Oakleigh Road South Depot

Phase 2 Ground Investigation & Assessment

April 2015



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Quality Management

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1. Introduction

1.1 Appointment

- 1.1.1 Capita Property and Infrastructure Ltd ("Capita") was commissioned by the London Borough of Barnet (LBB) to undertake an intrusive Phase 2 Ground Investigation and Assessment for the proposed relocation of Depot Facilities to a site off Oakleigh Road South, London.
- 1.1.2 A site location plan and an existing site layout plan are presented in Figure 1 of Appendix A.

1.2 Proposed Development

- 1.2.1 Development proposals are being considered to re-develop the site in order to relocate Waste Management and Depot Facilities to the Oakleigh Road South site.
- 1.2.2 The elements to be relocated and the facilities required include refuelling pump, vehicle washing facility, office facilities and associated staff facilities for various vehicle fleets; a maintenance facility; winter gritting and bulking station facilities.
- 1.2.3 A preliminary proposed layout drawing is included within Appendix A.

1.3 Background & Context

- 1.3.1 Capita has previously issued a "Phase 1 Geo-Environmental Desk Study" report for the subject site and proposed development. The full report reference is as follows:
 - Phase 1 Geo-Environmental Desk Study for Oakleigh Road South Depot on behalf of London Borough of Barnet. Capita Ref CS078406-P1DS-01 January 2015.
- 1.3.2 The conclusion of the desk study report was that in general the contamination potential for the subject site (including ground gas, its current condition and with no mitigation measures considered) was generally LOW to MODERATE.
- 1.3.3 In summary, rail sidings initially passed through the west of the site. Later the subject site was redeveloped as a warehouse, with a car park to the south and tanks along the base of the southern platform.
- 1.3.4 Although it was concluded that potentially significant soil contamination may be present associated with historic (particularly the rail sidings) land-uses, the sensitivity of the proposed end-use was considered to be very low.
- 1.3.5 The majority of the site is indicated to be underlain by the London Clay Formation.
- 1.3.6 On the basis of the above, a comprehensive "Phase 2" intrusive investigation and assessment was recommended to address the development specific issues relating to the proposed development and to determine the contamination status at the site.



1.4 Objective and Scope of Work

- 1.4.1 The objectives of this assessment were to obtain geotechnical design parameters for the proposed development and to establish the nature of the shallow ground conditions from a "land contamination" perspective.
- 1.4.2 It was therefore necessary to:
 - 1. Characterise the geological and hydrogeological conditions beneath the site;
 - 2. Collect sufficient information to allow a development specific geotechnical appraisal to be undertaken;
 - 3. Quantify the level of ground contamination present within any Made Ground and shallow strata across the site and assess this in terms of the proposed development; and
 - 4. Provide recommendations for further detailed investigation and/or cost effective remediation/mitigation where required.
- 1.4.3 To achieve the objectives the following scope of work was defined and undertaken:
 - 2no cable percussion boreholes, including in-situ geotechnical testing;
 - 6no trial pits;
 - Sampling and laboratory testing of soil for chemical and geotechnical purposes; and
 - Provision of a combined factual and interpretive report.

2. Site Investigation

2.1 Intrusive Works

- 2.1.1 The intrusive works reported herein were undertaken by TerraConsult Ltd and were carried out under the supervision and direction of a suitably qualified and experienced geo-environmental engineer to the specification of Capita.
- 2.1.2 In order to achieve the project objectives, an intrusive investigation was completed across the subject site between the 2nd and the 4th March 2015 and comprised:
 - Formation of 2no cable percussive boreholes with associated logging, sampling, and standard penetration testing; and
 - Formation of 6no trial pits with associated logging and sampling.
- 2.1.3 9no trial pits were originally planned, however TP105 and TP107 were inaccessible due to bailed waste storage and car parking respectively. TP106 was aborted due to services in the area.
- 2.1.4 The boreholes were located to give a reasonable site wide coverage; to target potential on-site sources of contamination and to gather geotechnical information for the structures proposed for the site.
- 2.1.5 BH101 was located in the south of the site in order to investigate the makeup of the raised platform. TP101 and TP109 were located to investigate the previous use of the area as rail sidings and TP108 was located close to the existing electricity substation to investigate any associated potential contamination.
- 2.1.6 In-situ strength tests comprising Standard Penetration Tests (SPT's) were undertaken in the cable percussion boreholes at regular intervals and at the final depth.
- 2.1.7 Exploratory hole locations are shown on the survey drawing in Appendix B.
- 2.1.8 TerraConsult have provided a Factual Report on the ground investigation which includes a summary of the works carried out, the exploratory hole logs and full chemical and geotechnical laboratory reports. A copy of their Factual Report is provided in Appendix B.

2.2 Soil Sampling

- 2.2.1 Soil samples comprising disturbed (bulk bag, glass jar and tub) and undisturbed samples were collected from the exploratory holes at distinct changes in lithology and across a range of depths/strata across the site in order to be tested for a range of chemical parameters, as well as any soils exhibiting palpable visual and/or olfactory signs of contamination.
- 2.2.2 Soil samples were selected for laboratory analysis by a Capita engineer based on a review of the site findings.
- 2.2.3 Samples selected for chemical analysis were transferred to laboratory prepared glass jars and/or plastic tubs and stored in pre-chilled cool boxes prior to dispatch to the laboratory.



2.3 Geotechnical Testing

- 2.3.1 16no soil samples were submitted for geotechnical laboratory analysis at PSL, Doncaster.
- 2.3.2 In order to obtain geotechnical parameters for the proposed development soil samples were scheduled for the following tests:
 - Moisture Content determination;
 - Atterburg Limits; and
 - Quick Undrained Shear Strength in triaxial compression.
- 2.3.3 A further 11no soil samples were submitted for pH and BRE sulphate suite analysis at DETS, Consett.
- 2.3.4 The results of the geotechnical testing are presented in the laboratory reports in Appendix B.

2.4 Chemical Testing

- 2.4.1 In order to quantify the level of contamination at the site, 10no soil samples were selected for laboratory analysis at DETS, Consett.
- 2.4.2 Soil samples were tested for one or more of the following:
 - Metals and Semi Metals: As, Cd, Cr, Cu, Ni, Pb, Hg, Se, and Zn;
 - Non-metallic Inorganics: pH and water soluble sulphate (SO₄);
 - Poly Aromatic Hydrocarbons (PAHs 16no);
 - Asbestos;
 - Banded TPH;
 - TPHCWG; and
 - Polychlorinated Biphenyls.
- 2.4.3 The results of the chemical testing are presented in the laboratory reports in Appendix B.

3. Ground Conditions

3.1 Stratigraphy

- 3.1.1 The ground conditions encountered during the intrusive investigation largely confirmed the anticipated geology and in general comprised Made Ground over London Clay.
- 3.1.2 The following table summarises the current findings:

Lithology	Depths to base of unit (mbgl)	Thickness Range (m)
Made Ground	1.5 to 7.1	1.5 to 7.1
London Clay	>11	>7.55

3.2 Made Ground

- 3.2.1 Made Ground was encountered in all of the exploratory holes to a maximum depth of 7.1mbgl. The Made Ground appears to thicken towards the north of the site.
- 3.2.2 Made Ground deposits are variable across the site but were generally found to comprise an upper horizon of clayey gravelly sand with oversize brick, concrete, metal, wood and plastic. This was typically underlain by more cohesive deposits comprising soft to firm brown slightly sandy slightly gravelly clay.
- 3.2.3 SPTs undertaken within the Made Ground deposits gave N-values in the range of 2 to11; indicating the variable soft to firm nature of the materials.
- 3.2.4 Geotechnical classification tests undertaken on 5no samples of cohesive Made Ground between depths of 1.00 and 5.95mbgl indicated the following:

Test	Range of Values
Natural Moisture Content (%)	31 – 54
Liquid Limit (%)	66 – 77
Plastic Limit (%)	28 – 35
Plasticity Index (%)	38 – 46
Fraction <0.425mm (%)	81 – 100

Summary of Classification Test Results

- 3.2.5 The classification test results generally indicate clay and slightly gravelly sandy clay of high to very high plasticity and the material has a medium to high shrinkage/swell potential on change of moisture content (BRE 240, 1993).
- 3.2.6 9no samples of Made Ground were submitted for chemical analysis for pH and sulphates. pH was recorded between 7.7 and 11.0 and water soluble sulphate between 310 and 2300mg/l.
 Total sulphur and total sulphate was recorded between 0.03-1.1% and 0.06-3.8% respectively.



3.3 London Clay

- 3.3.1 Natural strata of the London Clay Formation were encountered in the cable percussion boreholes and at the base of TP102 and TP103 at depths of between 1.5 and 7.1mbgl.
- 3.3.2 The London Clay is predominantly cohesive; however pockets of orange mottled grey slightly clayey slightly gravelly sand was identified in the trial pits.
- 3.3.3 The cohesive London Clay generally comprised firm to stiff brown slightly gravelly CLAY.
- 3.3.4 In-situ penetration testing within the strata gave N-values ranging from 10 to 20 indicating firm to stiff consistency.
- 3.3.5 Geotechnical classification tests undertaken on 10no samples of London Clay between depths of 3.00 and 10.95mbgl indicated the following:

Test	Range of Values
Natural Moisture Content (%)	15 – 31
Liquid Limit (%)	40 – 78
Plastic Limit (%)	21 – 32
Plasticity Index (%)	19 – 46
Fraction <0.425mm (%)	62 – 100

Summary of Classification Test Results

- 3.3.6 The classification test results generally indicate slightly gravelly clay of intermediate to very high plasticity and the material has a low to high shrinkage/swell potential on change of moisture content (BRE 240, 1993).
- 3.3.7 3no "undisturbed" samples of London Clay were submitted for quick undrained triaxial compression tests to determine the undrained shear strength (cohesion) of the material. A summary of the results is presented in the following table:

Exploratory Hole ID	Depth (m)	Cohesion (kPa)	Mode of Failure
BH101	5.50-5.95	58	Plastic
BH101	8.50-8.95	124	Brittle
BH102	10.50-10.95	100	Plastic

Summary of Undrained Triaxial Compression Test Results

- 3.3.8 The cohesion/shear strength of the strata has also been estimated based on the relationship between shear strength (c), plasticity index and SPT N value (after Stroud, 1975) whereby $c = f_1 N$. A mean plasticity index of around (39%) has been used to determine coefficient $f_1 = 4.3$.
- 3.3.9 The calculated shear strengths together with the laboratory recorded shear strengths are presented as a Depth Plot on Figure 2 in Appendix A.



3.3.10 2no samples of London Clay were submitted for chemical analysis for pH and sulphates. pH was recorded at 7.7 and 8.2 and water soluble sulphate at 690 and 2300mg/l. Total sulphur and total sulphate was recorded at 0.09-0.54% and 0.12-1.3% respectively.

3.4 Observations

- 3.4.1 Made Ground was recorded in all of the exploratory holes and frequently contained deleterious material including tarmac, plastic, metal and brick. A piece of asbestos sheeting was also identified in TP101 and was confirmed to be asbestos from the laboratory chemical analysis of the surrounding soils.
- 3.4.2 "Hydrocarbon odours" and "black oily grease" was recorded in TP104, 108 and 109 as described in the borehole logs (Appendix B in TerraConsult's factual report). These were generally recorded in the upper 2m of Made Ground. Although these observations were made in the field, the chemical test results confirm the low concentration of hydrocarbons with respect to the proposed end-use (see Section 5 for further details of this assessment).

3.5 Groundwater

- 3.5.1 Groundwater entries were recorded during hole formation in a number of exploratory hole positions at depths between 1.20mbgl to 7.00mbgl.
- 3.5.2 Groundwater was generally struck at shallower depths to the south of the site, and appears to be perched water in the Made Ground above the cohesive London Clay.
- 3.5.3 It should be appreciated that ground and groundwater conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.
- 3.5.4 It should also be noted that groundwater levels may be affected by seasonal variations such as rainfall and that no account can be taken of such variations in this report due to the short monitoring period.

4. Geotechnical Appraisal

4.1 Proposed Development

- 4.1.1 Development proposals are being considered to re-develop the site in order to relocate Waste Management and Depot Facilities to the Oakleigh Road South site.
- 4.1.2 The elements to be relocated and the facilities required include refuelling pump, vehicle washing facility, office facilities and associated staff facilities for various vehicle fleets; a maintenance facility; winter gritting and bulking station facilities.

4.2 Ground Conditions

- 4.2.1 The intrusive investigation information together with the known development history of the site (refer to Geo-Environmental Desk Study for further information and historic map extracts) indicates that the site and surrounding area originally sloped to the north, however to create a suitable development platform (e.g. for sidings; thus the requirement to have the site at the same level as the nearby railway) fill was imported to raise levels across the majority of the site.
- 4.2.2 The Made Ground therefore forms a "wedge" of fill which generally thickens to the north between BH101 and BH102. The ground levels along Oakleigh Road (rising to the north) suggest that the fill may progressively thin between BH102 and the northern extremity of the site; however in the absence of a borehole at the northern end of the site this has not been proven.
- 4.2.3 The borehole logs indicate that the raised area in the south of the site is largely a relic feature of the sloping site. Whilst there is ~2m of Made Ground/Reworked London Clay on the top of the raised area, the majority of the volume of the raised area is understood to be natural London Clay.
- 4.2.4 The depth to natural London Clay in the approximate centre of the site is ~7mbgl, as recorded in BH102.

4.3 Foundations & Floor Slabs

- 4.3.1 Given the variable thickness and poor competence of the Made Ground deposits across the site a piled foundation solution will be required for new structures.
- 4.3.2 Pile designs (in terms of depths, and method of installation) would be dependent upon the required working loads and should be undertaken in conjunction with a reputable, specialist, piling contractor; ideally with local experience.
- 4.3.3 Ground bearing floor slabs (bearing on granular Made Ground) will be suitable however the formation at all levels and in all areas should be proof-rolled prior to pavement construction, and any soft zones or hard spots thus revealed should be excavated/broken out, with the resulting excavation in-filled with appropriately graded engineered granular fill.



4.3.4 On the basis that pile foundations is the preferred foundation solution, suspended floor slabs may be more appropriate for smaller structures e.g. office buildings.

4.4 Pavement and Road Design

- 4.4.1 In consideration of the ground conditions encountered, it is likely that the pavement subgrade exposed at formation levels will comprise granular Made Ground.
- 4.4.2 Pavement and road design should be based upon a suitable (equilibrium) CBR value for such formation soils. Reference has been made to Table 5.1 'Equilibrium Subgrade CBR Estimation' in IAN 73/06 (Highways Agency, 2009) and from this it is recommended that new road pavement and road construction design should be based upon (an estimated) CBR value of between 3-5%.
- 4.4.3 However, the design value will need to be reviewed and confirmed by suitable in-situ testing at formation levels following earthwork operations and prior to pavement construction.
- 4.4.4 Notwithstanding, the formation at all levels and in all areas should be proof-rolled prior to pavement construction, and any soft zones thus revealed should be excavated out, with the resulting excavation in-filled with appropriately graded engineered granular fill.

4.5 Concrete Classification

- 4.5.1 Design/mix of buried concrete should be undertaken in accordance with the BRE Special Digest 1 (2005).
- 4.5.2 A summary of the soil chemical results pertinent to concrete classification is presented in the following table.

Matrix	Test	Range of Values
Soil	рН	7.7 – 11.0
	Sulphate (water sol 2:1) (mg/l)	310 - 2300
	Total Sulphur (S) (%)	0.03-1.10
	Total Sulphate (SO4) (%)	0.06-0.38

4.5.3 According to the water soluble sulphate results only the site would fall into Design Sulphate Class" DS-3. However in consideration of the total potential sulphate, the results fall within "Design Sulphate Class" DS-5, and the "Aggressive Chemical Environment for Concrete" (ACEC) class for the site is considered to be AC-4s. Design/mix of buried concrete should be undertaken in accordance with these classifications.



4.6 Excavations and Groundwater

- 4.6.1 Excavations at the site should be feasible using an appropriate scale of hydraulic plant. All excavations at the site will require adequate lateral support, or battering back to a safe angle, to ensure their stability.
- 4.6.2 Based on the available data, groundwater may be encountered in shallow excavations (i.e. <2.0mbgl) at the site. Should groundwater be encountered, appropriate control/dewatering provisions (e.g. sump and pump) should be employed to keep such excavations dry and prevent deterioration/softening of the exposed clay soils/formation.

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5. Contamination Assessment

5.1 Introduction

- 5.1.1 In line with CLR11 (DEFRA & EA, 2004), a Generic Quantitative Risk Assessment (GQRA) has been undertaken to determine the significance of the measured concentrations of contaminants from the chemical analysis.
- 5.1.2 The GQRA comprises the comparison of the measured concentrations with Generic Assessment Criteria (GACs).
- 5.1.3 The GACs used for the assessment of soil concentrations comprise Soil Guideline Values (SGVs) and values that have been derived using the CLEA model adopting the appropriate assumptions and input parameters provided in the SR series of reports.
- 5.1.4 In deriving the GACs for use on Brownfield sites we have assumed a "Sandy Soil" with 1% Soil Organic Matter.
- 5.1.5 The GQRA has been undertaken on the basis that the proposed development site falls under the "Commercial" land-use scenario as defined in SR3.
- 5.1.6 The relevant statistical tests have been undertaken where appropriate in accordance with guidance provided in CIEH & CLAIRE (2008).
- 5.1.7 The tables in Appendix C present the results of the GQRA and a summary of the findings is provided below.

5.2 Made Ground Analysis

- 5.2.1 10no samples of Made Ground have been analysed for potential contaminants of concern and assessed against the "Commercial" GACs.
- 5.2.2 pH was recorded between 7.7 and 11.0 which is representative of slightly alkaline to alkaline conditions and generally acceptable.
- 5.2.3 7no shallow soil samples were tested for:
 - Metals and semi-metals;
 - Total cyanide; and
 - PAHs.
- 5.2.4 None of the concentrations or 95th percentile concentrations of the metals exceeded their defined GACs.
- 5.2.5 None of the concentrations or 95th percentile concentrations of total cyanide exceeded the defined GAC.
- 5.2.6 All of the concentrations and 95th percentile concentrations of the PAHs passed their defined GACs.



- 5.2.7 5no samples were submitted for asbestos screen. Small bundles of Chrysotile were detected in the sample from 0.5mbgl in TP101.
- 5.2.8 3no samples were submitted for Total Petroleum Hydrocarbons (CWG), all of the concentrations were found to be below the laboratory method detection limit and therefore pass their respective GACs.
- 5.2.9 1no sample was tested for Banded Petroleum Hydrocarbons; all of the concentrations were recorded below the relevant GACs.
- 5.2.10 1no sample was tested for Poly Chlorinated Biphenyls; the concentration was recorded below the laboratory method detection limit.
- 5.2.11 1no sample was submitted for Semi Volatile Organic Compounds, all of the concentrations were recorded below the laboratory method detection limit.

5.3 Conclusions

- 5.3.1 Sampling and testing of the shallow soils has been undertaken at the site to quantify the level of contamination that could potentially be exposed at the surface in the proposed development.
- 5.3.2 In terms of the proposed redevelopment of the site for "commercial" end-use, the level of contamination in the shallow soils can generally be considered negligible and the site can be considered suitable for use.

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6. Other Development Considerations

6.1 Waste Arisings

- 6.1.1 On the basis of the current information it is likely that the bulk of the natural soils would be classifiable as "Inert" and the Made Ground deposits as "Non-hazardous" for landfill disposal.
- 6.1.2 Small bundles of Chrysotile were identified in TP101 however no asbestos containing materials (ACM) was identified in the remainder of the Trial Pits/Made Ground soils. TP101 was formed through what appears to be waste materials/soils deposited up against the raised area. It is therefore likely that this represents a "hotspot" in terms of ACM in soil and can be dealt with in isolation.
- 6.1.3 It should be noted that soils containing loose asbestos fibres or ACM fragments with concentrations of 0.1% asbestos or greater are classified as Hazardous Waste. An asbestos specialist should be appointed to oversee any excavations/management of soils in the area of TP101 such that the risks regarding potential negative impacts (e.g. release of airborne fibres, cross-contamination of soils etc) are appropriately mitigated.
- 6.1.4 An appropriate waste characterisation can only be undertaken on the material due to be disposed of via further chemical testing which should be completed prior to making disposal arrangements. In all cases where excess soils require off-site disposal, the materials need to be managed under the appropriate legislation and consideration given to any remedial techniques that could be used to improve the soil.
- 6.1.5 For Inert Waste disposal (and in the event of Hazardous Waste disposal), allowance will need to be made for adequate Waste Acceptance Criteria (WAC) testing with appropriate consideration of the additional time and cost associated with this.

6.2 Health, Safety & Environment

- 6.2.1 Despite the findings of the testing there remains a potential for more-significantly impacted soils to be encountered; consideration should therefore be given to the level of PPE that should be provided to future site operatives.
- 6.2.2 All work on site should be conducted in accordance with appropriate Health and Safety guidance, with particular reference to HSG66 (HSE, 1991).
- 6.2.3 Care should be taken to minimise the risk of potentially contaminative incidents occurring during redevelopment. Good working practices should be adopted during construction works in order to minimise the risk of contamination occurring as a result of spillage or leakage of fuels, oils or chemicals stored or used at the site during re-development. All such materials should be sited on an impervious base within a bund and should be adequately secured. In particular, care should be taken to prevent fuel, oils or other mobile contamination sources from entering any surface water drains at the site.



6.2.4 Throughout any redevelopment works, due regard should be given to potential detrimental effects on the surroundings including noise, vibration, odour and dust.

6.3 Potable Water Supply

- 6.3.1 There are currently no (fully adopted) national standards for the protection of potable water supply pipes in potentially contaminated ground. However the UKWIR has published guidance in this respect and site testing should be undertaken with due recognition of this guidance.
- 6.3.2 On the basis of the ground conditions encountered, no specific protection measures are envisaged for the subject site however it is recommended that consultation is undertaken with the local supplier to confirm this.



7. References

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Oakleigh Road South Depot April 2015

Appendix A

Appendix A Figures & Drawings



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P12 Security gatehouse & C Materials hatches adde widened to 3.5m. Exter	EB Office bu d. Priva nal Ligh	EWD uildings enla acy fence ac nting Colum	AM arged. Ke Ided. Tre ns addec	12/06/15 y and e screen I
P11 External steps omitted.	EB 1 comn	EWD nercial park	DS ing space	02/06/15 e added.
P10 Access Road, weighbri	EB dge upo	EWD dated	DS	22/05/15
			D 0	40/05/45

EB EWD DS 18/05/15 Road Markings and perimeter fence added.

P08 EB EWD DS 14/05/15 Parking deck omitted and new parking layout for staff & commercial vehicles. Vehicle Maintenance Building (VMC) size reduced. New traffic flow system to VMC. Stand 10no bikes, Barrier gate and island added.

P07 EB EWD DS 11/05/15 Omitted Automated Vehicle Wash, security gates relocated, office and welfare building updated, telegraph poles and indicative landscape steps shown

· · · ·	•			
P06 OS Licence No, added.	EB	EWD	DS	07/05/15
P05 Weigh Bridge and Food	EB Contai	EWD ners relocate	DS d	29/04/15
P04 Road Lines Added	EB	EWD	DS	23/04/15
P03 Site Layout amended & Preliminary FF levels ac	EB sheet s lded.	EWD ize and scale	DS e chang	23/04/15 ed.
P02 Visitor Parking relocated	EB d. Refer	EWD to notes	DS	05/03/15

EB EWD

Plan repositioned to show existing access to Oakleigh Rd.

DS 03/03/15

Status

Rev/Description By Checked Approved Date Purpose of Issue

PLANNING

Client

Project



Oakleigh Road South Depot

Drawing Proposed Site Master Plan

Scale @ A1 1:500	Drawn EB	Check ED	ked App	roved S
Project No.			Date	
CS/07840	6	()2/03/1	5
Drawing Identifier project origin zone	level file t	(BS119 ype role	2:2007/Avanti C number	ompliant) revision
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St. David's House, Pascal Close, St Mellons, Cardiff. CF3 0LW

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Oakleigh Road South Depot April 2015

Appendix B

Appendix B Factual Report & Lab Reports











DRAINAGE STONE

March 2015 Report No 10086-R01 Issue 1

OAKLEIGH ROAD SOUTH, BARNET PHASE 2 SITE INVESTIGATION REPORT

Prepared for

Capita Property and Infrastructure Ltd

TerraConsult

OAKLEIGH ROAD SOUTH, BARNET

PHASE 2 SITE INVESTIGATION REPORT

March 2015

Carried Out For:

Capita Property and Infrastructure

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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No 10086-R01	Title
	OAKLEIGH ROAD SOUTH, BARNET PHASE 2 SITE INVESTIGATION REPORT

Issue History

Issue	Status	Date		Signature	Date
1	Final	March 2015	Prepared By: Victoria Smith FGS	Victoria Smith	20/03/2015
			Checked By: Sue Slaven MIEnvSc CEnv SiLC	Sue Slaven	20/03/2015
			Authorised By: Sue Slaven MIEnvSc CEnv SiLC	Sue Slaven	20/03/2015

DISCLAIMER

This consultancy contract was completed by TerraConsult (South) Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

TerraConsult (South) Ltd cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works. This report is issued solely to the client and TerraConsult cannot accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.



Page

OAKLEIGH ROAD SOUTH, BARNET

PHASE 2 SITE INVESTIGATION REPORT

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OAKLEIGH ROAD SOUTH, BARNET PHASE 2 SITE INVESTIGATION REPORT

1. INTRODUCTION

1.1 Background Information

TerraConsult (South) Limited (TerraConsult) was commissioned by Capita PLC to carry out a Phase 2 Site Investigation at the site located off Oakleigh Road South, Barnet. This report details the fieldwork undertaken and the factual information obtained during the intrusive investigation carried out on 3 and 4 March 2015, together with the laboratory certificates

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance with regards to site investigations and contaminated land, including (but not limited to):

- BS5930:1999+A2:2010: "Code of practice for site investigations";
- BS10175:2011+A1:2013 "Investigation of Potentially Contaminated Sites Code of Practice".

TerraConsult's service constraints and report limitations are presented in Appendix A.

This report has been prepared and authorised by staff that are competent as defined in the NPPF. In preparation of this report, it is assumed that any information provided to TerraConsult by the client and other parties in connection with the commission is accurate, complete and not misleading. TerraConsult cannot guarantee the accuracy or validity of this information.

1.2 Site Location and General Description

The site is indicated in Figure 2 below and the site location is summarised in Table 1:



Figure 1 Site Location Plan (not to scale)

(Drawing produced by Capita, Project and Drawing Number – CS078406-001)

Table 1 Summary Description of the Site and its Environment

Location	The site is located on a small road off Oakleigh Road South in Barnet, accessed opposite the New Southgate Recreation Ground. The road then runs south east, parallel to Oakleigh Road South, for 170m to the site entrance. The site lies approximately 500m north of the New Southgate rail station and is generally in an urban location with residential properties to the east and south east. A railway line that runs north west – south east is situated to the south west of the site, 20m at its closest in the south west corner.			
Grid Reference	528425, 192696			
Post Code	N11 1HJ			
Site Area	Approximately 1.8ha			
Site	The site boundaries of this site are defined by fences. The eastern boundary at the bottom of the embankment is defined by Coppies Grove, a small residential road. The western boundary is defined by a fence which separates the site from a depot which backs onto the railway line and the northern boundary is defined by the old access gates for the warehouse that was previously on site.			
Topography	The majority of the site is flat at approximately 45m above sea level with hardstanding in the north and a slight rise in ground level to the vegetated Made Ground in the central area. In the southern sector, there is a steep mound which plateaus at about 50m above sea level. The north eastern edge has a steep embankment with mature tree growth which leads down to the site boundary.			
Description	The site can be divided broadly into two sectors. The northern sector was covered with hardstanding and was in use as parking and a storage area for			

	crushed and cubed waste ready for transportation. This area was used daily by large vehicles. The southern sector was slightly raised from this hardstanding ground and was vegetated by grass and scrub with rubbish and hardcore materials on the surface. A tarmac road ran through the eastern sector at the top of the embankment, from the north to the base of the mound in the south.
Services	Service plans were made available for this site, with a BT line located in the northern area near the cubed waste and low voltage electricity cables run east north east from a small substation on site. No water or gas services are shown to be on site.

1.3 Development Proposals

It is understood that the site is to be redeveloped to an industrial/commercial end-use.

1.4 Objectives of the Investigation

The objectives of the investigation are to provide information with regards to contaminated land and ground conditions, as follows:

- to confirm the contaminative status of the ground in the areas of Made Ground;
- to assess the nature and depth of the Made Ground;
- to assess the nature and depth of the natural strata (as far as is practicable);
- to confirm the depth to groundwater (if encountered); and
- carry out chemical and geotechnical laboratory analysis.

In order to achieve the objectives, the specific site investigation carried out was as follows:

- 1 day of trial pitting involving six exploratory holes excavated across the site to a minimum depth of 1.5m below ground level (bgl);
- 2 days drilling two boreholes at opposing ends of the site to a depth of 10m;
- Collection of solid samples for contamination and geotechnical testing; and
- Description of the ground encountered in accordance with BS5930:1999+A2 2010 "Code of Practice for Site Investigations".

2. FIELDWORK

2.1 Investigation Strategy

The fieldwork was carried out on 3 and 4 March 2015. An engineer from TerraConsult was present to supervise the fieldwork and describe the ground encountered. Fieldwork procedures were carried out in accordance with the relevant sections of:

- British Drilling Association (2008). "Guidance for Safe Intrusive Activities on Contaminated or Potentially Contaminated Land";
- BS EN 1997-2:2007 [Eurocode 7 Part 2];
- BS5930:1999+A2 2010 "Code of Practice for Site Investigations";
- BS10175:2011+A1 2013 "Investigation of potentially contaminated sites Code of Practice".

Due to the risk of unexploded ordnance (UXO) within the site, an explosive ordnance disposal engineer (EOD engineer) was required to provide a watching brief during excavation of the trial pits and carry out a magnetometer survey within the boreholes. He was also responsible for ensuring the safety of all site personnel.

The positions and depths of the exploratory holes were provided by Capita Limited prior to the fieldwork. Nine trial pits were proposed, together with two boreholes. However, trial pits TP105 and TP107 scheduled for the northern sector were abandoned due to the constant use of the area by the site occupiers. TP106 was also inaccessible at the base of the embankment and its nearest location, at the top of the embankment, was possibly hindered by underground services. Borehole BH102 was also moved slightly southwards due to the original location falling within the turning area of the large waste collection lorries.

Excavated trial pit and borehole locations are shown on Figure 2.



Figure 2 Trial Pit and Borehole Location Plan (not to scale)

Adapted from the original proposal by Capita Property and Infrastructure Ltd, 24/2/15, Rev 1, Project and Drawing CS078406-001.

2.2 Trial Pits

A total of six trial pits were excavated using a JCB 3CX excavator; all completed within the vegetated raised ground in the central and southern parts of the site. The trial pits were excavated to depths ranging between 1.5m bgl (TP101) in the south western area and 3.7m bgl (TP108) in the north eastern area.

The majority of the trial pits were excavated with a toothless bucket due to the risk of UXO, except for the occasional change to toothed buckets under watch by the EOD Engineer to penetrate areas of highly compacted Made Ground and rubble.

The arisings were logged in accordance to the relevant standards by the TerraConsult Engineer. As part of the investigation, a number of soil samples were taken to aid the characterisation of the material. From each trial pit, this included:

- A sample from the upper part of the trial pit for collection in a medium amber glass jar, a small amber glass jar as environmental samples for chemical analysis and a 1ltr plastic tub for asbestos screening.
- A bulk sample of approximately 25kg to characterise the materials with geotechnical testing.

A record of the strata encountered in all the trial pits, samples taken and visual, olfactory and other observations are presented in Appendix B. After logging, all trial pits were photographed (a selection of which are presented in Appendix B) and then backfilled with the arisings.

2.3 Cable Percussive Holes

Two boreholes were completed using cable percussive techniques under subcontract by SI Drilling Ltd using a D2000 series rig. The boreholes were drilled to depths of 10m in BH101 and 11m in BH102. At each location, the arisings were logged by the Lead Driller and subsequently verified by the TerraConsult Engineer. As part of the drilling process, a number of soil samples were obtained and *in-situ* tests carried out to characterise the ground conditions, including:

- Small disturbed samples for geotechnical testing generally taken at intervals of 1m and upon encountering different stratum or any unusual arisings;
- Standard penetration tests were undertaken at approximately 1.5m intervals; and
- U100 samples were collected from the cohesive strata.

A record of the strata encountered in the boreholes, samples collected and other observations are presented in Appendix B. Both boreholes were backfilled with the arisings upon completion.

2.4 Summary of Ground Conditions

Ground conditions varied across the site. Made Ground was encountered in all trial pits and boreholes, although the composition and type varied from rubble and concrete blocks to a black stained, odorous, slightly sandy, slightly gravelly clay. Reworked brown and grey clays were identified in BH101 (2.6-2.9m), BH102 (1.9-7.1m), TP104 (2.0-3.4m), TP108 (1.3-3.7m) and TP109 (1-2m).

The Made Ground was generally described as dark to light brown slightly clayey silty slightly gravelly sand with occasional red brick fragments, whole red bricks, whole yellow bricks, wood fragments, concrete fragments, metal, plastic and gravel. Possibly an asbestos sheet was identified in the arisings of TP101. Made Ground reached an observed maximum thickness in BH102 down to 7.1m bgl.

At the base of TP102 and TP103 and in the boreholes, natural ground was encountered and was described as a soft to firm dark brown, becoming dark to light grey, slightly sandy slightly gravelly clay. In the trial pits, pockets of a light orange mottled light to dark grey, slightly clayey, slightly gravelly sand were identified within the clays.

Excavation to the intended 4m was not possible within TP101 as it became unstable, showing collapse after rapid water ingress and was thus terminated at a depth of 1.5.

Groundwater was encountered within five trial pits (TP101, TP102, TP104, TP108 and TP109). Groundwater was encountered at levels between 1.2m bgl in TP102 in the south and 3.2m bgl in TP104 and TP108 in the central area. Extremely rapid ingress occurred in TP101 and TP109, and a medium to slow ingress was noted in the remaining three trial pits. Groundwater was encountered in both boreholes, at 2.0m in BH101 in the south and 7.0m at BH102 in the central area. Water levels rose to 1.6m and 6.4m respectively after 20 minutes.

3. LABORATORY TESTING

A programme of laboratory testing was undertaken, comprising chemical analysis and determination of geotechnical engineering parameters on collected soil samples. The analysis was carried out by two laboratories, as follows:

- Chemical Testing Derwentside Environmental Testing Services (DETS), Consett, County Durham
- Geotechnical Testing Professional Soils Laboratory (PSL), Doncaster, South Yorkshire

The laboratories are UKAS accredited in accordance with BS EN ISO/IEC 17025:2005¹ and also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme:

3.1 Chemical Laboratory Testing and Sampling Strategy

Soil samples selected for chemical analysis were collected from each trial pit, as described in Table 2:

Location	Samples taken	Depth	Strata	Rationale
TP101	250g amber glass jar	0.5m	Silty sandy Made Ground with bricks, fragments and	Targeting the loose material above the rubble.
	100g amber glass jar			
	1ltr Plastic Tub		concrete slabs.	
TP102	250g amber glass jar	0.3m	Silty sandy Made Ground with bricks,	Targeting near-surface
	100g amber glass jar			contamination.
	1ltr Plastic Tub	1.5m	concrete slabs.	Targeting loose material above the natural sands and sandy clays.
TD102	250g amber glass jar	0.5m	Silty sandy Made Ground with bricks, fragments and concrete slabs.	Targeting near-surface contamination.
	100g amber glass jar			
11 103	1ltr Plastic Tub	1.5m	Boundary between silty sandy Made ground and clayey sand.	Targeting the base of the Made Ground.

Table 2	Sample Strategy taken for Chemical Analysis
---------	---

¹ BS EN ISO/IEC:2005. "General requirements for the competence of testing and calibration laboratories.

TP104	250g amber glass jar 100g amber glass jar	2.0m	Boundary of the silty sandy Made Ground and the soft sandy reworked clay.	Targeting the Made Ground above the reworked clay.
TP108	250g amber glass jar	0.3m	Silty sandy Clay Made Ground with bricks and	Targeting near-surface contamination.
	100g amber glass jar		fragments.	
	1ltr Plastic Tub	1.4m	Boundary between Black clays and reworked clays.	Targeting the stratum beneath the black stained clay.
TP109	250g amber glass jar	0.3m	Silty sand Made Ground with bricks, fragments and	Targeting near-surface
	100g amber glass jar		concrete slabs.	contamination.
	250g amber glass jar	2.0m	Dark grey clay	Targeting the stratum beneath the black stained clay.
	1ltr Plastic Tub	2.011	Dark grey clay.	

The soil samples were labelled and stored in a cool box for transportation directly to the analytical laboratory. Following observations made during the intrusive investigation, the analytical suite for each sample was determined by Capita Property and Infrastructure Ltd. The results are presented in Appendix C.

3.2 Geotechnical Laboratory Testing

Bulk samples were collected from the trial pits and smaller samples from SPT testing were collected from the boreholes for geotechnical testing. All samples were prepared in accordance with BS1377 Pt I:1990 for transportation to the laboratory. The sample selection rationale is detailed in Table 3:

Location	Samples taken	Depth	Strata	Rationale
TP101	25kg bulk bag	0.5m	Silty clayey sand Made Ground with bricks, fragments and concrete.	Obtain information on the properties of the Made Ground within the southern sector of the site.
TP102	25kg bulk bag	1.5m	Silty clayey sand Made Ground with bricks, fragments and concrete.	Obtain information on the properties of the Made Ground within the southern sector of the site.
TP103	25kg bulk bag	1.5m	Silty clayey sand Made Ground with bricks, fragments and concrete.	Obtain information on the properties of the Made Ground within the southern sector of the site.
TP104	25kg bulk bag	2.0m	Boundary of the silty sandy Made Ground and the soft sandy reworked clay.	Obtain information on the properties of the reworked clays.
TP108	25kg bulk bag	1.4m	Boundary between Black clays and soft sandy reworked clays.	Obtain information on the properties of the reworked clays beneath the black stained clays.
TP109	25kg bulk bag	2.0m	Dark grey clay.	Obtain information on the properties of the clay

Table 3	Sample Strategy taken for Geotechnical Sampling
---------	---

Samples from the boreholes generally comprised disturbed samples usually taken at 1m intervals, together with SPT samples every 1.5m. U100 samples were also collected form depths of 5.5-5.95m and 8.5-8.95m in BH101 and 10.5-10.95m in BH102, when cohesive stratum was encountered.

Six samples from the boreholes were also selected for pH and water soluble sulphate analysis.

The geotechnical testing schedules for these samples were determined by Capita Property and Infrastructure Ltd and are presented in Appendix C.

Appendices

- Appendix A Service Constraints and Report Limitations
- Appendix B Fieldwork Records
- Appendix C Chemical Testing Laboratory Certificates
- Appendix D Geotechnical Testing Laboratory Certificates
Appendix A

Service Constraints and Report Limitations

Service Constraints and Report Limitations

This report (the "Services") was compiled and carried out by TerraConsult (South) Limited (TCSL) for the client named on the front page (the "client") in accordance with the terms of a contract between TCSL and the "client". The Services were performed by TCSL with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by TCSL taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between TCSL and the client.

Other than that expressly contained in the above paragraph, TCSL provides no other representation or warranty whether express or implied, is made in relation to the Services. Unless otherwise agreed, this report has been prepared exclusively for the use and reliance of the client in accordance with 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, or transferred to, by any other party without the written agreement of a Director of TCSL. If a third party relies on this report, it does so wholly at its own and sole risk and TCSL disclaims any liability to such parties.

It is TCSL's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon, the report in those circumstances by the client without TCSL 's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of TerraConsult (South) Limited.

The report was written in March 2015 and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of TCSL. In the absence of such written advice of TCSL, reliance on the report in the future shall be at the client's own and sole risk. Should TCSL be requested to review the report in the future, TCSL shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between TCSL and the client.

The observations and conclusions described in this report are based solely upon the Services that were provided pursuant to the agreement between the client and TCSL. TCSL has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. TCSL is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, TCSL did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, radon gas or other radioactive or hazardous materials.

The Services are based upon TCSL's observations of existing physical conditions at the site gained from existing documents, together with TCSL's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst TerraConsult (South) Limited has no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. Further, TCSL was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. TCSL is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to TCSL and

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and TCSL] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

Appendix B

Fieldwork Records

Bc	ore	hc	ole I or	n			Т	'erra(Con	sult
Perso Drilled Logge Date lo	nnel: by: d by: oggeo	: : :	MJ VSS 03/03/2015	Equipment & methods: Method: Hand excavated inspection pit. Cab percussion boring Plant: D2000 Hammer: FOLI/438 Er(%) 61	Diameter & casing: le Dia(mm): to: Casing: 150 10.45 5.00	Coord Grid: Eastir North	dinates ng: ng:	& level:	Dates: Start: End:	03/03/2015 03/03/2015
Backfill/	ike - ike	y.	Level & Depth	Stratum Description		Progres & Wa	s, Casing ter Data	Sample	es & In Situ	Testing
Instal'n	str str	XXXXXXXX	(Thickness)	MADE GROUND: Dark to light brown slightly s	' ilty gravelly SAND, Gravel is	Water:	Casing:	Depth	Type & No	Results
			(2.60) 2.60 (0.30) 2.90 (1.90) 4.80 (5.65)	MADE GROUND: Dark to light brown slightly s fine to course angular to subangular of brick an wood fragments MADE GROUND: Firm dark greyish brown slig fine to course angular to subangular of brick Firm to stiff dark brown gravelly CLAY	ilty gravelly SAND. Gravel is d concrete. Occasional htly gravelly CLAY. Gravel is	Dry Dry Dry Dry	2.30 2.30 2.30	1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 - 5.95 6.00 7.00 7.00 7.00 7.00 7.00 7.00	D C D C D C D C D C D U U D S D U U	N=10 (1,2/3,2,2,3) N=5 (0,1/0,1,2,2) N=12 (1,2/2,3,3,4) N=10 (2,2/3,2,2,3) 47 (100%) N=15 (2,3/4,4,3,4)
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<u>1178371</u>	1			Stratum continues next pa	ge			Depth	Type & No	Results
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Scale:		1:	50							Sheet 1 of

Bc	ore	ehc	ole Log				Terra(Con	sult
Perso	nnel:			quipment & methods: Diameter & c	asing:	Coordinat	es & level:	Dates:	
Drilled	by:		MJ	lethod: Hand excavated inspection pit. Cable Dia(mm): to	: Casing:	Grid:		Start:	03/03/2015
Logge	d by:		VSS	percussion boring 150 10.4	45 5.00	Easting:		End:	03/03/2015
Date lo	oggeo	d:	03/03/2015	lant: D2000		Northing:			
Check	ed by	<i>'</i> :	DD	ammer: EQU438 Er(%) 61		Level:			
Backfill/	er-		Level & Depth	Observers Description		Progress, Cas & Water Dat	a Sampl	es & In Situ	Testing
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Scale:		1:2	25	Client:						Sheet 1 of 1

Tri	Frial Pit Log							Terr	aCon	sult
Persor Logged Date lo Checke	n nel: d by: oggeo ed by	1: /:	VSS 03/03/2015 DD	Equipment Method: Plant: Shoring:	t & methods: Mechanically excavated JCB 3CX	Dimensions: Width: Length: Orientation: Bearing =	Coordin Grid: Easting Northing Level:	nates & level:	03/03/2015 03/03/2015	
Backfill/	ter- ike	Legend	Level & Depth		Stratum		I	Sam	ples & In Situ Te	esting
Instal'n	Wa str	Legend	(Thickness)		Statum			Depth	Type & No	Results
			(1.70) 1.70 (0.20) 1.90 (1.40) 3.30	Light brown Greyish bro with depth	DUND: Dark to light brown sligh ular to subrounded of brick and s, metal and wood	Ity sity gravelly SAND. Gra concrete. Occasional fragi style gravelly SAND gravelly SAND. Clay conte	nt increases	0.30	ESTP102	
Ground Struck 1.2	dwate :: 20	er entrie Rose to	s: Inflow rate: R	Depth relate From - to:	ed remarks: Remarks:			Depth General remark Weather: Stability: Remarks: Termination:	Type & No (s: Sunny, occasio Good	Results
AGS	Notes: F abbrevia	For explanatio itions see Key	n of symbols and Sheet.	Project:				Exploratory pos	sition reference:	
Log iss	All depth	is and reduce	AFT	Project No:	10086			-	FP102	
Scale:		1:2	5	Client:						Sheet 1 of 1

Trial Pit Log								Terr	aCon	sult
Perso Logge Date lo Check	nnel: d by: oggeo ed by	d: /:	VSS 03/03/2015 DD	Equipment & meth Method: Mech Plant: JCB Shoring:	hods: nanically excavated 3CX	Dimensions: Width: Length: Orientation: Bearing =	Coord Grid: Eastin Northi Level:	linates & level: g: ng:	Dates: Start: End:	03/03/2015 03/03/2015
Backfill/	ter- ike	Logond	Level & Depth		Stratum	Description	·	San	ples & In Situ Te	esting
Instal'n	Wa str	Legenu	(Thickness)		Stratum	Description		Depth	Type & No	Results
			(1.50) 1.50 (1.10) 2.60 (0.50) 3.10	MADE GROUND: angular to subround fragments of metal	Light to dark brown cla ded of brick and concre wires and bars, plastic n mottled light grey slip s of grey very soft sand ey slightly sandy slight thologies	ayey gravelly SAND. Gravel ete. Occasional whole bi is and electrical wires and ghtly clayey slightly grave dy slightly gravelly clay ly gravelly CLAY. Gravel	vel is fine to cours ricks. Occasional d cables	Depth e 0.50 - 1.50	ESTP103	Results
								Depth	Type & No	Results
Ground	dwate	er entrie Rose to	Inflow rate:	Depth related rema From - to: Ren	ırks: narks:			General remark Weather: Stability: Remarks: Termination:	(s: Sunny, occasio Good	nal shower
AGS	All depth	tions see Key and reduce	d levels are in meters.	Project No: 10086				Exploratory pos		1
Log is	sue:	DF	AFT	Client:					14103	
Scale:		1:2	5	1						Sheet 1 of 1

Tria	Trial Pit Log							Terr	aCon	sult
Personn Logged I Date log Checked	hel: by: ged: d by:		VSS 03/03/2015 DD	Equipment & methods: Method: Mechanically excava Plant: JCB 3CX Shoring:	ated	Dimensions: Width: Length: Orientation: Bearing =	Coord Grid: Easting Northin Level:	g: ng:	Dates: Start: End:	03/03/2015 03/03/2015
Backfill/ ৳	ike.	Legend	Level & Depth	St	ratum Descrin	tion		Sam	ples & In Situ Te	esting
Backfill / Back		Legend	Level & Depth (Thickness) (0.60) (1.40) 2.00 (1.40) 3.40	MADE GROUND: Dark to light brown red bricks. Occasional fragments of medium angular to subangular brick MADE GROUND: Soft to firm, dark sandy CLAY. Black oily grease press	htly sandy slig k	tion gravelly SAND. Or l and plastics htly gravelly CLAY. d light orangeish bi sings	ccasional whole	2.00 2.00	BTP104 ESTP104	Results
Groundw Struck: 3.20	vater	r entrie	s: Inflow rate: M	Depth related remarks: From - to: Remarks:				Depth General remark Weather: Stability: Remarks: Termination:	Type & No (s: Sunny, occasio Good	Results
	otes: Fo	r explanation	of symbols and Sheet.	Project:				Exploratory pos	sition reference:	
Log issu	e:	DR 1:2	AFT	Project No: 10086 Client:					ГР104	Sheet 1 of 1

Tri	al	Pi	t Log			Terr	sult			
Perso Logge Date lo Check	nnel: d by: ogged ed by	: d: /:	VSS 03/03/2015 DD	Equipment & methods: Method: Mechanically exe Plant: JCB 3CX Shoring:	cavated	Dimensions: Width: Length: Orientation: Bearing =	Coordin Grid: Easting Northing Level:	nates & level:	Dates: Start: End:	03/03/2015 03/03/2015
Backfill/	r e		Level & Depth					Sam	iples & In Situ Te	esting
Backfill/	Water-	Legend	Level & Depth (Thickness) (0.70) 0.70 (0.60) 1.30 (2.40)	Substitution Stratum Description 70 MADE GROUND: Soft blackish brown odorous slightly sandy slightly gravelly CLAY. Gravel is fine to course angular to subangular of brick. Occasional fragments of wood 70 MADE GROUND: Soft to firm dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subangular of red brick and concrete 30 MADE GROUND: Soft to firm light orangey brown becoming darker orangey greyish brown slightly gravelly CLAY. Gravel is fine to course angular to subangular of red brick and concrete. Oily sheen on ingressed water					ESTP10 BTP108	Results
Groun Struck 3.	dwate c: 00	er entrie Rose to	3.70 	Depth related remarks: From - to: Remarks:	Trial pit terminated at	3.70m		Depth General remark Weather: Stability: Remarks: Termination:	Type & No (S: Sunny, occasion Good	Results
AGS Log is: Scale:	Notes: For axplanation of symbols and abbreviations see Key Sheat. All depths and reduced levels are in meters. Project: SSUE: DRAFT : 1:25						Exploratory pos	ition reference:	Sheet 1 of 1	

Trial Pit Log								TerraCons			
Person Logged Date lo Checke	Sonnel: Equipment & methods: Dimensions: ged by: VSS Method: Mechanically excavated Width: e logged: 03/03/2015 Length: Length: cked by: DD Plant: JCB 3CX Orientation: Shoring: Bearing =							nates & level: : g:	Dates: Start: End:	03/03/2015 03/03/2015	
Backfill/	ter- ike	Legend	Level & Depth		Stratum D	escription		Sam	ples & In Situ Te	esting	
Instain	Wt st		(1.00) -	MADE GROU course angul	JND: Dark to light brown sligh ar to subangular of concret an	tly silty gravelly SAND. Grave d brick	el is fine to	0.30	Type & No ESTP109	Results	
			1.00 — (0.80) —	MADE GROU angular to su	JND: Soft blackish brown slig bangular fine to course of bric	htly sandy slightly gravelly CL k	_AY. Gravel is	1.40	BTP109		
			1.80 (0.20) 2.00 (1.50)	MADE GROU present on tr MADE GROU	JND: Firm to stiff dark blackis e arisings JND: Very wet blackish grey sl	h grey gravelly CLAY. Black c lightly sandy gravelly CLAY.	ily grease				
	•		3.50		large wo	od fragments (approx. 600	Omm long)	-			
								Death	Tage 8 Mg	Decisite	
Ground Struck: 3.2	Iwate	Er entrie Rose to	Inflow rate: R	Depth related From - to:	d remarks: Remarks:			Depth General remark Weather: Stability: Remarks: Termination:	Type & No (s: Sunny, occasio Good	Results	
AGS Log iss Scale:	abbrevia All depth UC:	itions see Key ns and reduce DF 1:2	sneet. d levels are in meters. SAFT	Project No: Client:	10086				FP109	Sheet 1 of 1	



Photograph 1: TP101. Rubble and waste. Water ingress



Photograph 2: TP101 Arisings of red brick, yellow brick, concrete, charcoal, plastic, metal, cables and wood



Photograph 3: Red and yellow brick in TP101 arisings



Photograph 4: Asbestos found in TP101 arisings after backfilling



Photograph 5: TP102. Made Ground and natural strata



Photograph 6: TP102 Natural strata





Photograph 7: TP103



Photograph 8: Compact rubble in TP103



Photograph 9: TP103 natural strata



Photograph 10: TP104. Note black material appearing in the bottom half of the picture



Photograph 11: Black Made Ground on top of the brown Made Ground arisings



Photograph 12: Yellow bricks from TP104



Photograph 13: Black grease on the clay from TP104



Photograph 14: TP108



Photograph 15: Reworked clay with bricks from TP108.



Photographs 16: Arisings of TP108



Photograph 17: TP109



Photograph 18: Gravelly Clay from TP109





Photograph 19: The brown clay and large wood fragments that were found at about 2.9m in TP109

Appendix C

Chemical Testing Laboratory Certificates



Certificate of Analysis Certificate Number 15-29521

23-Mar-15

Client Capita Property & Infrastructure 8th Floor The Observatory Chapel Walks Manchester M2 1HL

- Our Reference 15-29521
- *Client Reference* ZMCH/CS/078406
 - Contract Title Oakleigh Depot Phase 2
 - Description 4 Soil samples.
 - Date Received 12-Mar-15
 - Date Started 12-Mar-15
- Date Completed 23-Mar-15

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. 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. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

PUQ.

Rob Brown Business Manager





			Lab No	781617	781618	781619	781620
		Sa	ample ID	TP102	TP103	TP108	TP109
			Depth	0.30	0.50	0.30	0.30
			Other ID				
		Sam	ple Type	SOIL	SOIL	SOIL	SOIL
		Sampl	ing Date	03/03/15	03/03/15	03/03/15	03/03/15
		Sampl	ing Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
Preparation		1				1	
Moisture Content	DETSC 1004*	0.1	%	13	19	22	29
Metals		1	I	1		1	
Arsenic	DETSC 2301#	0.2	mg/kg	7.4	7.8	11	14
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.0	1.1	1.6	2.8
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.4	0.8	1.0
Chromium	DETSC 2301#	0.15	mg/kg	21	25	39	38
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	10	10	34	64
Lead	DETSC 2301#	0.3	mg/kg	16	16	39	52
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	0.05	0.12
Nickel	DETSC 2301#	1	mg/kg	16	17	26	32
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	30	31	78	87
Inorganics							
рН	DETSC 2008#			8.5	7.7	9.0	9.3
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1
Petroleum Hydrocarbons			-				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg			< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg			< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg			< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg			< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg			< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg			< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg			< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg			< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg			< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg			< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg			< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg			< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01
МТВЕ	DETSC 3321	0.01	mg/kg			< 0.01	< 0.01



			Lab No	781617	781618	781619	781620
		Sa	ample ID	TP102	TP103	TP108	TP109
			Depth	0.30	0.50	0.30	0.30
			Other ID				
		Sam	ple Type	SOIL	SOIL	SOIL	SOIL
		Sampl	ing Date	03/03/15	03/03/15	03/03/15	03/03/15
		Sampl	ing Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.5	0.4
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.4	0.2
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	1.2	0.8
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.8	0.5
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
РАН	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	3.0	1.9
PCBs							
PCB 7 Total	DETSC 3401#	0.01	mg/kg			< 0.01	



Summary of Chemical Analysis Soil VOC/SVOC Samples

			Lab No	781619
		Sa	ample ID	TP108
			Depth	0.30
			Other ID	
		Sam	ple Type	SOIL
		Sampl	ing Date	03/03/15
		Sampl	ing Time	n/s
Test	Method	LOD	Units	
SVOCs				
Phenol	DETSC 3433	0.1	mg/kg	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1
2.4.6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
2.4.5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2.4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1



Summary of Chemical Analysis Soil VOC/SVOC Samples

	i Bepoti nase E		_	
			Lab No	781619
		Sa	ample ID	TP108
			Depth	0.30
			Other ID	
		Sam	ple Type	SOIL
		Samp	ing Date	03/03/15
		Sampl	ing Time	n/s
Test	Method	LOD	Units	
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1



Information in Support of the Analytical Results

Our Ref 15-29521 Client Ref ZMCH/CS/078406 Contract Oakleigh Depot Phase 2

Containers Received & Deviating Samples

		Date			Inappropriate container for
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
781617	TP102 0.30 SOIL	03/03/15	GJ 250ml (250ml), GV (40ml)	pH (7 days)	
781618	TP103 0.50 SOIL	03/03/15	GJ 250ml (250ml), GV (40ml)	pH (7 days)	
781619	TP108 0.30 SOIL	03/03/15	GJ 250ml (250ml), GV (40ml)	pH (7 days)	
781620	TP109 0.30 SOIL	03/03/15	GJ 250ml (250ml), GV (40ml)	pH (7 days)	

Key: G-Glass J-Jar V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425μm sieve, in accordance with BS1377. Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis. The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate of Analysis Certificate Number 15-29271

20-Mar-15

Client Capita Property & Infrastructure 8th Floor The Observatory Chapel Walks Manchester M2 1HL

- Our Reference 15-29271
- *Client Reference* ZMCH/CS078406
 - Contract Title Oakleigh Depot Phase 2
 - Description 13 Soil samples.
 - Date Received 09-Mar-15
 - Date Started 10-Mar-15
- Date Completed 20-Mar-15
- Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.
 - *Notes* Opinions and interpretations are outside the scope of UKAS accreditation. 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. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

PUQ.

Rob Brown Business Manager





			Lab No	780090	780092	780093	780094	780095
		Sa	mple ID	TP101	TP103	TP104	TP108	TP109
			Depth	0.50	1.50	2.00	1.40	2.00
		C	Other ID					
		Samp	ole Type	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampli	ng Date	03/03/15	03/03/15	03/03/15	03/03/15	03/03/15
		Sampli	ng Time	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units					
Preparation								
Moisture Content	DETSC 1004*	0.1	%	23		30		31
Metals								
Arsenic	DETSC 2301#	0.2	mg/kg	12		14		15
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.3		1.2		3.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.6		0.8		0.9
Chromium	DETSC 2301#	0.15	mg/kg	21		45		51
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0		< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg	37		59		73
Lead	DETSC 2301#	0.3	mg/kg	89		68		66
Mercury	DETSC 2325#	0.05	mg/kg	0.15		0.20		0.13
Nickel	DETSC 2301#	1	mg/kg	16		36		36
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5		< 0.5		< 0.5
Zinc	DETSC 2301#	1	mg/kg	95		100		100
Inorganics								
рН	DETSC 2008#			9.9	8.2	7.9	7.8	8.3
Cyanide total	DETSC 2130#	0.1	mg/kg	0.2		< 0.1		< 0.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	1900	310		420	450
Total Sulphur as S	DETSC 2320	0.01	%	0.56	0.03		0.08	0.08
Total Sulphate as SO4	DETSC 2321#	0.01	%	1.9	0.06		0.09	0.15



			Lab No	780090	780092	780093	780094	780095
		Sa	mple ID	TP101	TP103	TP104	TP108	TP109
			Depth	0.50	1.50	2.00	1.40	2.00
		(Other ID					
		Sam	ole Type	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampl	ing Date	03/03/15	03/03/15	03/03/15	03/03/15	03/03/15
		Sampli	ng Time	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units					
Petroleum Hydrocarbons								
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg			< 0.01		
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg			< 0.01		
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg			< 0.01		
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg			< 1.5		
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg			< 1.2		
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg			< 1.5		
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg			< 3.4		
Aliphatic C5-C35	DETSC 3072*	10	mg/kg			< 10		
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg			< 0.01		
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg			< 0.01		
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg			< 0.01		
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg			< 0.9		
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg			< 0.5		
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg			< 0.6		
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg			< 1.4		
Aromatic C5-C35	DETSC 3072*	10	mg/kg			< 10		
TPH Ali/Aro	DETSC 3072*	10	mg/kg			< 10		
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg					< 0.1
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg					88
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311#	10	mg/kg					76
Benzene	DETSC 3321#	0.01	mg/kg			< 0.01		
Ethylbenzene	DETSC 3321#	0.01	mg/kg			< 0.01		
Toluene	DETSC 3321#	0.01	mg/kg			< 0.01		
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01		
МТВЕ	DETSC 3321	0.01	mg/kg			< 0.01		



			Lab No	780090	780092	780093	780094	780095
		Sa	mple ID	TP101	TP103	TP104	TP108	TP109
			Depth	0.50	1.50	2.00	1.40	2.00
		(Other ID					
		Sam	ole Type	SOIL	SOIL	SOIL	SOIL	SOIL
		Sampli	ing Date	03/03/15	03/03/15	03/03/15	03/03/15	03/03/15
		Sampli	ng Time	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units					
PAHs								
Naphthalene	DETSC 3301	0.1	mg/kg	0.3		< 0.1		< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	0.3		< 0.1		< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	0.5		< 0.1		< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	0.4		< 0.1		< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	4.8		< 0.1		0.4
Anthracene	DETSC 3301	0.1	mg/kg	1.1		< 0.1		0.2
Fluoranthene	DETSC 3301	0.1	mg/kg	4.6		0.3		0.8
Pyrene	DETSC 3301	0.1	mg/kg	3.9		0.3		0.8
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	2.4		< 0.1		< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	1.7		< 0.1		< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	1.2		< 0.1		< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.8		< 0.1		< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	1.5		< 0.1		< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1		< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1		< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	1.6		< 0.1		< 0.1
РАН	DETSC 3301	1.6	mg/kg	25		< 1.6		2.2



		Lab No	780096	780097	780098	780099	
		Sa	mple ID	BH101	BH101	BH101	BH102
			Depth	2.00	5.00	10.00-10.45	0.50
		(Other ID				
		Samj	ole Type	SOIL	SOIL	SOIL	SOIL
		Sampli	ing Date	03/03/15	03/03/15	03/03/15	04/03/15
		Sampli	ng Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
Preparation							
Moisture Content	DETSC 1004*	0.1	%				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg				
Boron (water soluble)	DETSC 2123#	0.2	mg/kg				
Cadmium	DETSC 2301#	0.1	mg/kg				
Chromium	DETSC 2301#	0.15	mg/kg				
Hexavalent Chromium	DETSC 2204*	1	mg/kg				
Copper	DETSC 2301#	0.2	mg/kg				
Lead	DETSC 2301#	0.3	mg/kg				
Mercury	DETSC 2325#	0.05	mg/kg				
Nickel	DETSC 2301#	1	mg/kg				
Selenium	DETSC 2301#	0.5	mg/kg				
Zinc	DETSC 2301#	1	mg/kg				
Inorganics							
рН	DETSC 2008#			11.0	7.7	8.2	9.7
Cyanide total	DETSC 2130#	0.1	mg/kg				
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	1800	690	2300	2300
Total Sulphur as S	DETSC 2320	0.01	%	1.1	0.09	0.54	0.93
Total Sulphate as SO4	DETSC 2321#	0.01	%	3.8	0.12	1.3	2.3


		780096	780097	780098	780099		
		Sa	mple ID	BH101	BH101	BH101	BH102
			Depth	2.00	5.00	10.00-10.45	0.50
		(Other ID				
		Sam	ple Type	SOIL	SOIL	SOIL	SOIL
		Sampl	ing Date	03/03/15	03/03/15	03/03/15	04/03/15
		Sampli	ing Time	n/s	n/s	n/s	n/s
Test	Method	LOD Units					
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg				
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg				
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg				
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg				
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg				
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg				
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg				
Aliphatic C5-C35	DETSC 3072*	10	mg/kg				
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg				
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg				
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg				
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg				
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg				
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg				
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg				
Aromatic C5-C35	DETSC 3072*	10	mg/kg				
TPH Ali/Aro	DETSC 3072*	10	mg/kg				
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg				
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg				
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311#	10	mg/kg				
Benzene	DETSC 3321#	0.01	mg/kg				
Ethylbenzene	DETSC 3321#	0.01	mg/kg				
Toluene	DETSC 3321#	0.01	mg/kg				
Xylene	DETSC 3321#	0.01	mg/kg				
МТВЕ	DETSC 3321	0.01	mg/kg				



			Lab No	780096	780097	780098	780099
		Sa	mple ID	BH101	BH101	BH101	BH102
			Depth	2.00	5.00	10.00-10.45	0.50
		(Other ID				
		Sam	ole Type	SOIL	SOIL	SOIL	SOIL
		Sampli	ing Date	03/03/15	03/03/15	03/03/15	04/03/15
		Sampli	ng Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
PAHs							
Naphthalene	DETSC 3301	0.1	mg/kg				
Acenaphthylene	DETSC 3301	0.1	mg/kg				
Acenaphthene	DETSC 3301	0.1	mg/kg				
Fluorene	DETSC 3301	0.1	mg/kg				
Phenanthrene	DETSC 3301	0.1	mg/kg				
Anthracene	DETSC 3301	0.1	mg/kg				
Fluoranthene	DETSC 3301	0.1	mg/kg				
Pyrene	DETSC 3301	0.1	mg/kg				
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg				
Chrysene	DETSC 3301	0.1	mg/kg				
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg				
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg				
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg				
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg				
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg				
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg				
РАН	DETSC 3301	1.6	mg/kg				



			Lab No	780100	780101	780102
		Sa	ample ID	BH102	BH102	BH102
			Depth	2.50-2.95	4.50-4.95	7.00
			Other ID			
		Sam	ple Type	SOIL	SOIL	SOIL
		Sampl	ing Date	04/03/15	04/03/15	04/03/15
		Sampl	ing Time	n/s	n/s	n/s
Test	Method	LOD	Units			
Preparation						
Moisture Content	DETSC 1004*	0.1	%			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg			
Boron (water soluble)	DETSC 2123#	0.2	mg/kg			
Cadmium	DETSC 2301#	0.1	mg/kg			
Chromium	DETSC 2301#	0.15	mg/kg			
Hexavalent Chromium	DETSC 2204*	1	mg/kg			
Copper	DETSC 2301#	0.2	mg/kg			
Lead	DETSC 2301#	0.3	mg/kg			
Mercury	DETSC 2325#	0.05	mg/kg			
Nickel	DETSC 2301#	1	mg/kg			
Selenium	DETSC 2301#	0.5	mg/kg			
Zinc	DETSC 2301#	1	mg/kg			
Inorganics						
рН	DETSC 2008#			8.0	8.0	7.5
Cyanide total	DETSC 2130#	0.1	mg/kg			
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	680	570	1200
Total Sulphur as S	DETSC 2320	0.01	%	0.07	0.06	0.83
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.15	0.12	0.31



			Lab No	780100	780101	780102
		Sa	mple ID	BH102	BH102	BH102
			Depth	2.50-2.95	4.50-4.95	7.00
		(Other ID			
		Samj	ole Type	SOIL	SOIL	SOIL
		Sampli	ing Date	04/03/15	04/03/15	04/03/15
		Sampli	ng Time	n/s	n/s	n/s
Test	Method	LOD	Units			
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg			
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg			
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg			
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg			
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg			
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg			
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg			
Aliphatic C5-C35	DETSC 3072*	10	mg/kg			
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg			
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg			
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg			
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg			
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg			
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg			
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg			
Aromatic C5-C35	DETSC 3072*	10	mg/kg			
TPH Ali/Aro	DETSC 3072*	10	mg/kg			
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg			
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg			
C24-C40 Lube Oil Range Organics (LORO)	DETSC 3311#	10	mg/kg			
Benzene	DETSC 3321#	0.01	mg/kg			
Ethylbenzene	DETSC 3321#	0.01	mg/kg			
Toluene	DETSC 3321#	0.01	mg/kg			
Xylene	DETSC 3321#	0.01	mg/kg			
МТВЕ	DETSC 3321	0.01	mg/kg			



Summary of Chemical Analysis Soil Samples

		Lab No	780100	780101	780102
	Sa	ample ID	BH102	BH102	BH102
		Depth	2.50-2.95	4.50-4.95	7.00
		Other ID		_	
	Sam	ple Type	SOIL	SOIL	SOIL
	Sampl	ing Date	04/03/15	04/03/15	04/03/15
	Sampl	ing Time	n/s	n/s	n/s
Method	LOD	Units			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	0.1	mg/kg			
DETSC 3301	1.6	mg/kg			
	Method DETSC 3301 DETSC 3301	Sam Sample Method LOD DETSC 3301 0.1 DETSC 3301 0.1	Lab No Sample ID Depth Other ID Sample Type Sampling Date Sampling Time Method LOD Units DETSC 3301 0.1 mg/kg DETSC 3301 0.1 mg/kg	Lab No 780100 Sample ID BH102 Depth 2.50-2.95 Other ID Sample Type SOIL Sampling Date 04/03/15 Sampling Time n/s Method LOD Units DETSC 3301 0.1 mg/kg DETSC 3301 0.1 mg/kg	Lab No 780100 780101 Sample ID BH102 BH102 Depth 2.50-2.95 4.50-4.95 Other ID 2.50-2.95 4.50-4.95 Other ID Sample Type SOIL Sampling Date 04/03/15 04/03/15 Sampling Time n/s n/s Method LOD Units DETSC 3301 0.1 mg/kg DETSC 3301 0.1 mg



Summary of Asbestos Analysis Soil Samples

Our Ref 15-29271 Client Ref ZMCH/CS078406 Contract Title Oakleigh Depot Phase 2

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
780090	TP101 0.50	SOIL	Chrysotile	small bundles of chrysotile	J Woodmansey
780091	TP102 1.50	SOIL	NAD	none	J Woodmansey
780092	TP103 1.50	SOIL	NAD	none	J Woodmansey
780094	TP108 1.40	SOIL	NAD	none	J Woodmansey
780095	TP109 2.00	SOIL	NAD	none	J Woodmansey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.



Information in Support of the Analytical Results

Our Ref 15-29271 Client Ref ZMCH/CS078406 Contract Oakleigh Depot Phase 2

Containers Received & Deviating Samples

				Holding time	Inappropriate
	6 L 15	Date		exceeded for	container for
Lab No	Sample ID	Sampled	Containers Received	tests	tests
780090	TP101 0.50 SOIL	03/03/15	GJ 500ml, GJ 60ml, PT 1L		
780091	TP102 1.50 SOIL	03/03/15	GJ 500ml, GJ 60ml, PT 1L		
780092	TP103 1.50 SOIL	03/03/15	GJ 500ml, GJ 60ml, PT 1L		
780093	TP104 2.00 SOIL	03/03/15	GJ 500ml, GJ 60ml		
780094	TP108 1.40 SOIL	03/03/15	GJ 500ml, GJ 60ml, PT 1L		
780095	TP109 2.00 SOIL	03/03/15	GJ 250ml, GJ 60ml, PT 1L		
780096	BH101 2.00 SOIL	03/03/15	PG, PT 1L		
780097	BH101 5.00 SOIL	03/03/15	PG		
780098	BH101 10.00-10.45 SOIL	03/03/15	PT 1L		
780099	BH102 0.50 SOIL	04/03/15	PG		
780100	BH102 2.50-2.95 SOIL	04/03/15	PT 1L		
780101	BH102 4.50-4.95 SOIL	04/03/15	PG		
780102	BH102 7.00 SOIL	04/03/15	PG		
Key: G-Glass	s P-Plastic J-Jar T-Tub G-Bag				

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377. Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis. The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix D

Geotechnical Testing Laboratory Certificates



LABORATORY REPORT



4043

Contract Number: PSL15/1142

Client's Reference:

Report Date: 19 March 2015

Client Name: Clemence House 9 Mellor Road Cheadle Hulme Cheshire SK8 5AT

For the attention of: Elizabeth Yeatman

Contract Title: Oakleigh Road Depot Phase 2

Date Received:6/3/2015Date Commenced:6/3/2015Date Completed:19/3/2015

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)

Ste

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 M Beastall (Laboratory Manager)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
BH101			1.00	MADE GROUND grey sandy silty gravel.
BH101			3.00	Brown very gravelly sandy CLAY.
BH101			4.00	Brown gravelly slightly sandy CLAY.
BH101			5.50-5.95	Firm brown slightly gravelly sandy CLAY.
BH101			6.00	Brown slightly gravelly CLAY.
BH101			7.00-7.45	Brown slightly gravelly CLAY.
BH101			8.50-8.95	Stiff brown CLAY.
BH101			9.00	Brown CLAY.
BH102			1.00	Dark grey slightly gravelly sandy CLAY with some organic material.
BH102			3.50-3.95	Brown CLAY.
BH102			5.50-5.95	Brown CLAY.
BH102			8.00-8.45	Brown CLAY.
BH102			10.50-10.95	Stiff brown CLAY.
BH102			11.00	Brown CLAY.
TP108			1.40	Brown slightly gravelly CLAY.
TP109			2.00	Brown gravelly slightly sandy CLAY.

	Compiled by	Date	Checked by	Date	Approved by	Date
est.	6200	19/03/15	Ste	19/03/15		19/03/15
Professional Soils Laboratory			Contract No:	PSL15/1142		
	UAKLE	IGH KUAI	Client Ref:	SC078406		

SUMMARY OF SOIL CLASSIFICATION TESTS

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

Hole	Sample	Sample	Depth	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
Tumber	Tumber	турс		Clause 3.2	Clause 7.2	Clause 7.2	Clause 8.2	70 Clause 4.3/4.4	Clause 5.3	Clause 5.4	2311111	
BH101			1.00				2.55					
BH101			3.00	15				44	22	22	62	Intermediate plasticity CI.
BH101			4.00	29				64	27	37	80	High plasticity CH.
BH101			5.50-5.95	23				40	21	19	87	Intermediate plasticity CI.
BH101			6.00	29				76	31	45	94	Very high plasticity CV.
BH101			7.00-7.45	29				74	30	44	96	Very high plasticity CV.
BH101			8.50-8.95	30				78	32	46	100	Very high plasticity CV.
BH101			9.00	31				76	31	45	100	Very high plasticity CV.
BH102			1.00	54				73	35	38	96	Very high plasticity CV.
BH102			3.50-3.95	35				71	30	41	100	Very high plasticity CV.
BH102			5.50-5.95	35				72	30	42	100	Very high plasticity CV.
BH102			8.00-8.45	30				75	31	44	100	Very high plasticity CV.
BH102			10.50-10.95	30				72	30	42	100	Very high plasticity CV.
BH102			11.00	30				73	30	43	100	Very high plasticity CV.
TP108			1.40	41				77	31	46	92	Very high plasticity CV.
TP109			2.00	31				66	28	38	81	High plasticity CH.

SYMBOLS : NP : Non Plastic

*: Liquid Limit and Plastic Limit Wet Sieved.

	Compiled by	Date	Checked by	Date	Approved by	Date
est.	6000	19/03/15	Ste	19/03/15	Ste	19/03/15
Professional Soils Laboratory	OAVIEI	Contract No:	PSL15/1142			
	UAKLEI	GII KUAL		Client Ref:	SC078406	



Undrained Shear Strength in Triaxial Compression

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



Axial Strain %

Diamete	er (mm):	102.0	Height (mm):	210.0	Test:	100 n	nm Single	Stage.	tage. Undisturbed			
Specimen	Moisture	Bulk	Dry	Cell	Corr. Max.	Shear	Failure	Mode		Ren	narks		
	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 = 1.9 %/min				
					(kPa)	(kPa)			Latex Membrane used 0.2 mm thickness			hickness,	
				θ_3	$(\theta_1 - \theta_3)_f$	$^{1}/_{2}(\theta_{1}-\theta_{3})_{f}$			Correction	applied	0.33	kPa	
А	23	2.08	1.69	110	117	58	20.5	Pastic	See summary of soil descriptions.				
									Checked	Date	Approved	Date	
									Il	19/03/15	Ste	19/03/15	
Profes	P ssional S	SL oils Labo	oratory	OAKL		Contra PSL1	act No: 5/1142						

Undrained Shear Strength in Triaxial Compression

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



Axial Strain %

Diameter (mm):		100.0	Height (mm):	210.0	Test:	100 n	nm Single	Stage.	Undistur	bed		
Specimen	Moisture	Bulk	Dry	Cell	Corr. Max.	Shear	Failure	Mode	Remarks				
	Content	Density	Density	Pressure	Deviator	Strength	Strain	of	Sample taken from top of tube				
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	Stress	Cu	(%)	Failure	Rate of strain = 1.9 %/min				
					(kPa)	(kPa)			Latex Membrane used 0.2 mm thickness				
				θ_3	$(\theta_1 - \theta_3)_f$	$^{1}/_{2}(\theta_{1}-\theta_{3})_{f}$			Correction applied 0.37 kPa				
А	30	1.91	1.47	170	248	124	6.7	Brittle	See summary of soil descriptions.				
									Checked	Date	Approved	Date	
									Ste	19/03/15	Ste	19/03/15	
Profes	P ssional S	SL ioils Labo	oratory	OAKL	EIGH R	OAD DI	EPOT P	HASE 2		Contra PSL1	act No: 5/1142		

Undrained Shear Strength in Triaxial Compression

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





Diameter (mm):		102.0	Height ((mm):	210.0	Test:	100 n	100 mm Single Stage. Undisturbed				
Specimen	Moisture	Bulk	Dry	Cell	Corr. Max.	Shear	Failure	Mode	Remarks			
	Content	Density	Density	Pressure	Deviator	Strength	Strain	of	Sample taken from top of tube			
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	Stress	Cu	(%)	Failure	Rate of strain = 1.9 %/min			
					(kPa)	(kPa)			Latex Membrane used 0.2 mm thickness			
				θ_3	$(\theta_1 - \theta_3)_f$	$^{1}/_{2}(\theta_{1}-\theta_{3})_{f}$			Correction applied 0.36 kPa			
А	30	1.98	1.52	210	200	100	8.1	Plastic	See summary of soil descriptions.			
									Checked	Date	Approved	Date
									Ste	19/03/15	Ste	19/03/15
Profes	P ssional S	SL joils Lab	oratory	OAKL	EIGH R	OAD DF	EPOT P	HASE 2		Contra PSL1	act No: 5/1142	



Oakleigh Road South Depot April 2015

Appendix C

Appendix C Generic Quantitative Risk Assessment

G.Q.R.A. Key statistical symbols and terms



GAC	Generic Assessment Criteria
Normality	Shapiro-Wilk test provides a reliable check on whether a test based on normailty (like the one- sample t-test) can be applied on the data set under scrutiny. Where the size of a data set is greater than n=50 a visual assessment of the normailty of the data is undertaken using a probability plot.
	Normal , deviation of the data set from normality is not significant. One-sample t-test can be used when testing the mean against a Critical concentration/GAC.
	Not Normal , deviation of the data set from normality has been identified as being significant. If normality of a relatively large data set appears to be normal through visual assessment but is indicated to be not normal by the Shapiro-Wilk test, then the One-side Chebychev Theorum has used when testing the mean against a Critical concentration/GAC.
No. exceeding GAC	Number of sample concentrations exceeding the defined GAC.
No. Outliers	Number of statistical Outliers determined using Grubbs Test for data sets n>2. Where the maximum value in a data set has been identified as an outlier, the test has been repeated on the second largest value (by removing the max value) and then the 3rd largest value etc, until the maximum concetration is not reported as an Outlier.
Test	t, the one-sample t-test (for datasets n>1)
	${\bf c},$ the one-sided Chebychev Theorum or Chebychev Inequality (for data sets n>1)
	N.B. the tests for comparing the mean against a critical concentration can only be applied when n>1 and the sample population standard deviation>0
UCL95%	95% Upper Confidence Limit (of the true population mean)
Test Result	FAIL, the 95% UCL exceeds the defined GAC.
	PASS, the 95% UCL does not exceed the defined GAC
Bold Red Type	Used to highlight the "No. exceeding GAC", "no. Outliers" and "Test Result" on the Summary of Statistics Sheet. Where the test result is reported as "FAIL" the whole row for a particular contaminant is highlighted.
Filled Cells	Used to highlight exceedances (individual sample concentrations exceeding the GAC) in the Summary of Concentrations sheets.
Bold Underlined	Used to highlight maximum value outliers (as determined using an iterative Grubbs Test) in the Summary of Concentrations sheets. Outliers may also be shown in filled cells (exceedances).

CAPITA SYMONDS



Oakleigh Road South Depot

Soils

Summary of Statistics

Geology: Site End Use:

Soil Type:

Made Ground Commercial

Sand - 1% SOM

Project Number: Client:

Г

CS078406

London Borough of Barnet

Marchine 640 7 7.4 - 15 0 Normal None t 13.8 PASS Boron 110000 7 1 - 3.3 0 Normal None t 2.6 PASS Chromiun VI 330 7 1 - 1 0 Normal None t 2.6 PASS Chromiun VI 330 7 10 - 73 0 Normal None t 2.6 PASS Chromiun VI 3300 7 10 - 73 0 Normal None t 0.9 PASS Lead 4400 7 16 - 36 0 Normal None t 0.2 PASS Selenium SGV 13000 7 0.5 - 0.5 0 Normal None t 0.2 PASS Nondkalts 5000 3 0.01 - 0.01 0 Not Normal None t 0.2 PASS Nonpatic C5-5 2600 3 0.01 - 0.01 0	Compound	GAC (mg/kg)	No. Samples	Range of values (mg/kg)	exceed- ing GAC	Normality	No. Outliers	Test	UCL _{95%} (of the true population mean)	Test Result
Albeint SoV 0-00 7 7.4 + 13 0 Normal Nome t 1.3.6 PASS Cadmium SOV 230 7 0.4 - 1 0 Normal None t 2.6 PASS Corper 33000 7 10 - 73 0 Normal None t 0.9 PASS Corper 39000 7 10 - 73 0 Normal None t 69.6 PASS Mecruy SGV 3600 7 0.5 - 0.5 0 Normal None t 0.2.4 PASS Selenium SGV 13000 7 0.1 - 0.2 0 Normal None t 0.2.2 PASS Vanadium 5600 3 0.01 - 0.01 0 Normal None c 12.5 PASS Moradia C5-6 2000 3 0.01 - 0.01 0 Not Normal None c 0.2.2 PASS Alphatic C12-6 5000 3 0.2.1	Areania SCV	640	7	74 15	0	Normal	Nono	+	12.0	DACC
Cardinium SQV 10000 7 1 - 3.3 0 Normal None t 2.5 PASS Chromium VI 330 7 1 - 1 0 Normal None t 0.9 PASS Chromium VI 330 7 10 - 73 0 Normal None t 0.9 PASS Cardinum SQV 3300 7 10 - 73 0 Normal None t 0.9 PASS Mickel SGV 3800 7 16 - 36 0 Normal None t 0.2 PASS Selenium SGV 1300 7 0.5 - 0.5 0 Normal None t 0.2 PASS NonMetals 0 0 Not Normal None c 1.2.5 PASS NonMetals 0 0.1 - 0.2 0 Not Normal None c 1.2.5 PASS Alphatic C6-4 2600 3 0.01 - 0.01 0 N/A N/A		040	7	7.4 - 15	0	Normal	None	L L	13.0	PASS
Cadmum Stov 230 7 0.4.1 0 Normal None t 0.9 PASS Corport 39000 7 10-73 0 Normal None t 50.6 PASS Mercury SGV 3600 7 0.05 - 0.2 0 Normal None t 50.6 PASS Mercury SGV 3600 7 0.5 - 0.5 0 Normal None t 0.2 PASS Selenium SGV 13000 7 0.5 - 0.5 0 Normal None t 0.2 PASS Vanadum 5500 0 - - - 0 Not Normal None t 0.2 PASS Monadit CS-6 55000 3 0.01 - 0.01 0 Not Normal 1 c 0.2 PASS Alphatic C2-6 25000 3 1.2 - 1.2 0 NA NA NA NA Alphatic C12-16 22000 3 0	Boron	110000	<u> </u>	1 - 3.3	0	Normai	None	t	2.6	PASS
Chromun VI 330 7 1-1 0 Copper 39000 7 10-73 0 Mercury SGV 3400 7 16-88 0 Mercury SGV 3400 7 16-86 0 Mercury SGV 1300 7 16-36 0 Selenium SGV 13000 7 16-36 0 Vanadium 5500 0 Zinc 660000 7 30-100 0 Not Normal None t 32.4 PASS Selenium SGV 13000 7 0.5-0.5 0 Vanadium 5600 0 Zinc 660000 7 30-100 0 Not Normal None c 125.5 PASS NorMetals Normal C5-6 2 Alphatic C5-6 2 Alphatic C5-6 2 Alphatic C5-6 2 Alphatic C5-6 12 Alphatic C5-12 Alphatic C5-13 12 Alphatic C5-13 12 Alphatic C5-13 12 Alphatic C5-13 12 Alphatic C5-12 Alphatic C5-13 Alphatic C5-13 Alphatic C5-13 Alphatic C5-13 Alphatic C5-14 Alphatic C5-13 Alphatic C5-12 Alphatic C5-14 Alphatic C5-13 Alphatic C	Cadmium SGV	230		0.4 - 1	0	Normal	None	t	0.9	PASS
Copper 39000 7 10 - 73 0 Normal None 1 65.6 PASS Mercury SGV 3600 7 0.05 - 0.2 0 Normal None 1 0.05 0.2 PASS Mercury SGV 13000 7 0.5 - 0.5 0 Normal None 1 0.2 PASS Selenium SGV 13000 7 0.5 - 0.5 0 Not Normal None 1 0.2 PASS Vanadium 660000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS Moreautic Casa 5000 3 0.01 - 0.01 0 Not Not N/A	Chromium VI	330	7	1 - 1	0					
Lead 4400 7 16 - 89 0 Normal None t 666 PASS Nickel SGV 13000 7 16 - 36 0 Normal None t 0.2 PASS Vanadium 5600 0 0 Normal None t 32.4 PASS Vanadium 5600 0 0 Not Normal None c 125.5 PASS NorMetals 660000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS Alphatic C5-6 2600 3 0.01 - 0.01 0 Not Normal 1 c 0.2 PASS Alphatic C5-6 2600 3 1.5 - 1.5 N/A N/A N/A N/A N/A Alphatic C12-16 25000 3 1.5 - 1.5 N/A N/A N/A N/A Alphatic C12-16 25000 3 0.5 - 0.5 0 N/A N/A Alphatic C12-	Copper	39000	7	10 - 73	0	Normal	None	t	59.6	PASS
Mercury SGV 3600 7 0.05 - 0.2 0 Normal None t 0.2 PASS Selenium SGV 13000 7 0.5 - 0.5 0 Normal None t 32.4 PASS Vanadium 66000 7 30 - 100 0 Not Normal None c 125.5 PASS NormAt13 660000 7 30 - 100 0 Not Normal 1 c 0.2 PASS Mercury SGV 16000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS Miphatic C3-6 2200 3 0.01 - 0.01 0 N/A Alphatic C1-61 12000 3 1.5 - 1.5 N/A N/A N/A N/A Alphatic C1-621 N/A 3 3.4 - 3.4 N/A N/A N/A Alphatic C1-621 22000 3 0.01 - 0.01 0 Aromatic C1-216 270000 3<	Lead	4400	7	16 - 89	0	Normal	None	t	69.6	PASS
Nickel SCV 1800 7 16 - 36 0 Normal None t 32.4 PASS Vanadium 66000 0 7 0.5 - 0.5 0 Normal None c 125.5 PASS Vanadium 660000 7 30 - 100 0 Not Normal None c 125.5 PASS NormAtalis 60000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS Alphatic C5-6 2600 3 0.01 - 0.01 0 N/A Alphatic C10-12 6300 3 1.5 - 1.5 N/A N/A N/A N/A Alphatic C10-12 6300 3 0.21 - 0.1 N/A N/A N/A Aromatic C10-12 9700 3 0.9 - 0.9 0 N/A Aromatic C10-12 9700 3 0.5 - 0.5 0 <td>Mercury SGV</td> <td>3600</td> <td>7</td> <td>0.05 - 0.2</td> <td>0</td> <td>Normal</td> <td>None</td> <td>t</td> <td>0.2</td> <td>PASS</td>	Mercury SGV	3600	7	0.05 - 0.2	0	Normal	None	t	0.2	PASS
Selenium SGV 13000 7 0.5 - 0.5 0 Nor C 125.5 PASS Vandium 660000 7 30 - 100 0 Not Normal None c 125.5 PASS NonMetals 1 c 0.2 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS TPH	Nickel SGV	1800	7	16 - 36	0	Normal	None	t	32.4	PASS
Vanadium 66000 0 Not Normal None c 125.5 PASS NorsMetals 60000 7 30 - 100 0 Not Normal 1 c 0.2 PASS Inorganic Cyanide 16000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS Alphatic C5-8 2600 3 0.01 - 0.01 0	Selenium SGV	13000	7	0.5 - 0.5	0					
Zinc 660000 7 30 - 100 0 Not Normal None c 125.5 PASS Inorganic Cyanide 16000 7 0.1 - 0.2 0 Not Normal 1 c 0.2 PASS TPH - - - 0 Not Normal 1 c 0.2 PASS Alphatic C3-6 2600 3 0.01 - 0.01 0 - - - - - - - - Alphatic C3-6 2600 3 1.5 - 1.5 0 N/A Alphatic C1-12 6300 3 1.0 - 10 0 - - - - - - - N/A N/A Aromatic C1-12 9700 3 0.5 - 0.5 0 - - - - - - - - - - - - - - - <td>Vanadium</td> <td>5600</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Vanadium	5600	0							
Non-Metals Image is a stress of the image is a stress of	Zinc	660000	7	30 - 100	0	Not Normal	None	с	125.5	PASS
Inorganic Cyanide 16000 7 0.1-0.2 0 Not Normal 1 c 0.2 PASS TPI	Non-Metals									
TPH C <thc< th=""> C <thc< th=""> <thc< th=""></thc<></thc<></thc<>	Inorganic Cyanide	16000	7	0.1 - 0.2	0	Not Normal	1	С	0.2	PASS
Aliphatic C5-6 2600 3 0.01 - 0.01 0 Aliphatic C6-8 5000 3 0.01 - 0.01 0 Aliphatic C10-12 6300 3 0.01 - 0.01 0 Aliphatic C10-12 6300 3 1.5 - 1.5 0 Aliphatic C16-21 N/A 3 1.5 - 1.5 N/A Aliphatic C16-35 N/A 3 3.4 - 3.4 N/A Aliphatic C16-35 1200000 3 0.01 - 0.01 0 N/A Aromatic C10-12 9700 3 0.5 - 0.5 0 N/A Aromatic C1-35 N/A 3 0.4 - 1.4 0 VOC Benzene SGV 16 3 0.01 - 0.01 0 Image: Comparison of the comparison of	ТРН									
Aiphatic C8-8 5000 3 0.01 - 0.01 0 Aiphatic C8-10 1200 3 0.01 - 0.01 0 Aiphatic C10-12 6300 3 1.5 - 1.5 0 Aiphatic C10-12 6300 3 1.5 - 1.5 0 Aiphatic C16-31 N/A 3 1.5 - 1.5 N/A N/A Aiphatic C16-35 N/A 3 3.4 - 3.4 N/A N/A Aiphatic C16-35 120000 3 0.0 - 0.9 0 N/A Aromatic C8-10 2200 3 0.0 - 0.9 0 N/A Aromatic C1-12 9700 3 0.6 - 0.6 0 0 0 Aromatic C1-16 27000 3 0.6 - 0.6 0 0 0 0 Aromatic C1-15 28000 3 1.4 - 1.4 0 0 0 0 Chloroethene 0.46 0 0 0 0 0 0 0 12-Dichloroethane 0.38 0.01 - 0.01 0 0 0 0 0 0 0 </td <td>Aliphatic C5-6</td> <td>2600</td> <td>3</td> <td>0.01 - 0.01</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Aliphatic C5-6	2600	3	0.01 - 0.01	0					
Aiphatic C8-10 1200 3 0.01 - 0.01 0 Aliphatic C10-12 6300 3 1.5 - 1.5 0 Aliphatic C12-16 25000 3 1.5 - 1.5 N/A Aliphatic C12-35 N/A 3 3.4 - 3.4 N/A Aliphatic C16-35 120000 3 0.01 - 0.01 0 N/A Aromatic C10-12 9700 3 0.01 - 0.01 0 N/A Aromatic C10-12 9700 3 0.05 - 0.5 0 - - Aromatic C16-21 27000 3 0.01 - 0.01 0 - - - Aromatic C16-21 27000 3 0.01 - 0.01 0 - - - Aromatic C10-12 9700 3 0.01 - 0.01 0 -<	Aliphatic C6-8	5000	3	0.01 - 0.01	0					
Aliphatic C10-12 6300 3 1.5 - 1.5 0 Aliphatic C12-16 25000 3 1.2 - 1.2 0 Aliphatic C16-21 N/A 3 1.5 - 1.5 N/A Aliphatic C16-21 N/A 3 1.5 - 1.5 N/A Aliphatic C16-35 1200000 3 10 - 10 0 N/A Aromatic C8-10 2200 3 0.01 - 0.01 0 N/A Aromatic C12-16 25000 3 0.6 - 0.6 0 - Aromatic C12-16 27000 3 0.6 - 0.6 0 - - Aromatic C13-5 28000 3 1.4 - 1.4 0 - - - VOCs - - - - - - - Benzene SGV 16 3 0.01 - 0.01 0 - - - - 12-Dichoroethane 0.36 0 - - - - - - - - - - - - - - - - -	Aliphatic C8-10	1200	3	0.01 - 0.01	0					
Aliphatic C12-16 25000 3 1.2 - 1.2 0 Aliphatic C16-21 N/A 3 1.5 - 1.5 N/A Aliphatic C13-35 N/A 3 3.4 - 3.4 N/A Aliphatic C16-35 120000 3 0.01 - 0.01 0 N/A Aromatic C10-12 9700 3 0.5 - 0.5 0 0 N/A Aromatic C16-21 27000 3 0.6 - 0.6 0 N/A N/A Aromatic C16-21 27000 3 0.6 - 0.6 0 N/A N/A Aromatic C16-21 27000 3 0.01 - 0.01 0 Image: C1-35 Image: C1-35 <td>Aliphatic C10-12</td> <td>6300</td> <td>3</td> <td>1.5 - 1.5</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Aliphatic C10-12	6300	3	1.5 - 1.5	0					
Aliphatic C16-21 N/A 3 1.5 - 1.5 N/A N/A N/A Aliphatic C1-35 1200000 3 10 - 10 0 N/A N/A Aliphatic C16-35 1200000 3 0.01 - 0.01 0 -	Aliphatic C12-16	25000	3	1.2 - 1.2	0					
Aliphatic C21-35 N/A 3 3.4 - 3.4 N/A N/A N/A Aliphatic C16-35 120000 3 0.01 - 0.01 0 - <td>Aliphatic C16-21</td> <td>N/A</td> <td>3</td> <td>1.5 - 1.5</td> <td>N/A</td> <td></td> <td></td> <td>N/A</td> <td></td> <td>N/A</td>	Aliphatic C16-21	N/A	3	1.5 - 1.5	N/A			N/A		N/A
Aliphatic C16-35 1200000 3 10 - 10 0 Image: C10 - 12 C10 - 12 <thc10 -="" 12<="" th=""> <</thc10>	Aliphatic C21-35	N/A	3	3.4 - 3.4	N/A			N/A		N/A
Aromatic C8-10 2200 3 0.01 - 0.01 0 Aromatic C10-12 9700 3 0.9 - 0.9 0 Aromatic C12-16 25000 3 0.6 - 0.5 0 Aromatic C16-21 27000 3 0.6 - 0.6 0 Aromatic C10-22 27000 3 0.6 - 0.6 0 Aromatic C10-21 27000 3 0.6 - 0.6 0 Aromatic C21-35 28000 3 1.4 - 1.4 0 VOC5 0 0.01 - 0.01 0 0 Chioroethane 0.36 0 0 0.01 - 0.01 0 I2-Dichloroethane 63 0 0 0 0 Tetrachloroethane 1.7 0 0 0 0 1,1,1-Trichloroethane 390 0 0 0 0 1 c 1.9 PASS Benz0alganthracene 140 7 0.1 - 2.4 0 Not Normal 1 c 1.9 PASS	Aliphatic C16-35	1200000	3	10 - 10	0					
Aromatic C10-12 9700 3 0.9 - 0.9 0	Aromatic C8-10	2200	3	0.01 - 0.01	0					
Aromatic C12-16 25000 3 0.5 - 0.5 0 0 Aromatic C16-21 27000 3 0.6 - 0.6 0 0 0 Aromatic C13-35 28000 3 1.4 - 1.4 0 0 0 VOCs 8 0.01 - 0.01 0 0 0 0 0 Senzene SGV 16 3 0.01 - 0.01 0 0 0 0 1,2-Dichloroethane 0.36 0 0 0 0 0 0 Tetrachloroethanes 63 0	Aromatic C10-12	9700	3	0.9 - 0.9	0					
Aromatic C16-21 27000 3 0.6 - 0.6 0 Aromatic C21-35 28000 3 1.4 - 1.4 0 VOCs 0 0 0 0 0 Benzene SGV 16 3 0.01 - 0.01 0 0 0 Chloroethene 0.04 0 0 0 0 0 0 1,2-Dichloroethane 0.36 0 0 0 0 0 0 Naphthalene 75 0 0 0 0 0 0 0 0 0 Tetrachloroethane 91 0	Aromatic C12-16	25000	3	0.5 - 0.5	0					
Aromatic C21-35 28000 3 1.4 - 1.4 0 Image: Constraint of the consthe constraint of the constraint of the constraint of t	Aromatic C16-21	27000	3	0.6 - 0.6	0					
VOCs vol vol <td>Aromatic C21-35</td> <td>28000</td> <td>3</td> <td>1.4 - 1.4</td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Aromatic C21-35	28000	3	1.4 - 1.4	0					
Benzene SGV 16 3 0.01 - 0.01 0 Image: constraint of the system	VOCs									
Chloroethene 0.04 0 1,2-Dichloroethane 0.36 0 Ethylbenzene SGV 510 3 0.01 - 0.01 0 Kaphthalene 75 0 - - Tetrachloroethanes 63 0 - - Tetrachloroethane 91 0 - - - Tetrachloroethane 1.7 0 - - - - Toluene SGV 835 3 0.01 - 0.01 0 - - - SVOCs 470 3 0.01 - 0.01 0 - - - Benz(ajanthracene 140 7 0.1 - 2.4 0 Not Normal 1 c 1.9 PASS Benzo(ajpyrene 14 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benzo(ajpilperylene 140 7 0.1 - 0.1 0 - - - - - - -	Benzene SGV	16	3	0.01 - 0.01	0					
1,2-Dichloroethane 0.36 0 0.01 - 0.01 0 Ethylbenzene SGV 510 3 0.01 - 0.01 0 Naphthalene 75 0	Chloroethene	0.04	0							
Ethylbenzene SGV 510 3 0.01 - 0.01 0 Naphthalene 75 0 Naphthalene 75 0 <t< td=""><td>1,2-Dichloroethane</td><td>0.36</td><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	1,2-Dichloroethane	0.36	0							
Naphthalene 75 0 Image: constraint of the second secon	Ethylbenzene SGV	510	3	0.01 - 0.01	0					
Tetrachloroethanes 63 0 Image: status of the status of	Naphthalene	75	0							
Tetrachloroethene 91 0 Participation Parcontinterpotent Partendify	Tetrachloroethanes	63	0							
Tetrachloromethane 1.7 0 0.01 - 0.01 0 Toluene SGV 835 3 0.01 - 0.01 0	Tetrachloroethene	91	0							
Toluene SGV 835 3 0.01 - 0.01 0 Image: second se	Tetrachloromethane	1.7	0							
1,1,1-Trichloroethane 390 0 1,1,1-Trichloroethane 390 0 1,1,1-Trichloroethane 1	Toluene SGV	835	3	0.01 - 0.01	0					
Trichloroethene 6.6 0 Xylenes SGV 470 3 0.01 - 0.01 0 SVOCs Benz[a]anthracene 140 7 0.1 - 2.4 0 Not Normal 1 c 1.9 PASS Benz[a]anthracene 140 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benz[a]pyrene 140 7 0.1 - 1.2 0 Not Normal 1 c 1.2 PASS Benzo[a]pyrene 140 7 0.1 - 1.2 0 Not Normal 1 c 1.2 PASS Benzo[k]fluoranthene 140 7 0.1 - 0.1 0 0 Not Normal 1 c 0.6 PASS Benzo[k]fluoranthene 1400 7 0.1 - 0.8 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 0 Normal 1 t 2.2 PASS	1.1.1-Trichloroethane	390	0		-					
Xylenes SGV 470 3 0.01 - 0.01 0 Image: constraint of the synthesis of the synthesyntex of the synthesis of the synthesis of the synthesy	Trichloroethene	6.6	0							
SVOCs Benz[a]anthracene 140 7 0.1 - 2.4 0 Not Normal 1 c 1.9 PASS Benz[a]anthracene 14 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benzo[a]pyrene 14 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benzo[b]fluoranthene 140 7 0.1 - 0.1 0 0 0 Not Normal 1 c 0.9 PASS Benzo[b]fluoranthene 140 7 0.1 - 0.1 0	Xvlenes SGV	470	3	0.01 - 0.01	0					
Benz[a]anthracene 140 7 0.1 - 2.4 0 Not Normal 1 c 1.9 PASS Benz0[a]pyrene 14 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benz0[b]fluoranthene 140 7 0.1 - 1.2 0 Not Normal 1 c 1.2 PASS Benz0[b]fluoranthene 140 7 0.1 - 0.1 0 0 Not Normal 1 c 0.9 PASS Benz0[k]fluoranthene 150 7 0.1 - 0.1 0 0 Not Normal 1 c 0.6 PASS Chrysene 1400 7 0.1 - 0.8 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 -	SVOCs									
Benzo[a]pyrene 14 7 0.1 - 1.5 0 Not Normal 1 c 1.2 PASS Benzo[b]fluoranthene 140 7 0.1 - 1.2 0 Not Normal 1 c 0.9 PASS Benzo[b]fluoranthene 140 7 0.1 - 0.1 0 1 c 0.9 PASS Benzo[k]fluoranthene 150 7 0.1 - 0.8 0 Not Normal 1 c 0.6 PASS Chrysene 1400 7 0.1 - 0.7 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0	Benz[a]anthracene	140	7	0.1 - 2.4	0	Not Normal	1	С	1.9	PASS
Benzo[biliuoranthene 140 7 0.1 - 1.2 0 Not Normal 1 c 0.9 PASS Benzo[ghi]perylene 140 7 0.1 - 0.1 0 0 1 c 0.9 PASS Benzo[k]fluoranthene 150 7 0.1 - 0.8 0 Not Normal 1 c 0.6 PASS Chrysene 1400 7 0.1 - 1.7 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0	Benzo[a]pyrene	14	7	0.1 - 1.5	0	Not Normal	1	с	1.2	PASS
Benzo[ghi]perylene 140 7 0.1 - 0.1 0 Not Normal 1 c 0.6 PASS Benzo[k]fluoranthene 150 7 0.1 - 0.8 0 Not Normal 1 c 0.6 PASS Chrysene 1400 7 0.1 - 0.1 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 7 1 1 t 2.2 PASS Fluoranthene 54000 7 0.1 - 4.6 0 Normal 1 t 2.2 PASS Indeno[123-cd]pyrene 140 7 0.1 - 1.6 0 Not Normal 1 c 1.2 PASS Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 0.3 PASS Phenol SGV 685 0 1 t 1.9 PASS	Benzo[b]fluoranthene	140	7	0.1 - 1.2	0	Not Normal	1	с	0.9	PASS
Benzo[k]fluoranthene 150 7 0.1 - 0.8 0 Not Normal 1 c 0.6 PASS Chrysene 1400 7 0.1 - 1.7 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 -	Benzo[ghi]perylene	140	7	0.1 - 0.1	0					
Chrysene 1400 7 0.1 - 1.7 0 Not Normal 1 c 1.3 PASS Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 0 1 t 2 PASS Fluoranthene 54000 7 0.1 - 4.6 0 Normal 1 t 2.2 PASS Indeno[123-cd]pyrene 140 7 0.1 - 1.6 0 Not Normal 1 c 1.2 PASS Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 0.3 PASS Phenol SGV 685 0	Benzo[k]fluoranthene	150	7	0.1 - 0.8	0	Not Normal	1	с	0.6	PASS
Dibenz[ah]anthracene 14 7 0.1 - 0.1 0 Normal 1 t 2.2 PASS Fluoranthene 54000 7 0.1 - 4.6 0 Normal 1 t 2.2 PASS Indeno[123-cd]pyrene 140 7 0.1 - 1.6 0 Not Normal 1 c 1.2 PASS Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 0.3 PASS Phenol SGV 685 0 - </td <td>Chrysene</td> <td>1400</td> <td>7</td> <td>0.1 - 1.7</td> <td>0</td> <td>Not Normal</td> <td>1</td> <td>с</td> <td>1.3</td> <td>PASS</td>	Chrysene	1400	7	0.1 - 1.7	0	Not Normal	1	с	1.3	PASS
Fluoranthene 54000 7 0.1 - 4.6 0 Normal 1 t 2.2 PASS Indeno[123-cd]pyrene 140 7 0.1 - 1.6 0 Not Normal 1 c 1.2 PASS Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 0.3 PASS Phenol SGV 685 0 0 Normal 1 t 1.9 PASS	Dibenz[ah]anthracene	14	7	0.1 - 0.1	0				-	
Indeno[123-cd]pyrene 140 7 0.1 - 1.6 0 Not Normal 1 c 1.2 PASS Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 1.2 PASS Phenol SGV 685 0 0 Not Normal 1 c 0.3 PASS Pyrene 76000 7 0.1 - 3.9 0 Normal 1 t 1.9 PASS	Fluoranthene	54000	7	0.1 - 4.6	0	Normal	1	t	2.2	PASS
Naphthalene 75 7 0.1 - 0.3 0 Not Normal 1 c 0.3 PASS Phenol SGV 685 0 0 Normal 1 t 1.9 PASS Pyrene 76000 7 0.1 - 3.9 0 Normal 1 t 1.9 PASS	Indeno[123-cd]pvrene	140	7	0.1 - 1.6	0	Not Normal	1	c	1.2	PASS
Phenol SGV 685 0 0 Normal 1 t 1.9 PASS Pyrene 76000 7 0.1 - 3.9 0 Normal 1 t 1.9 PASS	Naphthalene	75	7	0.1 - 0.3	0	Not Normal	1	c l	03	PASS
Pyrene 76000 7 0.1 - 3.9 0 Normal 1 t 1.9 PASS	Phenol SGV	685	0							
	Pyrene	76000	7	0.1 - 3.9	0	Normal	1	t	1.9	PASS

CAPITA SYMONDS

G.Q.R.A.			Oakleigh Road South Depot								oils	
Summary of Concentrations						Made Ground Commercial						
Project Number:	CS0784	06				S	oil Type:		Sand -	1% SOM		
Client:	London	Borough	of Barne	t								
		1	2	3	А	5	6	7	8	Q	10	
Compound	GAC	TP101	TP102	TP103	TP104	TP108	TP109	TP109				
		0.50m	0.30m	0.50m	2.00m	0.30m	0.30m	2.00m				
Metals												
Arsenic SGV	640	12	7.4	7.8	14	11	14	15	-	-	-	
Boron	110000	2.3	1	1.1	1.2	1.6	2.8	3.3	-	-	-	
Cadmium SGV	230	0.6	0.4	0.4	0.8	0.8	1	0.9	-	-	-	
Chromium VI	330	1	1	1	1	1	1	1	-	-	-	
Copper	39000	37	10	10	59	34	64	/3	-	-	-	
Lead	4400	89	16	16	68	39	52	66	-	-	-	
Mercury SGV	3600	0.15	0.05	0.05	0.2	0.05	0.12	0.13	-	-	-	
	1800	16	16	1/	36	26	32	36	-	-	-	
Selenium SGV	13000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	-	-	
Vanadium	5600	-	-	-	-	-	-	-	-	-	-	
	660000	95	30	31	100	/8	87	100	-	-	-	
Non-Metals	16000	0.2	0.1	0.1	0.1	0.1	0.1	0.1				
Inorganic Cyanide	16000	<u>0.2</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Aliphotic CE 6	2600				0.01	0.01	0.01					
Aliphatic C5-0	2000	-	-	-	0.01	0.01	0.01	-	-	-	-	
Aliphatic C0-0	1200	-	-	-	0.01	0.01	0.01	-	-	-	-	
Aliphatic C10-12	6300		-	-	1.5	1.5	1.5	-	-	-	-	
Aliphatic C12-16	25000				1.0	1.0	1.0	_				
Aliphatic C16-21	23000 N/A				1.2	1.2	1.2	_				
Aliphatic C21-35					3.4	3.4	3.4	_				
Aliphatic C16-35	1200000	_	_	_	10	10	10	_	_	_	_	
Aromatic C8-10	2200	-	-	-	0.01	0.01	0.01	-	-	-	-	
Aromatic C10-12	9700	-	-	-	0.9	0.9	0.9	-	-	-	-	
Aromatic C12-16	25000	-	-	_	0.5	0.5	0.5	-	-	-	_	
Aromatic C16-21	27000	-	_	_	0.6	0.6	0.6	-	-	-	_	
Aromatic C21-35	28000	-	_	_	1.4	1.4	1.4	-	-	-	_	
VOCs												
Benzene SGV	16	-	-	-	0.01	0.01	0.01	-	-	-	-	
Chloroethene	0.04	-	-	-	-	-	-	-	-	-	-	
1,2-Dichloroethane	0.36	-	-	-	-	-	-	-	-	-	-	
Ethylbenzene SGV	510	-	-	-	0.01	0.01	0.01	-	-	-	-	
Naphthalene	75	-	-	-	-	-	-	-	-	-	-	
Tetrachloroethanes	63	-	-	-	-	-	-	-	-	-	-	
Tetrachloroethene	91	-	-	-	-	-	-	-	-	-	-	
Tetrachloromethane	1.7	-	-	-	-	-	-	-	-	-	-	
Toluene SGV	835	-	-	-	0.01	0.01	0.01	-	-	-	-	
1,1,1-Trichloroethane	390	-	-	-	-	-	-	-	-	-	-	
Trichloroethene	6.6	-	-	-	-	-	-	-	-	-	-	
Xylenes SGV	470	-	-	-	0.01	0.01	0.01	-	-	-	-	
SVOCs												
Benz[a]anthracene	140	<u>2.4</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Benzolajpyrene	14	<u>1.5</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Benzolbjfluoranthene	140	<u>1.2</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Benzo[ghi]perylene	140	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Benzo[k]fluoranthene	150	<u>0.8</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
	1400	$\frac{1.7}{2}$	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
	14	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
	54000	4.6	0.1	0.1	0.3	0.2	0.8	0.8	-	-	-	
Naphthalana	140	<u>1.6</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Phenol SCV	() 605	<u>0.3</u>	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	
Pvrene	76000	20	- 0 1	- 0.1	-	- 0.8	0.5	- 0.2			-	
1 310110	10000	3.3	0.1	0.1	0.0	0.0	0.0	0.0	· -	· -		

Sample concentrations in mg/kg

CAPITA SYMONDS

CAPITA

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