacings and rare coarse sand and fine gravel sized vesicles. (MADE GROUND)	0.30	25.75	
	2D*	0.40										
	3B	0.50										
	4D	1.00										
		1.20	1.65	Nil	1				Light brownish grey slightly silty sandy subangular and subrounded fine to coarse brick, concrete and flint GRAVEL with rare red brick cobbles and fragments (<100mm length) of corroded cast iron. (MADE GROUND)			
	5B	1.20										
12/06/12 2100hrs Dry	6D*	1.20										
		2.00	2.15	1.80	C**					2.10	23.95	
									2.10m: Concrete obstruction. Borehole completed at 2.10m.	{8.00}		

EQUIPMENT: Hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (250mm) 1.20-2.00m.

CASING: 250mm diam. to 1.80m.

REMARKS: Cable (approx 30mm diam.) noted running approximately 50°-230° across base of pit at 0.90m. Inspection pit extended 400mm Northwest.

Cable (approx 50mm diam.) noted running approximately 110°-290° in Northwest wall of inspection pit at 0.50m.

Hole advanced by chiselling 2.00-2.10m (1hr).

Borehole terminated upon encountering concrete obstruction at 2.10m.

BACKFILL: On termination, hole backfilled with materials arising and the surface reinstated with coldlay tarmacadam.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
				Groundwater not encountered.

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 1

Start Date 12 June 2012 — Scale 1 : 50

End Date 12 June 2012 — mOD — Depth 2.10 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
12/06/12 2100hrs									Tarmacadam. (MADE GROUND)	0.05		
									Concrete comprising 60% angular to subrounded fine to coarse flint gravel and 40% light grey concrete matrix with frequent re-bar (5mm and 10mm diameter.) at 100mm spacings and rare coarse sand and fine gravel sized vesicles. (MADE GROUND)	0.30		
12/06/12 2240hrs Dry									Light brownish grey slightly silty gravelly fine to coarse SAND with rare red brick cobbles and fragments (<100mm length) of corroded cast iron. Gravel is subangular and subrounded fine to coarse brick, concrete and flint. (MADE GROUND)	2.10		
		2.10	2.12	Nil	C**				2.10m: Concrete obstruction. Borehole completed at 2.10m.	{8.00}		

EQUIPMENT: Hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.30m. Cable percussion (150mm) 1.30-2.10m.

CASING: None used.

REMARKS: Borehole terminated upon encountering concrete obstruction at 2.10m.

BACKFILL: On termination, hole backfilled with materials arising and the surface reinstated with coldlay tarmacadam.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
				Groundwater not encountered.

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 6

Start Date 20 June 2012 — Easting 529352.2 — Scale 1 : 50

End Date 28 June 2012 — Northing 181910.7 — Ground level 26.40mOD — Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
20/06/12 1930hrs								Tarmacadam (MADE GROUND)	0.10	26.30	
								Light grey concrete comprising 60% angular and subangular fine to coarse flint gravel and 40% light grey matrix with rebar (5mm diameter.) at 100mm spacings and rare fine and medium gravel sized vesicles. (MADE GROUND)	0.30	26.10	
	1D	0.40									
	2D*	0.40			Vo 0.00						
	3D	1.00									
	4D*	1.00			Vo 0.00						
		1.20	1.65	Nil	C 1			Very loose dark brown and greyish brown slightly silty gravelly fine to coarse SAND with rare brick and concrete cobbles, rare fragments (<100mm) of animal hair and rare rootlets. Gravel is angular to subrounded fine to coarse brick, concrete, flint and rare bone. (MADE GROUND)			
	5B	1.20	1.60								
		2.00	2.45	Nil	C 19				2.00	24.40	
	6B	2.00	2.60					Firm dark brownish grey slightly gravelly sandy SILT with organic odour. Gravel is angular to subrounded fine to coarse brick and flint. (MADE GROUND)			
	7D*	2.00			Vo 0.00						
	8B	2.70	3.00						3.00	23.40	
		3.00	3.45	2.90	C 28			Medium dense dark orangish brown and reddish brown gravelly locally very gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse flint.			
	9B	3.00	3.50					3.50 - 5.80m: Water added to assist boring.			
	10D*	3.00			Vo 0.00						
		4.00	4.45	3.90	C 17			4.00m: Becomes dark orangish brown with frequent cobble sized pockets of soft to firm light orangish brown sandy clay.			
	11B	4.00									
	12D*	4.00			Vo 0.00						
		5.00	5.45	4.90	C 13				5.00	21.40	
	13B	5.00						Medium dense dark orangish brown sandy locally very sandy angular and subrounded fine to coarse flint GRAVEL.			
	14D*	5.00			Vo 0.00						
	15W	6.00									
	16D	6.00									
		6.50	6.95	6.40	C 13			6.50m: Becomes predominantly fine and medium gravel.			
	17	6.50									
	18D*	6.50			Vo 0.00						
21/06/12 0230hrs 6.80m	19D	7.80							7.80	18.60	
								Continued Next Page	{8.00}		

EQUIPMENT: Light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (250mm) 1.20-25.00m, (200mm) 25.00-36.50 and (150mm) 36.50-49.50m.

CASING: 250mm diam to 7.90m and 200mm diam to 31.50m.

BACKFILL: On completion, a standpipe piezometer (19mm) was installed with tip at 48.50m, granular response zone 49.50-47.50m, bentonite seal 47.50-0.20m, concrete and stopcock cover 0.20-0.00m.

REMARKS: Water added to assist boring 3.50-5.80m, 37.20-38.50m, 42.50-45.00m and 45.50-48.50m

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
6.00	5.90	4.35	20	

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 6

Start Date 20 June 2012 — Easting 529352.2 — Scale 1 : 50

End Date 28 June 2012 — Northing 181910.7 — Ground level 26.40mOD — Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
21/06/12 1830hrs 6.50m	20D	8.00 - 8.45	7.90	S 19			Stiff extremely closely fissured dark orangish brown frequently mottled dark reddish brown locally slightly gravelly sandy CLAY. Gravel is angular and subangular fine to coarse flint.			
								9.00	17.40	
	21D	9.00		H 135			Very stiff extremely closely fissured dark brownish grey slightly sandy CLAY with rare fine sand sized selenite crystals.			
	22B	9.00 - 9.50								
	23D*	9.00		Vo 0.00						
	24U	9.50 - 9.95	7.90	Blows 35						
	25D	10.00					10.00m: Becomes extremely and very closely fissured.			
	26D	11.00 - 11.45	7.90	S 22			11.00 - 11.45m: Rare subangular and subrounded fine and medium mudstone lithorelicts (?).			
	27D	12.00					12.00m: With rare randomly orientated lenses (<2mm) of dark grey silt.			
	28U	12.50 - 12.95	7.90	Blows 40						
	29D	13.00					13.00m: Selenite crystals become frequent.			
	30D	14.00 - 14.45	7.90	S 28						
								15.00	11.40	
	31D	15.00					Very stiff dark brownish grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite and rare randomly orientated lenses (<2mm) dark grey silt.			
	32U	15.50 - 15.95	7.90	Blows 45						
	33D	16.00								
								17.00	9.40	
	34D	17.00 - 17.45	7.90	S 30			Very stiff locally extremely closely fissured slightly sandy CLAY with frequent fine and medium sand sized selenite crystals.			
								18.00	8.40	
							Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 6

Start Date 20 June 2012 — Easting 529352.2 — Scale 1 : 50

End Date 28 June 2012 — Northing 181910.7 — Ground level 26.40mOD — Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	35D	18.00						Very stiff locally extremely closely fissured dark brownish grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals and rare randomly orientated lenses (<1mm) of dark grey silt.			
	36U	18.50	18.95	7.90	Blows 50						
	37D	19.00						19.00m: With rare subhorizontal lenses (<1mm) of selenite.			
22/06/12 0200hrs Dry											
24/06/12 1830hrs 13.30m	38D	20.00	20.45	7.90	S 37						
	39D	21.00			H Re*						
	40U	21.50	21.95	7.90	Blows 50						
	41D	22.00			H Re*			22.00 - 23.00m: With frequent fine to coarse gravel sized shell fragments and rare medium and coarse gravel sized organic fragments including decomposed wood remains.			
	42D	23.00	23.45	7.90	S 35				23.45	2.95	
	43B	23.50						Very stiff extremely closely locally very closely fissured dark brownish grey frequently mottled light bluish grey and red slightly sandy CLAY. Tends to light bluish grey frequently mottled dark brownish grey and red.			
	44D	24.00									
	45U	24.50	24.95	7.90	Blows 60						
	46D	25.00			H Re*				25.00	1.40	
25/06/12 0230hrs 21.40m								Very stiff light bluish grey frequently mottled dark brownish red rarely mottled brown slightly sandy silty CLAY with rare fine and medium sand sized selenite crystals. 25.50 - 26.00m: Becomes extremely closely and very closely fissured.	26.00	0.40	
25/06/12 1830hrs 21.50m	47D	26.00	26.45	25.80	S*56			Hard locally extremely closely fissured dark brown frequently mottled dark reddish brown rarely mottled light bluish grey slightly sandy CLAY with rare fine sand sized selenite crystals.			
	48D	27.00						27.00m: Bluish grey mottling becomes frequent. 27.00 - 28.00m: Fine sand sized selenite crystals concentrations to bluish grey mottled fissure surfaces.			
	49U	27.50	27.95	26.70	Blows 100			27.00m: Bluish grey mottling becomes frequent.			
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 4 of 6

Start Date 20 June 2012 — Easting 529352.2 — Scale 1 : 50

End Date 28 June 2012 — Northing 181910.7 — Ground level 26.40mOD — Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	50D	28.00		H Re*						
								29.00	-2.60	
	51D	29.00 - 29.45	28.00	S 32			Very stiff friable extremely closely and very closely fissured dark bluish grey rarely mottled dark brown CLAY.			
	52D	30.00		H Re*						
	53U	30.50 - 30.95	30.00	Blows 70						
							30.80m: Approx. 200mm band of very stiff dark grey and black slightly sandy silt with rare subhorizontal lenses (<1mm) of light grey silt.	31.00	-4.60	
	54D	31.00						31.20	-4.80	
							Very stiff friable indistinctly thinly laminated dark grey slightly sandy clayey SILT with frequent coarse sand to coarse gravel sized shell fragments and rare coarse gravel sized fragments of ironstone.			
	55D	31.50								
	56D	32.00 - 32.43	30.00	S*55			Very stiff very closely fissured light grey silty CLAY. 31.40m: Becomes frequently mottled light yellowish brown and dark brownish red.			
								32.60	-6.20	
							Hard very closely fissured multicoloured (brownish red, yellowish grey, light green, yellowish brown, purple and rarely light bluish grey) slightly sandy CLAY with rare fine and medium sand sized selenite crystals.	33.00	-6.60	
	57D	33.00								
	58U	33.50 - 33.95	31.50	Blows 75			Very stiff light bluish grey frequently mottled light yellowish brown and dark brownish red slightly sandy silty CLAY locally tending to clayey SILT. 33.20m: With rare coarse gravel sized pockets of bluish grey and greenish grey fine to coarse sand.			
	59D	34.00					33.30m: Approx. 100mm band of light greenish grey and bluish grey slightly clayey fine to coarse sand. 33.40m: Becomes sandy.	34.20	-7.80	
	60D	34.20								
	61D	34.40					Very dense light greenish grey rarely light bluish grey locally clayey fine and medium SAND.			
	62D	35.00 - 35.23	31.50	S*183			35.00m: Tends to light yellowish brown.			
	63B	35.00								
26/06/12 0230hrs Dry	64D	36.00						36.40	-10.00	
26/06/12 1830hrs 35.50m	65D	36.50 - 35.64	31.50	S*333			Very dense light greenish grey and off-whitish grey fine and medium SAND with rare medium and coarse gravel sized pockets of dark brownish grey clay. 37.20 - 38.50m: Water added to assist boring.			
							Continued Next Page	{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 5 of 6

Start Date 20 June 2012 — Easting 529352.2 — Scale 1 : 50

End Date 28 June 2012 — Northing 181910.7 — Ground level 26.40mOD — Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	66D	38.00 - 38.12	31.50	S*429						
	67D	38.70					Hard light greenish grey frequently mottled light orangish brown rarely mottled dark bluish grey very sandy CLAY tending locally to a very clayey glauconitic fine and medium sand.	38.70	-12.30	
	68U	39.50 - 39.85	31.50	Blows 100						
	69D	39.85					Light greyish green rarely mottled dark orangish brown silty locally very silty fine glauconitic SAND.	39.85	-13.45	
	70D	41.00 - 41.24	31.50	S*120			Hard dark bluish grey sandy locally very sandy CLAY with frequent fine and medium sand sized selenite crystals and subhorizontal lenses (<3mm) of selenite.	41.00	-14.60	
27/06/12 0230hrs Dry	71D	42.00						42.40	-16.00	
27/06/12 1830hrs 41.00m	72D	42.50 - 42.65	31.50	S*333			Very dense dark greyish green locally slightly gravelly fine and medium glauconitic SAND with rare coarse gravel sized pockets of dark grey clay. 42.50 - 45.00m: Water added to assist boring.			
	73D	44.00 - 44.16	31.50	S*231			44.00m: Tends locally to light grey.			
	74B	44.50 - 45.00								
	75D	45.00						45.10	-18.70	
	76D	45.10					CHALK: recovered as locally slightly gravelly slightly sandy silt. Gravel is subangular and subrounded fine to coarse very weak chalk. 45.50 - 48.50m: Water added to assist boring.			
	77D	45.50 - 45.65	31.50	S*500			46.00m: Chalk gravel becomes weak. Rare angular and subangular fine to coarse flint gravel noted.			
	78D	46.50								
	79D	47.00 - 47.05	31.50	S**						
							Continued Next Page	{48.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT

Sheet 6 of 6

Start Date 20 June 2012 Easting 529352.2 Scale 1 : 50

End Date 28 June 2012 Northing 181910.7 Ground level 26.40mOD Depth 49.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range		instru -ment	description	depth (m)	reduced level (m)	legend
	80D	48.00										
	81D	48.50	48.62	31.50	S*300				CHALK: recovered as locally slightly sandy silty CLAY with rare angular and subangular fine to coarse flint fragments.	48.50	-22.10	
28/06/12 0230hrs 48.00m										49.50	-23.10	
									Borehole completed at 49.50m.	{58.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 4

Start Date 6 June 2012 — Easting 529358.7 — Scale 1 : 50

End Date 11 June 2012 — Northing 181890.1 — Ground level 26.14mOD — Depth 30.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
06/06/12 1830hrs								Tarmacadam (MADE GROUND)	0.05	26.09	
								Concrete comprising 60% angular to subrounded fine to coarse flint gravel and 40% light grey concrete matrix with frequent re-bar (5mm diameter.) at 100mm spacings and rare coarse sand and fine gravel sized vesicles. (MADE GROUND)	0.30	25.84	
	1D	0.50									
	2D*	0.50			Vo 0.00						
	3D	1.00									
	4D*	1.00			Vo 0.00						
		1.20	1.65	Nil	C 3			Very loose dark greyish brown slightly clayey locally clayey gravelly fine to coarse SAND with rare brick cobbles. Gravel is angular to subrounded fine to coarse brick, concrete and flint. (MADE GROUND)			
	5B	1.20						0.80 - 0.90m: Timber fragment extended across base of pit.			
								0.90 - 1.00m: Frequent brick cobbles.	2.00	24.14	
		2.00	2.45	Nil	C 9			Soft dark greyish brown slightly gravelly locally gravelly sandy CLAY with faint organic odour. Gravel is angular and subangular fine to coarse brick, concrete and flint. (MADE GROUND)			
	6B	2.00									
	7D*	2.50			Vo 0.10						
		3.00	3.45	2.40	C 20				3.10	23.04	
	8D	3.10						Medium dense dark orangish brown slightly clayey slightly gravelly locally gravelly fine and medium with rare coarse SAND. Gravel is angular to subrounded fine to coarse flint. (Possible loss of fines).			
	9B	3.10									
	10D*	3.50			Vo 0.60						
		4.00	4.45	3.90	C 16			4.00m: Becomes very gravelly.			
	11B	4.00									
	12W	4.20									
	13D*	4.50			Vo 0.00						
		5.00	5.45	4.90	C 20				5.00	21.14	
	14B	5.00						Medium dense dark orangish brown slightly clayey sandy angular to subrounded fine to coarse flint GRAVEL.			
	15D	6.00									
	16D*	6.00			Vo 0.70						
		6.50	6.95	6.40	C 30			6.50m: Becomes medium dense to dense.			
	17B	6.50									
	18D	7.00							7.20	18.94	
	19D	7.20						Firm dark orangish brown locally slightly gravelly slightly sandy CLAY. Gravel is subangular and subrounded fine flint.			
	20D*	7.20			Vo 0.00						
07/06/12 0200hrs 7.70m									8.00	18.14	
								Continued Next Page	{8.00}		

EQUIPMENT: Hydraulic breaker and light cable percussive (shell and auger) rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (250mm) 1.20-23.00m and (150mm) 23.00-30.50m.

CASING: 250mm diam to 8.20m.

BACKFILL: On completion, a slotted standpipe (50mm) was installed to 7.00m, granular response zone 3.00-7.00m, bentonite seal 30.50-7.00m and 3.00m-0.10m, concrete and stopcock cover 0.10-0.00m.

REMARKS: Water added to assist boring throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
5.00	5.00	4.10	20	

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 2 of 4

Start Date 6 June 2012 — Easting 529358.7 — Scale 1 : 50

End Date 11 June 2012 — Northing 181890.1 — Ground level 26.14mOD — Depth 30.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
07/06/12 2000hrs 5.80m	21D	8.00 - 8.45	7.70	S 18			Stiff extremely closely and very closely fissured slightly sandy CLAY with frequent fine and medium sand sized selenite crystals.			
	22D	9.00		H 115						
	23U	9.50 - 9.95	7.70	Blows 40						
	24D	10.00		H Re*						
	25D	10.50					Weak light grey MUDSTONE recovered as: cobbles with (15-20%) slightly clayey slightly sandy subangular and subrounded fine to coarse gravel matrix.	10.50	15.64	
	26D	11.00 - 11.45	7.70	S 24			Stiff extremely closely and very closely fissured dark brownish grey slightly sandy CLAY with rare fine and medium sand sized selenite crystals.	11.00	15.14	
	27D	12.00		H Re*			12.00m: Selenite crystals become frequent.			
	28U	12.50 - 12.95	7.70	Blows 40			12.50m: Very stiff.			
	29D	13.00								
		14.00		H Re*				14.00	12.14	
	30D	14.00 - 14.45	8.20	S 29			Very stiff dark grey slightly sandy CLAY with frequent fine and medium sand sized selenite crystals.			
	31D	15.00					Very stiff friable extremely closely fissured dark grey slightly sandy silty CLAY with frequent fine and medium sand sized selenite crystals.	15.00	11.14	
	32U	15.50 - 15.95	8.20	Blows 50						
	33D	16.00								
	34D	17.00 - 17.45	8.20	S 33						
							Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 3 of 4

Start Date 6 June 2012 — Easting 529358.7 — Scale 1 : 50

End Date 11 June 2012 — Northing 181890.1 — Ground level 26.14mOD — Depth 30.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	35D	18.00						18.00 - 20.00m: With rare coarse sand and fine gravel sized pockets of selenite crystals.			
		18.50			H Re*						
	36U	18.50	18.95	8.20	Blows 55						
	37D	19.00									
									20.00	6.14	
	38D	20.00	20.45	8.20	S 29			Very stiff very closely fissured dark grey slightly sandy silty CLAY with rare fine and medium sand sized selenite crystals and randomly orientated lenses (<2mm) of dark grey silt and selenite crystals.			
	39D	21.00			H 137						
	40U	21.50	21.95	8.20	Blows 60						
08/06/12 0400hrs Dry											
		23.00			H Re*						
10/06/12 1830hrs 14.70m	42D	23.00	23.45	8.20	S 44						
									23.45	2.69	
	43D	23.50						Very stiff extremely closely and very closely fissured light bluish grey frequently mottled dark brownish red and purplish red locally slightly sandy CLAY.			
	44U	24.50	24.95	8.20	Blows 100						
	45D	25.00			H Re*						
	46D	26.00	26.38	8.20	S*65			26.00m: Becomes friable. Frequently mottled yellowish brown.			
	47D	27.00						27.00 - 28.50m: Tends to light brown frequently mottled light bluish grey.			
	48U	27.50	27.95	8.20	Blows 100			27.50m: Hard.			
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 4 of 4

Start Date 6 June 2012 — Easting 529358.7 — Scale 1 : 50

End Date 11 June 2012 — Northing 181890.1 — Ground level 26.14mOD — Depth 30.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	49D	28.00			H Re*						
									28.50	-2.36	
								Very stiff light bluish grey frequently mottled light brown and yellowish brown slightly sandy silty CLAY.			
	50D	29.00	29.43	8.20	S*55						
11/06/12 0200hrs 25.80m	51U	30.00	30.45	8.20	Blows 100						
	52D	30.50			H Re*				30.50	-4.36	
								Borehole completed at 30.50m.			
									{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH121

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 1

Start Date 21 June 2012 — Easting 529361.0 — Scale 1 : 50

End Date 22 June 2012 — Northing 181934.0 — Ground level 25.99mOD — Depth 2.30 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
21/06/12 1830hrs								TARMACADAM. (MADE GROUND)	0.10	25.89	
								CONCRETE. (MADE GROUND)	0.35	25.64	
	1D*	0.50			Vo 0.0			Light brown slightly clayey sandy angular to rounded fine to coarse concrete, brick and siliceous GRAVEL with occasional bricks. (MADE GROUND)			
	2D*	1.00			Vo 0.0				1.10	24.89	
	3X	1.10 - 1.50		Nil				CONCRETE. (MADE GROUND)	1.20	24.79	
	4X	1.50 - 2.10		2.10				Multicoloured sandy clayey angular to rounded fine to coarse brick, concrete, siliceous and limestone GRAVEL. (MADE GROUND)			
	5D*	1.50			Vo 0.0						
22/06/12 0200hrs Dry	6D*	2.00			Vo 0.0				2.10	23.89	
	7C	2.10 - 2.30		2.10				CONCRETE. (MADE GROUND)	2.30	23.69	
								Borehole completed at 2.30m.	{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Concrete cored 0.00-0.35m. Hand dug inspection pit 0.35-1.10m. Dynamic sampled (113mm) 1.10-2.10m. Waterflush rotary core drilled (116mm) 2.10-2.30m.

CASING: 140mm diam to 2.10m.

BACKFILL: On completion, a slotted standpipe (50mm) was installed to 2.30m, granular response zone 2.30-1.00m, bentonite seal 1.00-0.30m, concrete and stopcock cover 0.30-0.00m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m) casing (m) rose to (m) time to rise (min) remarks

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BOREHOLE LOG

BH122

CLIENT WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED

SITE FITZROVIA REDEVELOPMENT — Sheet 1 of 1

Start Date 21 June 2012 — Easting 529351.2 — Scale 1 : 50

End Date 22 June 2012 — Northing 181886.6 — Ground level 25.31mOD — Depth 4.20 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
21/06/12 2300hrs								Tarmacadam. (MADE GROUND)	0.10	25.21	
								Light grey concrete comprising (60%) angular and subangular fine to coarse flint gravel in light grey matrix (40%) with rare fine gravel sized vesicles (0.10-0.18m) underlain by light grey concrete comprising (50%) angular and subangular fine to coarse flint gravel in light grey matrix (50%) with rare fine and medium gravel sized vesicles (0.18-0.38m). (MADE GROUND)	0.38	24.93	
	1B	0.40	0.80								
	2D*	0.40	0.80		Vo 0.00						
	3B	0.80	1.20								
	4D*	0.80	1.20		Vo 0.00						
	5X	1.20	2.70	2.70							
	6D*	1.50			Vo 0.00			Light tending to dark greyish brown slightly clayey locally clayey gravelly fine to coarse SAND with rare red brick cobbles. Gravel is angular to subrounded fine to coarse brick, concrete and flint. (MADE GROUND) 1.60 - 1.80m: Frequent red brick cobbles.	1.80	23.51	
	7D*	2.00			Vo 0.00				2.20	23.11	
	8D*	2.30			Vo 0.00			Dark greyish brown slightly gravelly clayey locally very clayey fine to coarse SAND. Gravel is angular to subrounded fine to coarse brick and flint. (MADE GROUND) 2.00 - 2.10m: Locally light yellowish brown.	2.45	22.86	
	9D*	2.65			Vo 11.6				2.60	22.71	
	10X	2.70	4.20	4.20							
	11D*	3.10			Vo 172			Firm light orangish brown mottled light grey and dark orangish brown slightly gravelly slightly sandy CLAY. Gravel is subangular and subrounded fine to coarse brick, flint and rare charcoal. (MADE GROUND)	3.05	22.26	
									3.20	22.11	
	12D*	3.50			Vo 145			Light orangish brown slightly clayey gravelly fine and medium rarely coarse SAND. Gravel is angular to subrounded fine to coarse brick, flint and charcoal. (MADE GROUND)	3.70	21.61	
22/06/12 1330hrs 3.20m	13D*	3.90			Vo 85.3			Soft dark greyish brown slightly gravelly slightly sandy CLAY with faint organic odour. Gravel is subangular and subrounded fine to coarse brick and rare flint. (MADE GROUND)	4.20	21.11	
								Dark grey and black fine and medium SAND with strong hydrocarbon odour. (MADE GROUND?)			
								Dark brownish grey and black sandy locally very sandy angular and subrounded fine and medium flint GRAVEL with strong hydrocarbon odour.			
								Dark yellowish brown locally clayey fine and medium SAND. 4.00 - 4.10m: Very gravelly. Gravel is angular and subangular fine and medium flint.			
								Borehole completed at 4.20m.	{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Concrete cored 0.00-0.35m. Hand dug inspection pit 0.38-1.20m. Dynamic sampled (113mm) 1.20-4.20m.

CASING: 140mm diam to 4.20m.

BACKFILL: On completion, a slotted standpipe (50mm) was installed to 4.20m, granular response zone 4.20-1.00m, bentonite seal 1.00-0.10m, concrete and stopcock cover 0.10-0.00m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
3.20				Struck during run 2.70-4.20m.

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TRIAL PIT LOG

TP101

CLIENT	WEST LONDON AND SUBURBAN PROPERTY INVESTMENTS LIMITED					Sheet	1 of 1
SITE	FITZROVIA REDEVELOPMENT					Scale	1 : 25
Start Date	18 May 2012	Easting	529355.5				
End Date	12 June 2012	Northing	181945.7	Ground level	25.41mOD	Depth	2.00 m

water record	sample/test no/type	sample/test result	sample/test depth (m)	description	depth (m)	level (m)	legend
				Light grey CONCRETE. (MADE GROUND)	0.26	25.15	
	1D*		0.50	Brown and reddish brown clayey sandy angular and subangular fine to coarse brick, charcoal, concrete and flint GRAVEL with frequent subangular brick and concrete cobbles and occasional fine to coarse gravel sized bone, wood and metal fragments. (MADE GROUND) 0.40 - 0.60m: Rare black organic flecks and a slight organic odour present.	1.05	24.36	
	2D*		1.10	Brown clayey gravelly fine to coarse SAND with occasional coarse gravel sized and cobble sized pockets of black organic silt and rare subangular brick cobbles and rare medium gravel sized bone fragments. Gravel is angular to subrounded fine to coarse brick, charcoal, concrete, flint (MADE GROUND)			
	3D*		1.60				
Dry.				Trial pit completed at 2.00m.	2.00	23.41	

Notes

Concrete surface broken out using floor saw and hydraulic breaker.
Trial pit excavated by hand.
Groundwater was not encountered.
Trial pit sides remained stable.
On completion, the trial pit was backfilled and the surface reinstated.

Sketch of Foundation - Not to scale. All dimensions in metres.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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