BASIC GROUND INVESTIGATION REPORT

FOR

32 PERCY STREET LONDON W1T 2DE



Specialists in the investigation & reclamation of brownfield sites



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EXECUTIVE SUMMARY

Riverdale Properties Ltd commissioned Jomas Associates Ltd ('JAL') to undertake a basic ground investigation at the site 32 Percy Street, London W1T 2DE.

The principle objectives of the study were as follows:

• To assess underlying ground conditions to inform a basement impact assessment to be undertaken by others.

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Ground Investiga	tion
Intrusive Investigation	The ground investigation was undertaken on 23 October 2015, and consisted of the following:
	• 1No. restricted access cable percussive borehole, drilled to 10m below ground level (bgl), with associated in situ testing and sampling;
	Laboratory analysis for chemical and geotechnical purposes,
	• 2No. return visits to monitor groundwater levels within the monitoring well.
Ground Conditions	The results of the ground investigation revealed a ground profile comprising Made Ground to 4.2m bgl (including an existing basement void of 2.9m) over deposits of sandy gravelly clay, sandy gravel, becoming clay with depth.
	During the ground investigation, groundwater was not observed.
	During return site visits groundwater was reported at around 7.0m below original ground level (3.9m below basement slab level).
Environmental Considerations	Following generic risk assessments no contaminants were found to exceed their respective criteria.
	The results of WAC testing indicate that both the made ground and natural soils should be considered as non hazardous for waste purposes. This is due to the sulphate and total dissolved solids within the made ground and marginal exceedance of the total organic content threshold within the natural (clay rich) superficial deposits. However, it is recommended that the results are forwarded to the proposed receiving facility for clarification of the disposal classification. It is possible that the natural clay may be accepted at an inert facility able to accept soils with higher total organic content.
	The Gas Screening Value calculated for the site indicates that the site may be classified as Characteristic Situation 1, where no formal gas protection measures are considered necessary.
	As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out, and caution must be exercised during construction works. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.
Geotechnical Considerations	Based upon the information obtained to date, it is considered that conventional foundations may be suitable for the proposed development. These would however need to be founded on the top of the gravel layer at around 6.25m below ground level (3.1m below basement level) due to the presence of made ground then soft clays beneath the basement slab level



Ground Investigation			
	Based on the SPT N values immediately beneath the basement slab allowable bearing capacities are indicated to be between 60kPa and 100kPa. These appear to increase significantly by around 6.0m bgl into the top of the gravel, where allowable bearing capacities of around 270 kPa are possible		
	The basement extension is situated beneath the existing building structure. Therefore, foundations are likely to be in place for this structure. The type and depth of these foundations has not been determined as part of this investigation. It is recommended that the existing foundations are investigated as it may be possible for the basement extension to tie into these.		
	The above comments are indicative only based on limited ground investigation data. Foundations should be designed by a suitably qualified Engineer. Once structural loads have been fully determined a full design check in accordance with BS EN 1997 should be undertaken to confirm suitability of foundation choice.		
	Based on the results of chemical testing, the required concrete class for the site is DS-2 in the made ground becoming DS-1 in the natural deposits, assuming an Aggressive Chemical Environment for Concrete classification of AC-1s to AC-1 in accordance with the procedures outlined in BRE Special Digest 1.		
	Made Ground in excess of 600mm thickness has been reported and the soils beneath the made ground are reported as initially being soft, then suspended floor slabs are recommended. It may be possible to undertake engineering works to the ground to improve its bearing capacity and enable a ground bearing slab to be utilised.		
	The basement excavation will be located beneath and existing structure and adjoining another structure. The progression of the basement excavation will need to consider the potential impact to existing structures and provide adequate and appropriate support. The groundwater level has been recorded below the proposed basement level. It may however affect potential foundation loads by reducing the allowable bearing capacity. It is possible that seasonal variation in the level may results in the depth to groundwater being shallower than the top of the basement slab. The existing basement may have control measures incorporated into the design to counter this.		



1 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 Riverdale Properties Ltd ("The Client") has commissioned Jomas Associates Ltd ('JAL'), to assess the ground conditions at a site referred to as 32 Percy Street, London W1T 2DE to provide indicative recommendations for foundation design prior to the extension of an existing basement at the site. It is understood that the existing buildings on site are to be retained.
- 1.1.2 To this end a basic intrusive investigation has been undertaken at the site.
- 1.1.3 A desk study was not required.

1.2 Objectives

- 1.2.1 The objectives of JAL's investigation were as follows:
 - To conduct a basic intrusive investigation, to determine the nature of the geology present at the site,
 - To assess the chemical properties of soil arisings to be anticipated from the construction of the basement, and;
 - To obtain geotechnical parameters to inform preliminary foundation design.

1.3 Scope of Works

- 1.3.1 The following tasks were undertaken to achieve the objectives listed above:
 - Basic intrusive ground investigation to determine shallow ground conditions through the drilling of 1No. borehole to 10mbgl as requested by the engineer;
 - Undertaking of laboratory chemical and geotechnical testing upon samples obtained;
 - The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.4 Limitations

- 1.4.1 Jomas Associates Ltd ('JAL') has prepared this report for the sole use of Riverdale Properties Ltd, in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of JAL. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.
- 1.4.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless JAL has actual knowledge to the contrary, information obtained from public sources or provided to JAL by site personnel and other information sources, have been assumed to be correct. JAL does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.



- 1.4.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.
- 1.4.4 This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.



2 SITE SETTING

2.1 Site Information

2.1.1 The site location plan is appended to this report as Figure 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	32 Percy Street London W1T 2DE
Approx. National Grid Ref.	529581, 181592
Site Area (Approx)	-
Site Ownership	Riverdale Properties Ltd
Site Occupation	Vacant offices
Local Authority	London Borough of Camden
Proposed Site Use	Extension to the existing basement

2.2 Site Description

2.2.1 A site walkover survey was undertaken by Jomas Associates on 23rd October 2015.

Table 2.2: Site Description

Area	Item	Details
On-site:	Current Uses:	The site is currently occupied by a four storey office building with an existing basement plus a single storey extension to the rear of the main structure with a part basement.
		At the time of the site visit, the site was vacant.
	Evidence of historic uses:	There was no evidence of historic uses of the site observed.
Surfaces:TVegetation:N		The whole site is covered by buildings.
		No vegetation is present on the site.
	Topography/Slope Stability:	Generally the site is level. The existing ground floor is slightly higher than street level.
	Drainage:	The site appears to be connected to normal drainage facilities.
	Services:	The site is assumed to be connected to the main statutory services.
	Controlled waters:	No controlled waters were noted on site.
_	Tanks:	No tanks were noted on site.
Neighbouring land:	North:	Commercial and business properties with potentially residential and/or business uses on upper floors.



Area	ltem	Details		
	East:	Commercial and business properties with potentially residential and/or business uses on upper floors.		
	South:	Percy Street forms the southern boundary beyond which are commercial and business properties with potentially residential and/or business uses on upper floors.		
	West:	Commercial and business properties with potentially residential and/or business uses on upper floors.		

2.3 **Proposed Development**

- 2.3.1 The proposed development is to comprise the lateral extension of the existing basement.
- 2.3.2 For the purposes of the contamination risk assessment, the proposed development is classified as 'Commercial'.



3 GROUND INVESTIGATION

3.1 Rationale for Ground Investigation

3.1.1 The rationale for the ground investigation was as requested by the Engineers.

3.2 Scope of Ground Investigation

- 3.2.1 The ground investigation was undertaken on 23rd October 2015.
- 3.2.2 The investigation focused on collecting data on the following:
 - Quality of Made Ground/ natural ground within the site boundaries;
 - Presence of groundwater beneath the site (if any), perched or otherwise;
- 3.2.3 A summary of the fieldwork carried out at the site, with justifications for exploratory hole positions, are offered in Table 3.1 below.

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved (m BGL)	Justification
Cable Percussive Borehole (restricted access rig)	1	BH1	10m	To undertake in situ testing and obtain samples for geotechnical and environmental testing
Ground gas/water monitoring installation	1	BH1	10m	To enable monitoring of groundwater levels and ground gas conditions.

Table 3.1: Scope of Intrusive Investigation

- 3.2.4 The exploratory holes were completed to allow soil samples to be taken from the boreholes as identified in Table 3.1 above. The hole was logged in accordance with BS5930:2015.
- 3.2.5 The approximate exploratory hole position is as shown in the exploratory hole location plan presented in Appendix 1. The exploratory hole records are included in Appendix 2.
- 3.2.6 The borehole was completed with a monitoring well, with soil arisings taken off-site, and the ground surface finished with a flush steel cover.

3.3 Sampling Rationale

- 3.3.1 Soil samples were taken from the borehole at various depths as shown in the exploratory hole log.
- 3.3.2 JAL's engineers normally collect samples at appropriate depths based on field observations such as:



- appearance, colour and odour of the strata and other materials, and changes in these;
- the presence or otherwise of sub-surface features such as pipework, tanks, foundations and walls; and,
- areas of obvious damage, e.g. to the building fabric.
- 3.3.3 A number of the samples were taken from the top 0-1m to aid in the assessment of the pollutant linkages identified at the site. In addition, some deeper samples were taken to aid in the interpretation of fate and transport of any contamination identified.
- 3.3.4 Samples were stored in cool boxes (<4°C) and preserved in accordance with laboratory guidance.
- 3.3.5 Bulk samples were collected for geotechnical analysis.
- 3.3.6 Groundwater strikes noted during drilling, are recorded within the exploratory hole records in Appendix 2.

3.4 Sampling Limitations

3.4.1 BH1 was moved from where initially positioned due to access limitations.

3.5 Laboratory Analysis

3.5.1 A programme of chemical laboratory testing, scheduled by JAL, was carried out on selected samples of Made Ground and natural strata. The testing was undertaken mainly to inform the disposal of waste arisings anticipated from the excavation of the proposed basement.

Chemical Testing

- 3.5.2 Soil samples were submitted to The Environmental Laboratory Ltd, East Sussex (a UKAS and MCerts accredited laboratory), for analysis.
- 3.5.3 The samples were analysed for a wide range of contaminants as shown in Table 3.2 below:

	No. of tests		
Test Suite	Made Ground / Topsoil	Natural	
Basic Suite S3	1	1	
Total Organic Carbon	1	-	
Water Soluble Sulphate	1	3	
Waste Acceptance Criteria	1	1	

Table 3.2: Chemical Tests Scheduled



3.5.4

The determinands contained in the basic suite are as detailed in Table 3.3 below:

DETERMINAND	LIMIT OF DETECTION (mg/kg)	UKAS ACCREDITATION	TECHNIQUE	
Arsenic	1	Y (MCERTS)	ICPMS	
Cadmium	0.5	Y (MCERTS)	ICPMS	
Chromium	5	Y (MCERTS)	ICPMS	
Chromium (Hexavalent)	0.02	Ν	Colorimetry	
Lead	5	Y (MCERTS)	ICPMS	
Mercury	0.5	Y (MCERTS)	ICPMS	
Nickel	5	Y (MCERTS)	ICPMS	
Selenium	1	PENDING	ICPMS	
Copper	5	Y (MCERTS)	ICPMS	
Zinc	45	Y (MCERTS)	ICPMS	
Boron (Water Soluble)	0.5	Ν	ICPMS	
pH Value	0.1 units	Y (MCERTS)	Electrometric	
Sulphate (Water Soluble)	0.02ug/l	Y (MCERTS)	Ion Chromatography	
Total Cyanide	1	Y (MCERTS)	Colorimetry	
Speciated/Total PAH	0.1/0.4	Y (MCERTS)	GCFID	
Phenols	5	Y (MCERTS)	HPLC	
Total Petroleum Hydrocarbons (banded)	1	Ν	Gas Chromatography	

Table 3.3: Basic Suite of Determinands

3.5.5 To support the derivation of appropriate tier 1 screening values, 1No. sample was also analysed for total organic carbon.

Laboratory test results are summarised in Section 6, with raw laboratory data included in Appendix 3.

Geotechnical Laboratory Testing

- 3.5.6 In addition to the chemical assessments, soil samples were submitted to the UKAS Accredited laboratory of PSL for the following assessment.
 - 3No. Atterberg Limit determinations;
 - 2No. Moisture Content;
 - 3No. Particle Size Distributions;
 - 1No. Quick Undrained Triaxial

All testing was in accordance with BS 1377.

3.5.7 The results of the geotechnical laboratory testing are presented as Appendix 4 and discussed in Section 9 of this report.



4 GROUND CONDITIONS

4.1 Soil

4.1.1 Ground conditions were logged in accordance with the requirements of BS5930:2015. Detailed exploratory hole logs are provided in Appendix 2. The ground conditions encountered are summarised in Table 4.1 below, based on the strata observed during the investigation.

Table 4.1: Ground Conditions Encountered

Stratum and Description	Encountered from (m bgl)	Base of strata (m bgl)	Thickness range (m)
MADE GROUND: Wooden floor and ceiling to basement, over 2.9m Basement void, over Concrete basement floor, over Dark grey brown silty sandy gravel of brick	0.0	4.2	4.2
Soft becoming very stiff very gravelly very sandy silty CLAY	4.2	6.25	2.05
Medium dense brown very sandy silty GRAVEL	6.25	8.35	2.1
Brown silty CLAY / sandy gravelly CLAY	8.35	9.0	0.65
Stiff dark blue grey slightly gravelly sandy CLAY	9.0	>10.0	10.0

4.2 Hydrogeology

4.2.1 Groundwater was not observed in the borehole during the investigation.

Table 4.2: Water Monitoring Records

DURING DRILLING						
Exploratory Hole ID	Depth Encountered (mbgl)	Depth After 20mins (mbgl)	Stratum			
BH1	Not Observed	-	-			
POST DRILLING/RETURN MONITORING						
Exploratory Hole ID	Depth Encountered (mbgl)	Depth to Base of Well	Stratum			
BH1	7.03	10.03				

4.3 Physical and Olfactory Evidence of Contamination

4.3.1 Visual or olfactory evidence of contamination was not observed during the course of the investigation.



5 RISK ASSESSMENT – ANALYTICAL FRAMEWORK

5.1 Context and Objectives

- 5.1.1 While a full land contamination assessment has not been requested, and the chemical analysis has been undertaken mainly to inform waste disposal, a generic quantitative risk assessment (GQRA) has also been completed.
- 5.1.2 The purpose of the GQRA is to compare concentrations of contaminants found on site against screening level generic assessment criteria (GAC) to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed assessment is required.

5.2 Analytical Framework – Soils

- 5.2.1 There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.
- 5.2.2 The CLEA model provides a methodology for quantitative assessment of the long term risks posed to human health by exposure to contaminated soils. Toxicological data have been used to calculate Soil Guideline Values (SGV) for individual contaminants, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.
- 5.2.3 In the absence of any published SGVs for certain substances, or where the assumptions made in generating the SGVs do not apply to the site, JAL have obtained Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4ULs and DEFRA C4SL. Site-specific assessments are undertaken wherever possible and/or applicable. All assessments are carried out in accordance with the CLEA protocol.
- 5.2.4 CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.
- 5.2.5 The assessment criteria used for the screening of determinands within soils are identified within Table 5.1.



Table 5.1:	Selected	Assessment	Criteria -	Contaminants	in	Soils
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Substance Group	Determinand(s)	Assessment Criteria Selected
Organic Substances		
Non-halogenated Hydrocarbons	Total Petroleum Hydrocarbons (TPHCWG banded)	LQM/CIEH
	Total Phenols	CLEA v1.06
Polycyclic Aromatic Hydrocarbons (PAH-16)	Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene	LQM/CIEH
Volatile Organic Compounds	Toluene, Ethylbenzene	LQM/CIEH
(1003/31003).	Benzene, Xylenes	LQM/CIEH
Inorganic Substances		
Heavy Metals and Metalloids	Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium	LQM/CIEH/C4SL
	Copper, Zinc	LQM/CIEH
Cyanides	Free Cyanide	CLEA v1.06
Sulphates	Water Soluble Sulphate	BRE Special Digest 1:2005

<u>BRE</u>

5.2.6 The BRE Special Digest 1:2005, 'Concrete in Aggressive Ground' is used with soluble sulphate and pH results to assess the aggressive chemical environment of future underground concrete structures at the site.

5.3 Analytical Framework – Groundwater and Leachate

- 5.3.1 Where undertaken, the groundwater quality analysis comprises a Level 1 assessment in accordance with the EA Remedial Targets Methodology Document (EA, 2006).
- 5.3.2 The criteria used by JAL in the Level 1 assessment of groundwater and leachate quality are shown in Table 5.2.



Substance Group	Determinand(s)	Assessment Criteria Selected
Metals	Arsenic, Copper, Cyanide, Mercury, Nickel, Lead, Zinc, Chromium	EQS/DWS
	Selenium	DWS
PAHs	Sum of Four – benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3- c,d)pyrene	DWS
PAHs	Benzo(a)pyrene,	DWS
PAHs	Remainder	LEC
Total Petroleum Hydrocarbons	Aliphatic C5-C6, Aliphatic >C6-C8, Aliphatic >C8-C10. Aliphatic >C10-C12, Aliphatic >C12-C16, Aliphatic >C16-C21, Aromatic >C7-C8, Aromatic >C7-C8, Aromatic >C10-C12, Aromatic >C10-C12, Aromatic >C12-C16, Aromatic >C16-C21, Aromatic >C16-C21, Aromatic >C21-C35	DWS/WHO
BTEX	Benzene	DWS
	Toluene	EQS
	Ethylbenzene	EQS
	Xylene	EQS
Oxygen Demand	Chemical Oxygen Demand and Biological Oxygen Demand	Urban Waste Water Treatment (England and Wales) Regulations

Table 5.2: Selected Assessment Criteria – Contaminants in Water

Environmental Quality Standards EQS

Environmental Quality Standards (EQS) have been released by the EA for dangerous substances, as identified by the EC Dangerous Substances Directive. EQS can vary for each substance, for the hardness of the water and can be different for fresh, estuarine or coastal waters.

Lowest Effect Concentration (LEC)

These criteria relate to the concentration of PAHs in groundwater. They are taken from the EA R&D Technical Report P45 – Polycyclic Aromatic Hydrocarbons (PAH): Priorities for Environmental Quality Standard Development (2001).

WHO Health

These screening criteria have been taken from the World Health Organisation Guidelines for Drinking Water Quality (1984). The health value is a guideline value representing the concentration of a contaminant that does not result in any significant risk to the receptor over a lifetime of exposure.

Further criteria have been obtained from 'Petroleum Products in Drinking-water' -Background document for development of WHO Guidelines for Drinking-water Quality (2005).



UK Drinking Water Standards (DWS)

These comprise screening criteria provided by the Drinking Water Inspectorate (DWI) in the Water Supply (Water Quality) Regulations 2006,

<u>Urban Waste Water Treatment (England and Wales) Regulations - UWWT Regs</u> The Urban Waste Water Treatment (England and Wales) Regulations SI/1994/2841 as amended by SI/2003/1788 sets down minimum standards for the discharge of treated effluent from waste water treatment works to inland surface waters, groundwater, estuaries or coastal waters. Standards of (125mg/L) COD and (25mg/L) BOD have been set.

Site Specific Criteria

5.3.3 The criteria adopted in the selection of correct screening criteria from published reports as previously described, are provided within Tables 5.3.

Input Details	Value
Land Use	Commercial
Soil Type	Sandy clay
рН	8
Soil Organic Matter	2.5%

Table 5.3: Site Specific Data

- 5.3.4 A pH value of '8' has been used for the derivation of generic screening criteria as 8.2 was the mean pH value of samples analysed.
- 5.3.5 As the published reports only offer the option of selecting an SOM value of 1%, 2.5% or 6%, an SOM value of 1% has been used for the generation of generic assessment criteria, as 2.35% was the mean value obtained from laboratory analysis.
- 5.3.6 It is understood that the existing basement on the site is to be extended laterally. As a result, the site has been assessed as commercial.



6 GENERIC QUANTITATIVE RISK ASSESSMENT

6.1 Screening of Soil Chemical Analysis Results – Human Health Risk Assessment

- 6.1.1 To focus on the contaminants of potential concern (COPC), the results have been compared with the respective SGV/GAC. Those contaminants which exceed the SGV/GAC are considered to be the COPC. Those which do not exceed the respective SGV/GAC are not considered to be COPC and as such do not require further assessment in relation to the proposed development of the site.
- 6.1.2 Laboratory analysis for soils are summarised in Tables 6.1 to 6.3. Raw laboratory data is included in Appendix 7.

Determinand	Unit	No. samples tested	Scre Crit	ening teria	Min	Мах	No. Exceeding
Arsenic	mg/kg	2	640	S4UL	11.7	19.3	0
Cadmium	mg/kg	2	190	S4UL	<0.5	<0.5	0
Chromium	mg/kg	2	8600	S4UL	19.8	23.6	0
Lead	mg/kg	2	2330	S4UL	380	535	0
Mercury	mg/kg	2	320	S4UL	1.2	3.1	0
Nickel	mg/kg	2	980	S4UL	15.2	24.8	0
Copper	mg/kg	2	68000	S4UL	55.8	171	0
Zinc	mg/kg	2	730000	S4UL	131	134	0
Total Cyanide ^B	mg/kg	2	33	CLEA v 1.06	<1.0	<1.0	0
Selenium	mg/kg	2	12000	S4UL	<1.0	1.1	0
Boron Water Soluble	mg/kg	2	240000	S4UL	1.2	1.5	0
Phenols	mg/kg	2	690	S4UL	<5	<5	0

Table 6.1: Soil Laboratory Analysis Results - Metals, Metalloids, Phenol, Cyanide

Notes:

^B Generic assessment criteria derived for free inorganic cyanide.



Determinand	Unit	No. Samples Tested	Screening Criteria		Min	Max	No. Exceeding
Naphthalene	mg/kg	2	S4UL	460	<0.1	<0.1	0
Acenaphthylene	mg/kg	2	S4UL	97000	<0.1	<0.1	0
Acenaphthene	mg/kg	2	S4UL	97000	<0.1	0.1	0
Fluorene	mg/kg	2	S4UL	68000	<0.1	<0.1	0
Phenanthrene	mg/kg	2	S4UL	22000	0.2	0.5	0
Anthracene	mg/kg	2	S4UL	540000	<0.1	0.1	0
Fluoranthene	mg/kg	2	S4UL	23000	0.2	0.5	0
Pyrene	mg/kg	2	S4UL	54000	<0.1	0.5	0
Benzo(a)anthracene	mg/kg	2	S4UL	170	<0.1	0.3	0
Chrysene	mg/kg	2	S4UL	350	<0.1	0.5	0
Benzo(b)fluoranthene	mg/kg	2	S4UL	44	<0.1	<0.1	0
Benzo(k)fluoranthene	mg/kg	2	S4UL	1200	<0.1	<0.1	0
Benzo(a)pyrene	mg/kg	2	S4UL	35	0.1	0.3	0
Indeno(123-cd)pyrene	mg/kg	2	S4UL	510	<0.1	0.3	0
Dibenz(ah)anthracene	mg/kg	2	S4UL	3.6	<0.1	<0.1	0
Benzo(ghi)perylene	mg/kg	2	S4UL	4000	<0.1	0.2	0
Total PAH	mg/kg	2	-		<2	4	-

Table 6.2: Soil Laboratory Analysis Results – Polycyclic Aromatic Hydrocarbons (PAHs)

Table 6.3: Soil Laboratory Analysis Results – Total Petroleum Hydrocarbons (TPH)

TPH Band	Unit	No. Samples Tested	Screening	Criteria	Min	Мах	No. Exceeding
C ₈ -C ₁₀	mg/kg	2	S4UL	4800	<1	<1	0
>C ₁₀ -C ₁₂	mg/kg	2	S4UL	2800	<1	<1	0
>C ₁₂ -C ₁₆	mg/kg	2	S4UL	37000	<1	<1	0
>C ₁₆ -C ₂₁	mg/kg	2	S4UL	28000	<1	<1	0
>C ₂₁ -C ₃₅	mg/kg	2	S4UL	28000	1.9	2.8	0
Total TPH	mg/kg	2	-	-	1.9	2.8	-

Note: *The lower value of guidelines for Aromatic/Aliphatics has been selected



Polychlorinated Biphenyl (PCB) & BTEX Concentrations 6.2

6.2.1 In addition to the suites outlined previously, analysis for PCBs and BTEX was undertaken. No PCBs or BTEX were reported above the laboratory method detection limits of 0.03mg/kg and 0.01mg/kg respectively.

Screening for Water Pipes 6.3

6.3.1 The results of the analysis have been assessed for potential impact upon water supply pipes. Table 6.4 below summarises the findings of the assessment:

Determinand	Threshold adopted for PE (mg/kg)	Min Value for site data	Max Value from site data
Total VOCs	0.5	-	-
BTEX	0.1	<0.01	<0.01
MTBE	0.1	-	-
EC5-EC10	1	<1	<1
EC10-EC16	10	<1	<1
EC16-EC40	500	<1	2.8
Naphthalene	5	<0.5	7.7
Phenols	2	<5*	<5*
*Laboratory detection I	imit		

Table 6.4: Screening Guide for Water Pipes

6.4 Waste Disposal

- 6.4.1 The classification of materials for waste disposal purposes was undertaken by analysis for the Waste Acceptance Criteria (WAC) tests.
- The results of WAC testing indicate that both the made ground and natural soils should 6.4.2 be considered as non hazardous for waste purposes.
- 6.4.3 This is due to the sulphate and total dissolved solids within the made ground and marginal exceedance of the total organic content threshold within the natural (clay rich) superficial deposits. However, it is recommended that the results are forwarded to the proposed receiving facility for clarification of the disposal classification. It is possible that the natural clay may be accepted at an inert facility able to accept soils with higher total organic content.



7 SOIL GAS RISK ASSESSMENT

7.1 Soil Gas Results

- 7.1.1 Two return monitoring visits have been undertaken to monitor wells installed within boreholes at the site for groundwater levels. Although not the purpose of the visit, soil gas concentrations within the wells were also monitored during the visits.
- 7.1.2 Monitoring was undertaken on 29th October and 10th November 2015.
- 7.1.3 The results of the monitoring undertaken are summarised in Table 7.1 below, with the monitoring records presented in Appendix 5.

Hole No.	CH₄ (%)	CO₂ (%)	O2 (%)	H₂S (ppm)	Atmospheric Pressure (mb)	VOCs	Peak Flow Rate (I/hr)	Depth to water (mbgl)	Depth of hole (mbgl)
BH1	0.2 – 0.3	0.2	20.9 - 21.1	0	1007 - 1015	0.0 - 1.8	0.0 – 0.3	7.01 - 7.03* (3.91 - 3.93)	10.03* (6.92)

Table 7.1: Summary of Gas Monitoring Data

* taken from the original top of the borehole (figures in brackets are from the top of basement slab)

7.2 Screening of Results

- 7.2.1 As shown in Table 7.1, methane and carbon dioxide has been reported to maximum concentrations of 0.3% and 0.2% v/v to date. Oxygen levels during the monitoring visits have varied from 20.9 to 21.1% v/v. Volatile organic compounds (VOCs) to a maximum concentration of 1.8ppm have been reported. A maximum flow rate of 0.3l/hr has been reported.
- 7.2.2 In the assessment of risks posed by hazardous ground gases and selection of appropriate mitigation measures, CIRIA document C665 (2007) identifies two types of development, termed Situation A and Situation B.
- 7.2.3 Situation A relates to all development types except low rise housing. Situation B relates to low rise housing with gardens. Situation A has been adopted as the relevant category for the proposed development.
- 7.2.4 The soil gas assessment method is based on that proposed by Wilson & Card (1999), which was a development of a method proposed in CIRIA publication R149 (CIRIA, 1995). The method uses both gas concentrations and borehole flow rates to define a characteristic situation based on the limiting borehole gas volume flow for methane and carbon dioxide. In both these methods, the limiting borehole gas volume flow is renamed as the Gas Screening Value (GSV).
- 7.2.5 The Gas Screening Value (litres of gas per hour) is calculated by using the following equation

GSV = (Concentration/100) X Flow rate

Where concentration is measured in percent (%) and flow rate is measured in litres per hour (l/hr)

7.2.6 The Characteristic Situation is then determined from Table 8.5 of CIRIA C665.



- 7.2.7 To accord with C665, worst case conditions are used in the calculation of GSVs for the site.
- 7.2.8 A worst case flow rate of 0.3/hr (maximum reported) will be used in the calculation of GSVs for the site.

For carbon dioxide and methane, the worst-case conditions and the corresponding GSV is presented below.

- Conservative flow rate:
- Highest CO₂ concentration:
- GSV Value:
- Highest CH₄ concentration:
 - GSV Value:

0.3 l/hr flow rate 0.2% v/v 0.0006 (l/hr) 0.3% v/v 0.0009(l/hr)

7.2.9 The result of the GSV calculation would indicate that the site may be classified as Characteristic Situation 1 for which no specific ground gas protection measures are required.



8 SUMMARY OF RESULTS

8.1 Risk Assessment - Land Quality Impact Summary

- 8.1.1 Following the basic intrusive investigation, the following is noted:
 - It is understood that the proposed development will comprise the lateral extension to the existing basement with continued use of the site as commercial/business space.
 - Following generic risk assessments none of the contaminants tested for exceeded the relevant assessment criteria.
 - The results of WAC testing indicate that both the made ground and natural soils should be considered as non hazardous for waste purposes. This is due to the sulphate and total dissolved solids within the made ground and marginal exceedance of the total organic content threshold within the natural (clay rich) superficial deposits. However, it is recommended that the results are forwarded to the proposed receiving facility for clarification of the disposal classification. It is possible that the natural clay may be accepted at an inert facility able to accept soils with higher total organic content.
 - Ground gas monitoring has indicated that the site should be considered as Characteristic Situation 1. This would indicate that no specific ground gas protection measures are required.
 - As with any ground investigation, the presence of further hotspots between sampling points cannot be ruled out. Should any contamination be encountered, a suitably qualified environmental consultant should be informed immediately, so that adequate measures may be recommended.
- 8.1.2 The above conclusions are made subject to approval by the statutory regulatory bodies.



9 **GEOTECHNICAL ENGINEERING RECOMMENDATIONS**

9.1 Ground Investigation Summary

- 9.1.1 No detailed structural engineering design information, with respect to the type of construction and associated structural loadings, was provided at the time of preparing this report. Consequently, a detailed discussion of all the problems that may arise during the proposed redevelopment scheme is beyond the scope of this report.
- 9.1.2 Practical solutions to the difficulties encountered, both prior to, and during construction, are frequently decided by structural constraints or economical factors. For these reasons, this discussion is predominantly confined to remarks of a general nature, which are based on site conditions encountered during the intrusive investigations.
- 9.1.3 It is understood that the proposed development comprises extending the existing basement horizontally beneath the extension to the rear of the property on site.
- 9.1.4 The results of the ground investigation revealed a ground profile comprising a variable thickness of Made Ground (up to 4.2m bgl depth), that includes the existing basement, overlying very gravelly very sandy silty Clay then very sandy silty GRAVEL, which overlies brown silt/sandy gravelly CLAY becoming dark blue grey slightly gravelly sandy CLAY encountered to the base of the boreholes (10m bgl).
- 9.1.5 A summary of ground conditions obtained from the ground investigation and subsequent laboratory testing is provided in Table 9.1 and 9.2 below.

Stratum and Description	Encountered from (m bgl)	Base of strata (m bgl)	Thickness range (m)
MADE GROUND (drilling from ground floor level)			
Wooden floor and basement ceiling over a 2.9m Basement void, over Concrete basement floor (to 3.5mbgl), over Dark grey brown silty sandy gravel of brick	0.0	4.2	4.2
Soft becoming very stiff very gravelly very sandy silty CLAY	4.2	6.25	2.05
Medium dense brown very sandy silty GRAVEL	6.25	8.35	2.1
Brown silty CLAY / sandy gravelly CLAY	8.35	9.0	0.65
Stiff dark blue grey slightly gravelly sandy CLAY	9.0	>10.0	10.0

Table 9.1: Ground Conditions Encountered



Table 9.2: Laborator	ry Test Data Summary
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Strata	SPT 'N' Value	Shear Strength (kPa)	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (plasticity term)	Particle Size Distribution (% passing 0.425mm)	NHBC Volume Change Classification
MADE GROUND (drilling from ground floor level) Wooden floor and basement ceiling over a 2.9m Basement void over Concrete basement floor (to 3.5mbgl), over Dark grey brown silty sandy gravel of brick (to 4.2m bgl)	-							
Soft becoming very stiff very gravelly very sandy silty CLAY	6 - 34		29	36	20	16	65	Low
Medium dense brown very sandy silty GRAVEL	22 - 27							
Brown silty CLAY / sandy gravelly CLAY	-		27	42	20	22	81	Low
Stiff dark blue grey slightly gravelly sandy CLAY	19		34	47	23	24	100	Medium



9.2 Geotechnical Data Summary

9.2.1 The results of the ground investigation revealed a ground profile comprising Made Ground that includes the existing basement, overlying very gravelly very sandy silty Clay then very sandy silty GRAVEL, which in turn overlies brown silt/sandy gravelly CLAY becoming dark blue grey slightly gravelly sandy CLAY



9.3 Foundations

- 9.3.1 Based upon the information obtained to date, and subject to design loads, it is considered that deep trench foundations may be suitable for the proposed development. These would however need to be founded on the top of the gravel layer at around 6.25m below ground level (3.1m below basement level). Ground conditions immediately beneath the basement slab comprise of made ground described as silty sandy gravel and cobbles of whole and part brick. This becomes a soft (but stiffening) dark grey brown very gravelly very sandy silty CLAY
- 9.3.2 Based on the SPT N values in the clay, allowable bearing capacities are indicated to be between 60kPa and 100kPa. These appear to increase significantly by around 6.0m bgl into the top of the gravel, where allowable bearing capacities of around 270kPa are estimated.



- 9.3.3 The basement extension is situated beneath the existing building structure. Therefore, foundations are likely to be in place for this structure. The type and depth of these foundations has not been determined as part of this investigation. It is recommended that the existing foundations are investigated as it may be possible for the basement extension to tie into these.
- 9.3.4 The above comments are indicative only based on limited ground investigation data. Foundations should be designed by a suitably qualified Engineer. Once structural loads have been fully determined a full design check in accordance with BS EN 1997 should be undertaken to confirm suitability of foundation choice.

9.4 Concrete in the Ground

- 9.4.1 Sulphate attack on building foundations occurs where sulphate solutions react with the various products of hydration in Ordinary Portland Cement (OPC) or converted High-Alumina Cement (HAC). The reaction is expansive, and therefore disruptive, not only due to the formation of minute cracks, but also due to loss of cohesion in the matrix.
- 9.4.2 In accordance with BRE Special Digest 1, in a data set where there are more than 10 results available, assessment should be undertaken against the average of the highest 20% of values. Where there are less than 10 results in a data set the highest value is taken.
- 9.4.3 Table 9.4 summarises the analysis of the aggressive nature of the ground for each of the stratum encountered within the ground investigation.

Stratum	No. Samples	pH range	WS Sulphate (ave 20% / highest)	Design Sulphate Class	ACEC Class
Made Ground	2	8.1 – 8.5	1370	DS-2	AC-1s
Clay	2	7.9 - 8.4	260	DS-1	AC-1s
Gravel	1	8.4	30	DS-1	AC-1
London Clay	1	8.3	140	DS-1	AC-1s

Table 9.4: Concrete in the Ground Classes

9.5 Ground Floor Slabs

- 9.5.1 Formations of the structures should be inspected by a competent person. Any loose or soft material should be removed and replaced with well-graded, properly compacted granular fill or lean mix concrete. The formation should be blinded if left exposed for more than a few hours or if inclement weather is experienced.
- 9.5.2 As Made Ground in excess of 600mm thickness has been reported and the soils beneath the made ground are reported as initially being soft, then suspended floor slabs are recommended.
- 9.5.3 It may be possible to undertake engineering works to the ground to improve its bearing capacity and enable a ground bearing slab to be utilised.



9.6 Excavations

- 9.6.1 Excavations will be required in the creation of the basement extension. This will be through made ground and based on the investigation undertaken it is considered that excavations will only remain stable for the short term.
- 9.6.2 In addition, the basement excavation will be located beneath and existing structure and adjoining another structure. The progression of the basement excavation will need to consider the potential impact to existing structures and provide adequate and appropriate support.
- 9.6.3 It is recommended that the stability of all excavations should be assessed during construction. The sides of any excavations into which personnel are required to enter, should be assessed and where necessary fully supported or battered back to a safe angle.

9.7 Groundwater Control

- 9.7.1 During the investigation, groundwater was not observed within the borehole. During return monitoring groundwater was reported at around 7.0m below the original ground level (3.90m below the basement slab level). This groundwater level is below the proposed basement level. It may however affect potential foundation loads by reducing the allowable bearing capacity.
- 9.7.2 There is also the potential that seasonal fluctuations may results in the groundwater becoming shallower than the top of slab level of the proposed basement. The existing basement does not appear to suffer from groundwater issues although control measures may have been incorporated into the basement to prevent water ingress.



10 REFERENCES

BRE Report BR211: Radon: Protective measures for new dwellings, 2007

BRE Special Digest 1: Concrete in Aggressive Ground, 2005

British Standards Institution (2011) BS 10175:2011 Code of practice for the investigation of potentially contaminated sites. Milton Keynes: BSI

British Standards Institution (2015) BS 5930:2015 Code of practice for site investigations. Milton Keynes: BSI

CIEH & CL:AIRE (2008) Guidance on comparing soil contamination data with a critical concentration. London: Chartered Institute of Environmental Health (CIEH) and CL:AIRE

Environment Agency (2004) *Model procedures for the management of land contamination*. CLR11. Bristol: Environment Agency

Environment Agency, NHBC & CIEH (2008) *Guidance for the safe development of housing on land affected by contamination.* R & D Publication 66. London: Environment Agency

Environment Agency (2006) *Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination* Environment Agency

LQM/CIEH S4ULs. LQM, 2014

National Planning Policy Framework. Department for Communities and Local Government, March 2012



APPENDICES



APPENDIX 1 – FIGURES







APPENDIX 2 – EXPLORATORY HOLE RECORD

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D 8.75 8.75 U 9.00 45 D + S 9.55 2 3 4 4 5 6 19 9.50 Stiff dark blue/grey slightly gravely sandy CLAY Sampling Code: 1.1. Undisturbed 8. Jarge Disturbed 9. So 10.00 10.00														Brown SIITY CLAY					
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D+S 9.55 2 3 4 4 5 6 19 9.50 $ -$										-									
D+S = 9.55 = 2 = 3 = 4 = 4 = 5 = 6 = 19 = 9.50 = 10.00 = 10.																			
Sampling Code: Li Undisturbed B - Large Disturbed W - Water (Li [*]) Non recovery of Sample	D+S	9.55	2	3	4	4	5	6	19	9.50 -	Fa-t-t-t-t								
Sampling Code: Li Undisturbed B - Large Disturbed W - Water (Li [*]) Non recovery of Sample								1		-									
Sampling Code: LL Undisturbed B - Large Disturbed W - Water (LL*) Non recovery of Sample								1		-									
Sampling Code: U- Undisturbed B - Large Disturbed W - Water (Ut*) Non recovery of Sample				1				1		-	E								
Sampling Code: U. Undisturbed, B Large Disturbed, D Small Disturbed, W Water, (U*) Non recovery of Sample				1				1		10.00		10.00							
Sampling Code: LL LIndisturbed, B., Large Disturbed, D., Small Disturbed, W., Water, (LL*) Non recovery of Sample								1		0.00									
Sampling Code: IL-Undisturbed, B Large Disturbed, D Small Disturbed, W Water, (U*) Non recovery of Sample				1			1			I									
Jomas Associates Ltd - Lakeside House, 1 Furzeground Way, Stockley Park, UB11 1BD			:	Sampli	ng Cod	le: U- l Jor	Undistu nas As	urbed sociate	B - Lar	ge Distur Lakeside	bed D - Sma House, 1 Furz	all Disturbed eground Way	W - Water , Stockley Pa	(U*) Non recovery of Sa ark, UB11 1BD	ample				



APPENDIX 3 – CHEMICAL LABORATORY TEST RESULTS



Unit A2 Windmill Road Ponswood Industrial Estate St Leonards on Sea East Sussex TN38 9BY Telephone: (01424) 718618 Facsimile: (01424) 729911 info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	15-04337
Issue:	1
Date of Issue:	02/11/2015
Contact:	Roni Savage
Customer Details:	Jomas Associates Ltd Lakeside House 1 Furzeground Way
	UB11 1BD
Quotation No:	Q14-00127
Order No:	P9273J732.4
Customer Reference:	J732
Date Received:	27/10/2015
Date Approved:	02/11/2015
Details:	32 Percy Street, London
Approved by:	J. WHAT
John Wilson, Operations Mar	nager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683



Sample Summary

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
43708	BH1 B 4.00	Not Provided	27/10/2015	Silty clayey loam	а
43709	BH1 D 5.75	Not Provided	27/10/2015	Clayey loam	а
43710	BH1 D 6.75	Not Provided	27/10/2015	Loamy sand	а
43711	BH1 D 9.55	Not Provided	27/10/2015	Clayey loam	а



		ELAB I	Reference	43708	43709	43710	43711	
	C	Customer I	Reference	В	D	D	D	
		Ś	Sample ID					
		Sar	nple Type	SOIL	SOIL	SOIL	SOIL	
		Sample	e Location	BH1	BH1	BH1	BH1	
		Depth (m)	4.00	5.75	6.75	9.55		
		Sam	pling Date					
Determinand	Codes	Units	LOD					
Anions								
Water Soluble Sulphate	Iphate M g/l 0.02							
Miscellaneous								
рН	М	pH units	0.1	8.1	8.4	8.4	8.3	



Method Summary Report No.: 15-04337

Parameter		Analysis Undertaken On	Date Method Tested Number		Technique	
Soil						
рН	М	Air dried sample	30/10/2015	113	Electromeric	
Water soluble anions	М	Air dried sample	29/10/2015	172	Ion Chromatography	



Unit A2 Windmill Road Ponswood Industrial Estate St Leonards on Sea East Sussex TN38 9BY Telephone: (01424) 718618 Facsimile: (01424) 729911 info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	15-04338
Issue:	1
Date of Issue:	03/11/2015
Contact:	Roni Savage
Customer Details:	Jomas Associates Ltd Lakeside House 1 Furzeground Way
	UB11 1BD
Quotation No:	Q14-00127
Order No:	P9273J732.3
Customer Reference:	J732
Date Received:	27/10/2015
Date Approved:	03/11/2015
Details:	32 Percy Street, London
Approved by:	J. WHAT
John Wilson, Operations Mar	nager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683



Sample Summary

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
43712	BH1 D 3.50	Not Provided	27/10/2015	Sandy silty loam	ac
43713	BH1 D 4.75	Not Provided	27/10/2015	Sandy silty loam	ac
43714	BH1 D 7.75	Not Provided	27/10/2015		а
43715	BH1 D 9.50	Not Provided	27/10/2015		а



			1		
		ELAB	Reference	43712	43713
	C	Customer	Reference	D	D
			Sample ID	-	-
		Sar	mple Type	SOIL	SOIL
		Sample	e Location	BH1	BH1
		Sample	Depth (m)	3.50	4.75
		, Sam	nlina Date		
	a .				
Determinand	Codes	Units	LOD		
Metals					
Arsenic	М	mg/kg	1	11.7	19.3
Cadmium	М	mg/kg	0.5	< 0.5	< 0.5
Chromium	М	mg/kg	5	19.8	23.6
Copper	М	mg/kg	5	55.8	171
Lead	М	mg/kg	5	360	535
Mercury	М	mg/kg	0.5	1.2	3.1
Nickel	М	mg/kg	5	15.2	24.8
Selenium	M	mg/kg	1	< 1.0	1.1
Zinc	М	mg/kg	5	134	131
Anions					
Water Soluble Sulphate	М	a/l	0.02	1.37	0.26
Inorganics		9/1	0.02	1.07	0.20
inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8
Total Cyanide	M	mg/kg	1	< 1.0	< 1.0
Acid Soluble Sulphate (SO4)	U	%SO4	0.02	0.36	0.09
Water Soluble Boron	N	mg/kg	0.5	1.5	1.2
Miscellaneous					
Acid Neutralisation Capacity	N	mol/kg	0.1	< 0.1	< 0.1
Loss On Ignition (450°C)	М	%	0.01	2.09	4.63
pH	М	pH units	0.1	8.5	7.9
Total Organic Carbon	N	%	0.01	1.4	3.3
Organics					
	N	ma/ka	1	c < 10	c < 10
	N	mg/kg	1	c < 1.0	0 < 1.0
>C12-C16 BCB	N	mg/kg	1	c < 1.0	c < 1.0
>C16-C21 BCB	N	mg/kg	1	c < 1.0	c < 1.0
>C10-C21 BCB	N	mg/kg	1	0 2 9	
>C35-C40 BCB	N	mg/kg	1	c < 10	c < 10
Total (>C8-C40) BCB	N	mg/kg	1	c 28	c 1 9
	IN	шу/ку	1	0 2.0	0 1.3
Phenois					
Total Monohydric Phenols	N	mg/kg	5	c < 5	c < 5
Polyaromatic hydrocarbon	S				
Naphthalene	М	mg/kg	0.1	c < 0.1	c < 0.1
Acenaphthylene	М	mg/kg	0.1	c < 0.1	c < 0.1
Acenaphthene	М	ma/ka	0.1	c 0.1	c < 0.1
Fluorene	М	ma/ka	0.1	c < 0.1	c < 0.1
Phenanthrene	M	ma/ka	0.1	c 0.5	c 0.2
Anthracene	М	mg/kg	0.1	c 0.1	c < 0.1
Fluoranthene	М	ma/ka	0.1	c 0.5	c 0.2
Pyrene	М	ma/ka	0.1	c 0.5	c 0.1
Benzo(a)anthracene	М	ma/ka	0.1	c 0.3	c < 0.1
Chrysene	M	mg/ka	0.1	c 0.5	c < 0.1
Benzo (b) fluoranthene	M	ma/ka	0.1	c < 0.1	c < 0.1
Benzo(k)fluoranthene	M	ma/ka	0.1	c < 0.1	c < 0.1
Benzo (a) pyrene	M	ma/ka	0,1	c 0.3	c 0.1
Indeno (1.2.3-cd) pyrene	M	ma/ka	0,1	c 0.3	c < 0.1
Dibenzo(a,h)anthracene	M	ma/ka	0.1	c < 0.1	c < 0.1
Benzola.h.ilpervlene	M	ma/ka	0.1	c 0.2	c < 0.1
Total PAH(16)	M	ma/ka	0.4	c 3.6	c 0.7
Total PAH (Including Coronene)	N	ma/ka	2	c 4	c < 2



	ELAB Reference									
	Customer Reference									
			Sample ID							
		Sa	mple Type	SOIL	SOIL					
		Sampl	e Location	BH1	BH1					
		Sample	Depth (m)	3.50	4.75					
	Sampling Date									
Determinand	Codes	Units	LOD							
BTEX										
Total BTEX	М	mg/kg	0.01	c 0.01	c < 0.01					
Total Petroleum Hydrocarb	ons									
Mineral Oil	U	mg/kg	5	c < 5	c < 5					
PCB (ICES 7 congeners)										
PCB (Total of 7 Congeners)	М	mg/kg	0.03	c < 0.03	c < 0.03					



Results Summary Report No.: 15-04338

WAC Analysis								
Flah Ref [.]	43713					Landf	ill Waste Ac	ceptance
	101 10						Criteria Lin	nits
Sample Date:							Stable Non-	
Sample ID:	BH1 D						reactive	
Depth (m)	4.75					Inert Waste	Hazardous	Hazardous
Site:		32 Pe	ercy Street	t, London		Landfill	waste in non- bazardous	Waste Landfill
							Landfill	
Determinand		Code	Units					
Total Organic Carbon		N	%		3.30	3	5	6
Loss on Ignition		М	%		4.6			10
Total BTEX		М	mg/kg		< 0.01	6		
Total PCBs (7 congeners)		М	mg/kg		< 0.03	1		
TPH Total WAC		М	mg/kg		< 5	500		
Total (of 17) PAHs		Ν	mg/kg		< 2	100		
рН		М			7.9		>6	
Acid Neutralisation Capacity		N	mol/kg		< 0.1		To evaluate	To evaluate
Eluate Analysis			10:1		10:1	Limit values	s for complian	ce leaching test
			mg/l		mg/kg	using B	S EN 12457-2 a	it L/S 10 l/kg
Arsenic		Ν	0.011		0.11	0.5	2	25
Barium		Ν	0.011		0.11	20	100	300
Cadmium		Ν	< 0.001		< 0.01	0.04	1	5
Chromium		Ν	< 0.005		< 0.05	0.5	10	70
Copper		Ν	< 0.005		< 0.05	2	50	100
Mercury		Ν	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		Ν	0.019		0.19	0.5	10	30
Nickel		Ν	0.001		< 0.05	0.4	10	40
Lead		Ν	0.002		< 0.05	0.5	10	50
Antimony		Ν	< 0.005		< 0.05	0.06	0.7	5
Selenium		Ν	< 0.005		< 0.05	0.1	0.5	7
Zinc		Ν	< 0.005		< 0.05	4	50	200
Chloride		Ν	< 5		< 50	800	15000	25000
Fluoride		Ν	< 5		< 10	10	150	500
Sulphate		Ν	34		338.00	1000	20000	50000
Total Dissolved Solids		Ν	120		1200.00	4000	60000	100000
Phenol Index		Ν	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		Ν	8.860		89.00	500	800	1000
Leach Test Information	า							
рН		N	8.0					
Conductivity (uS/cm)		N	227					
Dry mass of test portion (g)			101.000					
Dry Matter (%)			80					
Moisture (%)			25					
Eluent Volume (ml)			963					
<u></u>								

Results are expressed on a dry weight basis, after correction for moisture content where applicable

Stated limits are for guidance only and ELAB cannot be held responsible for any discrepencies with current legislation



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Results Summary Report No.: 15-04338

WAC Analysis								
Flah Ref	43712					Landf	ill Waste Ac	ceptance
	10/12						Criteria Lim	nits
Sample Date:							Stable Non-	
Sample ID:	BH1 D						reactive	
Depth (m)	3.5					Inert Waste	Hazardous	Hazardous
Site:		32 Pe	ercy Street	t, London		Landfill	waste in non- hazardous	Waste Landfill
							Landfill	
Determinand		Code	Units					
Total Organic Carbon		N	%		1.40	3	5	6
Loss on Ignition		М	%		2.1			10
Total BTEX		М	mg/kg		0.01	6		
Total PCBs (7 congeners)		М	mg/kg		< 0.03	1		
TPH Total WAC		М	mg/kg		< 5	500		
Total (of 17) PAHs		N	mg/kg		4.0	100		
рН		М			8.5		>6	
Acid Neutralisation Capacity		N	mol/kg		< 0.1		To evaluate	To evaluate
Eluate Analysis			10:1		10:1	Limit values	s for complian	ce leaching test
			mg/l		mg/kg	using B	S EN 12457-2 a	t L/S 10 l/kg
Arsenic		Ν	< 0.005		< 0.05	0.5	2	25
Barium		Ν	0.018		0.18	20	100	300
Cadmium		Ν	< 0.001		< 0.01	0.04	1	5
Chromium		Ν	< 0.005		< 0.05	0.5	10	70
Copper		Ν	< 0.005		< 0.05	2	50	100
Mercury		Ν	< 0.005		< 0.01	0.01	0.2	2
Molybdenum		Ν	< 0.005		< 0.05	0.5	10	30
Nickel		Ν	0.001		< 0.05	0.4	10	40
Lead		Ν	< 0.001		< 0.05	0.5	10	50
Antimony		Ν	< 0.005		< 0.05	0.06	0.7	5
Selenium		Ν	< 0.005		< 0.05	0.1	0.5	7
Zinc		Ν	0.005		0.05	4	50	200
Chloride		Ν	< 5		< 50	800	15000	25000
Fluoride		Ν	< 5		< 10	10	150	500
Sulphate		Ν	218		2180.00	1000	20000	50000
Total Dissolved Solids		Ν	430		4300.00	4000	60000	100000
Phenol Index		Ν	< 0.01		< 0.10	1	-	-
Dissolved Organic Carbon		Ν	4.070		41.00	500	800	1000
Leach Test Information)							
рН		Ν	8.2					
Conductivity (uS/cm)		N	574					
Dry mass of test portion (g)			100.000					
Dry Matter (%)			87					
Moisture (%)			15					
Eluent Volume (ml)			971					

Results are expressed on a dry weight basis, after correction for moisture content where applicable

Stated limits are for guidance only and ELAB cannot be held responsible for any discrepencies with current legislation



Method Summary Report No.: 15-04338

Parameter	Codes	Analysis Undertaken	Date Tostod	Method	Technique
Soil			Testeu	Number	
Hexavalent chromium	N	As submitted sample	30/10/2015	110	Colorimetry
Acid Soluble Sulphate	U	Air dried sample	02/11/2015	115	Ion Chromatography
Aqua regia extractable metals	М	Air dried sample	30/10/2015	118	ICPMS
Phenols in solids	М	As submitted sample	29/10/2015	121	HPLC
Polyaromatic hydrocarbons (GC-FID)	М	As submitted sample	28/10/2015	133	GC-FID
Water soluble anions	М	Air dried sample	29/10/2015	172	Ion Chromatography
Water soluble boron	N	Air dried sample	29/10/2015	202	Colorimetry
Total cyanide	М	As submitted sample	30/10/2015	204	Colorimetry
Basic carbon banding in soil	N	As submitted sample	28/10/2015	218	GC-FID
Leachate					
Arsenic*	N		03/11/2015	101	ICPMS
Cadmium*	N		03/11/2015	101	ICPMS
Chromium*	N		03/11/2015	101	ICPMS
Lead*	N		03/11/2015	101	ICPMS
Nickel*	N		03/11/2015	101	ICPMS
Copper*	N		03/11/2015	101	ICPMS
Zinc*	N		03/11/2015	101	ICPMS
Mercury*	N		03/11/2015	101	ICPMS
Selenium*	N		03/11/2015	101	ICPMS
Antimony	N		03/11/2015	101	ICPMS
Barium*	N		03/11/2015	101	ICPMS
Molybdenum*	N		03/11/2015	101	ICPMS
pH Value*	N		03/11/2015	113	Electrometric
Electrical Conductivity*	N		03/11/2015	136	Probe
Dissolved Organic Carbon	N		03/11/2015	102	TOC analyser
Chloride*	N		03/11/2015	131	Ion Chromatography
Fluoride*	N		03/11/2015	131	Ion Chromatography
Sulphate*	N		03/11/2015	131	Ion Chromatography
Total Dissolved Solids	N		03/11/2015	144	Gravimetric
Phenol index	N		03/11/2015	121	HPLC
WAC Solids analysis	N				
pH Value**	М	Air dried sample	30/10/2015	113	Electrometric
Total Organic Carbon	N	Air dried sample	30/10/2015	210	IR
Loss on Ignition**	М	Air dried sample	02/11/2015	129	Gravimetric
Acid Neutralization Capacity to pH 7	N	Air dried sample	30/10/2015	NEN 737	Electrometric
Total BTEX**	М	As submitted sample	30/10/2015	181	GCMS
Mineral Oil**	U	As submitted sample	28/10/2015	117	GCFID
Total PCBs (7 congeners)	М	Air dried sample	29/10/2015	120	GCMS
Total PAH (17)**	N	As submitted sample	29/10/2015	133	GCFID

Tests marked N are not UKAS accredited



APPENDIX 4 – GEOTECHNICAL LABORATORY TEST RESULTS



LABORATORY REPORT



4043

Contract Number: PSL15/5299

Client's Reference: J732

Report Date: 05 November 2015

Client Name: Jomas Associates Lakeside House 1 Furzground Way Stockley Park UB11 1BD

For the attention of: Roni Savage

Contract Title:	32 Percy Street, London

 Date Received:
 28/10/2015

 Date Commenced:
 28/10/2015

 Date Completed:
 05/11/2015

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director) A Watkins (Director) M Beastall (Laboratory Manager)

An

D Lambe (Senior Technician) S Royle (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe, Doncaster DN4 0AR tel: +44 (0)844 815 6641 fax: +44 (0)844 815 6642 e-mail: rgunson@prosoils.co.uk awatkins@prosoils.co.uk Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
BH1		В	5.00	Brown very gravelly very sandy very silty CLAY.
BH1		В	7.00	Brown very sandy slightly silty GRAVEL.
BH1		В	8.00	Brown very sandy silty GRAVEL.
BH1		D	8.75	Brown gravelly sandy CLAY.
BH1		U	9.00	Soft brown slightly gravelly sandy CLAY.

	Compiled by	Date	Checked by	Date	Approved by	Date
est.	R	04/11/15	Du	05/11/15	Alis	05/11/15
Professional Soils Laboratory	22 DL	DCV STD	EET LONDON		Contract No:	PSL15/5299
			EE1, LONDON		Client Ref:	J732

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content %	Bulk Density Mg/m ³	Dry Density Mg/m ³	Particle Density Mg/m ³	Liquid Limit %	Plastic Limit %	Plasticity Index %	% Passing .425mm	Remarks
				Clause 3.2	Clause 7.2	Clause 7.2	Clause 8.2	Clause 4.3/4.4	Clause 5.3	Clause 5.4		
BH1		В	5.00	29				36	20	16	65	Intermediate plasticity CI.
BH1		D	8.75	27				42	20	22	81	Intermediate plasticity CI.
BH1		U	9.00	34				47	23	24	100	Intermediate plasticity CI.
SYMBOLS	: NP : N	on Plastic			* : Liquid L	imit and Plas	stic Limit Wo	et Sieved.				·

	Compiled by	Date	Checked by	Date	Approved by	Date
ed ed en el	R	03/11/15	Au	05/11/15	an	05/11/15
Professional Soils Laboratory	22 DE		Contract No:	PSL15/5299		
		KUI SIK	CEI, LUNDUN		Client Ref:	J732



Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2





Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2





Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure B.S. 1377 : Part7 : Clause 8 : 1990



Diamete	er (mm):	102.0	Height (mm):	194.0	Test:	100 m	m Single	Stage.	Undistur	bed		
Specimen	Moisture	Bulk	Dry	Cell	Corr. Max.	Shear	Failure	Mode		Remarks			
	Content	Density	Density	Pressure	Deviator	Strength	Strain	of	Sample tak	Sample taken from top of tube			
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	Stress	Cu	(%)	Failure	Rate of strain = 2 %/min				
					(kPa)	(kPa)			Latex Membrane used 0.2 mm thick			hickness,	
				θ_3	$(\theta_1 - \theta_3)_f$	$^{1}/_{2}(\theta_{1}-\theta_{3})_{f}$			Correction	applied	0.35	kPa	
А	31	1.91	1.46	200	51	25	10.3	Plastic	See summary of soil descriptions.				
									Checked	Date	Approved	Date	
									de	05/11/15	Du	05/11/15	
PSL Professional Soils Laboratory				32 I	PERCYS	STREET	, LOND	OON.		Contra PSL1	act No: 5/5299		



APPENDIX 5 – SOIL GAS MONITORING TEST RESULTS

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET											
Site: J732 Percy Street	Operative(s): SB	s): SB Date: 29/10/15 Time: 11.50 Round: 1 Page: 1									
MONITORING EQUIPMENT											
Instrument Type Instrument Make Serial No. Date Last Calibrated											
Analox	GA5000				28/04/2015						
PID	Phocheck tiger				26/08/2015						
Dip Meter	GeoTech										
		MONITORING CO	NDITIONS								
Weather Conditions: Cloudy	Weather Conditions: Cloudy Ground Conditions: Dry Temperature: 15°C										
Barometric Pressure (mbar): 1007 Barometric Pressure Trend (24hr): Steady Ambient Concentration: 0.2 %CH4, 0.2 %CO2, 21.1 %											

	MONITORING RESULTS													
Monitoring		Flow	Atmospheric	Methane	Methane	Carbon	Oxygen	vo	C (ppm)	Hydrogen	Carbon	Depth to	Depth to Base	
Location	Peak	Average	(mbar)	%	% LEL	Dioxide %	%	Peak	Average	(ppm)	(ppm)	water (mbgl)	of well (mbgl)	
BH1	0.0	-	1007	0.2	-	0.2	21.1	1.8	-	0	0	3.93	6.92	

GAS AND GROUNDWATER MONITORING BOREHOLE RECORD SHEET											
Site: J732 Percy Street	Operative(s): SB	tive(s): SB Date: 10/11/15 Time: 10.15 Round: 2 Page: 2									
MONITORING EQUIPMENT											
Instrument Type Instrument Make Serial No. Date Last Calibrated											
Analox	GA5000				28/04/2015						
PID	Phocheck tiger				26/08/2015						
Dip Meter	GeoTech										
		MONITORING CO	NDITIONS								
Weather Conditions: Cloudy	Weather Conditions: Cloudy Ground Conditions: Dry Temperature: 15°C										
Barometric Pressure (mbar): 1015 Barometric Pressure Trend (24hr): Steady Ambient Concentration: 0.3 %CH4, 0.1 %CO2, 21.1 %											

MONITORING RESULTS													
Monitoring Point Location	Flow		Atmospheric	Methane	Methane	Carbon	Oxygen	VOC (ppm)		Hydrogen	Carbon	Depth to	Depth to Base
	Peak	Average	(mbar)	%	% LEL	Dioxide %	%	Peak	Average	(ppm)	(ppm)	water (mbgl)	of well (mbgl)
BH1	+0.3	-	1015	0.3	-	0.2	20.9	0.0	-	0	0	3.91	6.92