

R. CARR GEOTECHNICAL SERVICES

Ref: 4116/24

**PROPOSED REDEVELOPMENT AT
THE CUSTOM HOUSE, THE TERRACE,
GRAVESEND, KENT DA12 2BW.**

PHASE 2 REPORT ON SUBSOIL INVESTIGATIONS

February 2024

R. Carr Geotechnical Services 9 The Mallows, Maidstone, Kent ME14 2PX

Tel: 07974 758617 email: RONCARR200@aol.com

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Appendix A Subsoil Investigations
Appendix B Laboratory Test Results

The Custom House, The Terrace, Gravesend, Kent DA12 2BW.

1. Introduction

- 1.1 This report has been prepared following receipt of instructions from Mr M Keckes representing Mile Property Group, prospective developers of the site known as The Custom House, The Terrace, Gravesend.
- 1.2 The site is being considered for residential development involving the refurbishment and part demolition of existing buildings, together with the construction of new units.
- 1.3 This report should be viewed in conjunction with a previous Phase 1 Geo-environmental Desk Study and Preliminary Risk Assessment carried out for the site by R Carr Geotechnical Services during February 2021 (report ref: 3852/21). The Desk Study revealed that The Custom House had been constructed during the early part of the nineteenth century in order to instigate controls on shipping passing along the River Thames and to assess duties payable on cargoes. Buildings present to the rear of the site probably comprised accommodation for personnel and stabling for horses. Little change had occurred to the site since its original development, the buildings having since supported office accommodation and a small boat building enterprise. The site was therefore considered to pose a low to moderate risk to receptors including human health, plant life, underground plastic water supply pipes and groundwater from the following sources of potential contamination:
- Toxic metals, polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH) possibly present within sub-base material beneath existing surfacing
 - Possible localised hydrocarbon contamination (TPH) as a result of lubricant leakages from parked vehicles
 - Possible localised metal, hydrocarbon and solvent contamination in the vicinity of the former boat building workshop (e.g. iron, steel, lead paint, TPH and volatile organic compounds (VOC))
 - Asbestos-containing material possibly present in existing buildings
- 1.4 A low risk was considered applicable to the site from off-site sources of potential

contamination and no credible sources of gas migration were identified by the desk study. Data supplied by a Landmark environmental report indicated that radon protection measures were not required within the design of the proposed development.

- 1.5 The desk study recommended that a limited ground investigation comprising shallow boreholes and soil sampling should be undertaken specifically in areas of proposed garden and landscaping. Chemical testing was then to be undertaken on soil samples recovered from the excavations for a suite of common contaminants, speciated PAH, TPH fractions, VOC and presence of asbestos.
- 1.6 This report details the results of an intrusive investigation recently undertaken at the site. Information contained within the report has been derived from borehole investigations and subsequent laboratory tests carried out on samples of soil obtained from the site, in general compliance with the following guidelines:

- Land Contamination Risk Management (LCRM) Environment Agency (2020)
- National Planning Policy Framework (NPPF) (2021)

2. Topography

- 2.1 The site is situated to the north of The Terrace at OS Land Ranger map reference TQ 652 743.
- 2.2 Ground level at the site is sloping gently downhill from south to north, the rear of the site being of a relatively level contour.
- 2.3 At the time of the investigation no change had occurred to the site since the original inspection was undertaken three years previously.

3. Geology

- 3.1 Reference to the local Geological Survey sheet (no. 271: Dartford) has indicated that the site is underlain by the Seaford Chalk member of the White Chalk subgroup (formerly referred to as the Upper Chalk).

- 3.2 The Seaford Chalk consists of soft, white, friable limestone that is 95% calcium carbonate and contains scattered nodular and tabular flint. The upper surface of the Chalk is often deeply convoluted and may contain solution pipes filled with more recent tertiary deposits.

4. Hydrology and Hydrogeology

- 4.1 The River Thames flows west to east within 20m to the north of the site.
- 4.2 Two ponds are situated within 250m to the east of the site.
- 4.3 The Chalk is the Principal Aquifer of the area with high groundwater vulnerability. A Principal Aquifer is defined by the Environment Agency as a “highly permeable formation with known or possible presence of significant fracturing”. These tend to be highly productive and capable of supporting public supply and other abstractions. Soil Classification: Soils of High Leaching Potential (U).

5. Subsoil Investigations

- 5.1 Five boreholes were drilled in accessible areas of the site with a tracked windowless sampling rig on 13th February 2023 (WS1-WS5). Borehole WS1 was positioned in the area of proposed structural development in order to provide parameters for foundation design, whereas boreholes WS2-WS5 targeted proposed areas of landscaping and garden in the vicinity of the former boat building workshop. The locations of the boreholes are denoted on the accompanying site plan.
- 5.2 Disturbed samples of soil recovered from all boreholes were retained in plastic pots and glass jars for contamination analysis at an accredited laboratory. The samples were dispatched to the laboratory immediately after completion of the site work.
- 5.3 Details of the soils encountered are provided within logs contained in Appendix A, but can be conveniently summarised as follows:

Depth	Stratum
Ground level – 0.35m/0.4m	Tarmac surfacing on compact brick hardcore and localised concrete
0.35m/0.4m – 1.3m/1.9m	FILL – soft sandy clay with varying quantities of fine to coarse chalk gravel, fine to medium brick gravel, localised fine coal gravel and coarse subangular flints
1.3m – 2m (WS3 only)	HEAD DEPOSITS – firm slightly sandy CLAY
1.4m/1.9m – 2.4m	Weathered CHALK – friable very sandy CLAY with abundant fine to coarse chalk gravel and localised coarse subangular flints
2.4m – 4m+	SEAFORD CHALK – weak, medium density white CHALK composed of silty SAND and GRAVEL with localised yellow staining. Gravel is moderately strong. Occasional coarse flints present at 3.2m Grade IV C4

In Situ Soil Strength Tests

5.3 Standard Penetration tests carried out in WS1 as drilling progressed provided the following soil strength values:

Depth (m)	N value
1.0	0
2.0	8
3.0	13
4.0	10

- 5.4 Groundwater was not encountered within 4m of the site surface and the sides of the boreholes remained stable throughout the duration of the investigation.

6. Laboratory Testing

Geotechnical Tests

- 6.1 The results of the laboratory tests are provided in Appendix B. A particle size distribution test undertaken on a sample of the Seaford Chalk recovered from WS1 at 3m has provided the following analysis of soil composition:

Reference	Fines%	Sand%	Gravel%
WS2 3.0m	27.0	9.1	63.5

- 6.2 Chemical analysis undertaken on soil samples retrieved from depths of 1.5m and 3.5m in WS1 has determined soil pH of 8.4 and 8.0 with water soluble sulphate of 0.07 and 0.15 g/L (Class DS-1).

Contamination Tests

- 6.3 Samples of soil obtained from each borehole at a depth of 0.5m have been analysed for a suite of common contaminants including speciated polyaromatic hydrocarbons (PAH), petroleum hydrocarbon fractions (TPH/CWG), volatile organic compounds (VOC), semi-volatile organic compounds (SVOC) and presence of asbestos. The results of the tests have been compared with the following soil screening criteria for residential development with plant uptake:

- Contaminated Land Exposure Assessment model (CLEA) 2015
- LQM/CIEH S4ULs for Human Health Risk Assessment 2015
- SP1010 Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document 2014

- 6.4 Quantities of contaminants detected within the samples are within the utilised soil

screening values for residential development. VOC, SVOC and TPH fractions were below laboratory detection levels and no evidence of asbestos fibres was observed in the samples.

- 6.5 A Waste Acceptance Criteria test undertaken on a sample of the Fill recovered from a depth of 1.5m in WS1 has classified the material as suitable for disposal as inert waste landfill.

7. Discussion/Recommendations

- 7.1 The investigation has confirmed the presence of the Seaford Chalk beneath the site, overlain by compressible Fill material extending 1.9m below ground level in the southwest section of the site. Elsewhere on the site the Fill material extended to depths between 1.3m and 1.75m. It is likely that the Fill was historically deposited in order to reduce the slope of the site at the time of its original development.
- 7.2 Groundwater was not encountered within 4m of the site surface in the southwest section of the site but may occur at a shallower depth on the site's downslope area.

Foundations

- 7.3 It is essential that foundations should extend below the depth of any compressible soil into competent load-bearing strata. Due to its soft consistency the Fill material present beneath the site is unsuitable for the construction of conventional foundations. Foundations should therefore be extended into the underlying Seaford Chalk, where an allowable bearing pressure of 125 kNm² is applicable at a minimum depth of 2.5m. Alternatively, a piled foundation solution could be considered (unless the site level is to be reduced).
- 7.4 Sulphate determination has categorised the subsoil as Class DS-1, therefore special precautions would not be necessary within sub-surface concrete placed on the site (see BS 8500-1:2015+A2:2019).

Detailed Risk Assessment

- 7.5 The results of the chemical tests have not revealed excessive levels of contaminative substances beneath the site surface. A low risk has therefore been identified to human health and plant life. Fill material present beneath the site surface is however considered unsuitable as a horticultural medium, therefore some remediation is considered advisable.
- 7.6 A low risk has been identified to groundwater as no excessive contamination has been detected and potentially mobile contaminants including VOC, SVOC and TPH are below laboratory detection levels.
- 7.7 Previous gas risk assessment did not identify any credible off-site sources of ground gas migration. The on-site Fill material consists mainly of reworked, naturally occurring soil with occasional inert debris. Total organic carbon (TOC) did not exceed 2.2% and volatile compounds were below laboratory detection levels therefore a low risk is considered applicable to the site from emissions of soil vapours.
- 7.8 A low risk has been identified to polyethylene water supply pipes as TPH, VOC and SVOC were below laboratory detection levels. PAH were at relatively low concentrations. The advice of the local water authority should however be sought in order to confirm the suitability of potable water service materials.

Remediation Strategy and Options Appraisal

- 7.9 It is recommended that in proposed areas of domestic garden the Fill material should be excavated to a depth of 600mm and replaced with clean, imported topsoil that has been certified free from contamination. Areas of landscaping within the development should be provided with a 300mm layer of clean soil.
- 7.10 Alternatively, areas of landscaping could be provided with hardstanding and raised planters incorporated within the development.
- 7.11 Excavated surfacing materials and soil should be removed from the site to an appropriately licensed waste facility. Waste Acceptance Criteria testing has classified

the Fill material suitable for disposal as inert waste landfill. Naturally-occurring soils can also be assumed suitable for disposal as inert waste.

- 7.12 Site workers should be provided with appropriate PPE and washing facilities. It is also recommended that suppression of dust is undertaken as far as possible during excavation work.
- 7.13 Any asbestos-containing material discovered within the existing buildings should be removed by an experienced contractor to a suitably licensed depository.
- 7.14 Gas protection measures are not considered necessary within the development.
- 7.15 Every precaution should be taken during the course of the development in order to prevent the escape and subsequent migration of pollutants into the underlying Principal Aquifer. Any fuel and/or lubricants utilised by contractors' plant should be stored in a secure, preferably bunded area of the site.

Verification Plan

- 7.16 Photographs of the reduced site levels should be retained as evidence that the remediation procedure has been undertaken and for inclusion within a Closure Report for the site.
- 7.17 Haulage transfer notes should be provided as evidence that excavated soil has been removed from the site and for inclusion within the Closure Report.
- 7.18 Imported topsoil for use in garden areas should be tested in order to ensure that it is free from contamination and suitable for its proposed use. The results of chemical tests should be included within the Closure Report.
- 7.19 In the event that contamination not detected by the recent investigation is encountered during the course of the development, work should cease and an appropriate remediation strategy implemented. Evidence of contamination may include discoloured or malodorous soil and/or the presence of ash, clinker or asbestos fragments.

- 7.20 The findings and recommendations contained within this report should be made available to the Contaminated Land Officer of the Local Planning Authority prior to the commencement of the development.
- 7.21 This report has been prepared from information obtained at representative locations of the site. Although no significant variation in ground conditions is anticipated, no responsibility can be accepted for any such variations that may exist beneath the site in hitherto uninvestigated areas.

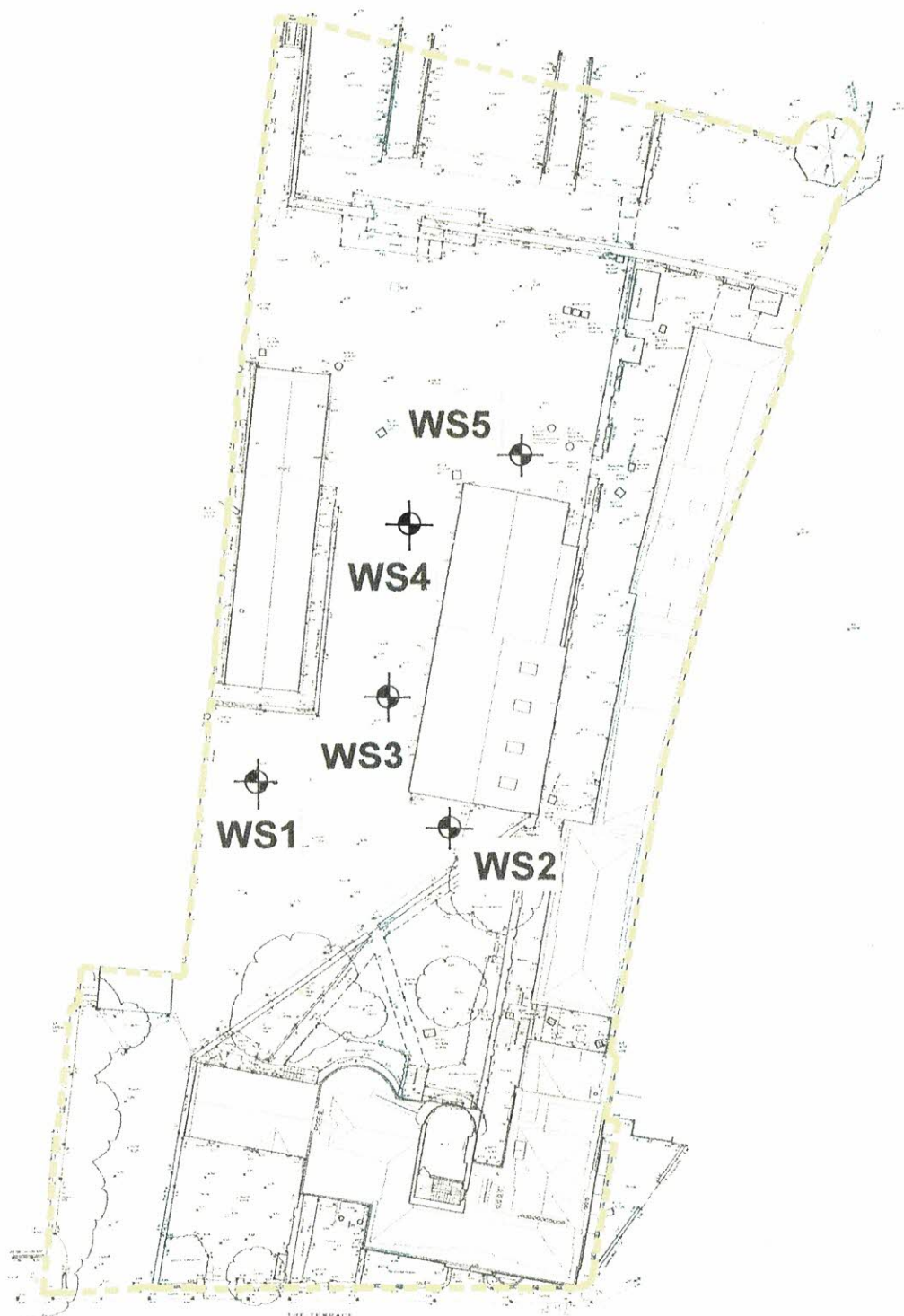
A handwritten signature in black ink, appearing to read 'R. Carr', with a long horizontal flourish extending to the right.

R. Carr BA (Hons) FGS

February 2024

Appendix A

Subsoil Investigations



**The Custom House, The Terrace, Gravesend.
Plan showing locations of boreholes.**

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STRATA LOG

Job: THE CUSTOM HOUSE, GRAVESEND

No. WS1

Method of excavation: **Tracked Windowless Sampler**

Date: 13.02.24

SAMPLE	DEPTH m.	G.L.	DESCRIPTION OF SOIL
			250mm tarmac on 150mm compact brick hardcore
●	0.50	0.40 0.50	Soft brown sandy clay with abundant fine to medium chalk gravel, scarce fine to medium brick gravel and occasional rootlets (FILL)
SPT ● 'N=0	1.00	1.00	
●	1.50	1.50	
SPT ● 'N=8	2.00	1.90 2.00	Friable buff very sandy CLAY with fine chalk gravel and occasional coarse subangular flints (Weathered CHALK)
●	2.50	2.40 2.50	Weak medium density white CHALK, composed of silty SAND and GRAVEL with localised yellow staining. Gravel is moderately strong. Occasional coarse subangular flints present at 3.2m (SEAFORD CHALK) Grade IV C5
SPT ● 'N=13	3.00	3.00	
●	3.50	3.50	
SPT ● 'N=10	4.00	4.00	
		4.50	
		End	Borehole dry on completion Sides of borehole stable ● '= Disturbed sample SPT '= Standard Penetration Test

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STRATA LOG

Job: THE CUSTOM HOUSE, GRAVESEND

No. WS2

Method of excavation: **Tracked Windowless Sampler**

Date: 13.02.24

SAMPLE	DEPTH m.	G.L.	DESCRIPTION OF SOIL
			200mm tarmac on 150mm compact brick hardcore
		0.35	
•	0.50	0.50	Soft brown sandy clay with scattered fine to medium chalk gravel, occasional fine brick and coal gravel and scarce rootlets (FILL)
•	1.00	1.00	
•	1.50	1.50	
		1.75	
			Friable light buff very sandy CLAY
•	2.00	2.00	with abundant fine chalk gravel (Weathered CHALK)
		End	Borehole dry on completion Sides of borehole stable
		2.50	• '= Disturbed sample
		3.00	
		3.50	
		4.00	
		4.50	

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STRATA LOG

Job: THE CUSTOM HOUSE, GRAVESEND

No. WS3

Method of excavation: **Tracked Windowless Sampler**

Date: 13.02.24

SAMPLE	DEPTH m.	G.L.	DESCRIPTION OF SOIL
			150mm tarmac on 200mm compact brick hardcore
•	0.50	0.35 0.50	Soft brown sandy clay with abundant fine chalk gravel, occasional coarse subangular flints and scarce coal gravel (FILL)
•	1.00	1.00	
		1.30	
•	1.50	1.50	Firm orange-brown slightly sandy CLAY (HEAD DEPOSITS)
•	2.00	2.00	Coarse chalk gravel appearing at 1.9m
		End	Borehole dry on completion Sides of borehole stable
		2.50	• '= Disturbed sample
		3.00	
		3.50	
		4.00	
		4.50	

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STRATA LOG

Job: THE CUSTOM HOUSE, GRAVESEND

No. WS4

Method of excavation: Tracked Windowless Sampler

Date: 13.02.24

SAMPLE	DEPTH m.	G.L.	DESCRIPTION OF SOIL
			200mm tarmac on 200mm compact brick hardcore
•	0.50	0.40 0.50	Firm grey-brown clay with abundant fine to coarse chalk gravel, and occasional fine to medium brick gravel (FILL)
•	1.00	1.00	
•	1.50	1.50	
		1.70	Friable grey- buff very sandy CLAY
•	2.00	2.00	with abundant coarse chalk gravel (Weathered CHALK)
		End	Borehole dry on completion Sides of borehole stable
		2.50	• '= Disturbed sample
		3.00	
		3.50	
		4.00	
		4.50	

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STRATA LOG

Job: THE CUSTOM HOUSE, GRAVESEND

No. WS5

Method of excavation: Tracked Windowless Sampler

Date: 13.02.24

SAMPLE	DEPTH m.	G.L.	DESCRIPTION OF SOIL
			100mm tarmac on 250mm concrete
•	0.50	0.50	Soft grey-brown sandy clay with scattered fine to medium chalk gravel and occasional fine brick gravel (FILL)
•	1.00	1.00	
•	1.50	1.50	
•	2.00	2.00	Soft brown-buff sandy CLAY with abundant fine to medium chalk gravel (Weathered CHALK)
		End	Borehole dry on completion Sides of borehole stable • '= Disturbed sample
		2.50	
		3.00	
		3.50	
		4.00	
		4.50	

Appendix B

Laboratory Test Results

Company Registration 3028997

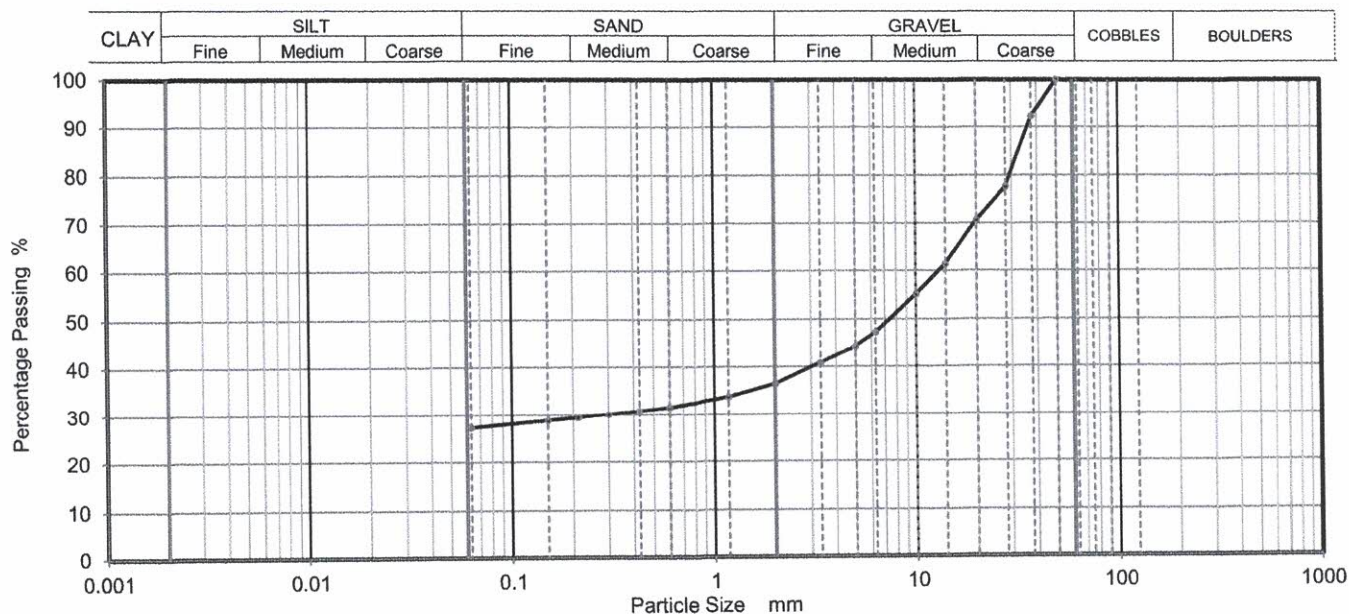


Peter Baxter Associates Laboratories
A subsidiary of Peter Baxter Associates
Kestner Works
Bredgar Road
Gillingham
Kent
ME8 6PL

www.peterbaxterassociates.co.uk
E info@peterbaxterassociates.co.uk
T +44(0)1634 234332 / 717974



PARTICLE SIZE DISTRIBUTION				Job Ref	1674/05
				Borehole/Pit No.	WS1
Site Name	The Custom House, The Terrace, Gravesend			Sample No.	2
Soil Description	Off white CHALK			Depth, m	3.00
Specimen Reference		Specimen Depth	m	Sample Type	D
Test Method	BS EN ISO 17892-4:2016, clause 5.2			KeyLAB ID	PBAL202402141



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
50	100		
37.5	92		
28	78		
20	71		
14	61		
10	55		
6.3	47		
5	44		
3.35	41		
2	37		
1.18	34		
0.6	32		
0.425	31		
0.3	30		
0.212	30		
0.15	29		
0.063	27		

Dry Mass of sample, g

1330

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	63.5
Sand	9.1
Fines <0.063mm	27.0

Grading Analysis	
D ₁₀₀	mm 50
D ₆₀	mm 13
D ₃₀	mm 0.281
D ₁₀	mm
Uniformity Coefficient	
Curvature Coefficient	
Remarks	

The results relate only to the items tested

Preparation and testing in accordance with BS EN ISO 17892 unless noted below

Operator	Checked	Approved	Sheet printed	Fig 1 Sheet
LI/KL/KB	LI/KB	kb	26/02/2024 09:59	



Ron Carr
R Carr Geotechnical Services
9 The Mallows
Maldstone
Kent
ME14 2PX

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 24-01494

Site Reference: The Custom House, The Terrace, Gravesend

Project / Job Ref: 4116

Order No: 4116

Sample Receipt Date: 14/02/2024

Sample Scheduled Date: 14/02/2024

Report Issue Number: 1

Reporting Date: 21/02/2024

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.

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

For Topsoil and WAC analysis the expanded uncertainty measurement should be considered while evaluating results against compliance values.



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698956	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.7	8.9	9.0	8.9	9.0
Total Cyanide	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	741	566	579	659	250
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.07	0.06	0.06	0.07	0.02
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter (SOM)	%	< 0.1	MCERTS	3.4	2	3.7	2.6	1.2
TOC (Total Organic Carbon)	%	< 0.1	MCERTS	2	1.1	2.2	1.5	0.7
Arsenic (As)	mg/kg	< 2	MCERTS	11	29	12	17	9
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	1.3	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3	0.4	0.3	0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	15	16	15	21	19
Copper (Cu)	mg/kg	< 4	MCERTS	37	17	24	21	11
Lead (Pb)	mg/kg	< 3	MCERTS	189	71	46	68	19
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	15	14	14	18	14
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Zinc (Zn)	mg/kg	< 3	MCERTS	66	62	46	59	45
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
TPH (EPH EC10-EC40)	mg/kg	< 6	MCERTS	10	< 6	< 6	< 6	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 24-01494		Date Sampled	13/02/24			
R Carr Geotechnical Services		Time Sampled	None Supplied			
Site Reference: The Custom House, The Terrace, Gravesend		TP / BH No	WS1			
Project / Job Ref: 4116		Additional Refs	None Supplied			
Order No: 4116		Depth (m)	1.50			
Reporting Date: 21/02/2024		DETS Sample No	698961			

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025				
pH	pH Units	N/a	MCERTS				
Total Cyanide	mg/kg	< 1	NONE				
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS				
Total Sulphate as SO ₄	%	< 0.02	MCERTS				
Sulphide	mg/kg	< 5	NONE				
Organic Matter (SOM)	%	< 0.1	MCERTS				
TOC (Total Organic Carbon)	%	< 0.1	MCERTS				
Arsenic (As)	mg/kg	< 2	MCERTS				
W/S Boron	mg/kg	< 1	NONE				
Cadmium (Cd)	mg/kg	< 0.2	MCERTS				
Chromium (Cr)	mg/kg	< 2	MCERTS				
Copper (Cu)	mg/kg	< 4	MCERTS				
Lead (Pb)	mg/kg	< 3	MCERTS				
Mercury (Hg)	mg/kg	< 1	MCERTS				
Nickel (Ni)	mg/kg	< 3	MCERTS				
Selenium (Se)	mg/kg	< 2	MCERTS				
Zinc (Zn)	mg/kg	< 3	MCERTS				
Total Phenols (monohydric)	mg/kg	< 2	NONE				
TPH (EPH EC10-EC40)	mg/kg	< 6	MCERTS				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs

DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698956	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.72	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	1.28	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	1.13	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.62	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	0.79	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.81	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.32	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.63	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.43	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.33	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	7	< 1.6	< 1.6	< 1.6	< 1.6

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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698956	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	< 21
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	< 21
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42	< 42	< 42

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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
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Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 24-01494	Date Sampled	13/02/24				
R Carr Geotechnical Services	Time Sampled	None Supplied				
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS1				
Project / Job Ref: 4116	Additional Refs	None Supplied				
Order No: 4116	Depth (m)	1.50				
Reporting Date: 21/02/2024	DETS Sample No	698961				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE				
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE				
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS				
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS				
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS				
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS				
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS				
Aliphatic (C5 - C34)	mg/kg	< 21	NONE				
Aromatic >C5 - C7	mg/kg	< 0.01	NONE				
Aromatic >C7 - C8	mg/kg	< 0.05	NONE				
Aromatic >C8 - C10	mg/kg	< 2	MCERTS				
Aromatic >C10 - C12	mg/kg	< 2	MCERTS				
Aromatic >C12 - C16	mg/kg	< 2	MCERTS				
Aromatic >C16 - C21	mg/kg	< 3	MCERTS				
Aromatic >C21 - C35	mg/kg	< 10	MCERTS				
Aromatic (C5 - C35)	mg/kg	< 21	NONE				
Total >C5 - C35	mg/kg	< 42	NONE				



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Soil Analysis Certificate - BTEX / MTBE

DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698956	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)				
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

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Soil Analysis Certificate - Volatile Organic Compounds (VOC)

DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)			
Dichlorodifluoromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Vinyl Chloride	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Chloromethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
Chloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Bromomethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
Trichlorofluoromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1-Dichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
cis-1,2-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
2,2-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Chloroform	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Bromochloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1-Dichloropropene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
Carbon Tetrachloride	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2-Dichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2
1,2-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Trichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Bromodichloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Dibromomethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
TAME	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
trans-1,3-Dichloropropene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
1,3-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Tetrachloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Dibromochloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2-Dibromoethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Chlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1,1,2-Tetrachloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Ethyl Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2
m,p-Xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2
o-Xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2
Styrene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Bromoform	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
Isopropylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2,3-Trichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
n-Propylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
Bromobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
2-Chlorotoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,3,5-Trimethylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
4-Chlorotoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
tert-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2,4-Trimethylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
sec-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
p-Isopropyltoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,3-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,4-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
n-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5
1,2-Dibromo-3-chloropropane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10
Hexachlorobutadiene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5

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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Semi Volatile Organic Compounds (SVOC)

DETS Report No: 24-01494	Date Sampled	13/02/24	13/02/24	13/02/24	13/02/24
R Carr Geotechnical Services	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: The Custom House, The Terrace, Gravesend	TP / BH No	WS2	WS3	WS4	WS5
Project / Job Ref: 4116	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 4116	Depth (m)	0.50	0.50	0.50	0.50
Reporting Date: 21/02/2024	DETS Sample No	698957	698958	698959	698960

Determinand	Unit	RL	Accreditation	(n)			
Phenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Nitrobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
0-Cresol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-chloroethoxy)methane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-chloroethyl)ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	mg/kg	< 0.15	ISO17025	< 0.15	< 0.15	< 0.15	< 0.15
Isophorone	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Hexachloroethane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
p-Cresol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15	< 0.15	< 0.15
2,4,6-Trichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15	< 0.15	< 0.15
2-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Dimethyl phthalate	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloroaniline	mg/kg	< 0.15	NONE	< 0.15	< 0.15	< 0.15	< 0.15
4-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Diethyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Dibutyl phthalate	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-ethylhexyl)phthalate	mg/kg	< 0.15	ISO17025	< 0.15	< 0.15	< 0.15	< 0.15
Benzyl butyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1

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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 24-01494	
R Carr Geotechnical Services	
Site Reference: The Custom House, The Terrace, Gravesend	
Project / Job Ref: 4116	
Order No: 4116	
Reporting Date: 21/02/2024	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
698956	WS1	None Supplied	0.50	15.6	Brown sandy clay with stones and chalk
698957	WS2	None Supplied	0.50	17.1	Light brown sandy clay with chalk
698958	WS3	None Supplied	0.50	16.8	Light brown sandy clay with stones and chalk
698959	WS4	None Supplied	0.50	19.9	Brown clay with chalk
698960	WS5	None Supplied	0.50	16.4	Light brown sandy clay
698961	WS1	None Supplied	1.50	16.7	Brown sandy clay with chalk

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Lenham Heath
Maidstone
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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 24-01494

R Carr Geotechnical Services

Site Reference: The Custom House, The Terrace, Gravesend

Project / Job Ref: 4116

Order No: 4116

Reporting Date: 21/02/2024

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 24-01494

R Carr Geotechnical Services

Site Reference: The Custom House, The Terrace, Gravesend

Project / Job Ref: 4116

Order No: 4116

Reporting Date: 21/02/2024

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Parameter	Matrix Type	Suite Reference	Expanded Uncertainty Measurement	Unit
TOC	Soil	BS EN 12457	12.2	%
Loss on Ignition	Soil	BS EN 12457	22.9	%
BTEX	Soil	BS EN 12457	11.2	%
Sum of PCBs	Soil	BS EN 12457	43.4	%
Mineral Oil	Soil	BS EN 12457	9.0	%
Total PAH	Soil	BS EN 12457	18.5	%
pH	Soil	BS EN 12457	0.335	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18.0	%
Clay Content	Soil	BS 3882: 2015	15.0	%
Silt Content	Soil	BS 3882: 2015	14.0	%
Sand Content	Soil	BS 3882: 2015	13.0	%
Loss on Ignition	Soil	BS 3882: 2015	22.9	%
pH	Soil	BS 3882: 2015	0.335	Units
Carbonate	Soil	BS 3882: 2015	12.0	%
Total Nitrogen	Soil	BS 3882: 2015	12.0	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24.0	%
Potassium (Extractable)	Soil	BS 3882: 2015	20.0	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26.0	%
Zinc	Soil	BS 3882: 2015	21.6	%
Copper	Soil	BS 3882: 2015	18.2	%
Nickel	Soil	BS 3882: 2015	24.3	%
Available Sodium	Soil	BS 3882: 2015	23.0	%
Available Calcium	Soil	BS 3882: 2015	23.0	%
Electrical Conductivity	Soil	BS 3882: 2015	10.0	%