

Foreman Homes

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Jonathan Driver, Jonathan.Driver@havant.gov.uk
David Eaves, David.Eaves@havant.gov.uk

11th May 2015

Your ref: Ranelagh Road Discharge of Conditions APP/14/01262

Our ref: Letter Report: 14933/ESFM

Dear Sirs,

FAO: Michael Avery

Re: Human Health Risk Assessment- Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR

This letter report complements the Lead Human Health Risk Assessment provided as part of the above development. It must be read in conjunction with the Reports presented in Table I. We have relied on these reports, the soil testing carried out at the site and the subsequent communications between Havant Borough Council and Soils Limited in the preparation of this letter report.

Table I. Previous Reports

Reference	Report	Author	Date
14099/GIR	Phase II Ground Investigation Report	Soils Limited (L. Howell)	February 2014
14099/PL	Letter Report	Soils Limited (L. Howell)	February 2014
14099/GIR	Phase II Ground Investigation Report	Soils Limited (L. Howell)	March 2014
14099/GIR/Rev 2.00	Phase II Ground Investigation Report	Soils Limited (L. Howell)	December 2014

Following further discussions, Havant Borough Council requested further data to characterise the superficial soil for the design of appropriate remediation measures, if required. Additional 10no. near surface soil samples were recovered from across the site and laboratory testing was carried out in April 2015 (i.e. HPI-HP10, Appendix A) in order to complement previous results and also to enable a further statistical analysis to be undertaken on the resulting data set.

The Site and Proposed Redevelopment

At the time of the site investigation presented in Table I, the site was located south of Ranelagh Road, in Havant, Hampshire and had an approximate site area of 2.5ha. The development was to include the erection of 81no. dwellings consisting of 10no. two-bed flats, 12no. two-bed flats, 6no. two-bed houses and 53no. three-bed houses. The proposed redevelopment included soft and hard landscaping such as access roads and private gardens.

Sampling Design

Samples were collected from the near surface soils (i.e. 0.0-0.6m bgl) for testing in order to assess risk to human health. The total site area was 2.5ha, therefore, the 31no. samples (over all phases of intrusive works) that were recovered for testing at the site were considered sufficient in view of the area of the site.



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Human Health Risk Assessment

The assessment was based on the following:

- The existing plan (i.e. Drawing by Reuby & Stagg Ltd, Number 002, dated 17/06/12)
- The proposed development plan (i.e. Drawing by ADP Architects Ltd., Number 01, dated May 2014)).
- The information about the nature, extent and distribution of the potential contaminant revealed by the intrusive site investigation to date,

The drawings were provided by the client and are appended to this letter (Appendix A).

Any change or deviation from the scheme outlined in the drawing could invalidate the remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

Concentrations of contaminants tested were to be compared against Published United Kingdom SGVs, the new DEFRA C4SL values, Soil Screening Values (SSV) and LQM/CIEH Suitable 4 Use Levels (S4ULs) published in 2015 where appropriate to assess risk to human health. The assessment criteria used to assess risks to human health are explained within Appendix B.

The results of the contamination testing are appended to this report (Appendix C) and the significant results of the assessment are presented in Table 2. The assessment was carried out using GAC for residential land-use scenario and shown on the development plan provided by the developer appended to this letter report (Appendix A).

The results show that the shallow ground contained elevated concentrations of lead in some areas as presented in Table 2.

The statistical analyses (Appendix D) of the results (i.e. including the outlier) of the 31 no. shallow samples recovered from depths not exceeding 0.6m bgl revealed the Upper 95th Percentile Concentration of 174.2mg kg⁻¹, which was below the most conservation guideline for residential with home ground produce end usage. The Upper 95th Percentile Concentration of the results excluding the outlier was 154.3 mg kg⁻¹ which also below the critical concentration of 200 mg kg⁻¹.

The outlying lead concentration (i.e. Hotspot) of 385.0 mg kg⁻¹ for the sample recovered from WS8 (i.e. sample recovered at 0.3m bgl) cannot be removed from the data set and must be dealt with separately, as discussed later in this report. The area is located in the proposed garden area of Plot 75 therefore different exposure pathways to the future resident exist. The statistical analysis carried out with the dataset excluding the outlier suggested that no further hotspots exist and that the true population mean (i.e. the 95% UCL) was less than the critical concentration of 200 mg kg⁻¹ for residential with home grown produce suggesting that no further actions are warranted. Therefore, with the exception of the proposed garden areas around WS8, remediation actions would only be undertaken in the proposed residential garden areas as a precautionary measure only.

The assessment has also shown that the results of the soil testing revealed no concentrations in excess of the relevant guideline values for public open space usages in a residential setting. The near surface soils tested could therefore be re-used communal garden areas, if present.

Table 2 Summary of Chemical Analysis and Statistical Analyses of Soils Samples

Chemical	Samples	Depth (m bgl)	Exceedances of 200 (mg kg ⁻¹)	Comments
Lead	WS2	0.3	290.0	Not suitable for residential with home grown produce*
	TP2	0.5	223.0	
	HP3	0.3	275.0	
	WS8	0.4	385.0	
Statistical Analysis Of The Soil Results For Lead (With WS8)				
			mg kg ⁻¹	
Number of samples tested			31.0	
Standard deviation			99.4	
Mean			95.5	
Upper 95 th Percentile Concentration			174.2	
Hotspot			385.0	Area of WS8: Remediation necessary
Statistical Analysis Of The Soil Results For Lead (Without WS8)				
Number of samples tested			30	
Standard deviation			80.9	
Mean			90.0	
Upper 95 th Percentile Concentration			154.3	
Hotspot			None	Areas other than WS8: Remediation not necessary
Risk Assessment For Lead				
Proposed Land use: Residential			GAC (mg Kg-l)	
With home-grown produce			200.0	95 % UCL DO NOT EXCEED GAC
Without home-grown produce			310.0	
Public Open Space (POS)			630.0	

Notes: * where results taken as standalone (i.e. no statistical analysis applied)

Remediation for Lead

Re-evaluation of the conceptual site model has revealed that plausible pollutant linkages remain after the risk assessment and further actions are warranted. There are three main ways to reduce or control unacceptable risks in land contamination applications:

- Remove or treat the (source) of pollutant(s);
- Remove or modify the pathway(s);
- Remove or modify the behaviour of receptor(s).

The remediation strategy addresses the risk removal with respect to human health and specific to the area set by the brief for the investigation. It should be considered in conjunction with an overall development plan of the site.

Table 3 presents remediation options that may also be used for remediating the Lead contaminated soils identified within the area of WS8. The higher the concentration of lead in the imported soil, the deeper the cover system required. The final depth of cover system required for residential gardens will depend on the concentration of lead in the imported Topsoil as presented in Table 4. Different scenarios were simulated using different concentrations of Lead in the Topsoil to be imported on site.

The proposal for up to 600mm of clean material to be adopted in the garden areas as previously recommended by Soils Limited was conservative yet appropriate in this occasion. The potentially

contaminated soils as presented in Table 2 could however be re-used within communal garden areas, if proposed, at the site.

Table 3 Remediation Option (Area of WS8)

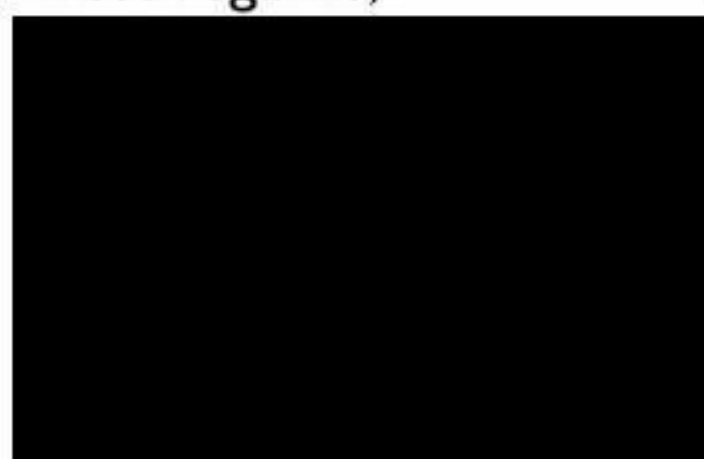
Option	Description	Comments
1	Remove Lead contaminated soils in location of WS8 and validate (i.e. 0.5m deep)	Soil export/Import
2	Cover System to raise site levels in impacted garden areas (i.e. WS8)	Soil import
3	Paved area around hotspot	No soil export/Import

Table 4 Cover System Design (i.e. using BRE, 2005)

Concentration mg kg ⁻¹	Maximum Depth of the cover system (mm)	Lead of Cover (Cc) mg kg ⁻¹	Remediation
223	68	20	Areas other than WS8: Cover system not required because no hotspot identified
223	80	50	
223	112	100	
223	189	150	
290	200	20	
290	225	50	
290	284	100	
290	368	150	
385	304	20	Area of WS8: Warranted if area to remain as soft landscaping. If area paved, no action will be warranted
385	331	50	
385	389	100	
385	472	150	

Please do not hesitate to contact the undersigned should you require clarification on any of the points or conclusions raised in this letter report.

Best regards,



Eliane S. Foteu Madio *B.Sc. (Hons), M.Sc. (Hons), M.Sc., Ph.D.*
Chief Environmental Consultant

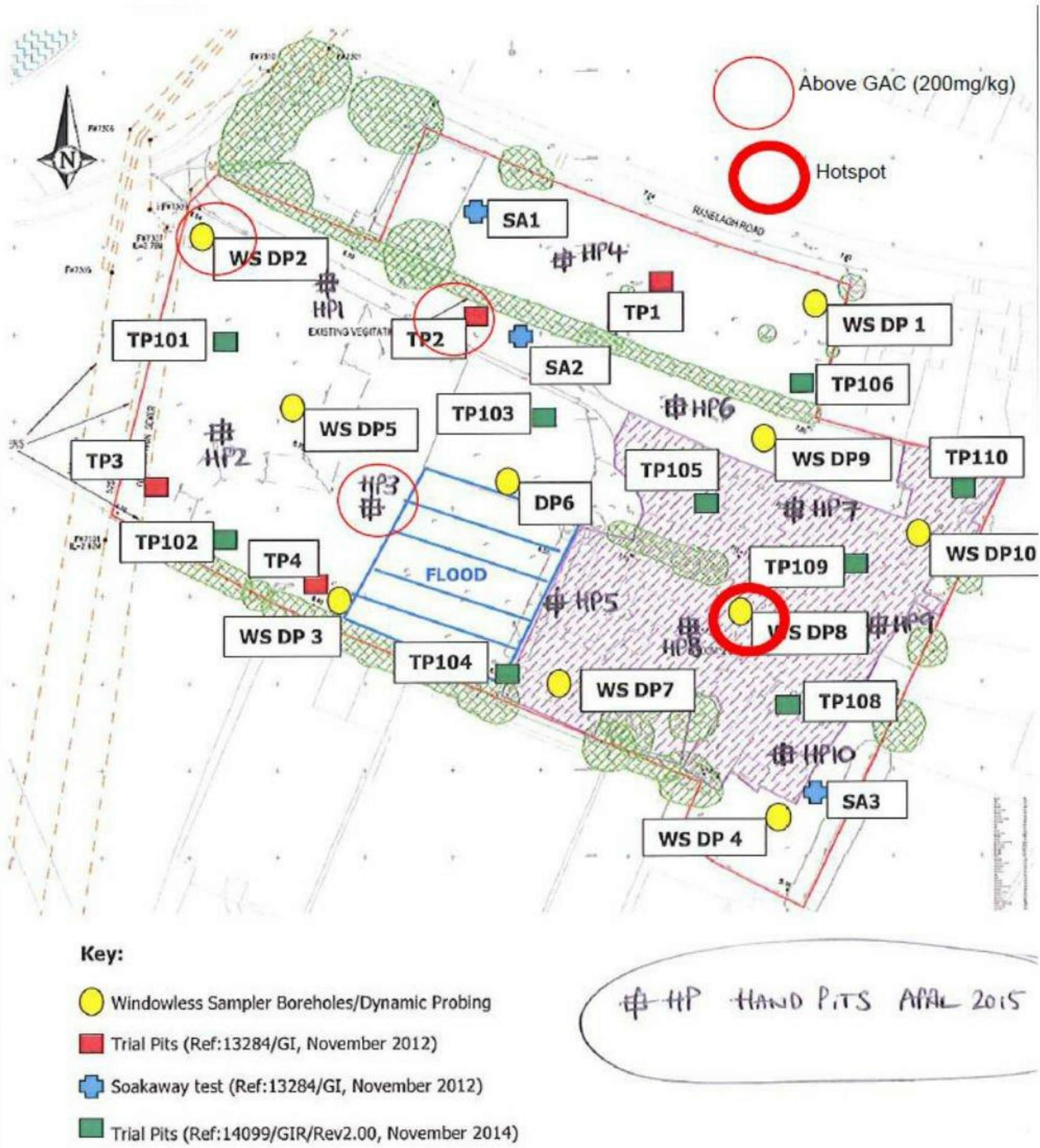
For and on Behalf of Soils Limited

APPENDIX A-Plans

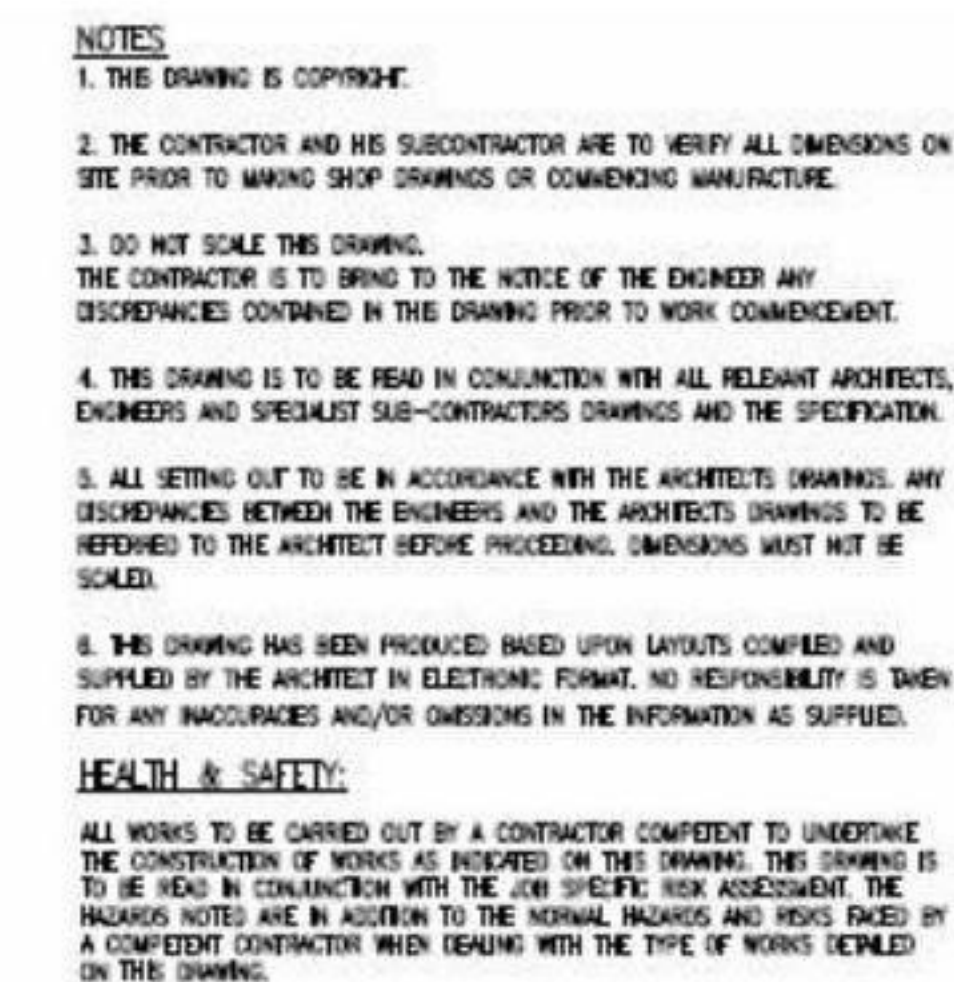


Samples m gbl	Lead (mg/kg)	Proposed Plan
WS2 0.3	290.0	(Garden area of Plot 16)
TP2 0.5	223.0	(Garden area of Plot 12)
HP3 0.3	275.0	(Garden area of Plot 63-68)
WS8 0.4	385.0	(Gardens of Plot 75)

Proposed Layout Plan



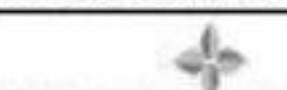
Existing Layout Plan Showing the Trial Pit Location



ALL CO-ORDINATES ARE RELATIVE TO
TOPOGRAPHICAL SURVEY CARRIED OUT BY:
Digital Terrain Surveys LLP, Tanners Court,
Tanners Lane, East Wellow, Romsey,
Tel 01794 514978

FOR STATION CO-ORDINATES AND LOCATIONS
REFER TO CONTRACT DRAWING Kingscroft Farm
Ruralcraft Road, Bodhrathampton
DATE: 11/09/2010
DATE September 2010

CONTRACTOR TO CHECK AND IDENTIFY ANY
DISCREPANCIES TO ENGINEER

P1	27/06/12	NTAL ESSE	RNB
date	date	drawings	notes
Project			
PROPOSED DEVELOPMENT, RANELAGH ROAD, HAVANT			
Client / Architect			
		Title	
		TOPOGRAPHICAL SURVEY	
			
			
REUBY & STAGG LTD. CONSULTING CIVIL & STRUCTURAL ENGINEERS			
Hampshire Office Dever House, 55 High Street, Basingstoke, Hampshire RG24 1JA Telephone: 01252 464403 Fax: 01252 464404 Email: info@reubyandstagg.co.uk			
date	JUN 2012	scale	1:500
client	9903	geo	AI
drawing no.	9964	drawing no.	002
revision	001	revision	P1

APPENDIX B- Human Health Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

1.1 Introduction

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
 - EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
 - EA CLEA Bulletin (2009).
 - CLEA software version 1.04 (2009)
 - Toxicological reports and SGV technical notes.
-

The CLEA guidance and tools:

1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
 2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
 3. do not provide a definitive test for telling when human health risks are significant.
 4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.
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1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.

SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less than the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.4 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

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- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
 - SGV reports may give values that differ from the GAC's used in this report.
 - These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.
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1.5 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*

1.6 Other Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

1.6.1 CL: AIRE Category 4 screening levels (C4SLs) (2014)

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not

contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

1.6.2 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)

The new S4UL's ((Nathanail *et al*, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEH GAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP1010.

For derivation of these Generic Assessment Criteria reference must be made to: Nathanail, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3rd edition)*. **Land Quality Press**. 2015.

1.7 Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

1.7.1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure duration is six years.
 - Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
 - Building type is a two-storey small terraced house.
-

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption.

Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure duration is six years.
 - Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
 - There is no building.
-

1.7.3 Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

-
- Critical receptor is a working female adult (aged 16 to 65 years old).
 - Exposure duration is a working lifetime of 49 years.
 - Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
 - Building type is a three-storey office (pre 1970).
-

1.7.4 Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

-
- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
 - Predominantly used by children for playing and may be used for activities such as a football kick about
 - Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
 - older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
 - ingestion rate 75 mg.day⁻¹
-

1.7.5 Public Open Space Park

This generic scenario refers to any public park that is more than 0.5ha in area:

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- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
-

-
- Female child age classes 1-6
 - Soil ingestion rate of 50 mg.day⁻¹
 - Occupancy period outdoors = 2 hours.day⁻¹
 - Exposure frequency of 170 days.year⁻¹ for age classes 2-18 and 85 days.year⁻¹ for age class 1
 - Outdoor exposure pathways only (no tracking back).
-

1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

-
- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
 - Developing more accurate parameters using site data.
-

1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed.

1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and CL: AIRE Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CLAIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CLAIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
 - Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.
-

Land Use			Residential With or Without Plan Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
Type	Contaminants	Species	Year																					
Metals	Arsenic		2014		37			40			49			640			79			168	C4SL	DEFRA	2014	
			2015		37			40			40			640			79			170	S4UL	LQM/CIEH	2015	
	Beryllium		2015		1.7			1.7			35			12			2.2			63	S4UL	LQM/CIEH	2015	
	Boron		2015		290			11000			45			240000			21000			46000	S4UL	LQM/CIEH	2015	
	Cadmium		2015		11			85			1.9			190			120			532	S4UL	LQM/CIEH	2015	
			2014		26			149			4.9			410			220			880	C4SL	DEFRA	2014	
	Chromium	III	2015		910			910			18000			8600			1500			33000	S4UL	LQM/CIEH	2015	
		IV	2014		21			21			170			49			23			250	C4SL	DEFRA	2014	
		IV	2015		6			6			1.8			33			7.7			220	S4UL	LQM/CIEH	2015	
	Copper		2015		2400			7100			520			68000			12000			44000	S4UL	LQM/CIEH	2015	
	Lead				200			310			80			2330			630			1300	C4SL	DEFRA	2014	
	Mercury	Elemental	2012		1.0			1.0			26			26							SGV	DEFRA	2012	
			2015		1.2			1.2			21			58			16			30	S4UL	LQM/CIEH	2015	
		Inorganic	2012		170			170			80			36000							SGV	DEFRA	2012	
			2015		40			56			19			1100			120			240	S4UL	LQM/CIEH	2015	
		Methyl	2012		11			11			8			410							SGV	DEFRA	2012	
			2015		11			15			6			320			40			68	S4UL	LQM/CIEH	2015	
	Nickel		2012		130			130			230			1800							SGV	DEFRA	2012	
			2015		180			180			230			980			230			3400	S4UL	LQM/CIEH	2015	
	Selenium		2012		350			350			120			13000							SGV	DEFRA	2012	
			2015		250			430			88			12000			1100			1800	S4UL	LQM/CIEH	2015	
	Vanadium		2015		410			1200			91			9000			2000			5000	S4UL	LQM/CIEH	2015	
	Zinc		2015		3700			40000			620			730000			81000			170000	S4UL	LQM/CIEH	2015	
BTEX & MTBE	Benzene		2012		0.33			0.33			0.07			95							SGV	DEFRA	2012	
			2014		0.87			3.3			0.18			98			140			230	C4SL	DEFRA	2014	
			2015	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	S4UL	LQM/CIEH	2015
	Toluene		2012		610			610			120			4400							SGV	DEFRA	2012	
			2015	130	290	660	880	1900	3900	22	51	120	65000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
	Ethylbenzene		2012		350			350			90			2800							SGV	DEFRA	2012	
			2015	47	110	260	83	190	440	16	39	91	4700	13000	27000	24000	24000	25000	17000	22000	27000	S4UL	LQM/CIEH	2015
	Xylenes	o-xylene	2012		250			250			160			2600							SGV	DEFRA	2012	
			2015	60	140	330	88	210	480	28	67	160	6600	15000	33000	41000	42000	43000	17000	24000	33000	S4UL	LQM/CIEH	2015
		m-xylene	2012		240			240			180			3500							SGV	DEFRA	2012	
		2015	59	140	320	82	190	450	31	74	170	6200	14000	31000	41000	42000	43000	17000	24000	32000	S4UL	LQM/CIEH	2015	
	p-xylene	2012		230			230			160			3200							SGV	DEFRA	2012		
		2015	56	130	310	79	180	310	29	69	160	5900	14000	30000	41000	42000	43000	17000	23000	31000	S4UL	LQM/CIEH	2015	
Petroleum Hydrocarbons Fractions	Aliphatic >C5 - C6		2015	42	78	160	42	78	160	730	1700	3900	3200	5900	12000	570000	590000	600000	95000	130000	180000	S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8		2015	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000	600000	610000	620000	150000	220000	320000	S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10		2015	27	65	150	27	65	150	320	770	1700	2000	4800	11000	13000	13000	13000	14000	18000	21000	S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12		2015	130	330	760	130	330	770	2200	4400	7300	9700	23000	47000	13000	13000	13000	21000	23000	24000	S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16		2015	1100	2400	4300	1100	2400	4400	11000	13000	13000	59000	82000	90000	13000	13000	13000	25000	25000	26000	S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35		2015	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44		2015	65000	92000	140000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7		2015	70	140	300	370	690	1400	13	27	57	26000	46000	86000	56000	56000	56000	76000	84000	92000	S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8		2015	130	290	660	860	1800	3900	22	51	120	56000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
	Aromatic >C8 - C10		2015	34	83	190	47	110	270	8.6	21	51	3500	8100	17000	5000	5000	5000	7200	8500	9300	S4UL	LQM/CIEH	2015
	Aromatic >C10 - C12		2015	74	180	380	250	590	1200	13	31	74	16000	28000	34000	5000	5000	5000	9200	9700	10000	S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015	140	330	660	1800	2300	2500	23	57	130	36000	37000	38000	5100	5100	5000	10000	10000	10000	S4UL	LQM/CIEH	2015
	Aromatic >C16 - C21		2015	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	S4UL	LQM/CIEH	2015
	Aromatic >C21 - C35		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015

Land Use	Residential With or Without Plan Uptake											Public Open Space (POS)									Name	Authority	Date		
	Type	Contaminants	Species	SOM	With home-grown produce			Without home-grown produce			Allotments			Commercial			Residential			Park					
					1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1				2.5	6
Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)	Aliphatic + Aromatic >C44 - C70			1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015	
	Acenaphthene	2015	210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015		
	Acenaphthylene	2015	170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015		
	Anthracene	2015	2400	5400	11000	31000	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015		
	Benzo(a)anthracene	2015	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015		
	Benzo(a)pyrene	2014			5			5.3			5.7			76			10			21	C4SL	DEFRA	2014		
		2015	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015		
	Benzo(b)fluoranthene	2015	2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015		
	Benzo(ghi)perylene	2015	320	340	250	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015		
	Benzo(k)fluoranthene	2015	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015		
	Chrysene	2015	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015		
	Dibenz(a,h)anthracene	2015	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015		
	Fluoranthene	2015	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015		
	Fluorene	2015	170	400	860	2800	3800	4500	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015		
	Indeno(1,2,3-cd)pyrene	2015	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015		
	Naphthalene	2015	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190	460	1100	4900	4900	4900	1200	1900	3000	S4UL	LQM/CIEH	2015		
Phenanthrene	2015	95	220	440	1300	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015			
Pyrene	2015	620	1200	2000	3700	3800	3800	110	270	620	54000	54	54000	7400	7400	4700	15000	15000	15000	S4UL	LQM/CIEH	2015			
Coal Tar(Bap as surrogate matter)	2015	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015			
Chloroalkanes & alkenes	1,2 Dichloroethane	2015	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015		
	1,1,1 Trichloroethane	2015	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000	76000	100000	S4UL	LQM/CIEH	2015		
	1,1,2,2 Tetrachloroethane	2015	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015		
	1,1,1,2 Tetrachloroethane	2015	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015		
	Tetrachloroethene	2015	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810	1100	1500	S4UL	LQM/CIEH	2015		
	Tetrachloromethane (Carbon Tetrachloride)	2015	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015		
	Trichloroethene	2015	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015		
	Trichloromethane	2015	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015		
	Vinyl Chloride (chloroethene)	2015	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	S4UL	LQM/CIEH	2015		
	Explosives	2,4,6 Trinitrotoluene	2015	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015	
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)		2015	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015		
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)		2015	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000	23000	24000	S4UL	LQM/CIEH	2015		
Pesticides	Aldrin	2015	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015		
	Dieldrin	2015	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	S4UL	LQM/CIEH	2015		
	Atrazine	2015	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	S4UL	LQM/CIEH	2015		
	Dichlorvos	2015	0.032	0.066	0.14	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	S4UL	LQM/CIEH	2015		
	Alpha - Endosulfan	2015	7.4	18	41	160	280	410	1.2	2.9	6.8	5600	7400	8400	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015		
	Beta - Endosulfan	2015	7	17	39	190	320	440	1.1	2.7	6.4	6300	7800	8700	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015		
	Alpha -Hexachlorocyclohexanes	2015	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	S4UL	LQM/CIEH	2015		
	Beta -Hexachlorocyclohexanes	2015	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	S4UL	LQM/CIEH	2015		
	Gamma -Hexachlorocyclohexanes	2015	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	S4UL	LQM/CIEH	2015		
Chlorobenzenes	Chlorobenzene	2015	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300	2000	2900	S4UL	LQM/CIEH	2015		
	1,2-Dichlorobenzene	2015	23	55	130	24	57	130	94	230	540	2000	4800	11000	90000	95000	98000	24000	36000	51000	S4UL	LQM			

Land Use			Residential With or Without Plan Uptake									Public Open Space (POS)									Name	Authority	Date			
			With			Without			Allotments			Commercial			Residential			Park								
			home-grown produce	home-grown produce																						
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6					
Type	Contaminants	Species	Year																							
Phenols & Chlorophenols	Pentachlorobenzene		2015	5.8	12	22	19	30	38	1.2	3.1	7	640	770	830	100	100	100	190	190	190	S4UL	LQM/CIEH	2015		
	Hexachlorobenzene		2015	1.8	3.3	4.9	4.1	5.7	6.7	0.47	1.1	2.5	110	120	120	16	16	16	30	30	30	S4UL	LQM/CIEH	2015		
	Phenols		2012	420			420			280			3200									SGV	DEFRA	2012		
			2015	280	550	1100	750	1300	2300	66	140	280	760	1500	3200	760	1500	3200	760	1500	3200	S4UL	LQM/CIEH	2015		
	Chlorophenols (4 Congeners)		2015	0.87	2	4.5	94	150	210	0.13	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	S4UL	LQM/CIEH	2015		
	Pentachlorophenols		2015	0.22	0.52	1.2	27	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	S4UL	LQM/CIEH	2015		
Others	Carbon Disulphide		2015	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	S4UL	LQM/CIEH	2015		
	Hexachloro-1,3-Butadiene		2015	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	S4UL	LQM/CIEH	2015		
	Sum of PCDDs, PCDFs and dioxin-like PCB's.		2012	8			8			8			240									SGV	DEFRA	2012		
NOTE																										
	Priority	Guideline (mg kg ⁻¹)																								
	1	Site Specific Assessment Criteria (SSAC) (Soils Limited)																								
	2	2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014)																								
	3	2012: Soil Guideline Value (SGV) (Environment Agency, 2009)																								
	4	2015: Suitable 4 Use Level (S4UL) (Nathanail <i>et al</i> , 2015)																								
	For Generic Risk Assessment, the values in Bold have priority																									

APPENDIX C- Results of Soil Testing



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Winnall Close
Winchester
SO23 0LB

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QTS Environmental Report No: 15-30721

Site Reference: Ranelagh Road

Project / Job Ref: 14933

Order No: None Supplied

Sample Receipt Date: 20/04/2015

Sample Scheduled Date: 20/04/2015

Report Issue Number: 1

Reporting Date: 23/04/2015

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd



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Soil Analysis Certificate						
QTS Environmental Report No: 15-30721	Date Sampled	16/04/15	16/04/15	16/04/15	16/04/15	16/04/15
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	HP1	HP2	HP3	HP4	HP5
Project / Job Ref: 14933	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.10	0.30	0.30	0.50	0.50
Reporting Date: 23/04/2015	QTSE Sample No	145335	145336	145337	145338	145339

Determinand	Unit	RL	Accreditation					
Arsenic (As)	mg/kg	< 2	MCERTS	7	4	7	5	5
Barium (Ba)	mg/kg	< 5	NONE	88	62	101	80	106
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	0.2	0.4	< 0.2	0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	32	21	30	31	21
Copper (Cu)	mg/kg	< 4	MCERTS	6	10	28	12	24
Lead (Pb)	mg/kg	< 3	MCERTS	22	27	275	23	76
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	21	20	20	28	16
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	50	35	52	48	35
Zinc (Zn)	mg/kg	< 3	MCERTS	56	49	114	63	88

Analytical results are expressed on a dry weight basis where samples are 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						
QTS Environmental Report No: 15-30721	Date Sampled	16/04/15	16/04/15	16/04/15	16/04/15	16/04/15
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	HP6	HP7	HP8	HP9	HP10
Project / Job Ref: 14933	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.20	0.25	0.30	0.40
Reporting Date: 23/04/2015	QTSE Sample No	145340	145341	145342	145343	145344

Determinand	Unit	RL	Accreditation					
Arsenic (As)	mg/kg	< 2	MCERTS	7	6	4	5	6
Barium (Ba)	mg/kg	< 5	NONE	149	79	58	82	71
Beryllium (Be)	mg/kg	< 0.5	NONE	0.6	< 0.5	< 0.5	< 0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	1.5	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3	0.2	0.4	0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	17	25	15	25	30
Copper (Cu)	mg/kg	< 4	MCERTS	38	11	< 4	< 4	< 4
Lead (Pb)	mg/kg	< 3	MCERTS	131	47	39	47	19
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	21	17	11	16	19
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	39	41	25	39	47
Zinc (Zn)	mg/kg	< 3	MCERTS	103	68	77	73	55

Analytical results are expressed on a dry weight basis where samples are 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 - Sample Descriptions	
QTS Environmental Report No: 15-30721	
Soils Ltd	
Site Reference: Ranelagh Road	
Project / Job Ref: 14933	
Order No: None Supplied	
Reporting Date: 23/04/2015	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
145335	HP1	None Supplied	0.10	17.8	Brown clay
145336	HP2	None Supplied	0.30	16.6	Brown clay with stones
145337	HP3	None Supplied	0.30	16.7	Brown clay
145338	HP4	None Supplied	0.50	15.4	Brown clay
145339	HP5	None Supplied	0.50	17.2	Brown clay with rubble
145340	HP6	None Supplied	0.20	19	Brown clay with rubble and vegetation
145341	HP7	None Supplied	0.20	14.7	Brown clay
145342	HP8	None Supplied	0.25	18.8	Brown clay with chalk
145343	HP9	None Supplied	0.30	18.6	Brown clay with vegetation
145344	HP10	None Supplied	0.40	17.6	Brown clay

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

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information	
QTS Environmental Report No: 15-30721	
Soils Ltd	
Site Reference: Ranelagh Road	
Project / Job Ref: 14933	
Order No: None Supplied	
Reporting Date: 23/04/2015	

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	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



Craig Morrison
Soils Ltd
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Tadworth
Surrey
KT20 5SR



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t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 14-26749

Site Reference: Ranelagh Road

Project / Job Ref: 14639

Order No: None Supplied

Sample Receipt Date: 21/11/2014

Sample Scheduled Date: 21/11/2014

Report Issue Number: 1

Reporting Date: 26/11/2014

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd



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Soil Analysis Certificate						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP101	TP102	TP103	TP104	TP105
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.25	0.50	0.50	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126538	126539	126540	126541	126542

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	6.9	7.0	7.5	7.5	7.8
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.03	0.04	0.03	0.02	0.02
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	NONE	1.4	0.4	0.2	4.1	1
Total Organic Carbon (TOC)	%	< 0.1	NONE	0.8	0.2	< 0.1	2.4	0.6
Arsenic (As)	mg/kg	< 2	MCERTS	5	5	4	4	7
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	0.5	< 0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium (Cr)	mg/kg	< 2	MCERTS	24	23	22	21	23
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	29	14	9	11	27
Lead (Pb)	mg/kg	< 3	MCERTS	40	22	10	48	194
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	17	21	23	10	16
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	38	32	31	33	37
Zinc (Zn)	mg/kg	< 3	MCERTS	64	50	45	109	73
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

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

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

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Piotr Lipski

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis ⁽⁵⁾



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Soil Analysis Certificate						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road	TP / BH No	TP106	TP108	TP109	TP110	
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	0.25	0.25	0.25	0.25	
Reporting Date: 26/11/2014	QTSE Sample No	126543	126544	126545	126546	

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	7.0	7.2	7.5	7.2	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.01	0.01	0.03	0.04	
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	
Organic Matter	%	< 0.1	NONE	6.5	1.4	2.1	3.6	
Total Organic Carbon (TOC)	%	< 0.1	NONE	3.8	0.8	1.2	2.1	
Arsenic (As)	mg/kg	< 2	MCERTS	10	6	7	9	
Beryllium (Be)	mg/kg	< 0.5	NONE	0.7	< 0.5	0.5	0.6	
W/S Boron	mg/kg	< 1	NONE	1.5	1.5	< 1	2.1	
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	0.8	< 0.5	< 0.5	< 0.5	
Chromium (Cr)	mg/kg	< 2	MCERTS	27	23	19	20	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	40	13	26	35	
Lead (Pb)	mg/kg	< 3	MCERTS	104	27	97	118	
Mercury (Hg)	mg/kg	< 1	NONE	1.4	< 1	< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	19	15	17	17	
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	
Vanadium (V)	mg/kg	< 2	NONE	40	37	39	41	
Zinc (Zn)	mg/kg	< 3	MCERTS	206	65	58	104	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	

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

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

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Piotr Lipski

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis ⁽⁵⁾



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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP101	TP102	TP103	TP104	TP105
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.25	0.50	0.50	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126538	126539	126540	126541	126542

Determinand	Unit	RL	Accreditation					
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	< 0.1	< 0.1	< 0.1	0.27	< 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	0.92	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.84	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.42	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.48	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.60	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.20	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.42	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.27	< 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	0.27	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	4.7	< 1.6

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



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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP106	TP108	TP109	TP110
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.25	0.25	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126543	126544	126545	126546

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	< 0.1	< 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	< 0.1	< 0.1	< 0.1	0.24	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.13	0.42	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.13	0.34	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.16	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.22	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.28	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.17	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 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	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	1.8	

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



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Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP102	TP104	TP105	TP106	TP108
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.25	0.25	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126539	126541	126542	126543	126544

Determinand	Unit	RL	Accreditation					
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	4	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	21	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21	25	< 21
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42	< 42	< 42

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



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Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road	TP / BH No	TP110				
Project / Job Ref: 14639	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.25				
Reporting Date: 26/11/2014	QTSE Sample No	126546				

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

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



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP102	TP104	TP105	TP106	TP108
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.25	0.25	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126539	126541	126542	126543	126544

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
p & m-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
o-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

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



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road	TP / BH No	TP110				
Project / Job Ref: 14639	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.25				
Reporting Date: 26/11/2014	QTSE Sample No	126546				

Determinand	Unit	RL	Accreditation				
Benzene	ug/kg	< 2	MCERTS	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5			
Ethylbenzene	ug/kg	< 10	MCERTS	< 10			
p & m-xylene	ug/kg	< 10	MCERTS	< 10			
o-xylene	ug/kg	< 10	MCERTS	< 10			
MTBE	ug/kg	< 5	MCERTS	< 5			

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



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Lenham Heath
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Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-26749	
Soils Ltd	
Site Reference: Ranelagh Road	
Project / Job Ref: 14639	
Order No: None Supplied	
Reporting Date: 26/11/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
126538	TP101	None Supplied	0.25	17.2	Brown loamy clay with vegetation
126539	TP102	None Supplied	0.50	12	Brown gravelly clay with stones
126540	TP103	None Supplied	0.50	13.6	Brown gravelly clay with stones
126541	TP104	None Supplied	0.25	16.9	Brown loamy clay with brick
126542	TP105	None Supplied	0.25	18.7	Brown loamy clay with brick
126543	TP106	None Supplied	0.25	31.6	Brown loamy clay with vegetation
126544	TP108	None Supplied	0.25	19	Brown clayey loam
126545	TP109	None Supplied	0.25	21.4	Brown gravelly clay with rubble
126546	TP110	None Supplied	0.25	19.7	Brown sandy clay with stones

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

Insufficient Sample ^{1/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information	
QTS Environmental Report No: 14-26749	
Soils Ltd	
Site Reference: Ranelagh Road	
Project / Job Ref: 14639	
Order No: None Supplied	
Reporting Date: 26/11/2014	

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	Determination of acetone/hexane extractable hydrocarbons by GC-FID	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	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

D Dried
AR As Received



Lucy Howell
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QTS Environmental Report No: 14-19431

Site Reference: Ranelagh Road, Havant

Project / Job Ref: 14099

Order No: None Supplied

Sample Receipt Date: 13/02/2014

Sample Scheduled Date: 13/02/2014

Report Issue Number: 1

Reporting Date: 19/02/2014

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd



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Soil Analysis Certificate						
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14	12/02/14	12/02/14	12/02/14	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road, Havant	TP / BH No	WS5	WS7	WS8	WS9	
Project / Job Ref: 14099	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	0.60	0.40	0.40	0.60	
Reporting Date: 19/02/2014	QTSE Sample No	93687	93688	93689	93690	

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	8.1	8.1	8.1	9.6	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	NONE	0.02	0.07	0.10	< 0.01	
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	
Organic Matter	%	< 0.1	NONE	< 0.1	1	2.9	< 0.1	
Total Organic Carbon (TOC)	%	< 0.1	NONE	< 0.1	0.6	1.7	< 0.1	
Arsenic (As)	mg/kg	< 2	MCERTS	4	9	12	5	
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	< 0.5	< 0.5	
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	2.7	< 1	
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	
Chromium (Cr)	mg/kg	< 2	MCERTS	28	16	18	8	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	13	31	30	15	
Lead (Pb)	mg/kg	< 3	MCERTS	13	27	385	58	
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	3.9	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	20	25	15	6	
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	
Vanadium (V)	mg/kg	< 2	NONE	43	34	35	16	
Zinc (Zn)	mg/kg	< 3	MCERTS	48	73	75	31	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	

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

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

Subcontracted analysis ^(S)



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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14	12/02/14	12/02/14	12/02/14	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road, Havant	TP / BH No	WS5	WS7	WS8	WS9	
Project / Job Ref: 14099	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	0.60	0.40	0.40	0.60	
Reporting Date: 19/02/2014	QTSE Sample No	93687	93688	93689	93690	

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	< 0.1	< 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	< 0.1	< 0.1	< 0.1	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.28	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.23	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.14	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 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	
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	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	

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



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Soil Analysis Certificate - TPH CWG Banded

QTS Environmental Report No: 14-19431	Date Sampled	12/02/14				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road, Havant	TP / BH No	WS8				
Project / Job Ref: 14099	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.40				
Reporting Date: 19/02/2014	QTSE Sample No	93689				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 1	NONE	< 1			
Aliphatic >C10 - C12	mg/kg	< 1	NONE	< 1			
Aliphatic >C12 - C16	mg/kg	< 1	NONE	< 1			
Aliphatic >C16 - C21	mg/kg	< 1	NONE	< 1			
Aliphatic >C21 - C34	mg/kg	< 6	NONE	< 6			
Aliphatic (C5 - C34)	mg/kg	< 12	NONE	< 12			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05			
Aromatic >C8 - C10	mg/kg	< 1	NONE	< 1			
Aromatic >C10 - C12	mg/kg	< 1	NONE	< 1			
Aromatic >C12 - C16	mg/kg	< 1	NONE	< 1			
Aromatic >C16 - C21	mg/kg	< 1	NONE	< 1			
Aromatic >C21 - C35	mg/kg	< 6	NONE	< 6			
Aromatic (C5 - C35)	mg/kg	< 12	NONE	< 12			
Total >C5 - C35	mg/kg	< 24	NONE	< 24			

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



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road, Havant	TP / BH No	WS8				
Project / Job Ref: 14099	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.40				
Reporting Date: 19/02/2014	QTSE Sample No	93689				

Determinand	Unit	RL	Accreditation				
Benzene	ug/kg	< 2	MCERTS	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5			
Ethylbenzene	ug/kg	< 10	MCERTS	< 10			
p & m-xylene	ug/kg	< 10	MCERTS	< 10			
o-xylene	ug/kg	< 10	MCERTS	< 10			

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



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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-19431	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 14099	
Order No: None Supplied	
Reporting Date: 19/02/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
93687	WS5	None Supplied	0.60	18.1	Light brown clay
93688	WS7	None Supplied	0.40	11.6	Brown clayey gravel with stones
93689	WS8	None Supplied	0.40	19.8	Brown clayey loam with rubble
93690	WS9	None Supplied	0.60	18.2	Brown clayey loam with chalk

Insufficient sample ^{U/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information	
QTS Environmental Report No: 14-19431	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 14099	
Order No: None Supplied	
Reporting Date: 19/02/2014	

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	Determination of acetone/hexane extractable hydrocarbons by GC-FID	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	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

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

D Dried
AR As Received



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QTS Environmental Report No: 12-11610

Site Reference: Ranelagh Road, Havant

Project / Job Ref: 13284

Order No: None Supplied

Sample Receipt Date: 01/11/2012

Sample Scheduled Date: 01/11/2012

Report Issue Number: 1

Reporting Date: 08/11/2012

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd



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Soil Analysis Certificate						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12	30/10/12	30/10/12	30/10/12
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS2	WS3	WS4	WS4
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.10	0.30	0.10	0.10	0.40
Reporting Date: 08/11/2012	QTSE Sample No	54862	54863	54864	54865	54866

Determinand	Unit	MDL	Accreditation					
Fibrous Material Screen	P/A	N / a	NONE	Negative	Negative	Negative	Negative	Negative
pH	pH Units	N / a	MCERTS	7.8	7.3	6.0	7.0	7.1
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	NONE	0.10	0.03	0.03	0.01	< 0.01
Sulphide	mg/kg	< 5	NONE	12	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	NONE	4.5	4.7	6.7	1.2	11.5
Total Organic Carbon (TOC)	%	< 0.1	NONE	2.6	2.7	3.9	0.7	6.7
Arsenic (As)	mg/kg	< 2	MCERTS	10	14	7	10	7
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	< 0.5	< 0.5	0.6	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	1.8	1.1	1.3	1.8
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium (Cr)	mg/kg	< 2	MCERTS	16	21	27	28	32
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	43	36	37	47	15
Lead (Pb)	mg/kg	< 3	MCERTS	84	290	96	195	18
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	13	18	20	21	21
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	31	36	51	48	47
Zinc (Zn)	mg/kg	< 3	MCERTS	83	194	139	274	56
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

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

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

Stone content is classified as material greater than 10mm in diameter

Subcontracted analysis ⁽⁵⁾



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Soil Analysis Certificate						
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12	26/10/12	26/10/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	S1	TP2	TP3		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.40	0.50	0.40		
Reporting Date: 08/11/2012	QTSE Sample No	54867	54869	54870		

Determinand	Unit	MDL	Accreditation					
Fibrous Material Screen	P/A	N / a	NONE	Negative	Negative	Negative		
pH	pH Units	N / a	MCERTS	7.2	7.8	7.1		
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2		
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	NONE	0.02	0.02	0.02		
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5		
Organic Matter	%	< 0.1	NONE	8.9	5.7	5.9		
Total Organic Carbon (TOC)	%	< 0.1	NONE	5.2	3.3	3.4		
Arsenic (As)	mg/kg	< 2	MCERTS	10	11	8		
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	< 0.5		
W/S Boron	mg/kg	< 1	NONE	2.1	2	1.4		
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5		
Chromium (Cr)	mg/kg	< 2	MCERTS	24	23	24		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	44	57	35		
Lead (Pb)	mg/kg	< 3	MCERTS	198	223	129		
Mercury (Hg)	mg/kg	< 1	NONE	1.1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	19	22	18		
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		
Vanadium (V)	mg/kg	< 2	NONE	35	45	47		
Zinc (Zn)	mg/kg	< 3	MCERTS	226	166	104		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

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

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

Stone content is classified as material greater than 10mm in diameter

Subcontracted analysis ⁽⁵⁾



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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12	30/10/12	30/10/12	30/10/12
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS2	WS3	WS4	WS4
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.10	0.30	0.10	0.10	0.40
Reporting Date: 08/11/2012	QTSE Sample No	54862	54863	54864	54865	54866

Determinand	Unit	MDL	Accreditation					
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	0.16	0.21	< 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	0.20	1.04	0.17	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	0.15	0.95	0.15	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.40	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.64	0.12	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.67	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.32	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.44	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.30	< 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	0.24	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	5.2	< 1.6	< 1.6	< 1.6

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



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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12	26/10/12	26/10/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	S1	TP2	TP3		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.40	0.50	0.40		
Reporting Date: 08/11/2012	QTSE Sample No	54867	54869	54870		

Determinand	Unit	MDL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	0.31	0.30	0.38		
Pyrene	mg/kg	< 0.1	MCERTS	0.27	0.27	0.35		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.14	0.16		
Chrysene	mg/kg	< 0.1	MCERTS	0.19	0.22	0.28		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.22	0.21	0.28		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.15	0.17		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	1.9		

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



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Soil Analysis Certificate - TPH CWG Banded

QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Ranelagh Road, Havant	TP / BH No	WS3	WS4			
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.10	0.10			
Reporting Date: 08/11/2012	QTSE Sample No	54864	54865			

Determinand	Unit	MDL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C21 - C34	mg/kg	< 6	NONE	< 6	< 6			
Aliphatic (C5 - C34)	mg/kg	< 12	NONE	< 12	< 12			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C21 - C35	mg/kg	< 6	NONE	< 6	< 6			
Aromatic (C5 - C35)	mg/kg	< 12	NONE	< 12	< 12			
Total >C5 - C35	mg/kg	< 24	NONE	< 24	< 24			

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



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Ranelagh Road, Havant	TP / BH No	WS3	WS4			
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.10	0.10			
Reporting Date: 08/11/2012	QTSE Sample No	54864	54865			

Determinand	Unit	MDL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5	< 5			
Ethylbenzene	ug/kg	< 10	MCERTS	< 10	< 10			
p & m-xylene	ug/kg	< 10	MCERTS	< 10	< 10			
o-xylene	ug/kg	< 10	MCERTS	< 10	< 10			

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



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Soil Analysis Certificate - Organochlorine Pesticides

QTS Environmental Report No: 12-11610	Date Sampled	26/10/12				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road, Havant	TP / BH No	TP1				
Project / Job Ref: 13284	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.20				
Reporting Date: 08/11/2012	QTSE Sample No	54868				

Determinand	Unit	MDL	Accreditation				
Aldrin ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
alpha-HCH ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
beta-HCH ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
cis-chlordane ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
delta-HCH ^(S)	mg/kg	< 0.02	NONE	< 0.02			
Dieldrin ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Endosulfan A ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Endosulfan B ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Endrin ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
gamma-HCH (Lindane) ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Heptachlor ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Heptachlor epoxide ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Hexachlorobenzene (HCB) ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Isodrin ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
Methoxychlor ^(S)	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDD ^(S)	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDE ^(S)	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDT ^(S)	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDD ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
p,p' - DDE ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
p,p' - DDT ^(S)	mg/kg	< 0.02	ISO17025	< 0.02			
trans-chlordane ^(S)	mg/kg	< 0.02	NONE	< 0.02			
Trifluralin ^(S)	mg/kg	< 0.02	NONE	< 0.02			

Analytical results are expressed on a dry weight basis where samples are dried at less than 30 °C
Subcontracted analysis ^(S)



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Soil Analysis Certificate - Phenyl Urea Herbicides

QTS Environmental Report No: 12-11610	Date Sampled	26/10/12				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road, Havant	TP / BH No	TP1				
Project / Job Ref: 13284	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.20				
Reporting Date: 08/11/2012	QTSE Sample No	54868				

Determinand	Unit	MDL	Accreditation					
Chloroxuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Chlortoluron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Diflubenzuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Dimefuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Diuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Isoproturon ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Linuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Methabenzthiazuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Metoxuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Monolinuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Monuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				
Pencycuron ^(S)	mg/kg	< 0.1	NONE	< 0.1				

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

Subcontracted analysis ^(S)



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Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 12-11610

Soils Ltd

Site Reference: Ranelagh Road, Havant

Project / Job Ref: 13284

Order No: None Supplied

Reporting Date: 08/11/2012

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
54862	WS1	None Supplied	0.10	17.1	Brown clayey loam with stones and chalk
54863	WS2	None Supplied	0.30	26.4	Brown loamy clay with vegetation and stones
54864	WS3	None Supplied	0.10	21.7	Light brown clayey sand with chalk
54865	WS4	None Supplied	0.10	23.4	Brown clayey loam with vegetation and rubble
54866	WS4	None Supplied	0.40	18.7	Light brown clay with vegetation
54867	S1	None Supplied	0.40	27.5	Brown loamy clay with vegetation
54868	TP1	None Supplied	0.20	27.4	Brown loamy clay with vegetation
54869	TP2	None Supplied	0.50	23.4	Brown loamy clay with vegetation
54870	TP3	None Supplied	0.40	21.8	Brown clayey loam with vegetation

Insufficient sample ^{1/s}

Unsuitable Sample ^{u/s}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 12-11610

Soils Ltd

Site Reference: Ranelagh Road, Havant

Project / Job Ref: 13284

Order No: None Supplied

Reporting Date: 08/11/2012

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
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	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	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	AR	Asbestos Screening	Visual screening of samples for fibrous material	E024
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E021
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
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	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by turbidimeter	E020
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E023
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	D	Phosphorus	Determination of phosphorus by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Sulphate (as SO ₄) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	D	Sulphate (as SO ₄) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	AR	Sulphide	Determination of sulphide by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia, potassium iodide/iodate followed by ICP-OES	E002
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	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E009
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
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	E009
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E010
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E009
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	EPH (with florisil cleanup)	Determination of acetone/hexane extractable hydrocarbons with florisil cleanup step by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001

Key

D Dried
AR As Received

APPENDIX D- Statistical Analysis

Statistical Analysis with the Hotspot

Test Results

Client/client ref: Project ref:

Site ref: 14099 Data description: Cover

Date: 23-Jul-2008 User details: Rob Higginson

Dataset: Reduced dig (mg/kg)

Sample mean, $\bar{x}$ (mg/kg)	99.419
Sample standard deviation, s	95.565
Sample size, n	31
Critical concentration, C_c (mg/kg)	200

Use Normal distribution to test

Outliers & non-detects

Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

Test scenario: Planning: is true mean lower than critical concentration ($\mu < C_c$)

Null hypothesis: The true mean concentration is equal to or greater than the critical concentration: $\mu \geq C_c$

Alternative hypothesis: The true mean concentration is less than the critical concentration: $\mu < C_c$

Evidence against Null hypothesis: 97%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

Back to data

Back to summary

Go to outlier test

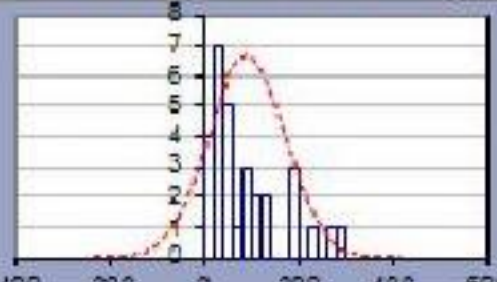
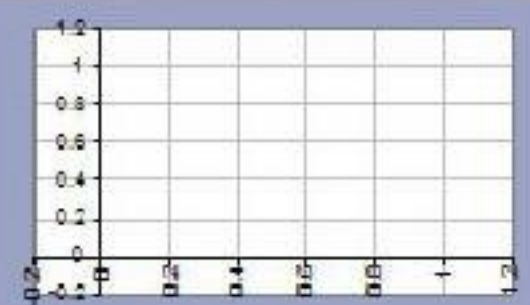
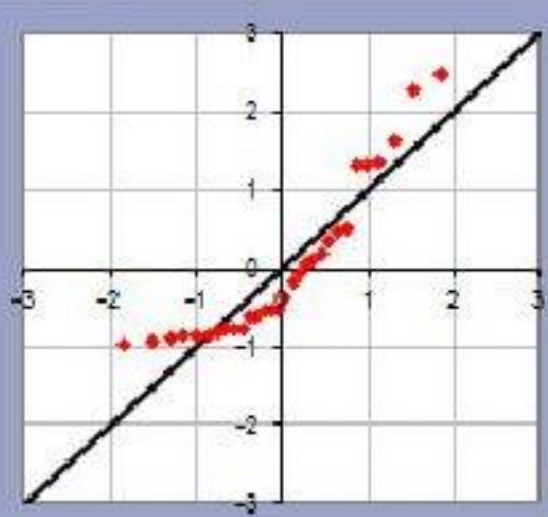
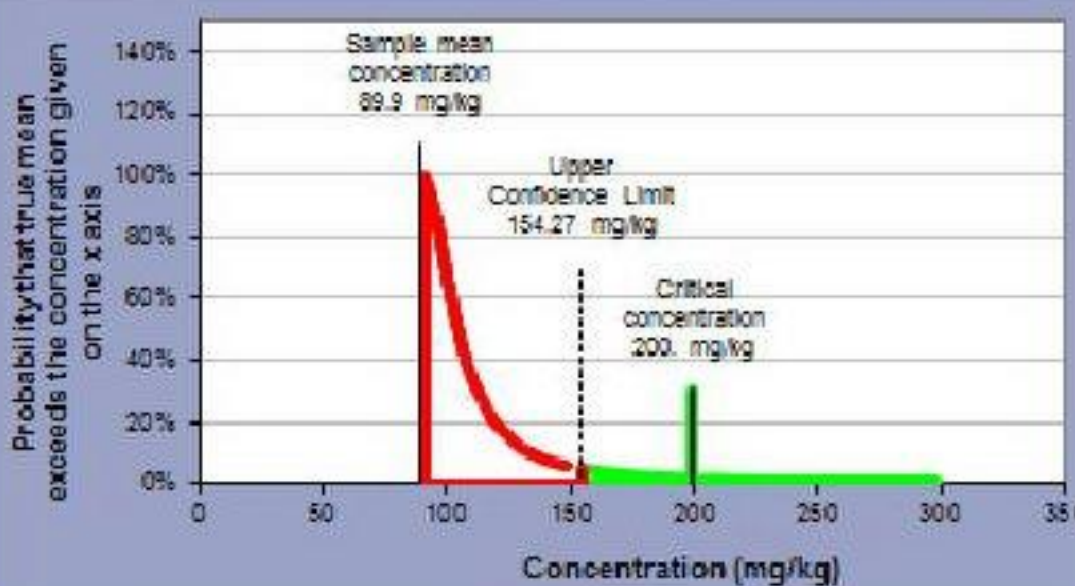
Go to normality test

Client/client ref: Project ref: Site ref: 14099 Data description: Cover Contaminant(s): Lead Test scenario: Planning Date: 23 July 2008 User details: Rob Higginson

Critical concentration, C_c	Reduced dig (mg/kg)	(mg/kg)	(mg/kg)
200	41	2	
Notes	Planning example from "Guidance Note on Comparing Soil"	Part 2A example from "Guidance Note on Comparing Soil Contamination"	
Sample size, n	31	0	0
Sample mean, $\bar{x}$	99.419355	No Data	No Data
Standard deviation, s	95.564559		
Number of non-detects	0		
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit
Outliers?	Yes		
Distribution	Non-normal		
Statistical approach	Auto: Chebychev	Auto	Auto
Test scenario:	Planning: is true mean lower than critical concentration		
t statistic, t_0 (or k_0)	-5.86001063		
Upper confidence limit (on true mean concentration, μ)	174.23507		
Evidence level	97%		
Base decision on:	evidence level		
Result	$\mu < C_c$		
Select dataset	☒ Y ☐ Y ☐ Y		

Back to data

Go to outlier test

Test Results		Client/client ref: Project ref:	Site ref: 14099 Data description:	Date: 00-Jan-1900 User details: Dr Eliane Foteu
Dataset: Reduced dig (mg/kg)	Use Normal distribution to test 	Outliers & non-detects		
Sample mean, $\bar{x}$ (mg/kg)	89.9	Outliers present?		NO
Sample standard deviation, s	80.879	Significance level		5%
Sample size, n	30	Outliers removed?		0
Critical concentration, Cc (mg/kg)	200	Non-detects		0
Normality test		Test scenario: Planning: is true mean lower than critical concentration ($\mu < C_c$)?		
Significance level: 5%		Null hypothesis: The true mean concentration is equal to or greater than the critical concentration: $\mu \geq C_c$		
Non-normal distribution		Alternative hypothesis: The true mean concentration is less than the critical concentration: $\mu < C_c$		
Use: Auto: Chebychev				Evidence against Null hypothesis: 98%
		Base decision on: evidence level		
		Evidence level required: 95%		
		Balance of probability? N/A		
		Reject Null Hypothesis? Yes		
$\mu < C_c$ (re this dataset)				

[Back to data](#)
[Back to summary](#)
[Go to outlier test](#)
[Go to normality test](#)

Client/client ref: Project ref: Site ref: 14099 Data description: Contaminant(s): Test scenario: Planning Date: 0 January 1900 User details: Dr Eliane Foteu	Reduced dig (mg/kg)	(mg/kg)	(mg/kg)
Critical concentration, C _c	200	44	21
Notes	Planning example from "Guidance Note on Comparing Soil"	Part 2A example from "Guidance Note on Comparing Soil Contamination"	
Sample size, n	30	0	0
Sample mean, $\bar{x}$	89.9	No Data	No Data
Standard deviation, s	80.87937		
Number of non-detects	0		
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit
Outliers?	No		
Distribution	Non-normal		
Statistical approach	Auto: Chebychev	Auto	Auto
Test scenario:	Planning: is true mean lower than critical concentration?		
t statistic, t ₀ (or k ₀)	-7.45607365		
Upper confidence limit (on true mean concentration, μ)	154.26562		
Evidence level	98%		
Base decision on:	evidence level		
Result	$\mu < C_c$		
Select dataset	☒ Y ☐ Y ☐ Y		
Back to data	Go to outlier test		