

Ground Investigation



Geotechnical & Environmental Consultants

Ground Investigation Report

At

**Land South of Ranelagh Road, Havant,
Hampshire, PO9 1NR**

For

Orchard Homes Limited

Soils Limited
Newton House
Cross Road
Tadworth
Surrey KT20 5SR
☎ 01737 814221
📄 01737 812557

REPORT 13284/GIR

Ground Investigation Report

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Client: Orchard Homes Limited

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	Name	Signature
Prepared by:	L Stockwell	
Checked by:	N J Lambert	
	R B Higginson	

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.



Soils Limited
Newton House
Tadworth
Surrey KT20 5SR
Phone 01737 814221
Fax 01737 812557

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For

Orchard Homes Limited

Commission

Soils Limited was commissioned by Orchard Homes Limited to carry out a Phase II Ground Investigation at the site known as land south of Ranelagh Road, Havant, Hampshire, PO9 1NR. The scope of the investigation was as outlined in Soils Limited quotation reference Q13950/Rev 1.02 dated 19th October 2012.

This report comprises the Phase II Ground Investigation and incorporates the results, discussion and conclusions to the intrusive investigation. This report must be read in conjunction with the Phase I Desk Study undertaken on the above site by Soils Limited (report ref: 13284/DS, October 2012).

A geotechnical assessment was not required and did not form part of the brief however dynamic probing was undertaken whilst on site and the site derived results have been presented.

The following sections make up the report made on the investigation and comprise:

Section 1 Introduction

- Objective of the Investigation;
- Location;
- Proposed Redevelopment;
- Limitations and Disclaimers.

Section 2 Site Works

- Proposed Works;
- Site Works;
- Ground Conditions;
- Roots;

- Groundwater.

Section 3

Discussion of Geotechnical In-Situ Testing

- General

Section 4

Engineering Discussion

- General.

Section 5

Conceptual Site Model and Chemical Analysis of Soil Samples

- Conceptual Site Model;
- Sampling Strategy;
- Determination of Contaminants of Concern for Soil Samples.

Section 6

Quantitative Risk Assessment

- Assessment Criteria;
- Representative Contamination Concentration;
- Soil Risk Assessment and Remediation Requirements.

Section 7

Groundwater Risk Assessment

- General;
- Analysis Suite for Water Samples;
- Comparison to Environmental Quality Standards;
- Duty of Care;
- Excavated Material;
- Re-use of Excavated material On-site;
- Imported Material;
- Discovery Strategy.

Figures

- Figure 1: Site Location Plan
- Figure 2: Trial Hole Layout Plan

Appendices

- Appendix A: Fieldwork
- Appendix B: Chemical Laboratory Analysis
- Appendix C: Soil Guideline Values and General Assessment Criteria
- Appendix D: Information Provided by the Client

Standards

The site works were performed in accordance with the methods given in BS 5930+A2:2010, BS EN ISO 22476-2:2005 and BS EN 1997-2:2007 plus associated National Annexes.

The chemical analyses were undertaken by QTS Environmental Ltd in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

Section 1 Introduction

1.1 Objective of the Investigation

The overall objective was understood to be to supply the client and their designers with information regarding ground conditions, to assist them in preparing a scheme for redevelopment that was appropriate to the conditions present on the site and safe for end-users and for workers during the redevelopment phase.

As the proposed redevelopment was understood to comprise the refurbishment of the existing building there was no requirement to provide parameters for the design of foundations. Dynamic probing (in-situ testing) was however undertaken to provide data suitable for designing foundations should this be required at a later date.

Soil samples were taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end users and the public from any contamination identified.

1.2 Location

The approximate O.S. National Grid Reference at the centre of the site was SU 708 063. The site area was approximately 2.5Ha.

The general site location map and plan are presented on Figures 1 and 2 respectively.

1.3 Proposed Redevelopment

At the time of reporting, November 2012, the proposed development was understood to comprise the erection of 81 dwellings consisting of 10no. two bed flats, 12no. two bed flats, 6no. two bed houses and 53no. three bed houses. The proposed redevelopment included the construction of access from Ranelagh Road, provision of landscaping, open space and associated works.

1.4 Limitations and Disclaimers

This Phase II Ground Investigation report relates to the land referred to as land south of Ranelagh Road, Havant, Hampshire, PO9 1NR (The "Site") and was prepared for the sole benefit of Orchard Homes Limited (The "Client") and was prepared solely for the scheme described in Section 1.3.

Soils Limited disclaims any responsibility to the client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

This report is personal and confidential to the client and Soils Limited accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly its own risk.

The Client may not assign the benefit of the report or any part to any third party without the consent of Soils Limited.

The ground and groundwater may exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation prior to the casting of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data on any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as *"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused"*.

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Section 2 Site Works

2.1 Proposed Works

The works to be undertaken on the site comprised the following items:

- The drilling of a series of windowless sampler boreholes to depths of up to 4m to provide site coverage in the general location of the proposed redevelopment;
- Installation of groundwater monitoring wells within four of the windowless sampler boreholes as dictated by the CSM in the Phase I Desk Study;
- Seven machine excavated trial pits with logging and sampling;
- Infiltration testing following the principles of BRE365 within three trial holes;
- Logging, sampling and in-situ testing as appropriate to the ground conditions encountered in the boreholes and from approximate formation levels.

2.2 Site Works (October 2012)

Site works were undertaken on 26th October 2012 and comprised the drilling of four windowless sampler boreholes (WS1 to WS4) at locations selected by Soils Limited based on the proposed development drawing (supplied by Orchard Homes Limited) and where no live services were identified. Windowless sampler boreholes were drilled to depths of 4.00m bgl.

'Super Heavy' Dynamic Probes (DPSH-B) were undertaken adjacent to and prior to the drilling of each of the windowless sampler borehole. Dynamic Probes DP1 to DP4 were advanced to depths of between 5.80m and 6.00m bgl. Windowless sampler boreholes were restricted in depth by the presence of competent strata at depth.

Seven machine excavated trial holes (referenced TP1 – TP4 and SA1 – SA3) were dug at locations selected by Soils Limited based on the proposed development drawing in order to recover supplementary shallow samples for geotechnical and chemical laboratory analysis to provide site wide coverage. The machine excavated trial pits were excavated to depths of between 3.00m bgl and 3.50 bgl.

Infiltration testing following the principles of BRE365 were undertaken within three trial pits (SA1 – SA3) at depths ranging between 2.00m bgl and 2.30m bgl. No infiltration rates were possible due to poor infiltration.

The approximate locations of all of the trial holes excavated are presented on Figure 2.

2.3 Ground Conditions

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole

logs and quoted in this report were measured from ground level directly adjacent to the individual trial hole.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots, or has been identified as part of the *in-situ* weathering profile, it has been described as Topsoil both on the logs and within this report. Where the soil has, in general, been found to have the same composition as the 'Topsoil' but also incorporated a minor constituent, e.g. less than an estimated 5%, of possibly non-naturally occurring material, or is of uncertain origin, the soil has been described as Topsoil/Made Ground both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the logs and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion the succession of conditions encountered in the trial holes in descending order can be summarised as detailed below:

Topsoil/Made Ground Head Deposits Lewes Nodular Chalk Formation

2.3.1 Topsoil

Topsoil was encountered in all trial holes and persisted to depths of between 0.25m and 0.55m bgl, where proven. The Topsoil was predominantly cohesive in nature and comprised silty sandy clay and numerous roots and rootlets.

No visual or olfactory evidence of contamination was recorded within any of the Topsoil encountered.

2.3.2 Made Ground

A layer of Made Ground was encountered from ground level in WS1. Made Ground was encountered to depths of 0.25m bgl. The Made Ground was predominantly cohesive in nature and comprised silty clay with frequent brick rubble, flint cobbles and rootlets.

Please note: Made Ground may be present to greater depths in other locations across the site.

No visual or olfactory evidence of contamination was recorded within any of the Made Ground encountered with the possible exception of ash within WS1.

2.3.3 Head Deposits

Head Deposits were encountered in all trial holes and persisted to depths of between 0.25m and 4.00m bgl, where proven. The Head Deposits were predominantly cohesive in nature and comprised clay and/or sandy silty clay with numerous flint gravels.

No visual or olfactory evidence of contamination was recorded within any of the Head Deposits.

2.3.4 Lewes Nodular Chalk Formation

Lewes Nodular Chalk Formation was only encountered within WS4 and persisted from 2.90m bgl and 4.00m bgl, (base of hole). The Lewes Nodular Chalk Formation was recovered as highly weather putty chalk with abundant flint and chalk gravel.

No visual or olfactory evidence of contamination was recorded within any of the Lewes Nodular Chalk Formation encountered.

For full and complete information within each trial hole, please refer to the trial hole logs appended within Appendix A.

2.4 Roots

Roots or rootlets were encountered in all of the trial holes and windowless sampler boreholes from depths ranging from 0.35m bgl and 1.10m bgl during the intrusive investigation.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole such as a windowless sampler borehole is low. A direct observation such as those within a trial pit is necessary to gain a better indication of the maximum root depth.

Mature shrubs / trees were not present on the site or close to the site boundary however it was not known if trees had been cleared from the site, or its close environs, in the recent past.

Roots may be found to greater depths at other locations on the site or around the site particularly close to trees and/or trees that have been removed.

2.5 Groundwater

Groundwater was recorded within windowless sampler boreholes TP3 and TP4 at depths of 2.30m bgl and 3.00m bgl respectively. Groundwater was not encountered in any of the other trial holes.

Please note; Windowless sampling techniques make precise measurement of groundwater seepages very difficult. Groundwater equilibrium conditions may only be conclusively established by means of a series of measurements made in a standpipe.

Standpipes were installed in all windowless sampler boreholes (WS1-WS4), each to the full depth the borehole to facilitate future groundwater and biogas monitoring, if required.

13284 Ranelagh Rd Groundwater Levels						
Borehole	6.11.12	15.11.12	TBC	TBC	TBC	TBC
WS1	2.52	2.69	-	-	-	-
WS2	3.60	3.65	-	-	-	-
WS3	2.47	2.54	-	-	-	-
WS4	1.38	1.61	-	-	-	-

Changes in groundwater level do occur for a number of reasons including seasonal effects and variations in drainage. The site investigation was conducted in October 2012, when groundwater levels should rising to their annual maximum (highest level).

The summer of 2012 was one of the wettest on record resulting in groundwater levels potentially being uncharacteristically high.

It is anticipated that in the long-term groundwater levels may rise as a result of factors such as climate change.

Section 3

Discussion of Geotechnical In-Situ Testing

3.1

The geotechnical element of this report is pending further geotechnical laboratory test results. These results will not alter the contamination element of the report.

Section 4 Engineering Discussion

4.1 General

The geotechnical element of the report is pending further geotechnical results.

A trench filled footing may be appropriate for this site dependant on pending geotechnical results and anticipated loadings. The foundation solution will not alter the contamination report.

Section 5

Conceptual Site Model & Sampling Strategy for Contamination Assessment

5.1 Conceptual Site Model

The Phase I Desk Study (report ref: 13284/DS, November 2012) identified a potential risks of contamination on-site from Made Ground from historical changes in land use, historical land use including allotments, orchards, nurseries, possible asbestos containing materials, and the farm/stable environment.

With the exception of the presence of a thin veneer of Made Ground (up to 0.25m bgl in WS1), locally containing ash and brick, no further evidence of potential contamination was identified during the Phase II intrusive investigation.

Off-site sources of potential contamination included a tannery, Water Works engine house, a brewery and a garage.

No other off-site sources of potential contamination or soil-gas were identified.

The Conceptual Site Model developed in report ref: 13284/DS is presented overleaf complete with any amendments applicable following the intrusive investigation:

Conceptual Site Model			
On-site Potential Sources	Potential Migration Pathway	Potential Absorption Pathway	Potential Receptor
FARM/STABLE ENVIRONMENT — MODERATE RISK POSSIBLE CEMENT BOUND ASBESTOS HIGH RISK ALLOTMENTS/ORCHARDS LOW RISK MADE GROUND FROM HISTORICAL REDEVELOPMENT MODERATE RISK NURSERY (HISTORICAL) LOW RISK	Via anthropogenic pathways such as service trenches Via porous ground accumulating in new buildings	Ingestion of soil Dermal contact Inhalation of dust Inhalation of vapour Consumption of home grown vegetables and attached soil Location of service supply pipes in contaminated soils	Construction workers (particularly during foundation construction) Service and Maintenance Operatives, especially in confined spaces Site Occupiers (end-user) Site Neighbours and the wider public Groundwater
Off-site Potential Sources			
TANNERY — LOW RISK WATERWORKS ENGINE WORKS TO WEST — LOW RISK BREWERY — LOW RISK GARAGE — LOW RISK			

5.2 Sampling Strategy - Soil

The strategy for the selection of the locations of exploratory positions was based on:

- The conceptual source, pathway and receptor model;
- Proposed redevelopment plan supplied by client;
- Contaminative activities identified by the Conceptual Site Model.

CLR4 (DOE 1994) and EA R&D P5-066/TR were used to inform the decision regarding the number of sampling locations appropriate to the investigation.

A non-targeted sampling strategy is appropriate when there is:

- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:

- Adequate information available regarding the likely locations of contamination;
- Sensitive areas where there is a need for a high degree of confidence.

Both a targeted and non-targeted sampling pattern was adopted with locations selected from near surface soils (Topsoil/Made Ground, Head or Lewes Nodular Chalk Formation) in areas of proposed soft landscaping (based on the proposed development drawing provided) and from soils to provide coverage of the proposed development area.

The human health receptors relevant to the sampling depths were as follows:

Samples	Potential Receptors
Near surface samples	• End users of the site; • Site operatives during demolition and redevelopment; • Maintenance workers; • Building materials and services; • Site neighbours and wider public; • Groundwater.

An area to the east of site (approximately a quarter of site) could not be investigated due to hard-standing and concrete across the area. This area posed a risk to soil due to contaminants associated with farm and stable environments identified in the Phase I Desk Study (ref: 13284/DS) . Further investigation of this area **is required** to identify any contamination sources.

5.3 Determination of Contaminants of Concern for Soil Samples

The driver for the determination of the analysis suite was the information obtained from both the Phase I Desk Study and the Phase II Ground Investigation (including on-site observations). In this instance, given the sites development history a broad range of commonly found contaminants including PAH, TPH and BTEX was adopted. Samples were also tested for herbicides and pesticides.

The full analysis suite is presented below and overleaf:

Fibrous Material Screen
pH

(6 samples)
(6 samples)

Water Soluble Sulphate	(6 samples)
Sulphide	(6 samples)
Organic Matter	(6 samples)
Total Phenols	(6 samples)
Total Cyanide	(6 samples)
Metals & Semi-Metals: Cd, Cr, Pb, Hg, Ni, Se, CN, Cu, Zn, V, B, As	(6 samples)
Organics:	
• USEPA 16 speciated Poly Aromatic Hydrocarbons (PAHs);	(6 samples)
• Speciated Total Petroleum Hydrocarbons (TPH);	(2 samples)
• BTEX.	(2 samples)
Herbicides and Pesticides	(1 sample)

Note: Fibrous material screening aims at identifying fibres or fibrous material, which are indicative of the presence of asbestos. Should fibres or fibrous material be detected the sample is characterised as "positive" and is subsequently submitted for further analysis for confirmation and speciation if required.

Six shallow samples (<0.50m bgl) of the Topsoil and Made Ground and three samples from the shallow Head Deposits (<0.50m bgl) were submitted for chemical laboratory testing.

The results of the soil chemical testing for Human Health are discussed in Section 6.3 of this report.

In addition to the soils samples scheduled above, three samples were scheduled for groundwater testing.

Sampling Strategy - Groundwater				
Location	Historic land-use	Location – proposed redevelopment	Analysis suite*	Purpose
WS1	Allotment	Residential property/ Private garden	SP2 Suite	Human receptor/groundwater
WS3	Open land	Private Garden	SP2 Suite	
WS4	Stables/farming environment	Residential	SP2 Suite	

Discussion of the groundwater results is provided within Section 7.

5.4 Groundwater Analysis

Groundwater analysis was undertaken on soil samples recovered from WS1, WS3 and WS4 to assess the potential for any contamination identified within the shallow soils in groundwater beneath the site.

For Tier 1 Qualitative risk assessment the results were compared with EQS's taken as those for the UK Drinking Water Standards (DWS) and the EA Standards for Protection of Aquatic Life (Freshwater). This represented a high degree of conservatism given the environmental setting of the site.

Further details are provided within Section 7 of this report.

Section 6 Quantitative Risk Assessment

6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix C.

6.2 Representative Contamination Concentration

The results of the comparison of the representative contaminants concentration for human health receptor to the Soil Guideline Values (SGV), ATRISK^{soil} Soil Screening Values (SSV) and General Assessment Criteria (GAC) are presented in the table below and are assessed against the **"Residential"** land-use scenario as this was considered the most appropriate land-use scenario given the development type:

Summary of Chemical Analysis of Soil Samples	
Substance	Sample Location Where relevant guideline value was exceeded for <i>Residential Scenario</i>
Arsenic	None
Beryllium	None
W/S Boron	None
Cadmium	None
Chromium	None
Copper	None
Lead	None**
Mercury (inorganic)	None
Nickel	None
Selenium	None
Vanadium	None
Zinc	None
PAH (USEPA 16 speciated)	None
TPH (CWG)	None
BTEX	None
Fibrous material screening*	None

* Fibrous material screening was undertaken by the sample preparers in sample reception at QTS Ltd's laboratory. They were trained to look for fibrous material though cannot actually determine whether it was asbestos. If they saw fibres, they report fibres as 'Positive'. The sample would then have to go to a specialist laboratory for confirmation and speciation. If they do not see fibres, they report fibres as 'Negative'.

** Lead 6% SOM was adopted in accordance with the ATRISK^{soil} Soil Screening Values (SSV) as this was considered the most appropriate given the SOM of the sample.

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed an SOM values of between 1.2% and 11.5%. The Soil Organic Matter recorded for each sample was used to derive the appropriate GAC for organic determinants.

Note on Asbestos; no possible Asbestos Containing Materials were identified within the soil or scattered at surface during the intrusive works. All samples are screened at the laboratory for the presence of fibrous material that may be indicative of the

presence of asbestos.

From the table on the previous page it can be seen that none of the determinants were in excess of the relevant DEFRA SGV, ATRISKsoil SSV or LQM CIEH GAC for a residential land-use scenario.

6.3 Soil Risk Assessment and Remediation Requirements

The Tier 1 Quantitative risk assessment established that there was **no risk to the human health receptors** of construction workers or future end users from the soils tested as none of the determinants were found to be in excess of the relevant DEFRA SGV, ATRISKsoil SSV or LQM CIEH GAC.

Therefore there is **no requirement for soil remediation** based on the results of the samples tested.

A Discovery Strategy (as detailed within Section 6.8) must however be adopted during the construction phase.

Full results of the contamination testing are presented in Appendix C.

Note on Asbestos; no possible Asbestos Containing Materials were identified within the soil or scattered at surface during the intrusive works. All samples are screened at the laboratory for the presence of fibrous material that may be indicative of the presence of asbestos. No fibres were recorded and therefore no asbestos ID samples were scheduled.

Full results of the contamination testing are presented in Appendix B.

Section 7 Groundwater Risk Assessment

7.1 General

Groundwater samples were taken from 50mm diameter wells installed in WS1, WS3, and WS4. The wells were purged by bailing three well volumes with disposable HDPE bailers. Samples were recovered using a disposable bailer and transferred to suitable cooled containers for transport to the laboratory.

7.2 Analysis Suite for Water Samples

The suite of tests was tailored to the use of the site and the site's environs as established by the investigation

The analysis suite (SP2) comprised:

- pH
- Sulphate
- Metals & Semi-Metals: Cd, Cr, Pb, Hg, Ni, Se, CN, Cu, Zn, B, Be, As, Va
- Total Organic Carbon
- Total Phenols
- USEPA 16 speciated PAH
- BTEX
- TPH

7.3 Comparison to Environmental Quality Standards

The table presented below and overleaf provides a comparison of the Environmental Quality Standards (EQS) to which the results of the groundwater and leachate analysis was screened.

Water and Leachate Samples – Comparison to EQS			
Determinant	Units	EQS Source	EQS Level
Arsenic	µg/l	DWS	10
Cadmium	µg/l	DWS	5
Chromium	µg/l	DWS	50
Copper	µg/l	DWS	2000
Nickel	µg/l	SPAL	50-200
Lead	µg/l	SPAL	4 - 250
Mercury	µg/l	DWS	1
Selenium	µg/l	DWS	10
Zinc	µg/l	DWS	5000
Boron	µg/l	DWS	1000
Sulphate	mg/l	DWS	250
Sulphide	µg/l	SPAL	0.25

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Total Cyanide	µg/l	DWS	50
Phenol ⁽¹⁾	µg/l	SPAL	300
Benzo (a) pyrene	µg/l	DWS	0.01
Naphthalene	µg/l	SPAL	10
Polycyclic Aromatic Hydrocarbon (2)	µg/l	DWS	0.1
Total Petroleum Hydrocarbons	µg/l	NONE (3)	10
Benzene	µg/l	DWS	1
Toluene	µg/l	SPAL	50
Ethylbenzene	µg/l	WHO	300
Xylene	µg/l	SPAL	30
Notes	DWS = UK Drinking Water Standards SPAL = EA Standard for Protection of Aquatic Life (Freshwater) WHO = World Health Organisation Guidelines for Drinking Water Quality, 1984 (1) Taken as Maximum Allowable Concentration (2) Sum of fluoranthene, benzo 3.4 fluoranthene (<i>benzo (b) flouranthene</i>), benzo 11.12 fluoranthene (<i>benzo (k) flouranthene</i>), benzo 3.4 pyrene (<i>benzo (a) pyrene</i>) and indeno (1,2,3-cd) pyrene (3) Value given is former DWS EQS (Now withdrawn)		

The table below shows the results of the screening exercise for both the groundwater and leachate samples tested:

Water and Leachate Samples – Comparison to EQS	
Samples	EQS Exceedance
WS1	None
WS3	None
WS4	None

Given the results recorded and the conservative nature of the EQS adopted for screening it was concluded that there was no impact to groundwater and that **no further action was required**.

A potential contamination source was identified by the Phase I Desk Study and Phase II site works in the form of the stable and farm buildings situated upon hard-standing to the east of the site. The area was not investigated due to the hard-standing across the area. The stable area could impact groundwater through cracks and breaks within the concrete base as well as direct infiltration off the side of the hard standing.

Using spot heights within the topographical survey provided by the client and depths to groundwater, it was established that groundwater was flowing in a westerly direction, towards the Water Works Pumping Station.

Sampling of groundwater entering and exiting the site (WS1, WS3 and WS4) revealed no elevated levels of determinants tested for.

Contamination impacting groundwater from the area beneath the hardstanding would have been identified within the groundwater monitoring undertaken.

It is recommended that further groundwater monitoring is undertaken immediately prior to commencement of site works, and again post demolition to ensure potential groundwater contamination is not mobilised as a result of site works.

7.4 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust were generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

7.5 Excavated Material

Excavated material must be classified with the Environment Agency for disposal at an appropriately licensed disposal facility. The requirements of Duty of Care and Health and Safety Guidance must be complied with.

Both Producers and Waste Management companies must ensure compliance with the new Waste Acceptance Criteria (WAC) prior to landfill in Hazardous, stable non-reactive cells and inert sites. These regulations govern the operation of landfill in England and Wales. Basic characterisation is the responsibility of the waste producer and compliance checking is generally the responsibility of the landfill operator. Therefore landfill operators will be unlikely to accept waste that does not meet the Waste Acceptance Criteria for their class of site.

There is an obligation to 'treat' all soils destined for landfill, including non-hazardous waste. This treatment must now be documented and presented to the landfill operator or waste may be refused entry. Note that all liquids are banned from landfill.

For the purposes of legal compliance, 'treatment' must comprise three things (the 'three-point test'):

1. It must be a physical, thermal, chemical or biological process.
2. It must change the characteristics of the waste.
3. It must do so in order to:
 - (a) reduce its volume, or
 - (b) reduce its hazardous nature, or
 - (c) facilitate its handling, or enhance its recovery.

Waste Acceptance Criteria tests have not been undertaken at this stage as these were not requested within the brief. It is recommended that WAC tests are performed on samples recovered from stockpiled material prior to disposal. Similar material should be stockpiled together.

7.6 Re-use of Excavated Material On-Site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

7.7 Imported Material

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

7.8 Discovery Strategy

There may be areas of contamination that have not been identified during the course of the intrusive investigation. For instance, there may have been underground storage tanks (UST's) not identified during the Ground Investigation for which there is no historical or contemporary evidence. Such occurrences may be discovered during the demolition and construction phases for the redevelopment of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination, this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person before proceeding, such that appropriate remedial measures and health and safety protection may be applied.

Should a new source of contamination be suspected or identified then the Local Authority and Soils Limited will be informed.

The following figures and appendices complete this report:

Figure 1	Site Location Map
Figure 2	Trial Hole Layout Plan
Appendix A	Field Work
Appendix B	Chemical Laboratory Analysis
Appendix C	Soil Guideline Values and General Assessment Criteria
Appendix D	Information Provided by the Client



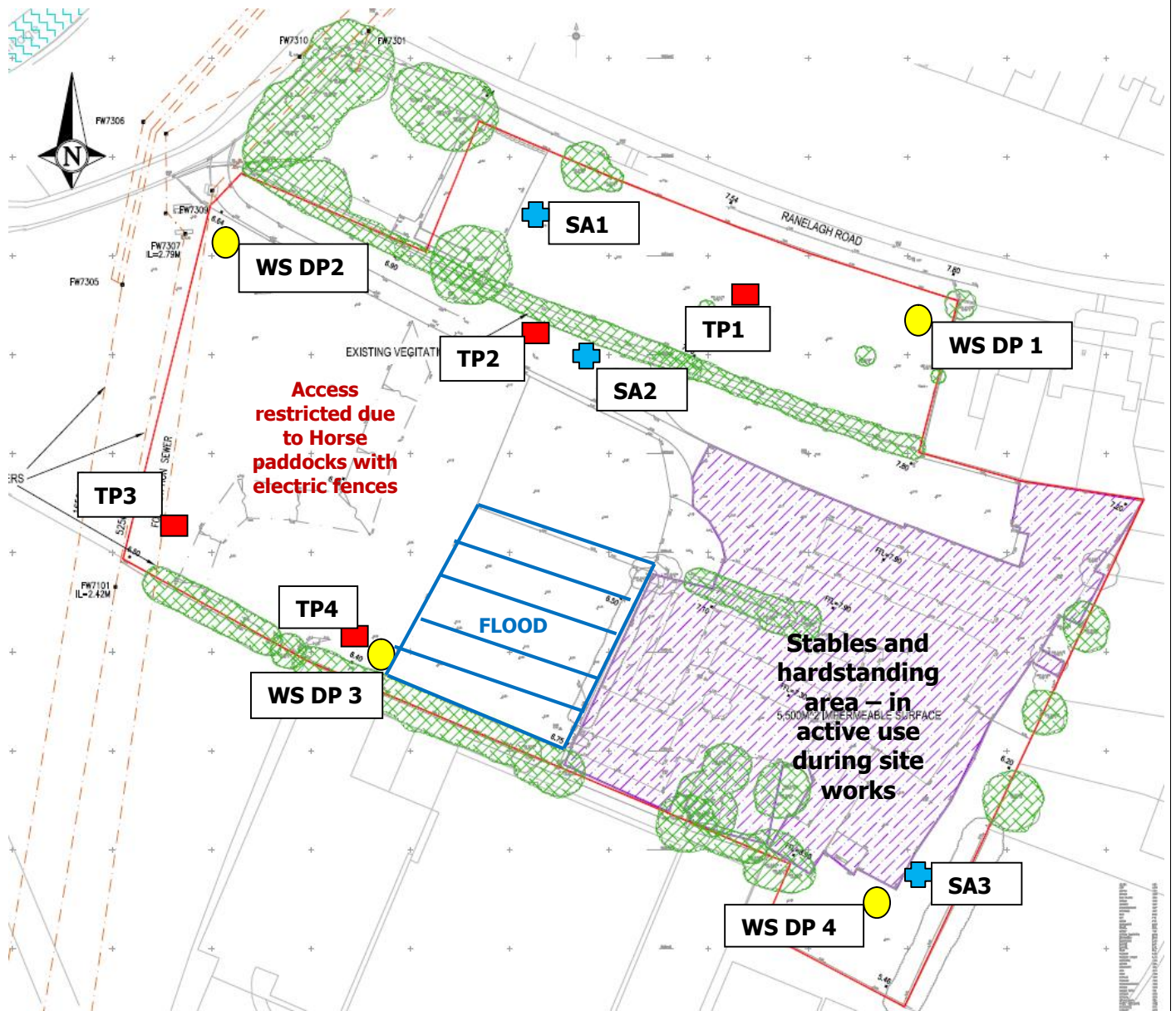
L. Stockwell BSc. (Hons.) FGS.



Eur Ing. R. B. Higginson B.Sc., PG. Dip., C.Eng., MICE., FGS.
Geotechnical Advisor



PROJECT: Land south of Ranelagh Road, Havant, Hampshire	DATE: November 2012	 <i>Geotechnical & Environmental Consultants</i>
CLIENT: Orchard Homes Limited	SCALE: Not to scale	
TITLE: Figure 1: Location Plan	REF: 13284	



Key:

- Windowless Sampler Boreholes/Dynamic Probing
- Trial Pits
- + Soakaway test

Project: Land south of Ranelagh Road, Havant, Hampshire

Client: Orchard Homes Limited

Date: November 2012

Figure 2: Trial Hole Layout Plan

Job Number: 13248

soils
LIMITED
*Geotechnical & Environmental
Consultants*

Appendix A

Field Work



Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant: Terrier Rig	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.10 - 0.10	D & J					0.25	MADE GROUND Dark brown silty clay with frequent brick rubble, flint cobbles and rootlets
0.40 - 0.40	D						At 0.10m bgl: Ash
0.90 - 0.90	D						HEAD Pale brown sandy clay with frequent fine to coarse flint and chalk gravel.
1.30 - 1.30	D						At 0.60m bgl: Ash
2.00 - 2.00	D					3.75	
2.40 - 2.40	D						
3.60 - 3.60	D					4.00	
							End of Borehole at 4.00 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated
2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.
3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.80m bgl. Well installed to 4.00m bgl
----------------------------------	----------------------	--



Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant: Terrier Rig	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.30 - 0.30	D & J					0.40	TOPSOIL Dark brown silty clay with numerous roots and rootlets
0.50 - 0.50	D					0.40	HEAD Orange brown soft CLAY with occasional roots to 0.70m bgl
1.00 - 1.00	D					0.55	
1.80 - 1.80	D					0.95	HEAD Pale creamy yellow very sand CLAY with frequent fine to coarse flint and chalk gravel and getting softer with depth at 2.80m bgl
2.30 - 2.30	D					3.05	
3.00 - 3.00	D						
3.50 - 3.50	D					4.00	End of Borehole at 4.00 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated
2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.
3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.70m bgl. Well installed to 4.00m bgl
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Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant: Terrier Rig	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.10 - 0.10	D & J					0.25	TOPSOIL Dark brown silty clay with numerous roots and rootlets
0.40 - 0.40	D					0.65	HEAD Orange brown soft CLAY with occasional roots to 0.70m bgl
0.75 - 0.75	D					0.90	HEAD Dark orange brown very gravelly CLAY with numerous fine to coarse flint gravel and cobbles
1.40 - 1.40	D					1.65	HEAD Pale creamy yellow very sandy CLAY with frequent fine to coarse flint gravel and getting softer with depth
2.00 - 2.00	D					2.35	Between 2.00-2.80m bgl: Loss of recovery
2.50 - 2.50	D						
3.40 - 3.40	D					4.00	End of Borehole at 4.00 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated
2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.
3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.60m bgl. Well installed at 4.00m bgl
----------------------------------	----------------------	--



Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant: Terrier Rig	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.10 - 0.10	D & J					0.20	TOPSOIL Dark brown silty clay with frequent brick rubble, flint cobbles and rootlets
0.40 - 0.40	D						HEAD Orange brown soft CLAY with occasional roots to 0.70m bgl
1.00 - 1.00	D					1.70	
1.30 - 1.30	D						
1.80 - 1.80	D					1.90	HEAD: Very soft pale yellow gravel with fine to coarse flint
						1.00	Between 2.00-2.80m bgl: No Recovery
2.90 - 2.90	D					2.90	Between 2.70-2.90m bgl : A band of pale creamy-yellow very sandy CLAY with frequent fine to coarse flint gravel at 2.7-2.9m
						1.10	LEWES NODULAR CHALK FORMATION Highly weathered putty CHALK with abundant flint and chalk gravel
3.80 - 3.80	D					4.00	Between 3.00-3.60m bgl : No Recovery
							End of Borehole at 4.00 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated
2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.
3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.50m bgl. Well installed at 4.00m bgl
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Soils Limited
Newton House
Cross Road
Tadworth KT20 5SR
Tel: 01737 814221 Fax: 01737 812557



Trial Pit: TP 1

Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant:	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.20 -	D					0.35	TOPSOIL Dark brown silty sandy clay with occasional roots and rootlets
0.50 -	D					0.35	HEAD Orange and dark orange mottled CLAY
1.00 -	D					1.12	
1.50 -	D					1.47	HEAD Pale yellow sandy silty clayey GRAVEL with numerous flint cobbles
2.00 -	D					0.73	
2.50 -	D					2.20	HEAD Grey orange mottled silty sandy CLAY
						0.90	
						3.10	HEAD Pale creamy yellow coarse very wet SAND
						3.30	End of Trial Pit at 3.30 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated

2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.

3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.35m bgl
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Soils Limited
Newton House
Cross Road
Tadworth KT20 5SR
Tel: 01737 814221 Fax: 01737 812557



Trial Pit: TP 2

Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant:	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.50 -	D					0.65	TOPSOIL Dark brown silty clayey topsoil with flint, numerous roots and rootlets
1.00 -	D					0.65	HEAD Orange brown mottled CLAY with occasional flint fragments
2.00 -	D					1.30	HEAD Creamy yellow very sandy GRAVEL with numerous flint cobbles
2.70 -	D					2.50	HEAD Orange CLAY
						0.80	
						3.30	End of Trial Pit at 3.30 m

General Notes:

1. All linear dimensions are in metres unless otherwise stated

2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data.

3. Trial pit logged from the ground surface below 1.2 m depth.

Groundwater Observations: Dry	Stability: Stable	General Remarks: Roots observed to 0.70m bgl
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Soils Limited
Newton House
Cross Road
Tadworth KT20 5SR
Tel: 01737 814221 Fax: 01737 812557



Trial Pit: TP 3

Site: Land South of Ranelagh Road, Havant	Start Date: 26/10/2012	Ground Level: -
Client: Orchard Homes & Developments Ltd	End Date: 26/10/2012	Easting: -
Project No: 13284	Logged By: LS	Northing: -
Site National Grid Reference:	Excavation Method:	
Site Level (mOD): 0.000	Plant:	
	Shoring/Support: None	
	Trial Pit Length: -	Trial Pit Width: -

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.40 -	D					0.40	TOPSOIL Dark brown silty sandy clay with occasional roots and rootlets
1.00 -	D					0.40 1.30	HEAD Orange brown mottled CLAY with numerous flint cobbles and gravel
2.30 -	D					1.70 1.30	HEAD Creamy white clayey sandy GRAVEL with numerous flint cobbles
						3.00	End of Trial Pit at 3.00 m

General Notes: 1. All linear dimensions are in metres unless otherwise stated 2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data. 3. Trial pit logged from the ground surface below 1.2 m depth.		
Groundwater Observations: 2.30m bgl	Stability: Stable	General Remarks: Roots observed to 0.70m bgl

Soils Limited
Newton House
Cross Road
Tadworth KT20 5SR
Tel: 01737 814221 Fax: 01737 812557



Trial Pit: TP 4

Site:	Land South of Ranelagh Road, Havant	Start Date:	26/10/2012	Ground Level:	-
Client:	Orchard Homes & Developments Ltd	End Date:	26/10/2012	Easting:	-
Project No:	13284	Logged By:	LS	Northing:	-
Site National Grid Reference:		Excavation Method:			
Site Level (mOD): 0.000		Plant:			
		Shoring/Support: None			
		Trial Pit Length: -		Trial Pit Width: -	

Samples & Tests				Strata Details			
Depth	Type	Result	Hand Pen.	Elev.	Legend	DepthThick	Description
0.10 -	D					0.25	TOPSOIL Dark brown silty sandy clay with turf, numerous rootlets and roots
0.70 -	D					0.85	HEAD Orange brown silty sandy CLAY with roots and rootlets
1.40 -	D					1.10	HEAD Orange brown very gravelly CLAY / clayey gravel with flint cobbles and gravel
1.60 -	D					1.60	HEAD Creamy white sandy very gravelly CLAY with orange white sandy clay band at 1.60m bgl
2.00 -	D					2.40	HEAD Very soft grey CLAY
2.70 -	D					3.50	End of Trial Pit at 3.50 m

General Notes: 1. All linear dimensions are in metres unless otherwise stated 2. All relative density/shear strength descriptions are based only on field observations and available in-situ test data. 3. Trial pit logged from the ground surface below 1.2 m depth.		
Groundwater Observations: 3.00m bgl	Stability: Stable	General Remarks: Roots observed to 1.10m bgl

DYNAMIC PROBING					Probe NoDP 1												
ClientOrchard Homes & Developments Ltd					Sheet 1 of 1												
SiteLand South of Ranelagh Road					Location No13284												
E -		N -		Level -		Date26/10/2012											
Depth (m)	Readings Blows/100mm				Diagram (N100 Values)										Torque		
					(N/m)										(Nm)		
0	2	2	2	3													
1	2	2	3	2													
2	1	0	1	2													
3	1	0	1	0													
4	0	0	0	0													
5	0	1	1	2													
6	6	7	6	6													
7	6	3	3	2													
8																	
9																	
					Fall Height		750		Cone Diameter		50		Logger Geolo				
					Hammer Wt		63.50		Final Depth		6.900						
					Probe Type		DPSH		Log Scale		1:50						

<i>DYNAMIC PROBING</i>	Probe No DP 2
------------------------	----------------------

<i>Client</i> Orchard Homes & Developments Ltd	Sheet 1 of 1
---	--------------

Sheet 1 of 1

<i>Site</i>	Land South of Ranelagh Road	<i>Location No</i>	13284
-------------	------------------------------------	--------------------	--------------

<i>E</i> -	<i>N</i> -	<i>Level</i> -	<i>Date</i> 26/10/2012
------------	------------	----------------	-------------------------------

Depth (m)	Readings					Diagram (N100 Values)	Torque (Nm)
	Blows/100mm						
0	0	0	0	0	0		
1	1	1	1	1	1		
2	2	2	2	6	8		
3	7	6	3	2	2		
4	4	5	4	3	4		
5	5	6	7	7	6		
6	8	8	10	9	11		
7							
8							
9							

5 10 15 20 25 30 35 40 45 10 20 30 40 (nm)

9

Log Scale 1:50

Geolo

DYNAMIC PROBING					Probe NoDP 3											
ClientOrchard Homes & Developments Ltd					Sheet 1 of 1											
SiteLand South of Ranelagh Road					Location No13284											
E -		N -		Level -		Date26/10/2012										
Depth (m)	Readings Blows/100mm				Diagram (N100 Values)										Torque (Nm)	
	0	0	1	0	1											
					Fall Height750					Cone Diameter50					Logger	
					Hammer Wt63.50					Final Depth5.600					Geolo	
					Probe TypeDPSH					Log Scale1:50						

DYNAMIC PROBING					Probe No DP 4											
Client Orchard Homes & Developments Ltd					Sheet 1 of 1											
Site Land South of Ranelagh Road					Location No 13284											
E -		N -		Level -		Date 26/10/2012										
Depth (m)	Readings Blows/100mm				Diagram (N100 Values)										Torque	
					(N/m)											
0	0	1	0	0												
	0	1	0	0												
1	0	1	0	1												
	1	0	1	1												
2	4	4	3	4												
	1	4	4	3												
3	4	4	3	3												
	3	3	3	6												
4	8	8	7	6												
	8	8	8	8												
5	10	11	10	10												
	11	13	9	10												
6																
7																
8																
9																
					Fall Height 750		Cone Diameter 50		Logger							
					Hammer Wt 63.50		Final Depth 5.900		Geolo							
					Probe Type DPSH		Log Scale 1:50									

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Appendix B

Chemical Laboratory Analysis

Appendix C
Soil Guideline Values and General Assessment Criteria

Appendix C

Soil Guideline Values and General Assessment Criteria

C1 Assessment Criteria

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

C1.1 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:

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

The CLEA guidance and tools:

- *do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.*
- *do not cover risks to the environment, such as groundwater, ecosystems or buildings.*
- *do not provide a definitive test for telling when human health risks are significant.*
- *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.*

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.

C1.2 Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models as follows:

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 homegrown 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.

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.

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).

C1.3 Soil Guideline Values

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.

C1.4 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 will be used. For derivation of these Generic Assessment Criteria reference must be made to:

Nathanial, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition)*. **Land Quality Press**. 2009.

In the case of Lead, the AtRisk Soil SSV have been used.

C1.5 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 with 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.

C1.6 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.

- ⇒ 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.

C1.7 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.*

C1.8 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) 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.

C2 Soil Guideline Values and General Acceptance Criteria

Soil Guideline Values and General Acceptance Criteria used in the preparation of this report is tabulated in the following pages:

DEFRA CLEA 1.04 Soil Guideline Values (as at July 2012)

(Sandy Loam, pH 7, SOM 6%)

Contaminant	Residential (mg/kg DW)	Allotments (mg/kg DW)	Commercial (mg/kg DW)
Inorganic			
Arsenic	32	43	640
Cadmium	10	1.8	230
Mercury			
- Elemental	1.0	26	26
- Inorganic	170	80	3600
- Methyl	11	8	410
Nickel	130	230	1800
Selenium	350	120	13000
Organic			
May not be protective if SOM <6%			
Phenol	420	280	3200 (38,000*)
Benzene	0.33	0.07	95
Toluene	610	120	4400
Ethylbenzene	350	90	2800
Xylenes			
- o-xylene	250	160	2600
- m-xylene	240	180	3500
- p-xylene	230	160	3200
Dioxins			
Sum of PCDDs, PCDFs and dioxin-like PCB's.	8	8	240

* Based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health affects following long term exposure provided for illustration only)

Atkins AtRisk SSV Guideline Values For Lead (mg/kg)

Contaminant	Residential With Plant Uptake	Residential Without Plant Uptake	Commercial & Industrial	Open spaces
Lead 1% SOM sand soil	276	383	6490	1590
Lead 6% SOM sandy loam soil	342	383	6490	1590

LQM CIEH General Assessment Criteria (2nd edition) (mg/kg)

Contaminant	Residential	Allotment	Commercial
Metals			
Beryllium	51	55	420
Boron	291	45	192000
Chromium (III)	3000	34600	30400
Chromium (VI)	4.3	2.1	35
Copper	2330	524	71700
Vanadium	140	150	4250
Zinc	3750	618	665000

LQM CIEH General Assessment Criteria

General Assessment Criteria For Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)

Determinants		Residential	Allotments	Commercial
Acenaphthene	1.0% SOM	210	34	85,000 (57) ^{sol}
	2.5% SOM	480	85	98,000 (141) ^{sol}
	6.0% SOM	100	200	100,000
Acenaphthylene	1.0% SOM	170	28	84,000 (86) ^{sol}
	2.5% SOM	400	69	97,000 (212) ^{sol}
	6.0% SOM	850	160	100,000
Anthracene	1.0% SOM	2,300	380	530,000
	2.5% SOM	4,900	950	540,000
	6.0% SOM	9,200	2200	540,000
Benzo(a)anthracene	1.0% SOM	3.1	2.5	90
	2.5% SOM	4.7	5.5	95
	6.0% SOM	5.9	10	97
Benzo(a)pyrene	1.0% SOM	0.83	0.6	14
	2.5% SOM	0.94	1.2	14
	6.0% SOM	1.0	2.1	14
Benzo(b)flouranthene	1.0% SOM	5.6	3.5	100
	2.5% SOM	6.5	7.4	100
	6.0% SOM	7.0	13	100
Benzo(ghi)perylene	1.0% SOM	44	70	650
	2.5% SOM	46	120	660
	6.0% SOM	47	160	660
Benzo(k)flouranthene	1.0% SOM	8.5	6.8	140
	2.5% SOM	9.6	14	140
	6.0% SOM	10	23	140
Chrysene	1.0% SOM	6.0	2.6	140
	2.5% SOM	8.0	5.8	140
	6.0% SOM	9.3	12	140
Dibenzo(ah)anthracene	1.0% SOM	0.76	0.76	13
	2.5% SOM	0.86	1.5	13
	6.0% SOM	0.90	2.3	13
Flouranthene	1.0% SOM	260	52	23,000
	2.5% SOM	460	130	23,000
	6.0% SOM	670	290	23,000
Flourene	1.0% SOM	160	27	64,000 (31) ^{sol}
	2.5% SOM	380	67	69,000
	6.0% SOM	780	160	71,000
Indeno(123-cd)pyrene	1.0% SOM	3.2	1.8	60
	2.5% SOM	3.9	3.8	61
	6.0% SOM	4.2	7.1	62
Napthalene	1.0% SOM	1.5	4.1	200 (76) ^{sol}
	2.5% SOM	3.7	9.9	480 (183) ^{sol}
	6.0% SOM	8.7	23	1100 (432) ^{sol}
Phenanthrene	1.0% SOM	92	16	22,000
	2.5% SOM	200	38	22,000
	6.0% SOM	380	90	23,000
Pyrene	1.0% SOM	560	110	54,000
	2.5% SOM	1,000	270	54,000
	6.0% SOM	1,600	620	54,000

^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.

General Assessment Criteria For TPH (mg/kg)

Determinants		Residential	Allotments	Commercial
Aliphatic				
EC 5-6	1.0% SOM	30	740	3,400 (304) ^{sol}
	2.5% SOM	55	1,700	6,200 (558) ^{sol}
	6.0% SOM	110	3,900	13,000 (1150) ^{sol}
EC >6-8	1.0% SOM	73	2,300	8,300 (144) ^{sol}
	2.5% SOM	160	5,600	18,000 (322) ^{sol}
	6.0% SOM	370	13,000	42,000 (736) ^{sol}
EC >8-10	1.0% SOM	19	320	2,100 (78) ^{sol}
	2.5% SOM	46	770	5,100 (118) ^{vap}
	6.0% SOM	110	1,700	12,000 (451) ^{vap}
EC >10-12	1.0% SOM	93 (48) ^{vap}	2,200	10,000 (48) ^{sol}
	2.5% SOM	230 (118) ^{vap}	4,400	24,000 (118) ^{vap}
	6.0% SOM	540 (283) ^{vap}	7,300	49,000 (283) ^{vap}
EC >12-16	1.0% SOM	740 (24) ^{sol}	11,000	61,000 (24) ^{sol}
	2.5% SOM	1,700 (59) ^{sol}	13,000	83,000 (59) ^{sol}
	6.0% SOM	3,000 (142) ^{sol}	13,000	91,000 (142) ^{sol}
EC >16-35	1.0% SOM	45,000 (8.48) ^{sol}	260,000	1,600,000
	2.5% SOM	64,000 (21) ^{sol}	270,000	1,800,000
	6.0% SOM	76,000	270,000	1,800,000
EC >35-44	1.0% SOM	45,000 (8.48) ^{sol}	260,000	1,600,000
	2.5% SOM	64,000 (21) ^{sol}	270,000	1,800,000
	6.0% SOM	76,000	270,000	1,800,000
Aromatic				
EC 5-7	1.0% SOM	65	13	28,000 (1220) ^{sol}
	2.5% SOM	130	27	49,000 (2260) ^{sol}
	6.0% SOM	280	57	90,000 (4710) ^{sol}
EC >7-8	1.0% SOM	120	22	59,000 (869) ^{vap}
	2.5% SOM	270	51	110,000 (1920) ^{sol}
	6.0% SOM	611	120	190,000 (4360) ^{vap}
EC >8-10	1.0% SOM	27	8.6	3,700 (613) ^{vap}
	2.5% SOM	65	21	8,600 (1500) ^{vap}
	6.0% SOM	151	51	18,000 (3580) ^{vap}
EC >10-12	1.0% SOM	69	13	17,000 (364) ^{sol}
	2.5% SOM	160	31	29,000 (899) ^{sol}
	6.0% SOM	346	74	34,500 (2150) ^{sol}
EC >12-16	1.0% SOM	140	23	36,000 (169) ^{sol}
	2.5% SOM	480	57	37,000
	6.0% SOM	770	130	37,800
EC >16-21	1.0% SOM	250	46	28,000
	2.5% SOM	480	110	28,000
	6.0% SOM	770	260	28,000
EC >21-35	1.0% SOM	890	370	28,000
	2.5% SOM	1,100	820	28,000
	6.0% SOM	1,230	1,600	28,000
EC >35-44	1.0% SOM	890	370	28,000
	2.5% SOM	1,100	820	28,000
	6.0% SOM	1,230	1,600	28,000
Aromatic & Aliphatic				
EC >44 - 70	1.0% SOM	1200	1200	28,000
	2.5% SOM	1300	2100	28,000
	5.0% SOM	1300	3000	28,000

Note: a) SOM = Soil Organic Matter Content (%) b) LQM CIEH GAC not set for Allotment land-use

ICRCL 70/90 Restoration of metalliferous mining areas (mg/kg)

Phytotoxicity (Harmful to Plants) Threshold Trigger Values	
Copper	250
Zinc	1000

Notes: Many cultivars and specifically grasses have a high tolerance and there will be no ill-effect at the threshold trigger values given for neutral or near neutral pH. Site observation of plant vitality may give additional guidance.

LQM CIEH General Assessment Criteria

Volatile and Semi-Volatile Organic Compounds (mg/kg)

Contaminant	Residential	Allotment	Commercial
Chloroalkanes & alkenes			
1,2 Dichloroethane			
1.0% SOM	0.0054	0.0046	0.71
2.5% SOM	0.0080	0.0083	1.00
6.0% SOM	0.014	0.016	1.80
1,1,2,2 Tetrachloroethane			
1.0% SOM	1.4	0.41	290
2.5% SOM	2.9	0.89	580
6.0% SOM	6.3	2.0	1200
1,1,1,2 Tetrachloroethane			
1.0% SOM	0.90	0.79	120
2.5% SOM	2.1	1.9	260
6.0% SOM	4.8	4.4	590
Tetrachloroethene			
1.0% SOM	0.94	1.6	130
2.5% SOM	2.1	3.7	290
6.0% SOM	4.8	8.7	660
1,1,1 Trichloroethane			
1.0% SOM	6.2	48	700
2.5% SOM	13	110	1400
6.0% SOM	28	240	3100
Tetrachloromethene			
1.0% SOM	0.018	0.16	3.0
2.5% SOM	0.039	0.37	6.6
6.0% SOM	0.089	0.85	15
Trichloroethene			
1.0% SOM	0.11	0.43	12
2.5% SOM	0.22	0.95	25
6.0% SOM	0.49	2.2	55
Trichloromethane			
1.0% SOM	0.75	0.36	110
2.5% SOM	1.3	0.70	190
6.0% SOM	2.7	1.5	370
Vinyl Chloride			
1.0% SOM	0.00047	0.00055	0.063
2.5% SOM	0.00064	0.0010	0.081
6.0% SOM	0.00099	0.0018	0.12

Contaminant	Residential	Allotment	Commercial
Explosives			
2,4,6 Trinitrotoluene			
1.0% SOM	1.6	0.24	1000
2.5% SOM	3.7	0.58	1000
6.0% SOM	8.0	1.4	1100
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)			
1.0% SOM	3.5	0.52	6400
2.5% SOM	7.4	1.1	6400
6.0% SOM	16	2.5	6400
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)			
1.0% SOM	5.7	0.86	110,000
2.5% SOM	13	1.9	110,000
6.0% SOM	26	3.9	110,000
Atrazine			
1.0% SOM	0.24	0.037	870
2.5% SOM	0.56	0.085	880
6.0% SOM	1.3	0.20	880
Pesticides			
Aldrin			
1.0% SOM	1.7	1.3	54
2.5% SOM	2.0	2.6	54
6.0% SOM	2.1	4.0	54
Dieldrin			
1.0% SOM	0.69	0.13	90
2.5% SOM	1.4	0.32	91
6.0% SOM	2.2	0.73	92
Dichlorvos			
1.0% SOM	0.29	0.044	942
2.5% SOM	0.6	0.091	972
6.0% SOM	1.3	0.2	983
Alpha - Endosulfan			
1.0% SOM	2.9	0.47	2310 (0.003) ^{vap}
2.5% SOM	7.0	1.2	2990 (0.007) ^{vap}
6.0% SOM	16	2.7	3390
Beta - Endosulfan			
1.0% SOM	2.8	0.44	2580 (0.00007) ^{vap}
2.5% SOM	6.6	1.1	3160 (0.0002) ^{vap}
6.0% SOM	15	2.6	3480
Alpha -Hexachlorocyclohexanes			
1.0% SOM	19	3.0	14000
2.5% SOM	46	7.4	14600
6.0% SOM	100	18	14900
Beta -Hexachlorocyclohexanes			
1.0% SOM	1.7	0.26	1120
2.5% SOM	3.9	0.64	1130
6.0% SOM	8.5	1.5	1130
Gamma -Hexachlorocyclohexanes			
1.0% SOM	0.58	0.089	532
2.5% SOM	1.4	0.22	546
6.0% SOM	3.0	0.52	552

Chlorobenzenes			
Chlorobenzene			
1.0% SOM	0.33	5.9	59
2.5% SOM	0.73	14	32
6.0% SOM	59	130	310
1,2-Dichlorobenzene			
1.0% SOM	16	94	2100 (571) ^{sol}
2.5% SOM	39	230	5100 (1370) ^{sol}
6.0% SOM	91	540	12000 (3240) ^{sol}
1,3-Dichlorobenzene			
1.0% SOM	0.29	0.25	32
2.5% SOM	0.70	0.61	77
6.0% SOM	1.7	1.5	180
1,4-Dichlorobenzene			
1.0% SOM	30	15	4500 (224) ^{vap}
2.5% SOM	72	37	10000 (540) ^{vap}
6.0% SOM	167	88	22000 (1280) ^{vap}
1,2,3,-Trichlorobenzene			
1.0% SOM	1.0	4.7	110
2.5% SOM	2.6	12	270
6.0% SOM	6.1	28	620
1,2,4,-Trichlorobenzene			
1.0% SOM	1.8	31	230
2.5% SOM	4.5	75	560
6.0% SOM	11	180	1300
1,3,5,-Trichlorobenzene			
1.0% SOM	0.23	4.7	24
2.5% SOM	0.57	12	57.8
6.0% SOM	1.3	28	140
1,2,3,4,-Tetrachlorobenzene			
1.0% SOM	12	4.4	1800 (122) ^{vap}
2.5% SOM	4.5	75	3200 (304) ^{vap}
6.0% SOM	11	180	4500 (728) ^{vap}
1,2,3,5,- Tetrachlobenzene			
1.0% SOM	0.49	0.38	52 (39.4) ^{vap}
2.5% SOM	1.2	0.94	120 (98.1) ^{vap}
6.0% SOM	2.8	2.2	250 (235) ^{vap}
1,2,4, 5,- Tetrachlobenzene			
1.0% SOM	0.30	0.064	44 (19.7) ^{sol}
2.5% SOM	0.68	0.16	73 (49.1) ^{sol}
6.0% SOM	1.4	0.37	97
Pentachlorobenzene			
1.0% SOM	5.2	1.2	650 (43.0) ^{sol}
2.5% SOM	10	3.1	770 (107) ^{sol}
6.0% SOM	17	7.1	830
Hexachlorobenzene			
1.0% SOM	0.59 (0.20) ^{vap}	0.18	48 (0.20) ^{vap}
2.5% SOM	1.0 (0.50) ^{vap}	0.42	53
6.0% SOM	1.4	0.92	55
Phenols & Chlorophenols			
Chlorophenols (4 Congeners)			
1.0% SOM	0.87	0.13	3500
2.5% SOM	2.0	0.30	4000
6.0% SOM	4.4	0.70	4200
Pentachlorophenols			
1.0% SOM	0.55	0.084	1200
2.5% SOM	1.3	0.21	0.49
6.0% SOM	1200	1300	1400

<i>Others</i>			
Carbon Disulphide			
1.0% SOM	0.10	4.8	12
2.5% SOM	0.20	10	23
6.0% SOM	0.44	23	50
Hexachloro-1,3-Butadiene			
1.0% SOM	0.21	0.25	32
2.5% SOM	0.51	0.61	69
6.0% SOM	1.2	1.4	120

^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.

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Appendix D
Information Provided by the Client

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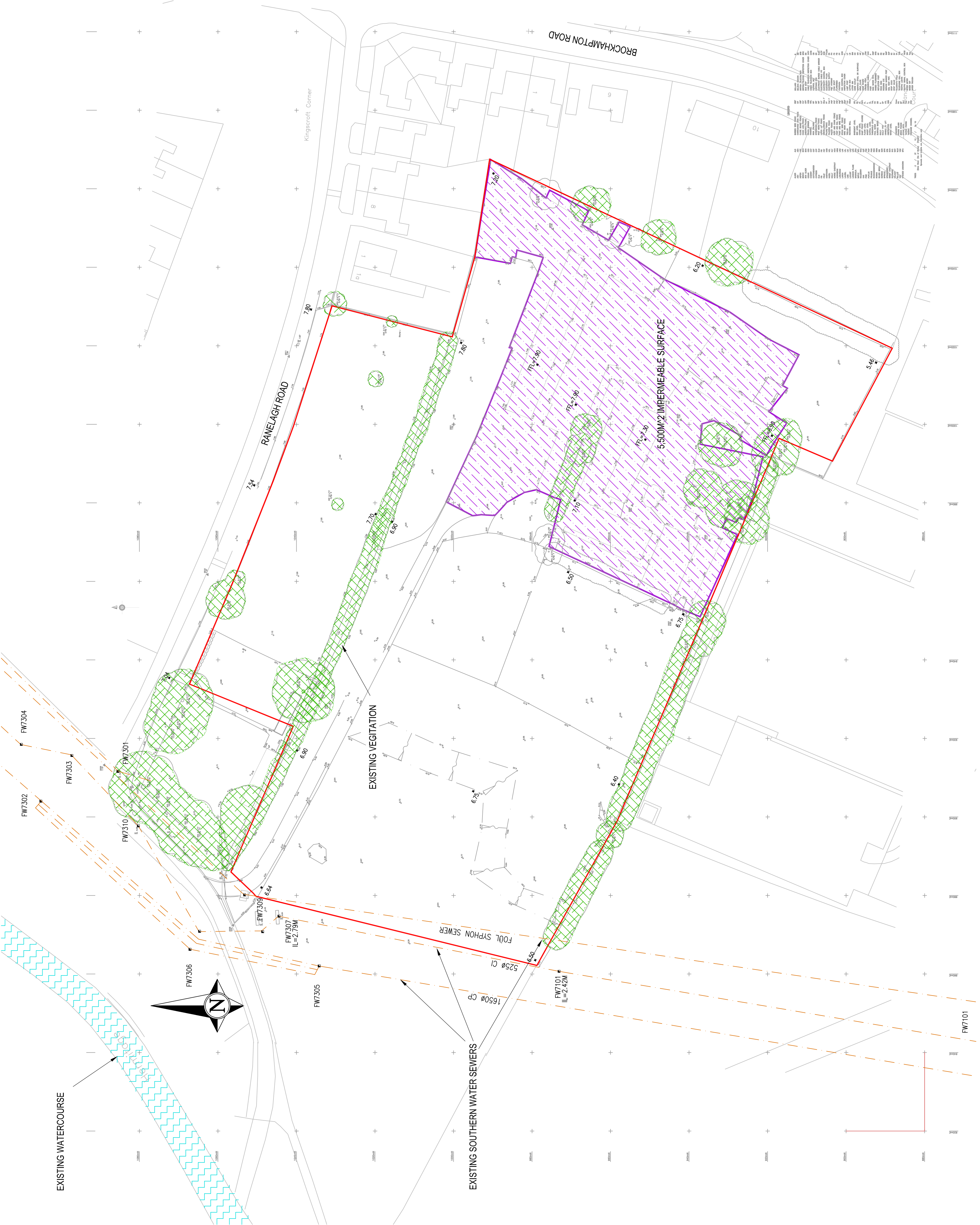
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ALL CO-ORDINATES ARE RELATIVE TO
TOPOGRAPHICAL SURVEY CARRIED OUT BY:
Digital Terrain Surveys LLP, Tanners Court,
Tanners Lane, East Wellow, Romesey,
Tel 01794 514978

FOR STATION CO-ORDINATES AND LOCATIONS
REFER TO CONTRACT DRAWING Kingscroft Farm,
Ranelagh Road, Bedhampton
TITLE SITE SURVEY
DATE september 2010

CONTRACTOR TO CHECK AND IDENTIFY ANY
DISCREPANCIES TO ENGINEER.



P1	27/06/12	INITIAL ISSUE	RHB
rev	date	description	Initials

Project

PROPOSED DEVELOPMENT, RANELAGH ROAD, HAVANT

Client / Architect

Title

TOPOGRAPHICAL SURVEY



Hampshire Office:
Dewey House, 55 High Street,
Ringwood, Hampshire BH24 1AE
Telephone: 01425 484400
Facsimile: 01425 484409
Email: admin@reuby-stagg.co.uk

REUBY & STAGG LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS

date	JUN 2012	scale	size	project no.	revision
drawn	RHB	1:500	A1	9964	002
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COURTYARD & ROADWAY
- DENOTES POROUS PAVING
PRIVATE DRIVEWAY
- DENOTES HOUSE SOAKAWAY
- DISTRIBUTOR DRAIN
- SUB-BASE FORMATION DRAIN
- FOUL WATER SEWER



P1

rev

27/06/12

date

INITIAL ISSUE

description

RHB

initials

Project

PROPOSED DEVELOPMENT, RANELAGH ROAD, HAVANT

Client / Architect

Orchard

RESIDENTIAL DRAINAGE FOR YOUR FUTURE

Title

PROPOSED DRAINAGE PLAN

REUBY & STAGG LTD.

CONSULTING CIVIL & STRUCTURAL ENGINEERS

Hampshire Office:

Devey House, 55 High Street,

Ringwood, Hampshire BH24 1AE

Telephone: 01425 484400

Facsimile: 01425 484409

Email: admin@reuby-stagg.co.uk

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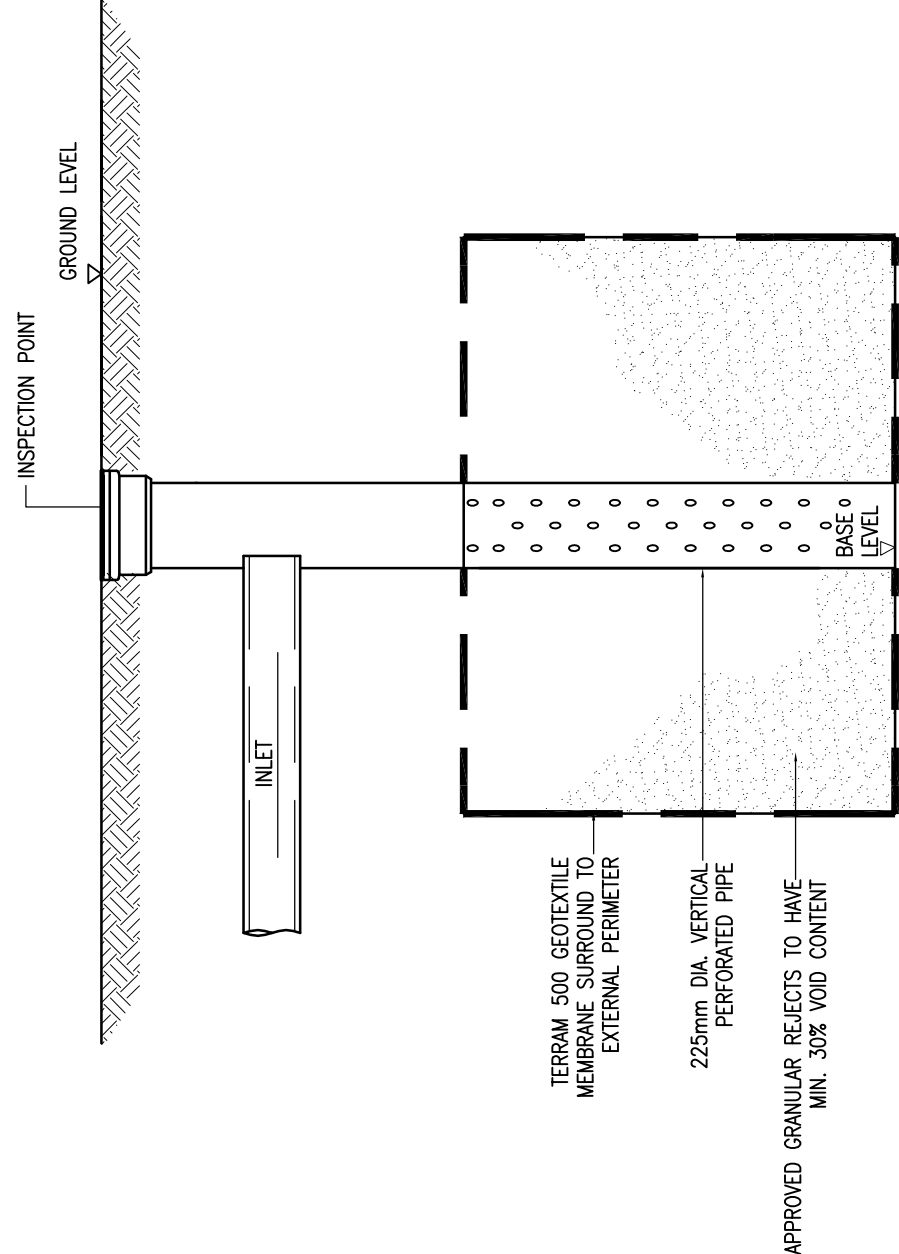
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HEALTH & SAFETY:

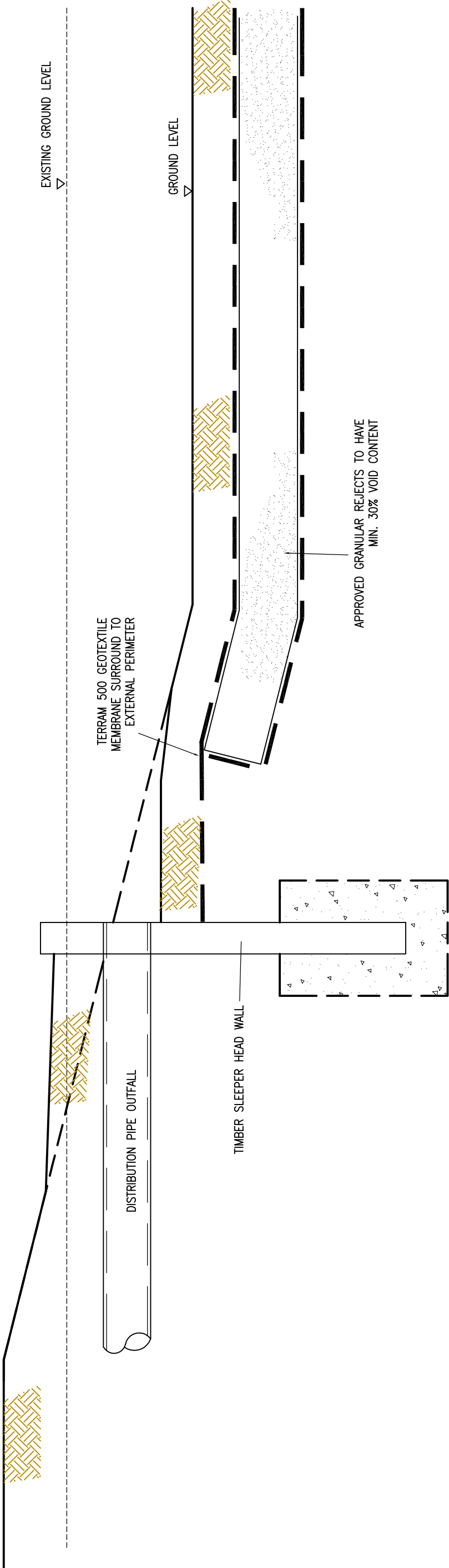
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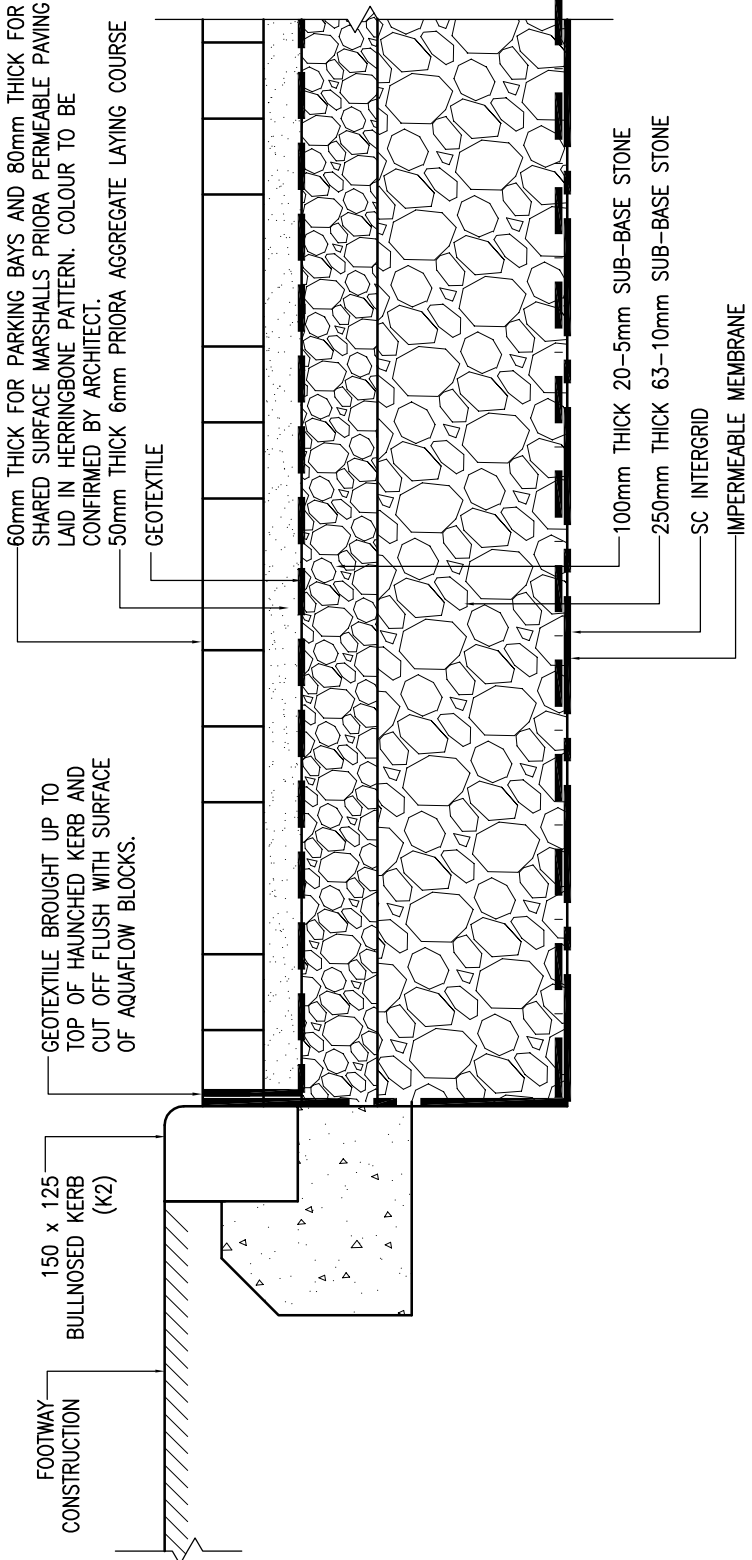
NOTES

- ALL SOAKAWAYS TO BE SITUATED 5.0M MIN. FROM ANY STRUCTURE (MEASURED FROM EXTENT OF GRANULAR SURROUND).
- PIT SIZE REQUIRED FOR GRANULAR SURROUND ON THE ABOVE DETAIL IS INDICATIVE ONLY.
- GRANULAR SURROUND MUST BE APPROVED BY THE ENGINEER.
- CONTENT SPECIFIED FOR THE GRANULAR REJECTS PRIOR TO USE ON SITE.
- GEOTEXTILE MEMBRANE TO BE PROVIDED AGAINST ALL FACES OF SOAKAWAY PIT. THE MEMBRANE IS NOT TO BE PROVIDED TO THE FLOOR AREA WITHIN THE POC RING PERIMETER.

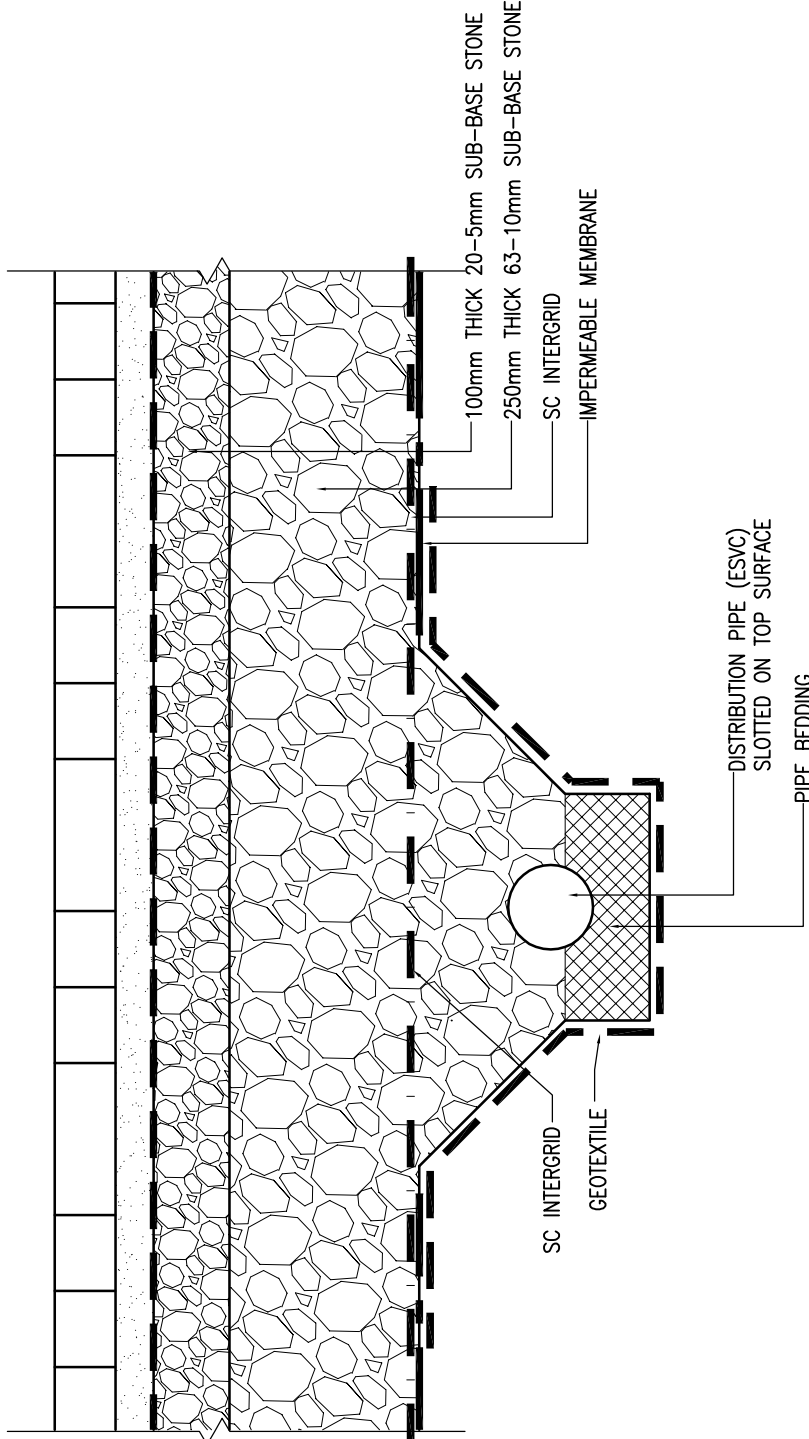
HOUSE SOAKAWAY DETAIL



DETENTION/INFILTRATION BASIN



TYPICAL POROUS ROAD CONSTRUCTION



TYPICAL DISTRIBUTION PIPE

P1	27/06/12	INITIAL ISSUE	RHB
rev	date	description	initials

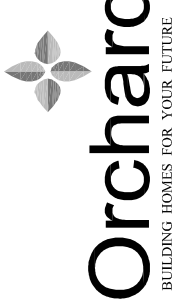
Project

PROPOSED DEVELOPMENT, RANELAGH ROAD, HAVANT

Client / Architect

Title

PROPOSED SUDS DETAILS



REUBY & STAGG LTD.
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Hampshire Office:
Devey House, 55 High Street,
Ringwood, Hampshire BH24 1AE
Telephone: 01425 484400
Facsimile: 01425 484409
Email: admin@reuby-stagg.co.uk

date	JUN 2012	scale	1:500	size	A1	project no.	9964	drawing no.	501	revision	P1
drawn	RHB	checked	RHB								



Craig Morrison
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA



QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 851105
russell.jarvis@qtsenvironmental.com

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105



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⁾



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105



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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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
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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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105



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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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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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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Unit 1, Rose Lane Industrial Estate
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Maidstone
Kent ME17 2JN
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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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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
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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			
Diiflubenzuron ^(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 dayey 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 dayey sand with chalk
54865	WS4	None Supplied	0.10	23.4	Brown dayey 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 dayey loam with vegetation

Insufficient sample ^{1/5}
 Unsuitable Sample ^{u/s}



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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
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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



Craig Morrison
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA



QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 851105
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 12-11608

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: 07/11/2012

Authorised by:

Russell Jarvis
Director

On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director

On behalf of QTS Environmental Ltd



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105



Soil Analysis Certificate						
QTS Environmental Report No: 12-11608	Date Sampled	30/10/12	30/10/12	30/10/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS2	WS4		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	1.30	1.00	2.90		
Reporting Date: 07/11/2012	QTSE Sample No	54854	54855	54856		

Determinand	Unit	MDL	Accreditation					
pH	pH Units	N / a	MCERTS	8.1	8.1	8.2		
Total Sulphate as SO ₄	mg/kg	< 200	NONE	445	< 200	513		
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	NONE	0.05	0.02	0.01		
Total Sulphur	mg/kg	< 200	NONE	< 200	< 200	< 200		
Ammonium as NH ₄	mg/kg	< 0.5	NONE	< 0.5	< 0.5	< 0.5		
W/S Chloride (2:1)	mg/kg	< 10	NONE	< 10	< 10	< 10		
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 4	NONE	4	12	< 4		
W/S Magnesium	mg/kg	< 10	NONE	< 10	10	< 10		

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⁾



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105



Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 12-11608	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 13284	
Order No: None Supplied	
Reporting Date: 07/11/2012	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
54854	WS1	None Supplied	1.30	12.2	Grey gravelly clay with chalk and stones
54855	WS2	None Supplied	1.00	18	Brown clay with vegetation
54856	WS4	None Supplied	2.90	13.9	Light brown clay with chalk and stones

Insufficient sample ^{I/S}
Unsuitable Sample ^{U/S}



QTS Environmental Ltd
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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 12-11608

Soils Ltd

Site Reference: Ranelagh Road, Havant

Project / Job Ref: 13284

Order No: None Supplied

Reporting Date: 07/11/2012

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 diphenylcarbazine 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
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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

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