



Report on Desk Study & Ground Investigation

**82A JUBILEE ROAD
WATERLOOVILLE
PO7 7RE**

For : Douglas Construction Ltd

Report Ref: 590 / R01 (Rev1)

Dated: 25th May 2017

Geotechnical & Geoenvironmental Consultants

*Dig-Geotech Limited Registered in England and Wales.
Company Number 5335508. VAT No 871 353 031*

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Report No 590 R01. Rev 1

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Rev 1	25 05 2017	Geotech Lab Testing included	David Grant
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Prepared for Douglas Construction Ltd
by Dig-Geotech Ltd

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1. INTRODUCTION

Dig-Geotech Ltd was requested by Douglas Construction Ltd to carry out a desk study & intrusive ground investigation at 82A Jubilee Road, Waterloooville. The site is currently used for storage. Redevelopment is proposed as three domestic properties. The site has planning permission under Havant Borough Council reference App/15/00408.

This report details the desk study & ground investigation works carried out, presents the results and discusses the findings in relation to the proposed development.

2. THE SITE

2.1 Site Location and Topography

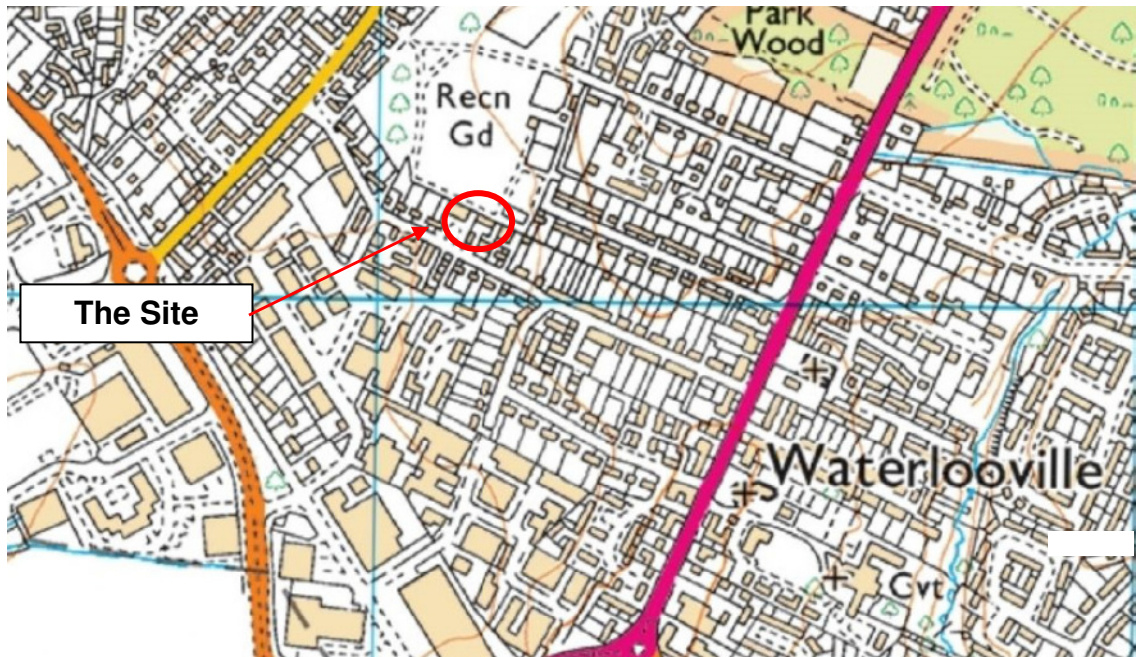
The site is located to the north of No's 78 & 80 Jubilee Road, Waterloooville (Figures 1 & 2). Access is via a track to the west of 80 Jubilee Road. OS map information suggests the site to be at an elevation of about 43m OD. The site covers an area of about 0.11Ha.

At the time of the desk study and ground investigation the area for development comprised a gravelled parking area and some storage buildings. Photographs taken as part of the site reconnaissance are enclosed as **Appendix A**.

The area of proposed development was bounded to the north by playing fields, to the west by Hillcrest Jubilee Junior School, and to the east and south mostly by domestic gardens. At the very southwest was a day care centre.

2.2 Geology

British Geological Survey (BGS) information shows the site to be underlain by *London Clay Formation – Clay, Silt & Sand*.



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Figure 1 : Site Location



Figure 2 : Aerial Image

2.3 Proposed Development

Plans showing the existing & proposed site are enclosed as **Appendix B**. Three new houses are proposed. Each shall have a private domestic garden at the east and some communal driveways and parking to the west.

No significant earthworks or landscaping works are proposed as part of the new development.

2.4 Previous Reports

No previous reports pertaining to the site or adjacent land have been revealed as part of this desk study.

3. DESK STUDY

3.1 Information Sources

Desk study information was obtained from a number of sources as follows:

- Historic maps – EnviroCheck Report
- Groundwater and other environmental data – EnviroCheck Report
- Historical Trade Information – EnviroCheck Report

An EnviroCheck Report is a commercially available report that provides historic maps and other database information for a site. Elements of the EnviroCheck maps & data relevant to this report are enclosed as **Appendix C**.

3.2 Historic Maps

Historic Ordnance Survey maps from 1870 to present were inspected at scales of 1:2500, 1:10000 & 1:10560. Copies of the maps are enclosed within Appendix C.

The earliest maps showed the site as within open fields from **1870** up to **1909**. The **1932** large scale OS plan showed a small building at the site. Land to the north had become a *Recreation Ground* and land to the south and west was not yet developed. *Park Road* was shown a short distance to the south. By **1953-65** Park Road had become renamed as *Jubilee Road*. The site was

shown with a similar outline as to date. The previously noted building had gone and new small building was present to the west. Plots were shown for No's 78, 80 and 82 Jubilee Road but only No 82 at the west had any buildings shown.

The **1961-77** OS plan showed further development at the site and with a similar layout as to date. Houses had being constructed to the south and east and No82 was indicated as a *club*.

A **1972-74** large scale plan showed an *engineering works* on land to the immediate east of the site and a later plan for **1977-85** showed the same area as vacant but indicated as *works*. By **1993** the area to the east was shown as a garage and the walkover in 2017 showed it redeveloped as housing. The site itself had some minor changes to buildings layout between 1977 and 1993 and was similar at the walkover to the 1993 plans.

A walkover of the site and immediate surrounding area in December 2016 showed no major changes.

3.3 Other Environmental Information

Other environmental information listed in the EnviroCheck Report can be summarised as :-

Discharge consents - None within 176m. Nearest at 176m related to trade effluent. Next nearest active consent at 658m related to a supermarket.

Local Authority Pollution Prevention Controls –Nearest at 413m and related to recycling. License has been surrendered. No others within 525m.

Surface water features - 159m from the site to the east.

Pollution incidences to controlled waters – none listed within 0.5km.

Water Abstractions – none listed within 1km

Groundwater vulnerability – not classified

Bedrock aquifer designation – Unproductive strata / Secondary Aquifer - A.

Superficial aquifer designation – No data available.

Licensed Waste Management Facilities - None within 400m

Historical landfill sites - None within 992m.

Registered waste transfer - none listed within 417m.

Local Authority recorded landfill sites – nearest at 743m

Potentially infilled land – none within 235m.

Radon - The site is within a lower probability radon area as less than 1% of homes are above the action level. The Envirocheck report notes that no radon protection measures are necessary in the construction of new dwellings or extensions.

Contemporary trade directory entries – Solentec Ltd (electrical engineers) recorded at the site but as inactive. Various other small industrial uses within 100m.

Fuel stations entries – none listed within 500m.

3.4 Walkover Survey

A walkover survey of the site was undertaken by an experienced geoenvironmental engineer on the 17th December 2016. Photographs taken as part of the walkover are enclosed as **Appendix A**.

The area for development was accessed via a concrete driveway adjacent to 82A Jubilee Road. Prefabricated type concrete buildings were present to the north and west. Near the buildings and site entrance was a concrete surface. The remainder of the site had a gravel surface that was rutted in parts. The east of the site was being used for storage of a number of vehicles, a caravan and a small camping trailer.

There was no evidence of any former or current above ground fuels / oils tanks. There was no surface evidence of significant made ground, soil staining or any olfactory evidence of potential contamination. The inside of the buildings could not be viewed. A later site visit for ground investigation works in February 2017 showed concrete floors to the buildings.

4. CONCEPTUAL MODEL

4.1 Background

The risk of contamination in the ground impacting a site or any proposed development is typically assessed using a pollutant transfer model. For a risk to exist at a site there must be a **hazard** (eg. pollution in the ground), a **receptor** (eg building occupants, controlled waters) and a **transfer path** whereby the hazard can impact the potential receptor.

Only if a hazard, receptor and a pathway exist can contamination take place. The legal definition of contaminated land is precise and given in *Part IIA* of the *Environmental Protection Act 1990* (as amended by the *Environment Act 1995*). However planning guidance, land transfer liabilities and redevelopment issues usually mean that land contamination has to be considered and dealt with on most previously used land even though the site may not be “contaminated land” within any strict legal definition. The term *potential land contamination* is therefore more typically applied to such land.

The likely affect of any contamination in the ground is assessed by forming a **Conceptual Model**. The Conceptual Model presents the likely sources of contamination, the likely targets and considers the pathways via which the sources of contamination may impact the targets. A *Preliminary Conceptual Model* is formed at the desk study stage and is used to determine the need for an intrusive ground investigation. The model can then be updated following the results of any intrusive investigation and the updated model used as a basis for recommending remediation works.

The basis for the conceptual model and any following intrusive investigation is generally in accordance with advice that has been prepared by UK Government bodies (*Refs 1, 2, 3*). The guidance is not yet fully formulated and not all risks have been defined. However the procedures to be used are well illustrated and, with the application of engineering judgement, a sound assessment may be made for most sites.

4.2 Site Specific Conceptual Model

4.2.1 Hazards

Desk study information has revealed the following potential hazards:-

Hazard	Source	Comments
Oils, fuels	Small spillages from parked vehicles, oil storage drums & any above ground tanks that may have been present in the past.	Unlikely to be present in very large volumes. Small significant 'hotspots' possible.
Metals and or asbestos fibres	Lead, zinc, copper or asbestos fibres may potentially be present in eg hardcore used below workshed floors & hard standings etc	Historic maps show past building outlines that differ to those present now. Hardcore etc may be present. As may former foundations.
PAH's VOC's, heavy metals etc	Small surface spillages associated with former uses.	Unlikely to be present in very large volumes. Bonfires, coals dusts etc can also give rise to PAH's.
Ground gases (methane & carbon dioxide)	Off site backfilled pits, ponds etc.	Local sources considered unlikely

It should be noted that the above table refers to potential hazards only.

4.2.2 Receptors

Desk study information has revealed the following potential receptors:-

Receptor	Where	Comments
Humans	Building occupiers	The site is to be developed as domestic houses with private gardens.
	Site workers and future maintenance workers	Site workers and future maintenance workers need to be protected from potential contamination.
Surface waters	Over 150m from the site	No desk study information suggesting risks to surface waters has been found

Receptor	Where	Comments
Groundwaters	Below the site	No desk study evidence to suggest risks to groundwater has been revealed.

4.2.3 Pathways

Desk study information has revealed the following potential pathways:-

Pathway	Receptor	Comments
Ingestion	Humans	The site is to be developed as domestic dwellings with private gardens. Ingestion is possible.
Dermal Contact	Humans	The site is to be developed as domestic dwellings with private gardens. Dermal contact is likely.
Inhalation (dusts)	Humans	Dusts may be inhaled from soils during construction.
Migration (gases)	Humans / buildings fabric	A damp proof membrane & modern air tightness requirements shall afford some protection. No source has been identified
Leaching, adsorption etc	Groundwaters Surface waters	No significant contamination is expected that may impact the surface or groundwaters.

4.2.4 Preliminary Conceptual Model

The above information leads to the following **Preliminary Conceptual Model** :

A site at 82A Jubilee Road, Waterloooville is to be developed as three domestic houses. The site was fields in the late 19th & early 20th Century. Later it became used for storage and workshops. The most recent use has been for vehicle storage. Desk study information identified former site usage at the site that warrants intrusive ground investigation.

The following network diagram may be created to indicate the potential sources, pathways and targets more clearly:-

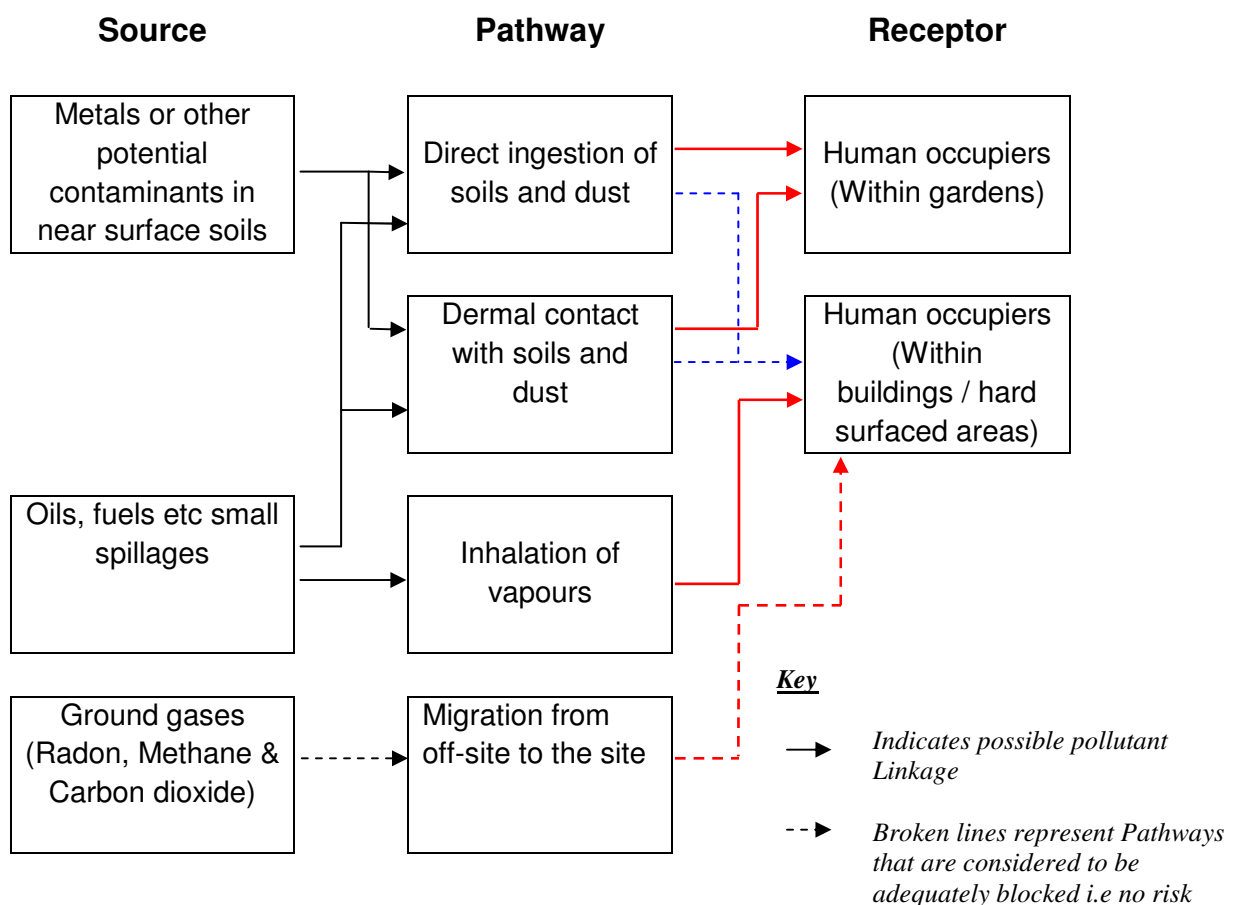


Figure 3 : Network diagram to show Preliminary Conceptual Model

The above diagram shows that the occupants within hard surfaced areas & new buildings are not considered likely to be at risk from any minor soils contamination that may exist at the site. A risk may be present in garden areas if contaminants are present in near surface soils.

The above network diagram did not include future maintenance workers who

should also be considered. All services trenches at the site should be over-excavated by 50mm and backfilled with clean granular soils.

Some ground investigation for potential ground contamination is recommended. Section 5. discusses the issues in more detail.

5. DISCUSSION ON DESK STUDY

5.1 Potential land contamination

Desk study information identified a moderate risk of potential contaminants in the ground that could cause harm to human health.

The hard surfaces to the proposed new buildings and associated external, pathways, driveways etc shall adequately block pathways that allow potential soil borne contaminants to impact future site occupants via ingestion and dermal contact. Garden areas present a higher risk. It is likely that imported clean topsoils shall be required as part of the redevelopment. However it shall be important to assess the soils immediately below any imported soils.

Section 5.3 discusses the required ground investigations.

5.2 Potential gases contamination

Desk study information identified a minor risk of ground gases & vapours related to possible breakdown of putrescible materials, hydrocarbons, coal dusts etc that may be present within fill materials at or near the site. Given the location of the site, putrescible materials are not considered likely to be present at the site or nearby. Specific investigation for a gases risk is not considered necessary. If ground investigation reveals a significant depth of made ground or putrescible materials, the assessment should be reviewed.

5.3 Suggested intrusive ground investigations

Figure 4 shows the suggested plan for the intrusive ground investigation. The investigation was to consider both issues related to potential contamination and the requirement for new foundations.

Five windowless sampler boreholes and four dynamic probe holes were recommended. If time & access constraints allowed, some assessment was to be made of the access driveway.

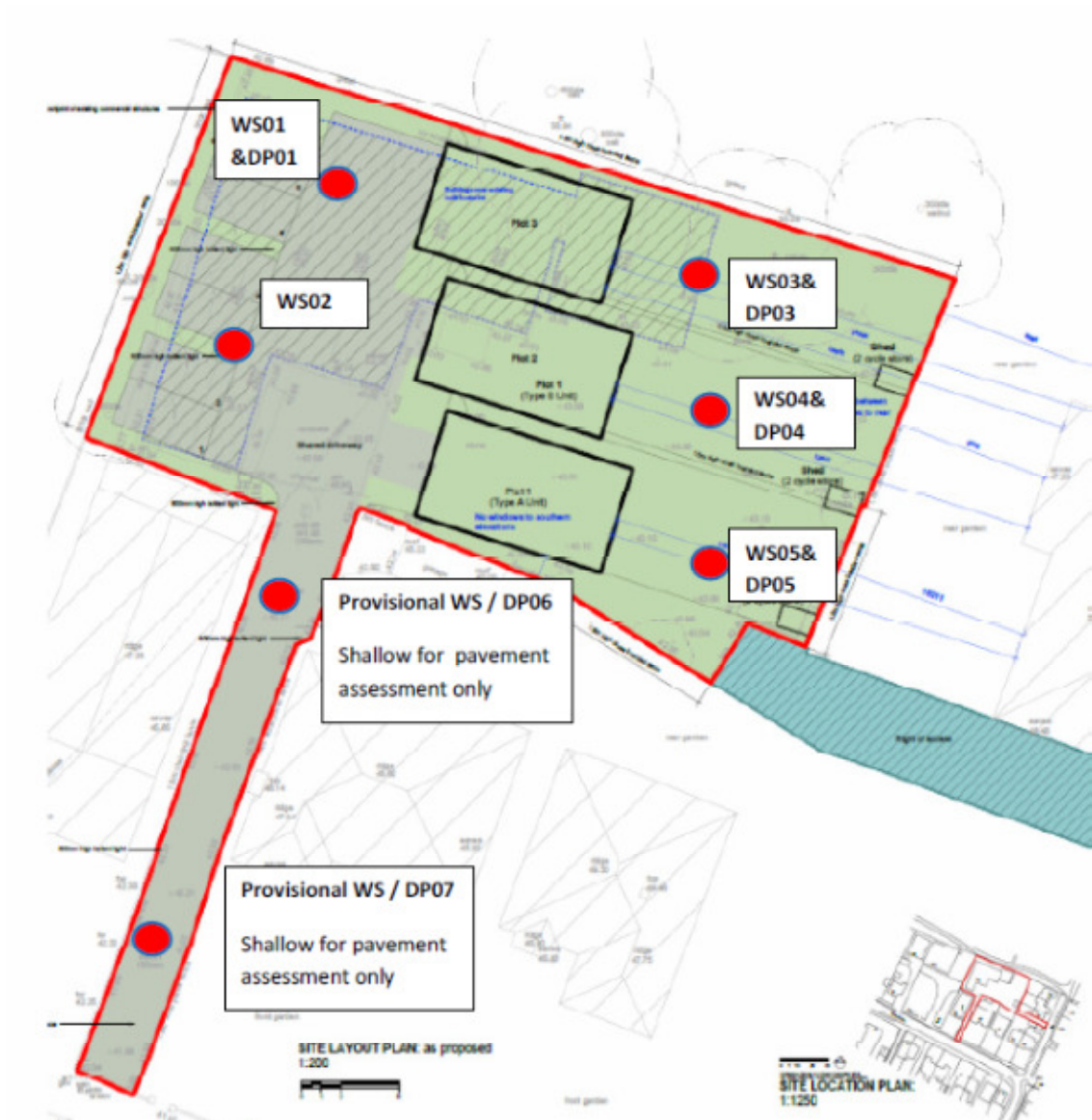


Figure 4 : Proposed Exploratory Hole Location Plan

6. GROUND INVESTIGATION

The intrusive ground investigation was undertaken in general accordance with the Code of Practice for Site Investigations, BS5930 (BSI, 1999), and Code of Practice for the Investigation of Potentially Contaminated Sites, BS10175 (BSI, 2011).

6.1 Specific Objectives

The ground investigation was designed to investigate concerns shown by the Preliminary Conceptual Model that was in turn based on a review of desk study information.

Specific objectives were to:

- Determine the thickness, distribution and nature of any Made Ground.
- Identify the nature and properties of the Natural Strata underlying the site.
- Assess the chemical properties of the soils present across the site.

Additionally the investigation aimed to obtain geotechnical information for future foundations assessments.

6.2 Fieldworks

Ground investigation fieldworks were carried out on the 16th February 2017. The works comprised :

- 5 No. windowless sampler boreholes (WS's 01, 02, 03, 04 & 05)
- 4 No. dynamic probe holes adjacent to WS holes (DP's 01, 03, 04 & 05).

The windowless sampler holes were each to 3.0m depth. The dynamic probe holes were to approximately 6m depth.

The fieldworks were procured and supervised by Douglas Construction Ltd. Engineers' Logs were prepared by an experienced geotechnical engineer from Dig-Geotech Ltd. Engineers' exploratory hole logs and a plan showing the exploratory hole locations are enclosed as **Appendix D**.

6.3 Laboratory contamination testing

Representative soils samples were taken from the windowless sampler holes. Samples were placed into appropriate containers and stored in cooled and insulated boxes for transfer to specialist laboratories. Testing was carried out by QTS Environmental Ltd, a UKAS and MCerts accredited laboratory.

Testing comprised :-

- 9 No. pH tests
- 9 No. Total Organic Content;
- 9 No. metals suite. Arsenic, Boron (water soluble), Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide (Total)
- 9 No. Speciated Polyaromatic Hydrocarbons (PAH's) suites;
- 4 No. Total Petroleum Hydrocarbons (TPH) suites. Results presented as aliphatic & aromatic LQM carbon banded.
- 4 No. BTEX / MTBE Suite. Comprising Benzene, Toluene, Ethylbenzene, p&m-xylene, o-xylene, MTBE.
- 2 No. Volatile Organic Compounds (VOC's) suites
- 4 No. asbestos screens.

The results of the laboratory chemical testing are enclosed as **Appendix E**.

6.4 Laboratory geotechnical testing

Geotechnical laboratory testing comprised three plasticity index determinations. The results of the laboratory geotechnical testing are enclosed as **Appendix F**.

7. GROUND INVESTIGATION RESULTS

7.1 Ground conditions

Table 1 summarises the ground conditions found in the windowless sampler boreholes. The boreholes showed Made Grounds and possible / probable Made Grounds to depths of between 0.6m and 1.3m. Below the made grounds were brown or grey silts. The silts were generally firm becoming stiff with depth. However at WS02 only, a soft brown slightly sandy silt was observed at between 2.0m and 2.5m depth.

Stratum	WS01	WS02	WS03	WS04	WS05	Ave	Min	Max
Made Ground : Concrete slab & hardcore	0.00	0.00	-	-	-	0.00	0.00	0.00
(thickness)	0.40	0.40				0.40	0.40	0.40
Made Ground : Sandy clay with occ brick fragments or gravel	-	0.40	0.00	0.00	0.00	0.10	0.00	0.40
(thickness)		0.90	0.60	0.80	0.90	0.80	0.60	0.90
Probable Made Ground : sand and gravel	0.40	1.00	-	-	-	0.70	0.40	1.00
(thickness)	0.60	0.30				0.45	0.30	0.60
Firm, firm to stiff brown or grey, possibly sl sandy, SILT.	1.00	1.30	0.60	0.80	0.90	0.92	0.60	1.30
(thickness)		0.70	2.40	2.20	2.10	1.85	0.70	2.40
Soft brown sl sandy SILT	-	2.00	-	-	-	2.00	2.00	2.00
(thickness)		0.50				0.50	0.50	0.50
Stiff sl sandy SILT	-	2.50	-	-	-	2.50	2.50	2.50
(thickness)		0.50				0.50	0.50	0.50
End of BH	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Depths, m (thicknesses, m)

Table 1 : Summary Ground Conditions (WS's 01 – 05).

7.2 Groundwater

Groundwater was not encountered within the windowless sampler boreholes.

7.3 Laboratory geotechnical testing

The results for the laboratory geotechnical testing are enclosed as **Appendix E**.

Four clay samples were tested for water content & plasticity index. Water content values varied between 22% and 26%. Plasticity index values were between 19% and 27%.

Sulphate and pH determinations were carried out on one sample. The pH value was 8.0. Sulphate concentrations were 0.16 g/l SO₄.

7.4 Laboratory contamination testing

The results for the laboratory chemical testing are enclosed as **Appendix E**. The following paragraphs detail the test results and compare them to published guidance. The findings are discussed in relation to the proposed development at Section 8.1.

The general approach to assessment of potential land contamination is to compare laboratory chemical test results to the 2014 published DEFRA guidance (*Ref 2*) and to 3rd edition LQM / CIEH derived S4UL's (*Ref 3*).

Terminology has recently changed to distinguish between the newer assessment criteria and those previously used. The DEFRA guidance uses the term C4SL's (*Category 4 Screening Levels*) and the LQM / CIEH guidance S4ULs (*Suitable 4 Use Levels*). All derived values are based on an assessment of Significant Possibility of Significant Harm (SPOSH). The guidance documents note that the concentrations given are purposefully conservative and can be used as a safe assessment of land for planning purposes. More exact concentrations can be derived by computer methods for individual sites or specific risks within a site.

The guidance values also relate to proposed land use. The land uses considered within the guidance are :

- Residential with home grown produce
- Residential without home grown produce
- Allotment
- Commercial
- Public open spaces (near to residential)
- Public open spaces (parks)

In this case the relevant land use is :

- a. Residential **with** home grown produce: Rear garden area characterised by WS's 3, 4 & 5.

- b. Residential **without** home grown produce: Soft landscaping and driveways by WS's 1 & 2.

7.3.1 Residential with home grown produce (WS's 3, 4 & 5)

No **asbestos fibres** were detected.

The QTS results had a general suite of results for pH, total cyanide, total sulphate as SO₄, sulphide and TOC. **pH** values were mostly close to neutral with a range from 7.1 to 7.5. The **total sulphates** values are relevant to concrete design and not discussed further here. **TOC** values varied between 0.4 and 3.6%. **Total cyanide** concentrations were all at <2mg/kg.

The metals suite comprised **As, Boron** (water soluble), **Cd, Cr, Cu, Pb, Hg, Ni, Se & Zn**. Comparison of the laboratory test results to published C4SL's & S4UL's for a Residential land use with home grown produce showed no risks.

Total phenols have been assessed at a typical safe limit for water services pipes of 5mg/kg rather than the very much higher S4UL of about 280mg/kg. Phenol concentrations were all < 2mg/kg i.e well below any likely risk for human health and below a threshold at which water services pipes may need further protection.

Speciated PAH's showed no raised concentrations above those relevant to a Residential land use with home grown produce.

TPH - LQM Banded. Comparison of the laboratory test results to published S4UL's showed all concentrations at well below the published criteria for a Residential land use with home grown produce.

BTEX. Comparison of the laboratory test results to published LQM S4UL's showed all BTEX concentrations at well below the published criteria (Note the QTS results for BTEX are presented as µg/kg i.e 10⁻³ mg/kg). No risk to human health is hence considered likely due to BTEX compounds.

MTBE is an additive to petrol. The measured concentrations were very low at less than 0.005mg/kg compared to a recommended residential (with plant uptake) GAC of 49mg/kg. No risk to human health is considered likely.

VOC's. Comparison of the laboratory test results to published LQM S4UL's showed all VOC concentrations below the relevant published criteria. (Again note the QTS results for VOC's are presented as µg/kg i.e 10⁻³ mg/kg).

7.3.2 Residential without home grown produce (WS's 1 & 2)

No **asbestos fibres** were detected.

The QTS results had a general suite of results for pH, total cyanide, total sulphate as SO₄, sulphide and TOC. **pH** values were all close to neutral. The **total sulphates** values are relevant to concrete design and not discussed further here. **TOC** values varied between 0.9% and 1.6%. **Total cyanide** concentrations were at <2mg/kg.

The metals suite comprised **As, Boron** (water soluble), **Cd, Cr, Cu, Pb, Hg, Ni, Se & Zn**. Comparison of the test results to published C4SL's & S4UL's showed no risks.

Total phenols have been assessed at a typical safe limit for water services pipes of 5mg/kg rather than the very much higher S4UL of about 280mg/kg. Phenol concentrations were at < 2mg/kg i.e well below any likely risk for human health and below a threshold at which water services pipes may need further protection.

Speciated PAH's showed no raised concentrations above those relevant to a Residential land use without home grown produce.

TPH - LQM Banded. Comparison of the laboratory test results to published S4UL's showed all concentrations at well below the published criteria for a Residential land use without home grown produce.

BTEX. Comparison of the laboratory test results to published LQM S4UL's showed all BTEX concentrations at well below the published criteria (Note the QTS results for BTEX are presented as µg/kg i.e 10⁻³ mg/kg). No risk to human health is hence considered likely due to BTEX compounds.

MTBE is an additive to petrol. The measured concentrations were very low at less than 0.005mg/kg compared to a recommended residential (with plant uptake) GAC of 49mg/kg. No risk to human health is considered likely.

VOC's. Comparison of the laboratory test results to published LQM S4UL's showed all VOC concentrations below the relevant published criteria. (Again note the QTS results for VOC's are presented as µg/kg i.e 10⁻³ mg/kg).

8. DISCUSSION ON GROUND INVESTIGATION

8.1 Potential land contamination

Desk study information and a Preliminary Conceptual Model showed a low risk at the site due to potential soil contamination. Intrusive ground investigation has confirmed that significant contamination is not present for a residential end use.

Topsoil are likely to be required for garden areas. The existing site does not have topsoils and hence topsoils, if required, shall need to be imported. Imported topsoil should preferably be supplied with test certificates that show them as suitable for use in a domestic garden. If that is not possible the imported topsoil should be stockpiled at site and tested before final placement.

Future maintenance workers who should also be considered. All new services trenches at the site should be over excavated by 50mm and backfilled with clean granular soils.

8.2 Discovery Strategy

There is a small chance of made ground or other features not shown by this investigation being revealed during construction works. A *Discovery Strategy* should be included in future construction contracts that sets out actions & responsibilities should unexpected contamination be revealed.

8.3 Revised Conceptual Model

Figure 5 shows a revised Conceptual Model for the site. The model is revised from that presented at Figure 3.

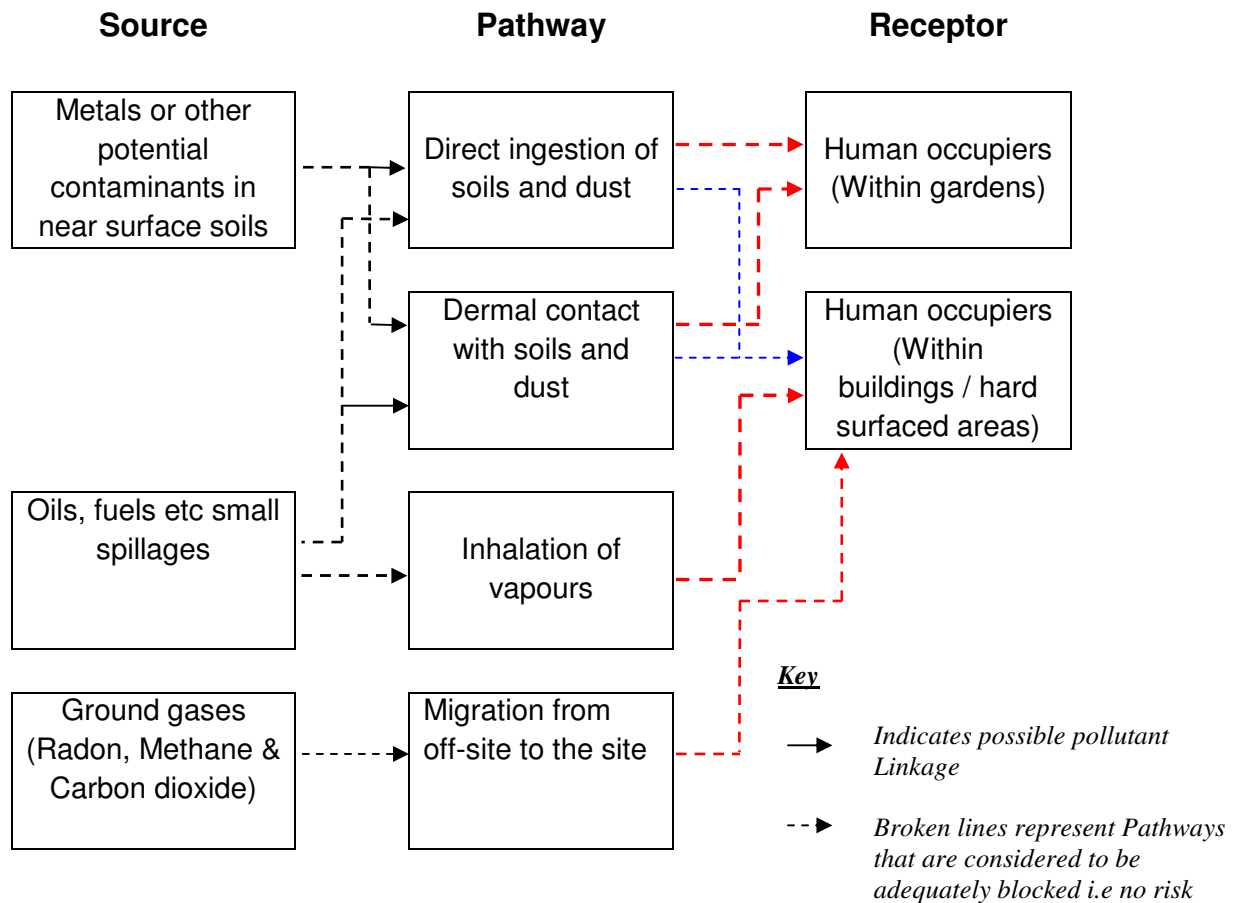


Figure 5 : Revised Conceptual Model (Residential End use)

9. CONCLUSIONS

A desk study and ground investigation for proposed new domestic houses at 82A Jubilee Road, Waterloooville has shown no concerns related to potential soil contamination. Clean imported topsoil shall be requires for domestic garden areas.

The results of this report should be discussed with the local authority environmental health & planning teams prior to any works commencing at site.

Report prepared by



.....

25 May 2017

D I Grant BSc, PhD

References :

1. DEFRA (2014). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. March 2014 (accessed online March 2016).
2. LQM / CIEH (2014). The LQM / CIEH S4ULs for Human Health Risk. ISBN 978-0-9931084-0-2.
3. EIC/AGS/CL:AIR (2010). Soil Generic Assessment Criteria for Human Health Risk Assessment.

Appendix A - Photographs







Appendix B - Proposed Development Plans

H.M. LAND REGISTRY

TITLE NUMBER

HP 502228

ORDNANCE SURVEY
PLAN REFERENCE

SU 6810

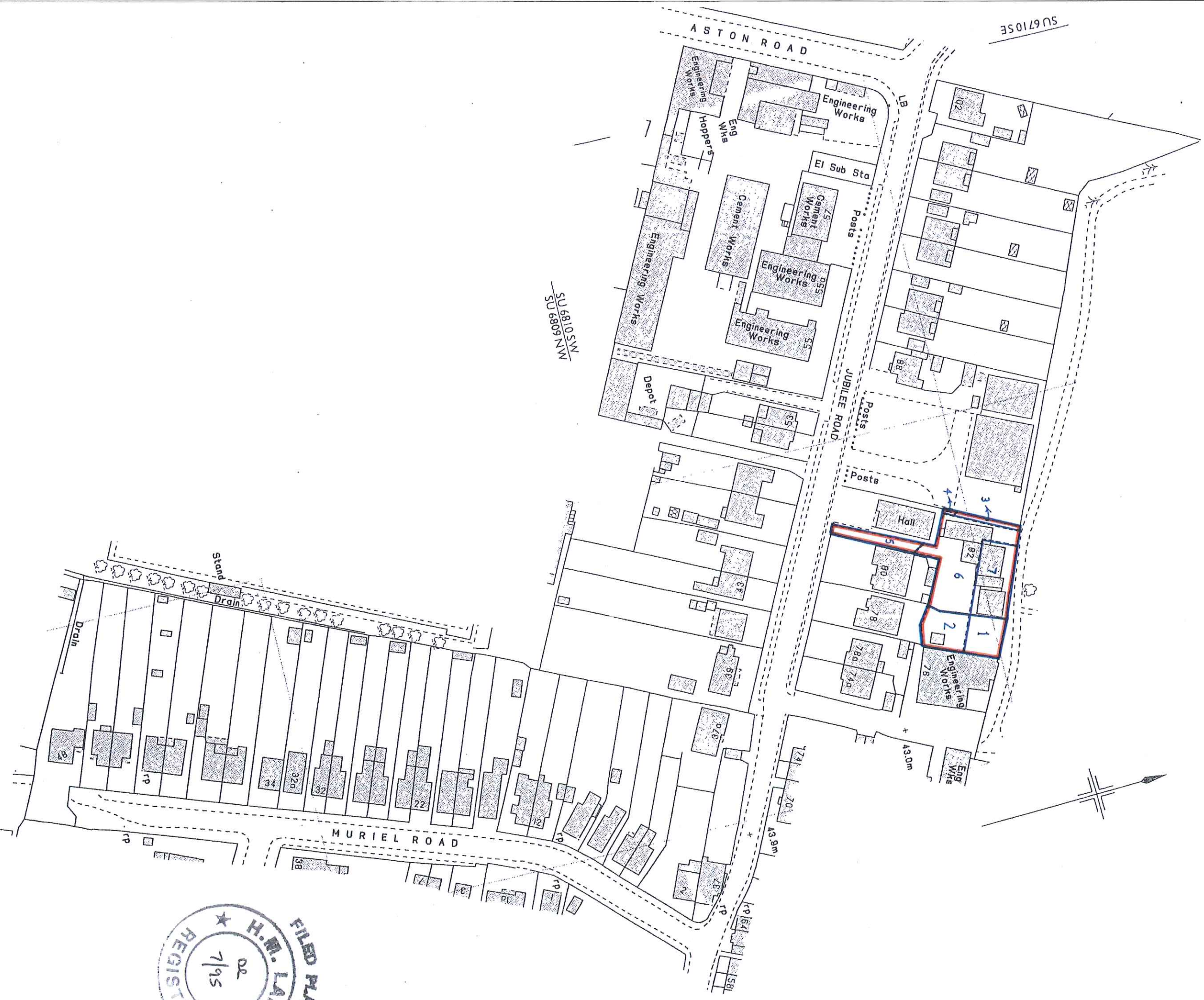
SECTION G

Scale
1/1250

COUNTY HAMPSHIRE

DISTRICT HAVANT

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Appendix C - Envirocheck Report

Appendix D - Exploratory Hole Logs

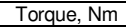
Dig-Geotech Ltd		Job Ref : 590		Windowless Sampler No : 1			
Equipment & Methods		Location :					
Terrier Rig. Windowless sampler		82A Jubilee Road, Waterloooville					
Carried out for : Douglas Construction Ltd		Ground Level mOD		Coordinates E N to			
				Date 16/02/2017 16/02/2017			
Description	Reduced level, mOD	Legend	Depth (Thickness), metres	Sample/ Tests			
				Depth, m	Sample Type No	Test	
MADE GROUND : Concrete slab / hardcore broken out by Client prior to works.			(0.40)	GL - 1.0 0.25	S D		
Light brown mottled brown slightly sandy SILT with some to much rounded fine to medium gravel. (Probable Made Ground)			0.50 (0.60)	0.60	J		
Firm to stiff brown mottled grey slightly sandy SILT.			1.00 (2.00)	1.00 1.0 - 2.0	J S		HSV Cu = 50 kN/m2
... grading to stiff light brown slightly (fine) sandy SILT.			1.50 (2.00)	1.50	J		HSV Cu = 50 kN/m2
			2.00 (2.00)	2.0 - 3.0	S D D		HSV HSV Cu = 50 kN/m2 Cu = 56 kN/m2
			2.50 (2.00)	2.20	D		HSV Cu = 70 kN/m2
End of Hole 3.0m			3.00 (3.00)	3.00	D		
			3.50 (3.00)				
			4.00 (3.00)				
			4.50 (3.00)				
			5.00 (3.00)				
			5.50 (3.00)				
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			7.00 (3.00)				
			7.50 (3.00)				
			8.00 (3.00)				
			8.50 (3.00)				
			9.00 (3.00)				
			9.50 (3.00)				
			10.00 (3.00)				
continued							
Remarks : 1. S1 =100mm nominal dia, S2 = 90mm dia, S3 = 75mm dia, S4 = 50mm dia.							Logged By : DG
www.dig-geotech.com							

Dig-Geotech Ltd		Job Ref : 590		Windowless Sampler No : 2			
Equipment & Methods		Location :					
Terrier Rig. Windowless sampler		82A Jubilee Road, Waterloooville					
Carried out for : Douglas Construction Ltd		Ground Level mOD		Coordinates E N to			
				Date 16/02/2017 16/02/2017			
Description	Reduced level, mOD	Legend	Depth (Thickness), metres	Sample/ Tests			
				Depth, m	Sample Type No	Test	
MADE GROUND : Concrete slab broken out by Client prior to works.			(0.40)	GL - 1.0	S		
			0.40	0.4 - 1.0	J		
MADE GROUND : Firm brown sandy clay with occasional fine gravel sized brick fragments .			0.50				
			(0.60)				
			1.00	1.0 - 2.0	S		
Soft light brown sandy CLAY / SILT with occasional dark grey pocket of clay with twigs (Possible Made Ground)			(0.30)	1.0 - 1.2	J		
			1.30				
			1.50	1.40	J		
Firm light brown slightly sandy SILT. Occasional to some fine and medium rounded gravel.			(0.70)	1.50	D		HSV
			2.00	2.0 - 3.0	S		HSV
				2.20			HSV
Soft light brown slightly sandy SILT. Rare fine and medium rounded gravel. Wet.							
			2.50	(1.00)			
...stiff below 2.5m							
			3.00	3.00	D		HSV
			3.50				
			4.00				
			4.50				
			5.00				
			5.50				
			6.00				
			6.50				
			7.00				
			7.50				
			8.00				
			8.50				
			9.00				
			9.50				
			10.00				
continued							
Remarks : 1. S1 =100mm nominal dia, S2 = 90mm dia, S3 = 75mm dia, S4 = 50mm dia.							Logged By : DG
www.dig-geotech.com							

Dig-Geotech Ltd		Job Ref : 590		Windowless Sampler No : 3			
Equipment & Methods		Location :					
Terrier Rig. Windowless sampler		82A Jubilee Road, Waterlooville					
Carried out for : Douglas Construction Ltd		Ground Level mOD		Coordinates E N to		Date 16/02/2017 16/02/2017	
Description	Reduced level, mOD	Legend	Depth (Thickness), metres	Sample/ Tests			
				Depth, m	Sample		
Type	No						
MADE GROUND : Sandy gravelly clay. Occasional fine gravel sized fragments of brick. Rare concrete cobble.				GL - 1.0 0.1 - 0.3	S D		
			0.40	J			
Firm light brown mottled grey SILT. ...pocket light grey fine sand 1.0 - 1.1m			0.60				
			(0.40)	0.80	J		
			1.00	1.0 - 2.0 1.00	S J	HSV	Cu = 40 kN/m2
			1.50			HSV	Cu = 45 kN/m2
			2.00	2.0 - 3.0 2.00	S D	HSV	Cu = 40 kN/m2
						HSV	Cu = 58 kN/m2
			2.50	2.4 - 2.5	D		
			2.80			HSV	Cu = 52 kN/m2
			3.00	2.9 - 3.0	D	HSV	Cu = 54 kN/m2

Dig-Geotech Ltd		Job Ref : 590		Windowless Sampler No : 4				
Equipment & Methods		Location :						
Terrier Rig. Windowless sampler		82A Jubilee Road, Waterlooville						
Carried out for : Douglas Construction Ltd		Ground Level mOD		Coordinates E N to		Date 16/02/2017 16/02/2017		
Description	Reduced level, mOD	Legend	Depth (Thickness), metres	Depth, m	Sample/ Tests		Test	
					Type	No		
MADE GROUND : Dark brown & black sand & gravel. Brick cobbles 0.6 - 0.8m.				GL - 1.0 0.1- 0.5 0.30	S D J			
			0.50					
Firm light brown SILT.			1.00	0.80 1.0 - 2.0 1.00	J S J		HSV	Cu = 32 kN/m2
			1.50	1.50	D		HSV	Cu = 40 kN/m2
...becoming below 2.0m light brown mottled grey slightly sandy SILT.			2.00	2.0 - 3.0 2.00	S D		HSV	Cu = 42 kN/m2
			2.50	2.4 - 2.5	D		HSV	Cu = 55 kN/m2
			3.00	2.80 3.00	D		HSV	Cu = 80 kN/m2
End of Hole 3.0m								
			3.50					
			4.00					
			4.50					
			5.00					
			5.50					
			6.00					
			6.50					
			7.00					
			7.50					
			8.00					
			8.50					
			9.00					
			9.50					
			10.00					
Remarks : 1. S1 =100mm nominal dia, S2 = 90mm dia, S3 = 75mm dia, S4 = 50mm dia.		Logged By : DG						
www.dig-geotech.com								

Dig-Geotech Ltd		Job Ref : 590		Windowless Sampler No : 5			
Equipment & Methods		Location :					
Terrier Rig. Windowless sampler		82A Jubilee Road, Waterloooville					
Carried out for : Douglas Construction Ltd		Ground Level mOD		Coordinates E N to 16/02/2017 16/02/2017			
Description	Reduced level, mOD	Legend	Depth (Thickness), metres	Sample/ Tests			
				Depth, m	Sample Type No	Test	
MADE GROUND : Dark brown & black sand & gravel. Rare brick fragment. Weak concrete layer at 0.8 - 0.9m.			GL - 1.0 0.1- 0.5 0.50 0.4 - 0.5	S D J			
Firm light brown SILT.			1.00 1.00 1.50 2.00 2.00 2.50 2.80 3.00 3.00	0.9- 1.0 1.0 - 2.0 110 - 1.2 J S D D S D D		HSV	Cu = 48 kN/m2
			2.00 2.00 2.50 2.80 3.00 3.00	2.0 - 3.0 2.00 2.4 - 2.5 2.80 3.00 3.00		HSV HSV HSV HSV HSV	Cu = 25 kN/m2 Cu = 31 kN/m2 Cu = 64 kN/m2 Cu = 64 kN/m2 Cu = 64 kN/m2
End of Hole 3.0m			3.50 4.00 4.50 5.00 5.50 6.00 6.50 7.00 7.50 8.00 8.50 9.00 9.50 10.00				
continued							
Remarks : 1. S1 =100mm nominal dia, S2 = 90mm dia, S3 = 75mm dia, S4 = 50mm dia.							Logged By : DG
www.dig-geotech.com							



Logged by DG

Dig-Geotech Ltd			Job No: 590		DYNAMIC PROBE No : DP03								
Sheet 1 of 1		Client: Douglas Construction Ltd			Date: 16/02/17								
DPSH Dynamic Probe		Site Address: 82A Jubilee Road, Waterloooville			Ground Level, mOD								
Sacrificial Tip													
Depth, m	Blows / 100 mm	Torque, Nm											
GL	8	GL	0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
	3		0	5	10	15	20	25	30	35	40	45	50
	1		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	1		0	5	10	15	20	25	30	35	40	45	50
	1		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
1	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
	3		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
	3		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
	3		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
2	3		0	5	10	15	20	25	30	35	40	45	50
	2		0	5	10	15	20	25	30	35	40	45	50
	4		0	5	10	15	20	25	30	35	40	45	50
	3		0	5	10	15	20	25	30	35	40	45	50
	4		0	5	10	15	20	25	30	35	40	45	50
	4		0	5	10	15	20	25	30	35	40	45	50
	5		0	5	10	15	20	25	30	35	40	45	50
3	6		0	5	10	15	20	25	30	35	40	45	50
	5		0	5	10	15	20	25	30	35	40	45	50
	5		0	5	10	15	20	25	30	35	40	45	50
	5		0	5	10	15	20	25	30	35	40	45	50
	7		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	7		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	7		0	5	10	15	20	25	30	35	40	45	50
4	6		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	6		0	5	10	15	20	25	30	35	40	45	50
	7		0	5	10	15	20	25	30	35	40	45	50
	7		0	5	10	15	20	25	30	35	40	45	50
	8		0	5	10	15	20	25	30	35	40	45	50
	8		0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
5	8		0	5	10	15	20	25	30	35	40	45	50
	10		0	5	10	15	20	25	30	35	40	45	50
	10		0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
	9		0	5	10	15	20	25	30	35	40	45	50
	10		0	5	10	15	20	25	30	35	40	45	50
6	13		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
7	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
8	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
9	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
	0		0	5	10	15	20	25	30	35	40	45	50
10	0		0	5	10	15	20	25	30	35	40	45	50
REMARKS		Dando Terrier rig. DPSH											

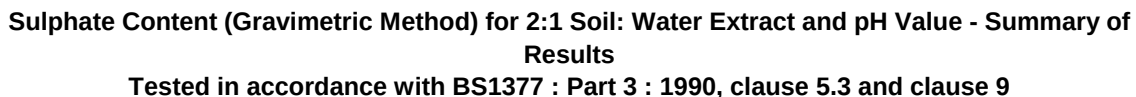
Dig-Geotech Ltd			Job No: 590		DYNAMIC PROBE No : DP04										
Sheet 1 of 1		Client: Douglas Construction Ltd			Date: 16/02/17										
DPSH Dynamic Probe		Site Address: 82A Jubilee Road, Waterlooville			Ground Level, mOD										
Sacrificial Tip															
Depth, m	Blows / 100 mm														
GL	5	GL	0	5	10	15	20	25	30	35	40	45	50	Torque, Nm	
	4														
	4														
	3														
	1														
	0														
	0														
	1														
	0														
1	0														
	0														
	2														
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7	0														
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	0														
	0														
8	0														
	0														
	0														
	0														
9	0														
	0														
	0														
	0														
10	0														
REMARKS		Dando Terrier rig. DPSH													

Dig-Geotech Ltd			Job No: 590		DYNAMIC PROBE No : DP05								
Sheet 1 of 1		Client: Douglas Construction Ltd			Date: 16/02/17								
DPSH Dynamic Probe		Site Address: 82A Jubilee Road, Waterlooville			Ground Level, mOD								
Sacrificial Tip		Torque, Nm											
Depth, m	Blows / 100 mm												
GL	3	GL	0	5	10	15	20	25	30	35	40	45	50
	3		0	3									
	8		0	8									
	6		0	6									
	3		0	3									
	2		0	2									
	0		0	0									
	0		1	0									
1	0		0	0									
	1		1	2									
	2		2	2									
	4		4	3									
	3		3	3									
	3		3	3									
	3		3	3									
2	4		4	4									
	4		4	3									
	4		4	4									
	4		4	4									
	5		5	5									
	4		4	5									
3	6		6	5									
	5		5	6									
	6		6	7									
	7		7	8									
	8		8	7									
	7		7	7									
	7		7	8									
4	8		8	8									
	8		8	9									
	9		9	9									
	10		10	9									
	9		9	10									
5	10		10	10									
	10		10	11									
	11		11	9									
	9		9	10									
	12		12	12									
	12		12	13									
6	12		12	12									
	0		0	0									
	0		0	0									
	0		0	0									
	0		0	0									
7	0		0	0									
	0		0	0									
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	0		0	0									
8	0		0	0									
	0		0	0									
	0		0	0									
	0		0	0									
9	0		0	0									
	0		0	0									
	0		0	0									
	0		0	0									
10	0		0	0									
REMARKS		Dando Terrier rig. DPSH											

Appendix E - Laboratory Contamination Test Results



 UKAS TESTING 2519	Test Methods: BS1377: Part 2: 1990: Natural Moisture Content : clause 3.2 Atterberg Limits: clause 4.3 and 5.0	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Tel: 01923 711 288 Email: James@k4soils.com	Checked and Approved Initials J.P Date: 25/05/201
	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R1(b)

[illegible]

Checked and Approved	
Initials	J.P
Date:	25/05/2017

Appendix F - Laboratory Geotechnical Test Results



Dr David Grant
Dig-Geotech Limited
Southview
2 Easthams Road
Crewkerne
Somerset
TA18 7AQ



QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 17-55829

Site Reference: 82A Jubilee Road, Waterlooville

Project / Job Ref: 590

Order No: 590/dq/002

Sample Receipt Date: 02/03/2017

Sample Scheduled Date: 02/03/2017

Report Issue Number: 1

Reporting Date: 08/03/2017

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

QTSE is the trading name of DETS Ltd, company registration number 03705645



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17	16/02/17
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS01	WS01	WS02	WS02	WS03
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 590/dg/002	Depth (m)	0.25	0.60	0.40 - 1.00	1.40	0.10 - 0.30
Reporting Date: 08/03/2017	QTSE Sample No	255968	255969	255970	255971	255972

Determinand	Unit	RL	Accreditation				
Asbestos Screen ⁽⁵⁾	N/a	N/a	ISO17025	Not Detected			Not Detected
pH	pH Units	N/a	MCERTS		7.7	7.2	7.1
Total Cyanide	mg/kg	< 2	NONE		< 2	< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	NONE		762	500	240
Total Sulphate as SO ₄	%	< 0.02	NONE		0.08	0.05	0.02
Sulphide	mg/kg	< 5	NONE		< 5	< 5	< 5
Total Organic Carbon (TOC)	%	< 0.1	MCERTS		0.9	1.6	1
Arsenic (As)	mg/kg	< 2	MCERTS		4	4	11
W/S Boron	mg/kg	< 1	NONE		< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS		< 0.2	0.3	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS		10	11	24
Copper (Cu)	mg/kg	< 4	MCERTS		5	8	6
Lead (Pb)	mg/kg	< 3	MCERTS		16	55	11
Mercury (Hg)	mg/kg	< 1	NONE		< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS		4	5	9
Selenium (Se)	mg/kg	< 3	NONE		< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS		22	339	47
Total Phenols (monohydric)	mg/kg	< 2	NONE		< 2	< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS		< 6		< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

Subcontracted analysis ⁽⁵⁾



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17	16/02/17
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS03	WS03	WS04	WS04	WS04
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 590/dg/002	Depth (m)	0.40	0.80	GL - 0.50	0.30	1.00
Reporting Date: 08/03/2017	QTSE Sample No	255973	255974	255975	255976	255977

Determinand	Unit	RL	Accreditation					
Asbestos Screen ⁽⁵⁾	N/a	N/a	ISO17025			Not Detected		
pH	pH Units	N/a	MCERTS	7.7	7.1		7.5	7.5
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2		< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	NONE	322	504		803	< 200
Total Sulphate as SO ₄	%	< 0.02	NONE	0.03	0.05		0.08	< 0.02
Sulphide	mg/kg	< 5	NONE	< 5	< 5		< 5	< 5
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	0.6	0.6		2.9	0.4
Arsenic (As)	mg/kg	< 2	MCERTS	3	4		9	8
W/S Boron	mg/kg	< 1	NONE	< 1	< 1		< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	3	1.8		0.9	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	44	59		58	33
Copper (Cu)	mg/kg	< 4	MCERTS	97	78		82	15
Lead (Pb)	mg/kg	< 3	MCERTS	95	82		153	11
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1		< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	12	15		18	15
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3		< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	165	175		388	47
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2		< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS		< 6			< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

Subcontracted analysis ⁽⁵⁾



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17		
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS05	WS05	WS05		
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 590/dg/002	Depth (m)	0.10 - 0.50	0.50	1.00		
Reporting Date: 08/03/2017	QTSE Sample No	255978	255979	255980		

Determinand	Unit	RL	Accreditation				
Asbestos Screen ⁽⁵⁾	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS		7.4	7.3	
Total Cyanide	mg/kg	< 2	NONE		< 2	< 2	
Total Sulphate as SO ₄	mg/kg	< 200	NONE		905	414	
Total Sulphate as SO ₄	%	< 0.02	NONE		0.09	0.04	
Sulphide	mg/kg	< 5	NONE		< 5	< 5	
Total Organic Carbon (TOC)	%	< 0.1	MCERTS		3.6	0.6	
Arsenic (As)	mg/kg	< 2	MCERTS		11	11	
W/S Boron	mg/kg	< 1	NONE		1.3	< 1	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS		1.4	< 0.2	
Chromium (Cr)	mg/kg	< 2	MCERTS		48	25	
Copper (Cu)	mg/kg	< 4	MCERTS		81	9	
Lead (Pb)	mg/kg	< 3	MCERTS		117	18	
Mercury (Hg)	mg/kg	< 1	NONE		< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS		22	8	
Selenium (Se)	mg/kg	< 3	NONE		< 3	< 3	
Zinc (Zn)	mg/kg	< 3	MCERTS		393	49	
Total Phenols (monohydric)	mg/kg	< 2	NONE		< 2	< 2	
EPH (C10 - C40)	mg/kg	< 6	MCERTS			< 6	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

Subcontracted analysis ⁽⁵⁾



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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17	16/02/17
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS01	WS02	WS02	WS03	WS03
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 590/dg/002	Depth (m)	0.60	0.40 - 1.00	1.40	0.40	0.80
Reporting Date: 08/03/2017	QTSE Sample No	255969	255970	255971	255973	255974

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.70	< 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	< 0.1	< 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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17	
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS04	WS04	WS05	WS05	
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 590/dg/002	Depth (m)	0.30	1.00	0.50	1.00	
Reporting Date: 08/03/2017	QTSE Sample No	255976	255977	255979	255980	

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	0.15	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.92	< 0.1	0.37	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	0.23	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	2.41	< 0.1	1.04	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	2.08	< 0.1	0.90	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	1.04	< 0.1	0.48	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	0.94	< 0.1	0.51	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	1.58	< 0.1	1.03	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.61	< 0.1	0.35	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	1.22	< 0.1	0.74	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.79	< 0.1	0.50	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.66	< 0.1	0.39	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	12.6	< 1.6	6.3	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH LQM Banded

QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS02	WS03	WS04	WS05
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 590/dg/002	Depth (m)	0.40 - 1.00	0.40	0.30	0.50
Reporting Date: 08/03/2017	QTSE Sample No	255970	255973	255976	255979

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	32	< 2	< 2	
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	33	< 2	< 2	
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	17	< 3	< 3	
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	82	< 30	< 30	
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	14	< 2	< 2	
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	20	< 2	< 2	
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	11	< 2	< 2	
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	10	5	
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	89	61	
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	< 30	45	99	66	
Total >C5 - C44	mg/kg	< 60	NONE	< 60	127	99	66	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17	16/02/17	16/02/17	
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 82A Jubilee Road, Waterlooville	TP / BH No	WS02	WS03	WS04	WS05	
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 590/dg/002	Depth (m)	0.40 - 1.00	0.40	0.30	0.50	
Reporting Date: 08/03/2017	QTSE Sample No	255970	255973	255976	255979	

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

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Soil Analysis Certificate - Volatile Organic Compounds (VOC)

QTS Environmental Report No: 17-55829	Date Sampled	16/02/17	16/02/17			
Dig-Geotech Limited	Time Sampled	None Supplied	None Supplied			
Site Reference: 82A Jubilee Road, Waterloooville	TP / BH No	WS04	WS05			
Project / Job Ref: 590	Additional Refs	None Supplied	None Supplied			
Order No: 590/dg/002	Depth (m)	0.30	0.50			
Reporting Date: 08/03/2017	QTSE Sample No	255976	255979			

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

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Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 17-55829

Dig-Geotech Limited

Site Reference: 82A Jubilee Road, Waterloooville

Project / Job Ref: 590

Order No: 590/dg/002

Reporting Date: 08/03/2017

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
\$ 255969	WS01	None Supplied	0.60	15.4	Brown clayey sand with stones
\$ 255970	WS02	None Supplied	0.40 - 1.00	22.1	Brown clay
\$ 255971	WS02	None Supplied	1.40	18	Brown clay
&\$ 255973	WS03	None Supplied	0.40	6.1	Brown sandy gravel with stones
\$ 255974	WS03	None Supplied	0.80	8.8	Brown sandy gravel with stones
\$ 255976	WS04	None Supplied	0.30	12.4	Brown sandy gravel with stones
\$ 255977	WS04	None Supplied	1.00	18.6	Orange clayey sand
\$ 255979	WS05	None Supplied	0.50	14.3	Brown sandy gravel with stones
\$ 255980	WS05	None Supplied	1.00	18.1	Brown clay

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

Insufficient Sample ^{1/5}

& samples received in inappropriate containers for hydrocarbon analysis

\$ samples exceeded recommended holding times



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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 17-55829

Dig-Geotech Limited

Site Reference: 82A Jubilee Road, Waterloooville

Project / Job Ref: 590

Order No: 590/dg/002

Reporting Date: 08/03/2017

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 dphenylcarbazine 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	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

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