

SUPPLEMENTARY GROUND INVESTIGATION REPORT
for the land at
HAVANT RETAIL PARK, PORTSDOWN HILL ROAD,
BEDHAMPTON, HAMPSHIRE PO9 3NA
on behalf of
LINDEN HOMES SOUTHERN LIMITED

Havant Retail Park
Linden Homes Southern Limited

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EXECUTIVE SUMMARY		
Site Details	Site Address	Havant Retail Park, Portsdown Hill Road, Bedhampton, Hampshire PO9 3NA
	National Grid Reference	469690, 106430
	Site Area	2.1Ha
	Form of Development	Construction of a residential development comprising houses and flats with gardens, communal soft landscaping, estate roads and associated development infrastructure.
Encountered Conditions	Scope of works	The assessment comprised a supplementary ground investigation, geotechnical testing to support foundation selection and design, geochemical laboratory testing and ground gas monitoring to clarify the findings of a previous phase of investigation and inform the remedial strategy.
	Ground Conditions	The ground conditions comprised a variable thickness of generally clayey Made Ground overlying Chalk.
	Groundwater	Groundwater was encountered at depth (>10m bgl) during the intrusive investigation but was not present during subsequent groundwater monitoring visits. Monitoring was undertaken in a wells installed within the Made Ground and also wells installed in to the Chalk at depth.
Geotechnical Considerations	Foundations	The variation in depth to the Chalk will require a combination of conventional, shallow foundations and piled foundations. Where piled foundations are required, it is recommended that CFA piles are used given the sensitivity of the Chalk (aquifer and groundwater protection status) beneath the site.
	Floor Slabs	Suspended floor slabs are recommended due to the variable thickness and composition of Made Ground.
	Excavations	Shallow excavations are likely to remain marginally stable in the short term. Longer, or deeper excavations and any which encounter water are likely to become unstable rapidly. Under no circumstances should personnel be permitted to enter unsupported excavations during construction or maintenance.
	Pavements	A CBR value of 2% is recommended based on in-situ testing. The shallow soils are considered frost susceptible, this requiring a pavement construction thickness of at least 450mm.
	Drainage	Soakage tests have shown that storm water run-off could discharge to the ground although some allowance for peak flow storage and attenuation would be required. Given that the site has been extensively quarried, the potential for solution features is reduced influencing location/design. Nonetheless all soakaways should discharge solely in to the blocky Chalk rock mass. No soakaways should be constructed within the eastern portion of the site given its location within SPZ1 for Bedhampton Springs public water supply abstractions.
	Buried Concrete	Buried concrete should be designed to Class DS1 (AC1).
Environmental Considerations	Human Health	Localised areas of soil contamination have been identified which will require the incorporation of risk mitigation measures to protect human health. For Plots 1-16 and 84-86, this is recommended to comprise the removal of tarmac, concrete and underlying hardcore/aggregate to reveal the Made Ground formation and placement of clean imported subsoil and Topsoil each to a minimum thickness of 150mm (i.e. total minimum cover thickness of 300mm). For Plots 17-49, a crushed concrete layer at least 150mm thick should be placed between

		the subsoil and Made Ground formation. This crushed concrete layer would serve to act as a capillary break and physical dig barrier. Geotextile separator fabric should be placed immediately below and above the crushed concrete layer to prevent the ingress of fines from Made Ground and/or subsoil. Plots 50-83 incorporate an area of amenity soft landscaping and this will also require the placement of a crushed concrete layer beneath the subsoil and Topsoil. All 'soils' placed in gardens must meet suitability criteria for the protection of human health and be capable of supporting plant growth.
	Groundwater	In the absence of any specific pollutant linkages, no risk mitigation measures are considered to be required.
	Ground Gases	The ground gas assessment has utilised both spot monitoring and continuous monitoring from across the site. On the basis of the data gathered, the site's gassing regime is classified as Characteristic Situation 1 (CIRIA) and Green (NHBC). As such, no ground gas protection measures are required.
	Radon Gas	No radon protection measures are required.
	Built Environment	An allowance should be made for the use of barrier pipe or the like to protect potable water supplies on this site.
	Waste Disposal	WAC test results indicate that Made Ground if to be removed from site would comprise a combination of Inert Waste to Hazardous Waste. However, it is understood that the development strategy includes waste minimisation and retention of surplus soils for specific use on site wherever possible. If surplus spoil is to be retained on site then it is recommended that the protocols set out under the Definition of Waste code of practice are followed.
Further Action: • Consideration of the site under CL:AIRE Definition of Waste • Preparation of a Remediation Method Statement. • Remediation supervision/inspection. • Verification testing of imported subsoil and topsoil for gardens and soft landscaped areas. • Preparation of a Validation Report.		
<i>This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report ref. GE9752-SGIR-140425</i>		



1.0 INTRODUCTION

1.1 General

Geo-Environmental Services Limited (Geo-Environmental) was instructed by Linden Homes Southern Limited to undertake a supplementary investigation of the geotechnical and geo-environmental factors pertaining to proposed development at Havant Retail Park, Portsdown Hill Road, Bedhampton, Hampshire PO9 3NA (the site). The site's location is presented in Figure 1.

1.2 Form of Development

The proposed development comprises the construction of 86 residential units incorporating houses and flats, gardens, communal soft landscaping, estate roads and associated development infrastructure. The blocks of flats are to be located along the site's western boundary, with houses occupying the remainder of the site.

1.3 Objectives

The data from the geotechnical investigation was to form the basis of an interpretation with respect to foundation design, pavement construction, concrete specification, excavation stability and other pertinent construction issues.

A Preliminary Risk Assessment (PRA) was undertaken in accordance with CLR11, as part of the previous phase of investigation, in order to provide a basis for the scope and rationale of the subsequent phases of intrusive investigation. The data from Phase I and Phase II were then to form the basis of a subsequent Tier 1 Generic Quantitative Risk Assessment (GQRA). The objective of the risk assessments was to evaluate the risk of harm to human health, the built environment and controlled waters, in the context of likely planning requirements, immediate liabilities under the Environment Act 1990 and risks posed to Controlled Waters under the Water Resources Act.

1.4 Standards

Where practicable, the ground investigation and subsequent geotechnical and environmental assessments were undertaken in accordance with the following documents and guidance:

- o National Planning Policy Framework, March 2012
- o Planning Policy Statement 23 Planning and Pollution Control;
- o Model Procedures for the Management of Contaminated Land, CLR11, DEFRA and Environment Agency 2004;
- o Environment Agency Guidance on Requirements for Land Contamination Reports, Version 1 dated July 2005;
- o BS10175:2011 Investigation of Potentially Contaminated Sites - Code of Practice, BSI 2011;
- o BS5930: 1999 Code of Practice for Site Investigations, BSI 1999;
- o EN ISO 14688 Geotechnical Investigation and Testing Part 1-2002 and Part 2-2004;
- o BS1377: 1990 Soils for Civil Engineering Purposes, BSI1990;
- o NHBC Standards Chapter 4.1 Land Quality, Managing Ground Conditions, September 1999;
- o NHBC Standards Chapter 4.2 Building Near Trees;
- o CIRIA C574 Engineering in Chalk (2002);
- o CIRIA C665 Assessing risks posed by hazardous ground gases to buildings (2007);
- o NHBC 10627-R01(04) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present (2007);
- o BS8485:2007 Code of practice for the characterisation and remediation from ground gas in affected developments;
- o The Ground Gas Handbook, Wilson, Card and Haines (2009).

1.5 Conditions

This report does not purport to be a “Geotechnical Design Report” as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004) and some of the data used to support this preliminary geotechnical assessment may not be fully compliant with that design code. It is considered possible that further detailed ground investigations could be required to facilitate the detailed geotechnical design process and should be carried out on a structure specific basis if necessary.

The data collected from the investigations have been used to provide an interpretation of the geotechnical and/or environmental conditions pertaining to the site. The recommendations and opinions expressed in this report are based on the data obtained. Geo-Environmental takes no responsibility for conditions that either have not been revealed in the available records, or that occur between or under points of physical investigation. Whilst every effort has been made to interpret the conditions, such information is only indicative and liability cannot be accepted for its accuracy.

It should be noted that in particular the concentrations and levels of mobile liquid and gaseous materials are likely to vary with time. The results obtained may therefore only be representative of the conditions at the time of sampling. This report should not be taken as any guarantee that a site is free of hazardous or potentially contaminative materials.

Information contained in this report is intended for the use of the Client and Geo-Environmental can take no responsibility for the use of this information by any party for uses other than that described in this report. Geo-Environmental makes no warranty or representation whatsoever express or implied with respect to the use of this information by any third party. Geo-Environmental does not indemnify the Client or any third parties against any dispute or claim arising from any finding or other result of this investigation report or any consequential losses.

Assessment criteria or other parameters developed for the evaluation of contamination on this site are based on a number of assumptions regarding exposure and toxicology. Exposure to contaminants and levels of adverse effects may therefore vary. Whilst reasonable care and expertise has been employed in the development of such criteria, no liability is accepted in this respect. Other criteria or guidance on the development of assessment criteria may be published in the future and no liability is accepted in this respect.

2.0 SITE CONTEXT

The site has been the subject of a previous phase of investigation and assessment by Geo-Environmental, as reported in the Ground Investigation Report GE8756/GIR dated August 2012. This previous phase of assessment incorporated a desk study, preliminary risk assessment and an intrusive investigation to provide general details and coverage of the external areas of the site. Whilst a summary of key elements is presented below, the Ground Investigation Report should be referred to for more detail.

2.1 Site Description

The site comprised an irregularly shaped parcel of generally flat and level land within a former chalk quarry. With reference to the site topographical survey, ground levels were generally around 23.7m to 24.5m AOD, albeit with a slight rise to c. 25.75m AOD at the entrance with Portsdown Hill Road. The site extended to approximately 2.1Ha and was located at NGR 469690, 106430.

At the time of the original site walk over survey, June 2012, the site was occupied by two portal-framed buildings used as a bowling alley and DIY store. However, at the time of the supplementary investigation, February to March 2014, both businesses had closed down, with the DIY store comprising an empty building and the bowling alley undergoing final strip out of equipment.

External areas comprised tarmac covered car parking to the north-east of the buildings and a concrete covered service road and yard area to the south and west of the buildings. A marginal strip of scrub/soft landscaping was present along the western boundary of the site and an infestation of Japanese Knotweed was identified within this portion of the site. It was understood that the Japanese Knotweed had been sprayed with a targeted herbicide as part of an eradication plan. However, new growth was observed as shoots sprouting during the latter portion of the supplementary investigation period.

An electricity substation was present in a wooded area on the southern boundary to the rear of the DIY store. The substation remained live, both in terms of incoming feed to the site and outgoing supply to the two units. In addition, it was understood that the substation would be retained as part of the proposed development.

The north-western, south-eastern and southern boundaries were marked by near vertical chalk cliffs varying in height from approximately 2-3m up to 8-10m, remnants of the former use of the site as a chalk quarry. A chain-link fence was present along the toe (offset from the toe by c. 2-5m), presumably to act as a 'catch fence' for chalk which come free from the exposed face. In several areas, a debris slope formed by smaller fragments of chalk was present at the toe of the exposed face. In addition, some areas of recent spalling/rock fall were observed at the time of the supplementary investigation. Vegetation was also present on the chalk faces and in some locations, roots were observed to be growing into the exposed chalk face.

The highest portion of exposed chalk face formed the site's northern boundary and it appeared that a bench step was present towards the toe of the exposed face.

The site was bounded to the north by Portsdown Hill Road; to the east by houses fronting on to Portsdown Hill Road; to the south by gardens and houses fronting on to Bedhampton Hill; and to the west by a vegetated slope falling c. 3-5m down to the A3(M). The site was accessed from Portsdown Hill Road.

2.2 Geology

British Geological Survey mapping indicated the geology of the site to comprise Chalk of the Portsdown Hill Formation over the northern two thirds of the site and Spetisbury Chalk Member over the southern third of the site. The previous investigation also confirmed the presence of a variable and, in some areas, significant thickness of Made Ground overlying the Chalk.

The term **Made Ground** is used to describe material which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material. The BSI Code of Practice for Foundations, BS8004:1986 Clause 2.2.2.3.5 Made Ground and Fill, includes the caveat that “all made ground should be treated as suspect, because of the likelihood of extreme variability”.

The **Portsdown Chalk Formation** is characterised by white chalk with marl seams (particularly in the lower part) and flint bands. The lowest part contains several belts rich in shell debris, as well as isolated marl seams and pairs of marl seams that likewise contain much shell debris. The highest part is essentially marl-free. The lower boundary is conformable at the base of the ‘Portsdown Marl 1’ where it overlies white chalks of the Spetisbury Chalk Member.

The **Spetisbury Chalk Member** is characterised by white chalk with regular large flint seams.

However, the distinction between the two Chalk strata was not readily discernable either within the exposed quarry faces or from chalk recovered from boreholes during the previous phase of investigation. As such, the Chalk strata have been described *en masse* as Upper Chalk.

2.3 Hydrogeology

With reference to the Environment Agency website and the Groundwater Vulnerability Map No 52 entitled Southern Hampshire, the site is indicated to overlie bedrock classified as a Principal Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability and usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The soil cover across the site was classified as High (class U) leaching potential. This is likely to relate to the site comprising former mineral workings, i.e. a former chalk quarry, and thus natural soil and overburden cover are likely to have been removed or altered. Water movement within these strata is likely to be highly variable and probably discontinuous if variable soils have been deposited within the former quarry.

According to information provided from the Environment Agency, the site is located within Zone I of the “Bedhampton & Havant Springs” groundwater Source Protection Zone (SPZ). An SPZ is a protection zone placed around a well, or cluster of wells, that supplies groundwater of potable quality. An SPZ is divided into three zones defined as follows:

- Zone I - Travel time (of water) of 50 days or less to the groundwater source.
- Zone II - Either 25% of the source area or a travel time of 400 days whichever is greater.
- Zone III - The total area needed to support the discharge and abstraction from the protected groundwater source.

The closest groundwater abstraction to the subject site was recorded 718m to the east of the site and comprised a potable water supply abstracting groundwater from a single point. This comprised the closest of a cluster of potable supply abstractions between c. 700m and 1200m to the east of the site.

It is possible that groundwater flow beneath the subject site was towards the abstractions, due to geological conditions and abstraction drawdown.

The desk study did not identify any discharge consents to land, or any substantiated pollution incidents to groundwater within 500m of the site boundary.

2.4 Hydrology

No surface water features were present on site. The closest surface water feature to the site comprised a stream 258m to the north, which flowed from west to east. In addition, Langstone Harbour (a tidal lagoon) was located approximately 900m to the south of the site and at an elevation approximately 20m lower than the site.

No potentially significant connection was identified between the site's hydrological setting and any recorded discharges, abstractions or pollution incidents.

2.5 Radon

Data supplied by the Health Protection Agency (HPA) and British Geological Survey (BGS) indicate the site was not located in a radon affected area, as less than 1% of homes are above the action level. The BGS also state that no radon protection measures are necessary in the construction of new dwellings on the subject site.

2.6 Trade Directories

The desk study did not identify any specific current or former land uses in close proximity to the site which could have resulted in a detrimental impact to the subject site.

2.7 Geotechnical Data

The site was situated within an area that was considered by the Coal Authority as being unlikely to be affected by coal mining activity. However, the site was located within a former chalk quarry and thus extractive processes had taken place on the site.

The desk study identified the following solution features within the Chalk in proximity to the site:

- Solution pipe within Upper Chalk with no recorded superficial soil cover 17m to the north of the site.
- Cluster of 3No. solution pipes within the Upper Chalk with a cover of Lambeth Group (sand, silt and clay) 42m to the north-east of the site.

However, given that the site was located within a former chalk quarry, it was considered that the potential for solution features to be present was substantially reduced within the site.

2.8 Landfill and Waste Management Facilities

Information obtained and reviewed as part of the desk study identified numerous records of landfill and/or waste management facilities within 1km of the site, but only one within 500m of the site. This comprised an historic landfill at Scratchface Lane, 463m to the north of the site and had been authorised to accept inert waste. This location comprised a recreation ground at the time of the desk study assessment.

Whilst the desk study information did not identify any infilling of the former chalk quarry on the site, consultation with the Contaminated Land Officer at Havant Borough Council revealed that Council

records showed the site was likely to have been infilled, at least in part. However, more specific information on the dates of any filling and nature of fill materials was not available.

The previous phase of intrusive investigation identified a variable thickness of Made Ground over the Chalk and this was considered to support the Council's records.

2.9 Historic Mapping

Historic mapping indicated that the site had operated as a chalk quarry since at least 1868 but appeared on the 1897 to be disused, at least in the apparently deeper section of the quarry, i.e. in the south-eastern portion of the site. The mapping evidence indicated that the quarry floor included a series of bench steps, i.e. similar to those exposed on the quarry faces rising above the current site ground level. The mapped positions of the former quarry floor and possible buried bench steps are shown in Figure 4.

The site was also indicated to have several other uses following cessation of the quarrying, these including a coal yard on the northern and north-western portion of the site and various buildings within the southern portion of the site. A summary of mapped historic uses is presented in Figure 5.

2.10 Previous Ground Investigations

As stated above, Geo-Environmental undertook and reported on an earlier phase of intrusive investigation on this site. The investigation was limited to external areas of the site and was undertaken at a time when the site was operational and open to the public. Whilst the Ground Investigation Report, GE8756/GIR, should be referred to for more detail, the key information on ground conditions and all of the data from site screening, ground gas monitoring and laboratory testing have been incorporated into the assessment presented in the following sections of this report.

2.11 Potential Contamination

The information obtained from the desk study showed that the subject site had been used since prior to 1868 as a chalk pit and that the pit continued to operate and expand laterally and possibly deeper until some time before 1952. Following cessation of quarrying, historic mapping indicated that the site was probably partly infilled to form a level site and that activities on site since the 1950s included a coal depot, works and most recently a retail park.

Whilst the quarrying of chalk was unlikely to have resulted in any contamination *per se*, on site activities such as limekilns were likely to have generated waste ash which could have been deposited on the site. Similarly, the use of areas of the site as a coal depot and works, together with operating a vehicles on the site as part of these activities, could have resulted in the introduction of contaminants to the ground and most likely to include hydrocarbons, metals and PAH compounds, although if coal dust were present, this could also represent a risk of combustion within the ground.

The previous investigation confirmed that materials/soils were imported on to the site to infill deeper sections of the quarry and form a level development plateau. The source of any such imported material is now untraceable and it is possible that a range of potential contaminants could have been introduced on to the site, such as metals, inorganic compounds, hydrocarbons, PAH compounds, asbestos and the like. In addition, if organic materials were deposited, then these could release hazardous ground gas, although it should be noted that no such organic materials were encountered during the previous phase of investigation.

In addition to generic potential contamination, the current development includes an electricity sub-station, which could be a source for mineral oil and PCB contamination, although both of these contaminants would only be present in small quantities and become readily adsorbed onto soil

particles. Pollution from the sub-station would usually be evident as oil staining on the ground and no such staining was observed. It is understood that the sub-station will remain on site.

The following potential contaminants were considered most likely to be associated with historic and/or current site activities:

- Arsenic, Beryllium, Barium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Vanadium, Zinc, cyanide, nitrate, sulphate, asbestos, phenol, oil/fuel hydrocarbons, aromatic hydrocarbons, polyaromatic hydrocarbons, chlorinated aliphatic hydrocarbons and PCB.
- Potential ground gases associated with any Made Ground including, methane, carbon dioxide, oxygen, VOC and flow.

2.12 Ground Gas Summary

Given that the site was found to include areas of deep Made Ground, a potential source for hazardous ground gas was identified within the site. Thus, in line with best practice at the time of the previous investigation, a period of 'spot' monitoring was undertaken to inform the ground gas assessment.

Best practice guidance has evolved since the time of the previous phase of investigation and thus the ground gas assessment strategy for the supplementary investigation combined 'spot' monitoring in existing gas monitoring wells and continuous gas monitoring within three boreholes. The continuous monitoring used in-well probes programmed to record the concentrations of a series of hazardous gases and other pertinent information at hourly intervals over a four week period. Thus whilst the 'spot' monitoring would derive a single dataset for weekly monitoring, the continuous monitoring would provide approximately 168 datasets for the same period, thereby supporting a more robust assessment.

Best practice guidance recommends that gas monitoring (spot monitoring) should be undertaken during periods of low and falling atmospheric pressure as these conditions are likely to be more conducive to the release of gases and vapours from the ground. In addition, other factors such as rising and/or falling groundwater levels could influence the flow of gas within the ground. Current best practice guidance for continuous monitoring incorporates these requirements but also extends to periods of rapidly falling pressure, which research has shown to be a critical period for the release and/or flow of gases through the ground.

3.0 PRELIMINARY ASSESSMENT

A preliminary assessment was originally developed as part of the previous investigation and has been updated in the following sections.

3.1 Potential Geotechnical Issues

The following factors that might impact the geotechnical condition of the site were identified as part of the desk study:

- The possible presence of Made Ground which if encountered may affect the foundation design and construction.
- The presence of buried former quarry bench steps which could influence the serviceability and performance of foundations and structures straddling such features.
- The presence of structures within the ground removal of which may result in voids in the ground, and consideration of the associated impact on proposed foundations.
- The presence of laterally and vertically variable strata and the impact these could have on further construction.
- The viability of soakaways (restricted to discharge directly in to the Chalk to mitigate the risk of inundation collapse settlement in Made Ground).

3.2 Preliminary Environmental Conceptual Site Model & Risk Assessment

3.2.1 Methodology

A Preliminary Risk Assessment ('PRA') and Conceptual Site Model ('CSM') have been prepared in accordance with CLR11 based on information obtained as part of the desk study. Possible risks associated with potential sources of contamination and sensitive receptors identified have been qualitatively assessed following a source-pathway-receptor ('Pollutant Linkage') approach in accordance with current UK protocols.

A risk of harm may only exist where a plausible pollutant linkage is present, and where the quantity or concentration of a contaminant is sufficient so as to pose harm. Under the statutory definition, "Contamination" may only strictly exist where contaminants pose a risk of harm to a receptor. The risk classification has been assessed in accordance with CIRIA C552 (Rudland et al., 2001). A summary of how the risks are derived and their definitions are presented in Tables 3.1 and 3.2.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Table 3.1 Risk Ratings Matrix

Risk Rating	Definitions
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High risk	Harm is likely to arise to a designated receptor from an identified hazard Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not already undertaken) is required and remediation works may be necessary in the short term and are likely over the longer term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Moderate to low risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is unlikely that any such harm would be severe, or if any harm were to occur it is probable that the harm would be relatively mild.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table 3.2 Risk Rating Definitions**3.2.2 Summary of Plausible Sources**

Possible sources of contamination identified from the desk study are summarised in Table 3.3.

Source	Description	Contaminants
Shallow Soils	General background quality of natural soils. Given that most of the site has been quarried, naturally occurring shallow soils are unlikely within the development area, i.e. restricted to the soil profile at the top of quarry faces.	Possible elevated metals, non-metals and organic contaminants.
Made Ground	The desk study has identified that Made Ground is likely to be present on the subject site. Generic contaminants could be associated with any Made Ground, if present on site.	Possible elevated concentrations of metals, metalloids, TPH and PAH compounds, and asbestos in Made Ground (if present).
Coal Depot	The use of the northern portion of the site could have led to the deposition of finer fractions of coal and coke.	Possible elevated concentrations of metals, hydrocarbons and PAH compounds. Combustion risk due to high calorific value of unburned/partially combusted coal and/or coke (if present).
Works	The specific use of the Works is unknown but is likely to have been some form of light industrial operation.	Possible elevated metals, non-metals, organic contaminants and asbestos.
Current Retail Park	No specific contaminative activities are undertaken on site and there is extensive built footprint and external hard cover. However, localised leakages such as spills from parked vehicles could occur.	Possible localised hydrocarbon contamination at ground level.

Source	Description	Contaminants
Ground Gases and Vapours	The desk study has identified former scrub type grass areas in the quarry floor which were subsequently filled. Thus there is the potential for organic material and Made Ground on the subject site and these could result in the presence of ground gases on site. Vapours could be present if soil based hydrocarbon impacts are present.	Possible elevated concentrations of methane, carbon dioxide, depleted oxygen and flow of gas within the ground. Possible hydrocarbon type vapours or VOCs from soil based impact (if present).

Table 3.3 Possible Sources of Contamination**3.2.3 Summary of Plausible Pathways**

The plausible pathways are summarised in Table 3.4. These pathways are based on the proposed residential end use.

Pathway	Description
Direct Contact	Ingestion of soil particles, inhalation of soil derived dust (including tracked back dust), dermal contact, ingestion of soil, bio-accumulation and ingestion of home grown produce.
Gas Inhalation	Inhalation of hazardous ground gas both inside and outside of buildings (if present).
Vertical & Lateral Migration	Contaminant movement both vertically through leaching/gravity and horizontally along preferential pathways, e.g. services trenches, or with groundwater; dissemination and/or diffusion throughout the soil mass; and migration along natural higher permeability zones such as bedding planes, joints and the like. Vertical migration associated with in-ground structures, e.g. foundations, drainage and soakaways.
Root Uptake	Uptake of soil and waterborne contaminants by plants.
Chemical Attack	Attack of buried plastics and concrete by aggressive ground conditions.
Plume migration	Contamination migration as a plume within the saturated or unsaturated zone

Table 3.4 Possible Contamination Pathways**3.2.4 Summary of Plausible Receptors**

Potential receptors associated with the site and its development are summarised in Table 3.5.

Receptor	Description	Comments
Site Workers	Persons involved in construction and future maintenance of the proposed development.	Ground workers could become exposed during demolition, construction and maintenance.
End Users	Users of the proposed redevelopment.	Occupation of the proposed residential properties.
Soft Landscaping	Possible areas of planting including lawns, shrubs, trees, etc.	Lawns and soft landscaping.
Built Environment	Buried concrete for foundations and plastics for potable water supply pipes may be laid in contact with contaminated soils.	Aggressive ground conditions and Made Ground may be present beneath the site.

Receptor	Description	Comments
Adjacent Land Users	Sensitive land uses identified within the immediate vicinity.	Residential land use to the north, east and south.
Groundwater	Controlled Waters contained within the aquifer(s) beneath the site.	The site overlies a Principal Aquifer and is located within Zone I of a groundwater Source Protection Zone for potable supply.
Surface Water	Controlled Waters within lakes, rivers, and ponds, etc., or coastal waters.	No surface water receptors were identified on or in close proximity to the site. The nearest stream is to the north and uphill from the site and flows from west to east.

Table 3.5 Possible Receptors of Contamination

Site workers involved in the preparation and construction of the development have not been considered further in this assessment as the Principal Contractor is duty bound under the current CDM Regulations to undertake their own risk assessments with respect to their employees.

Whilst the above sources and receptors have been identified, Table 3.6 summarises the identified plausible pollution linkages and a qualitative assessment of the risks based on the desk study research.

Potential Source/media	Potential Receptors	Potential Pathways	Likelihood	Consequence	Risk and Justification
Shallow soils	End users	Direct contact and inhalation / ingestion of soil derived dust	Likely	Mild	Moderate to Low End user exposure would be associated with gardens and soft landscaped areas. Measures may be required to protect end users.
	Soft Landscaping	Root Uptake	Unlikely	Mild	Very Low Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Unlikely	Mild	Very Low Adjacent land user exposure is mitigated to a large degree by elevation above the site and separation created by the chalk quarry faces.
	Water supply pipes	Direct contact	Unlikely	Mild	Very Low It is possible that water supply pipes could come into contact with impacted soils depending upon depth of installation and extent of any soil impact.
	Buildings and infrastructure	Direct contact	Likely	Minor	Very Low It is likely that foundations and infrastructure will be constructed within or extending through shallow soils and natural soils are unlikely to be aggressive.
	Groundwater	Vertical migration	Unlikely	Medium	Low Whilst the site is underlain by a Principal Aquifer and is situated within a Source Protection Zone, shallow soils are likely to be slightly weathered and/or disturbed/reworked by historic quarrying and thus would inhibit vertical migration. An unsaturated zone (at least 10m deep) is anticipated beneath the site and this would also enable diffusion and attenuation processes to occur.
	Surface Water	Lateral Migration	Unlikely	Mild	Very Low No surface water courses were located on or in close proximity to the site.
Made Ground	End users	Direct contact and inhalation / ingestion of soil derived dust	Highly	Medium	High End users could become exposed to contaminated Made Ground in soft landscaped areas or due to soil dust exposure. Suitable clean cover will be required to break pollutant linkages and be protective of human health.
	Soft Landscaping	Root Uptake	Likely	Medium	Moderate Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Likely	Medium	Moderate Adjacent land user exposure would most likely be to dust exposure which would be mitigated by clean cover to soft landscaped areas.
	Water supply pipes	Direct contact	Likely	Medium	Moderate It is possible that water supply pipes could come into contact with impacted soils depending upon depth of installation and extent of any soil impact.
	Buildings and infrastructure	Direct contact	Likely	Medium	Moderate Foundations and utilities will be constructed in/through Made Ground soils which could be aggressive to construction materials.
	Groundwater	Vertical migration	Likely	Medium	Moderate Leaching of contaminants out of the Made Ground in to the underlying Principal Aquifer could occur but would be inhibited by the construction of buildings and external hard cover, discharge of soakaways directly in to the Chalk and evaporation loss in soft landscaped areas. In addition, the presence of clay

Potential Source/media	Potential Receptors	Potential Pathways	Likelihood	Consequence	Risk and Justification
					rich Made Ground would reduce soil permeability and thus also inhibit infiltration.
	Surface Water	Lateral Migration	Low	Mild	Very Low No surface water courses were located on or in close proximity to the site.
Coal Depot	End users	Direct contact and inhalation / ingestion of soil derived dust	Likely	Medium	Moderate End users could become exposed to contaminants associated with the former Coal Yard in soft landscaped areas or due to soil dust exposure. Suitable clean cover will be required to break pollutant linkages and be protective of human health.
	Soft Landscaping	Root Uptake	Likely	Medium	Moderate Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Likely	Medium	Moderate Adjacent land user exposure would most likely be to dust exposure which would be mitigated by clean cover to soft landscaped areas.
	Water supply pipes	Direct contact	Likely	Medium	Moderate It is possible that water supply pipes could come into contact with impacted soils depending upon depth of installation and extent of any soil impact.
	Buildings and infrastructure	Direct contact	Likely	Medium	Moderate Foundations and utilities will be constructed in/through soils which could be aggressive to construction materials.
	Groundwater	Vertical migration	Likely	Medium	Moderate Leaching of contaminants from the former Coal Yard use in to the underlying Principal Aquifer could occur but would be inhibited by the construction of buildings and external hard cover, discharge of soakaways directly in to the Chalk and evaporation loss in soft landscaped areas. In addition, the presence of clay rich Made Ground would reduce soil permeability and thus also inhibit infiltration.
	Surface Water	Lateral Migration	Low	Minor	Very Low No surface water courses were located on or in close proximity to the site.
Works	End users	Direct contact and inhalation / ingestion of soil derived dust	Likely	Medium	Moderate End users could become exposed to contaminants associated with the former Works in soft landscaped areas or due to soil dust exposure. Suitable clean cover will be required to break pollutant linkages and be protective of human health.
	Soft Landscaping	Root Uptake	Likely	Medium	Moderate Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Likely	Medium	Moderate Adjacent land user exposure would most likely be to dust exposure which would be mitigated by clean cover to soft landscaped areas.
	Water supply pipes	Direct contact	Likely	Medium	Moderate It is possible that water supply pipes could come into contact with impacted soils depending upon depth of installation and extent of any soil impact.
	Buildings and infrastructure	Direct contact	Likely	Medium	Moderate Foundations and utilities will be constructed in/through soils which could be aggressive to construction materials.
	Groundwater	Vertical migration	Likely	Medium	Moderate

Potential Source/media	Potential Receptors	Potential Pathways	Likelihood	Consequence	Risk and Justification
					Leaching of contaminants from the former Works use in to the underlying Principal Aquifer could occur but would be inhibited by the construction of buildings and external hard cover, discharge of soakaways directly in to the Chalk and evaporation loss in soft landscaped areas. In addition, the presence of clay rich Made Ground would reduce soil permeability and thus also inhibit infiltration.
	Surface Water	Lateral Migration	Low	Minor	Very Low No surface water courses were located on or in close proximity to the site.
Sub-Station	End users	Direct contact and inhalation / ingestion of soil derived dust	Low	Medium	Moderate to low No development is proposed in the vicinity of the sub-station. The sub-station will remain on site and secured from unauthorised access. No evidence of oil staining or other leakage was observed.
	Soft Landscaping	Root Uptake	Low	Medium	Moderate to low Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Unlikely	Mild	Very low In the unlikely event that a spillage has occurred, the cooling oils and PCBs would become readily adsorbed to clay soils and organic matter in the surface soils around the substation. This combined with adjacent land users being at higher elevation is considered to reduce exposure risk further.
	Water supply pipes	Direct contact	Low	Mild	Low New water pipes are not proposed in close proximity to the sub-station.
	Buildings and infrastructure	Direct contact	Low	Mild	Low Foundations and utilities are unlikely to be constructed in close proximity to the substation.
	Groundwater	Vertical migration	Low	Medium	Moderate to low Vertical migration of cooling oils and PCBs would be inhibit by the presence of organic matter in surface soils and possible clay rich Made Ground onto which oils and PCBs would readily adsorb. No visual evidence of any spillage/leakage was recorded.
	Surface Water	Lateral Migration	Low	Minor	Very Low No surface water courses were located on or in close proximity to the site.
Retail Park	End users	Direct contact and inhalation / ingestion of soil derived dust	Low	Medium	Moderate to low End users could become exposed to contaminants associated with the former Retail Park use in soft landscaped areas or due to soil dust exposure. Suitable clean cover will be required to break pollutant linkages and be protective of human health. However, the potential for this is reduced by the presence of built footprints and external hardcover in the retail park development.
	Soft Landscaping	Root Uptake	Low	Mild	Low Soft landscaping is included within the proposed development. However, trees would be planted within tree pits and soft landscaping completed within a uncontaminated soils in the near surface root zone.
	Adjacent land users	Direct contact	Low	Medium	Moderate to low Adjacent land user exposure would most likely be to dust exposure which would be mitigated by clean cover to soft landscaped areas. However, the potential for this is reduced by the presence of built footprints and external hardcover in the retail park development.
	Water supply pipes	Direct contact	Low	Mild	Low It is possible that water supply pipes could come into contact with impacted soils depending upon depth of installation and extent of any soil impact.
	Buildings and	Direct contact	Low	Mild	Low

Potential Source/media	Potential Receptors	Potential Pathways	Likelihood	Consequence	Risk and Justification
	infrastructure				Foundations and utilities will be constructed in/through soils which could be aggressive to construction materials.
	Groundwater	Vertical migration	Low	Mild	Low Leaching of contaminants from the former retail park use in to the underlying Principal Aquifer are unlikely to occur due to the nature of the retail park's use, i.e. DIY store and bowling alley, and would be inhibited by the construction of buildings and external hard cover, discharge of soakaways directly in to the Chalk and evaporation loss in soft landscaped areas. In addition, the presence of clay rich Made Ground would reduce soil permeability and thus also inhibit infiltration.
	Surface Water	Lateral Migration	Low	Minor	Very Low No surface water courses were located on or in close proximity to the site.
Ground Gases and Vapours	End Users	Inhalation	Likely	Severe	High Ingress of hazardous ground gas through floor slabs, service penetrations, wall cavities and the like could occur and could result significant harm. Incorporation of gas protection measures could mitigated the risk of harm.
	Buildings and infrastructure	Gas accumulation and potential explosion of flammable gases	Likely	High	Moderate Ingress and accumulation of flammable gas, e.g. methane, could occur within buildings (without protection measures) and ignition could result of explosion and significant structural damage.
	Adjacent Land Users	Inhalation	Low	Severe	Moderate Migration of hazardous gases could occur and thus impact on adjacent land users, with life changing consequences. Off-site migration could be inhibited to some degree by the clayey nature of the Made Ground, although service trenches and the like could create artificial migration pathways.

Table 3.6 Plausible Pollutant Linkages & Qualitative Risk Assessment

3.3 Preliminary Risk Assessment Summary

The PRA and CSM developed from the information gathered as part of the desk study and previous investigation have identified plausible potential pollutant linkages that exist in relation to the proposed redevelopment of the site.

The potential pollutant linkages established within this PRA are not considered to prevent development on the subject site, but could require investigation and assessment to support further characterisation, calibration of the CSM and where/if necessary determine a remedial strategy to reduce, remove or otherwise control any risk within the site to key receptors.

3.4 Scope of Works

The scope of works for the supplementary ground investigation was developed from the findings of the previous investigation, discussions with the Client and also following a review of comments received from the Local Authority's Contaminated Land Officer. Initially, the supplementary investigation was to be undertaken in two phases, with window sample and cable percussion boreholes within the external areas of the site (with the site still open to the public) and a second phase of trial pitting across the footprint of the two buildings following demolition. However, the second phase of works was brought forward at the Client's request and thus was undertaken prior to demolition. The scope of works undertaken comprised:

- The construction of 56No. window sample boreholes (to supplement the 10No. drilled as part of the previous phase) at locations across the site. The window sample boreholes were located to target former land uses including the coal yard, proposed gardens, buried quarry bench steps and to provide coverage of the site.
- The construction of 3No. cable percussion boreholes to provisional depths of 20m bgl. Given the ground conditions on the site and the sensitivity of the underlying aquifer and groundwater, aquifer protection measures were employed during drilling. This comprised commencing each borehole at 200mm diameter, forming a bentonite seal at the junction between the Made Ground and Chalk, allowing the seal to 'go off' and then proceeding at 150mm diameter in the Chalk. In addition, an allowance was made for washing all drilling equipment to avoid cross contamination.
- Excavation of 5No. trial pits, at locations agreed with the Client's Civil Engineer, to assess the ground conditions at proposed soakaway positions.
- Undertake trial pit soakage tests in general accordance with BRE Digest 365 within each trial pit.
- Installation of groundwater monitoring standpipes at depth with the Chalk in the cable percussion boreholes. The screened section and filter pack of each of these standpipes was solely within the Chalk and sealed from the overlying Made Ground using bentonite.
- Installation of ground gas monitoring wells within each of the cable percussion boreholes and within one window sample borehole to facilitate the installation of continuous ground gas monitoring probes.
- On site logging and sampling augmented by screening of recovered soils for Volatile Organic Compounds (VOCs) using a Photo-Ionisation Detector (PID) calibrated to 100ppm isobutylene. The PID results would be used to augment organoleptic evidence of possible organic contamination, e.g. solvents and fuel/oil type hydrocarbons. This would be used to inform the sampling strategy and selection of samples for laboratory analysis.
- Continuous ground gas monitoring using GasClams® within two wells installed in to the deep Made Ground and a third installed into shallow Made Ground. The GasClams were programmed to take measurements of gas concentrations and other pertinent data at hourly intervals over a four week period.

- Spot monitoring of the remaining wells installed during previous investigations at weekly intervals over approximately one month.
- Geotechnical laboratory testing on soil samples recovered from the exploratory holes to support the geotechnical assessment. Whilst clay rich Made Ground had been encountered during the previous investigation, given the inherent variability of Made Ground, it was considered that tests to determine volume change potential could be unrepresentative of clayey Made Ground away from the test positions and thus an assumed High Volume Change Potential was assumed for all clay Made Ground.
- Geochemical laboratory testing on selected soils to support the soil contamination assessment, controlled waters assessment and classification of possible surplus soils as waste. The analytical suite accounted for the known previous land uses, presence of Made Ground and observations made during the intrusive investigation. Samples were selected to provide general coverage of the site, as well as targeting former uses of specific areas, e.g. the former coal yard and also targeting of proposed garden areas.
- Provision of a Supplementary Ground Investigation Report.

3.5 Investigation Strategy

As stated above, the exploratory holes were positioned to target specific former land uses, such as the former coal yard, to clarify the presence and geometry of buried quarry bench steps, provide greater coverage of the site and to target proposed gardens. Table 3.7 sets out the general strategy adopted for the supplementary investigation. This takes account of the findings of the previous investigations, Local Authority comments and discussion with the Client and their Consultant Team.

Area of Concern	Investigation	Positions
General ground conditions	Exploratory holes located across the site, coupled with sampling and laboratory analysis.	All positions
Deep Made Ground (including pile design)	Boreholes constructed in the area of deepest quarrying as anticipated from historic mapping.	BH101 to BH103
Buried quarry bench steps	Window sampling and dynamic probing along transects to clarify the position and geometry of any buried former quarry bench steps.	WS4, WS102, WS103, WS105, WS108, WS112 to WS114, WS119 to WS140, DP101 to DP104
Former Coal Yard	Window sampling to provide coverage of the former coal yard and tie in with proposed gardens, coupled with sampling and laboratory analysis.	WS1, WS3, WS9, WS101, WS102, WS103, WS104, WS106, WS107, WS108, WS110, WS141, WS142, WS144, WS145, WS148, WS149, WS150, WS151, WS152, WS156, TP1
Former Works	Window sampling to provide coverage of the former Works and tie in with proposed gardens, coupled with sampling and laboratory analysis.	WS134, WS135, TP3
Former DIY Store	Window sampling to provide coverage and tie in with proposed gardens, coupled with sampling and laboratory analysis.	WS117, WS118, WS126 to WS140

Former Bowling Alley	Window sampling to provide coverage and tie in with proposed gardens, coupled with sampling and laboratory analysis.	WS9, WS10, WS141 to WS156
Car park areas	Window sampling to provide coverage and tie in with proposed gardens, coupled with sampling and laboratory analysis.	WS1 to WS8, WS10, WS101 to WS125, WS156, TP1, TP2, TP3, BH101, BH102
Ground gas regime	Installation of monitoring wells and continuous gas monitoring	BH101, BH102 and WS122
	Spot monitoring from existing wells	WS1, WS8, WS10, WSA to WSD and BH103
Groundwater monitoring wells (sealed from Made Ground)	Boreholes constructed through the area of deepest Made Ground and separate monitoring wells installed at shallow depth in the Made Ground and underlying Chalk, i.e. dual installations in each borehole.	BH101 to BH103
Potential hydrocarbon type vapours	Screening of recovered soils with a PID.	All positions.
Proposed soakaway positions	Trial pitting and soakage testing.	TP1 to TP5

Table 3.7 Summary of the supplementary investigation strategy

Soil samples were collected and placed into amber jars and cool boxes on site for transit to the office, where they were stored under chilled conditions (<4°C) prior to final transportation in cool boxes to the laboratory by their in-house courier. Both the geotechnical and contamination testing were undertaken by UKAS accredited laboratories. Contamination testing of soil samples was also undertaken in accordance with accredited MCERTs protocols. Samples were stored in temperature controlled conditions from sampling until receipt at the laboratory from which time sample preparation and storage was determined by testing requirements and in line with laboratory's protocols.

4.0 ENCOUNTERED CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections.

For further details of the ground conditions, reference should be made to the exploratory hole logs presented in Appendix A, ground model sections in Appendix B, the geotechnical testing results in Appendix C, geochemical testing results in Appendix D, statistical assessment of contamination data in Appendix E and the gas monitoring results in Appendix F.

The physical ground investigation works were undertaken between 24th February and 8th April 2014.

Unless stated otherwise, all depths are reported as metres below ground level (m bgl).

4.1 Soils

The ground conditions encountered were broadly consistent with those anticipated from the desk study, i.e. with a highly variable thickness of Made Ground over Chalk. The ground conditions are summarised in Table 4.1.

Top (m bgl)	Base (m bgl)	Description
0	0.1 - 9.0	MADE GROUND: Reinforced concrete; tarmac; crushed limestone gravel; brown sand and flint gravel; black ash; off-white chalk with varying proportions of brick, concrete, ash/clinker and flint; brown and grey sandy clay, silt and silty clay with varying proportions of gravel sized flint, concrete, brick and rare inclusions of metal, plastic and timber.
0.1 – 9.0	20+	CHALK: White structureless CHALK; White moderately strong slightly weathered to fresh CHALK with closely spaced, clean and tight joints and occasional flint nodules. CIRIA Grades Dm/Dc and B/C.

Table 17 Summary of Ground Conditions

Screening the recovered soils did not identify the presence of any VOCs, i.e. all PID results were 0.0ppm (parts per million).

Whilst in general no organoleptic or site screening evidence of contamination was noted, the recovered soils were sampled for analysis as many contaminants cannot readily be detected on site.

The Made Ground soils in WS112 were observed to exhibit a hydrocarbon type odour, although VOCs were not detected by the PID (i.e. 0.0ppm). Samples were selected for laboratory analysis from the depth range where the odour was detected.

Whilst numerous exploratory holes were constructed through the area of the former coal yard, no evidence of coal or coal dust was observed within any of these exploratory holes. Thus, testing for calorific values was considered unwarranted.

The investigation to identify the presence, location and approximate geometry of the buried quarry bench steps was able to locate the bench steps to within a few metres, i.e. sufficient to identify impact on proposed buildings. The buried bench step locations correlated reasonably well with historic mapping, as summarised in Figure 4. The ground model sections presented in Appendix B give an indication of the variation in depth of Made Ground across the site. This is considered further in Section 5 of this report.

For more detailed descriptions at specific locations, reference should be made to the exploratory hole logs presented in Appendix A and the ground model sections presented in Appendix B.

4.2 Groundwater

Groundwater strikes were recorded in boreholes BH101 and BH102 during drilling. However, groundwater was not present in any wells during subsequent monitoring. Groundwater records from return monitoring are presented in Table 4.2.

Borehole	Strike Depth (m bgl)	Standing Depth (m bgl)	Comment
BH101	11.0	11.0	Standing at 20 minutes
	-	Dry	All subsequent monitoring/sampling visits.
BH102	10.0	10.0	Standing at 20 minutes
	-	Dry	All subsequent monitoring/sampling visits.

Table 18 Summary of Groundwater Records

Whilst water could be present within the Made Ground, this would be considered to be perched water and a discontinuous water body.

The groundwater monitoring indicates the presence of an unsaturated zone at least 20m deep.

Whilst it has not been possible to triangulate groundwater levels and thus determine groundwater flow, it is anticipated that local groundwater flow is influenced by the public supply abstractions c. 0.7-1.2km to the east and thus flow would be anticipated to be towards the abstraction point(s).

It should also be noted that changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed within appropriate response zones.

4.3 Obstructions

Obstructions were encountered during the fieldwork and included buried concrete, gravel and brick within the Made Ground and a combination of flint and hard (estimated to be at least moderately strong) chalk bands in the underlying Chalk. The presence of obstructions within the Made Ground and underlying Chalk should be anticipated and allowance made for ground works, foundation construction and the like.

4.4 Ground Gases and Vapours

Ground gas monitoring was undertaken as part of the supplementary investigation. The monitoring included the installation of in well continuous gas sampler/loggers (GasClams) within BH101, BH102 and WS122, these being selected to provide coverage of the deep Made Ground and the latter outside of the deep Made Ground. In addition, existing wells were spot monitored on a weekly basis for approximately one month. Current best practice is based on continuous ground gas monitoring and thus the spot monitoring was undertaken to supplement the data and assessment thereof.

The spot monitoring undertaken to date detected methane up to 0.1%, carbon dioxide at concentrations in the range 0.0-2.3% and oxygen in the range 16.5-21.9%. Flows were detected in the range -0.5l/hr to +0.2l/hr. Whilst VOCs were detected, this was only up to a concentration of 3.5ppm (parts per million). The spot monitoring included a period of low atmospheric pressure (995mb on 03/04/2014).

The continuous monitoring was undertaken using a Gasclam in-well probe to take a measurement at one hour intervals over a period of four weeks. This enabled the recovery of gas concentrations and related data over an extended period of changing atmospheric conditions.

The key data obtained from continuous monitoring are summarised in Table 4.3.

Well	Methane (%)	Carbon Dioxide (%)	Carbon Monoxide (ppm)	Oxygen (%)	Borehole Pressure (mb)	Atmospheric Pressure (mb)	Hydrogen Sulphide (ppm)	VOC (ppm)
BH101	0.0	0.0-3.29	0.0-1.0	1.4-20.9	993-1025	993-1025	1.0	0.0-1.0
BH102	0.0	0.0-1.3	0.0-9.0	16.5-21.0	996-1028	997-1029	0.0	0.0
WS122	0.0	0.03-0.55	0.0-2.0	16.5-21.6	985-1026	990-1025	0.0	0.0-2.0

Table 4.3 Summary of gas data from continuous monitoring

Fluctuations in atmospheric and borehole pressures can result in significant variances in the gas concentrations detected. Current best practice looks wherever possible not only to target low pressure, i.e. <1000mb, but also periods of rapidly falling pressure as this can also facilitate the release of key hazardous gases. As stated above, the pressure trend over the monitoring period was variable. The monitoring period included several rapid falls, i.e. at least 10mb fall in a 24 hour period. With reference to the data from BH101, these rapid falls occurred on 20th March, 21st March, 24th March and 2ⁿ April. Other falls in pressure did occur but not to the same magnitude. Thus the monitoring period included atmospheric conditions which best practice indicates should be targeted.

Plots of key gas concentrations over time from the continuous monitoring data are presented in Figures 8, 9 and 10 for BH101, BH102 and WS122 respectively. These plots show that under some atmospheric conditions, the concentration of carbon dioxide would increase. However, this was not always evident with concentrations at other times generally stable or lower scale fluctuation in response to changing atmospheric pressure. On several occasions, oxygen concentrations rose and fell with pressure trends. The lowest oxygen concentrations were generally associated with sharp falls in pressure and/or very low atmospheric pressure and also with a corresponding higher concentration of carbon dioxide.

The results from the continuous gas monitoring appeared to indicate that hazardous gas concentrations are sensitive to atmospheric pressure, with possible pressure pumping occurring such that gas concentrations appear to pulse in the ground.

The implications of the gas monitoring data are considered in Section 6 of this report.

4.5 Chemical Analysis

In order to assess the general chemical quality of the strata encountered, samples of soils recovered from the exploratory holes were submitted for analysis for a range of potential contaminants selected on the basis of the findings of the desk study and supported by CLR publication CLR8 and Environment Agency R&D66 publication.

The testing rationale included sampling and analysis to provide a general coverage of the subject site. Testing was undertaken for a broad range of commonly occurring contaminants including metals, metalloids, inorganic compounds, speciated TPH, PAH and asbestos. The suite also reflected the key potential contaminants identified within DoE Industry Profiles for the types of land uses identified from the desk study.

4.6 Geotechnical Testing

In-situ probing was undertaken using a Mexecon CBR penetrometer to estimate CBR values for possible pavement design. Measured CBR values were typically less than 2% for the near surface soils, i.e. Made Ground.

Trial pit soakage tests were undertaken in general accordance with BRE Digest 365 at five locations

where soakaways are proposed to be constructed as part of the development. Permeabilities of $7.0 \times 10^{-4} \text{ m/s}$ to and $6.4 \times 10^{-6} \text{ m/s}$ were derived from the tests undertaken in TP1, TP2, TP3 and TP5. Whilst the test undertaken in TP4 was within Chalk, the water level did not fall sufficiently to enable a permeability to be estimated. The Chalk encountered within TP4 was a 'hard band' with fewer and tighter joints and fractures than the Chalk encountered within other pits and this was considered to be the likely reason why the soakage tests was unsuccessful at this location. Test results are presented in Appendix A.

Super heavy dynamic probing was undertaken at four locations, DP101 to DP104, the purpose of the probing was to augment other investigation data in determining the likely depth and extent of the deep Made Ground. Probe results are presented in Appendix A and have been incorporated within the foundation assessment presented in Section 5 of this report.

Standard Penetration Tests (SPTs) were undertaken at regular intervals within BH101 to BH103. The test results are presented on the respective borehole logs in Appendix A and have been incorporated in to the foundation assessment presented in Section 5 of this report. The SPT N values in the Made Ground were variable. Several of the SPTs in the Chalk terminated in hard chalk bands or flint seams. No trend in SPT N value with depth was discernible from the test data.

Given the inherent variability of Made Ground, geotechnical laboratory testing was not undertaken to determine the volume change potential of clayey Made Ground soils. Whilst the sources of the clayey Made Ground cannot be identified, many of the local strata are of high volume change potential and thus, it was considered prudent to assume this classification for all clayey Made Ground on the subject site.

Water soluble sulphate and pH determinations were undertaken on samples of Made Ground and Chalk recovered from the exploratory holes. The results indicate pH values of between pH7.3 and pH10.6 and water soluble sulphate concentrations ranging from $<0.01 \text{ g/l}$ to 1.49 g/l . In line with the guidance set out in BRE Special Digest 1, the design sulphate classification should account for the mean sulphate concentration of the top 20% of test results. This mean value for the analytical dataset is 0.35 g/l . Test results are presented in Appendix C (geotechnical testing) and Appendix D (geochemical testing).

5.0 ENGINEERING CONSIDERATIONS

Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

5.1 Foundations

As stated in Section 4, the ground conditions comprised a variable thickness of Made Ground overlying Chalk. The Chalk was effectively the floor of the former quarry and comprised a thin mantle of structureless, disturbed Chalk underlain by fresh, jointed chalk rock mass.

Given the variation in the depth to the Chalk, it was considered that conventional foundations would only be suitable for specific areas of the site. Thus, where Chalk was encountered within approximately 2.5m of ground level, it was considered that conventional foundations could be constructed to terminate in the Chalk. An allowance for steps in the base of foundation excavations are likely to be required on some plots, i.e. where the depth to the Chalk increases along a given foundation run. Where such steps are incorporated they should not exceed 0.5m for any given single change in depth (ideally be at 0.25m depth intervals) and should be offset at least 1m from any corner or foundation junction/node. An allowance should also be made for the inclusion of light mesh reinforcement where multiple steps are required due to the variability in depth to the Chalk.

In addition, it should be noted that the chalk quarry was excavated using bench steps in the quarry faces, as evident in the exposed sections at the time of the investigation. The supplementary investigation has demonstrated that further bench steps were located beneath the Made Ground. As such, plots located over or close to a bench step could be susceptible to excessive differential settlement or catastrophic foundation failure. Therefore, a deep foundation solution, e.g. piled foundations, would be required for these plots, as with those located over deep Made Ground.

On the basis of the ground conditions encountered, the foundation recommendations are summarised in Table 5.1 and presented in Figure 11.

Plot	Foundation Solution	Likely depth of conventional Foundation (m bgl)
1-3	Piled	-
4-8	Strip/trench fill	1.0-2.5
9-10	Strip/trench fill	1.0-2.5
11-16	Piled	-
17-21	Strip/trench fill	0.5-2.0
22-25	Strip/trench fill	0.5-1.5
26-29	Strip/trench fill	1.0-2.0
30-36	Strip/trench fill	1.0-2.0
37-38	Strip/trench fill	1.5-2.5
39-45	Piled	-
46-49	Strip/trench fill	2.0-2.5
50-61	Strip/trench fill	1.5-2.0
62-71	Strip/trench fill	1.0-1.5
72-78	Strip/trench fill	2.0-2.5
79-83	Strip/trench fill	1.0
84-86	Strip/trench fill	1.0-1.5

Table 5.1 Summary of foundation recommendations

The foundation summary presented in Table 5.1 does not account for the presence of existing soakaway chambers within the car park area of the existing site layout. It is recommended that the potential impact of existing soakaways on foundation construction depths is assessed as soon as the relevant information is made available.

In addition, it is possible that deep excavations in the Made Ground could become prone to instability during construction. As such, there may be some commercial benefit, e.g. in terms of reduced risk of overspend and programme delay, if piled foundations were constructed for plots other than those identified in Table 5.1.

As stated in Section 4, Made Ground is inherently variable and thus given the general clayey nature of the Made Ground encountered on this site, it is recommended that the high volume change potential is assumed. Thus, inclusion of compressible media and other foundation controls as set out in NHBC Standards should be incorporated where applicable. The underlying Chalk was considered to be non-shrinkable.

On the basis of the information gathered by the ground investigation and assuming conventional foundations, a net allowable bearing capacity of 200kPa is recommended for the fresh to slightly weathered Chalk present beneath the Made Ground. For the allowable bearing capacity given, total settlement should remain within tolerable limits. Foundations should terminate wholly within the Chalk and should penetrate in to the Chalk by at least 0.3m.

Foundation excavations should be concreted or blinded as soon after excavation as possible. Where concreting could take place the following day it is recommended that excavations are not taken to full depth overnight and that the final 0.5m of cover is only removed immediately prior to concreting.

5.2 Piled Foundations

Preliminary working loads have been calculated for nominal 300mm diameter CFA piles based on the ground conditions encountered at BH102, i.e. in the area of the deepest Made Ground, and are summarised in Table 5.2. The design should be used for preliminary purposes only as the actual working load is dependent on the type of pile and method of installation. Piles should be taken at least five times the pile diameter into the founding stratum.

Pile length (m)	Diameter (mm)	Safe Working Load (kN)
12	300	160
14		210
16		350

Table 5.2 Preliminary Pile Working Loads for CFA piles (based on BH102)

It should be noted that the 12m pile was shown to result in overstressing of the strata immediately below the pile toe and thus greater penetration would be required. In addition, the overburden pressure for this case exceeded 150kPa and under these circumstances CIRIA guidance recommends that pile testing is undertaken to establish skin friction.

The construction of a piled foundation is a specialist job and the advice of a reputable contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design. The actual working load for proposed piles will depend on the particular type of pile and method of installation adopted.

These working loads have been calculated on the basis of the ground and groundwater conditions encountered within the boreholes and assume the following parameters:

- The contribution to the working load through the Made Ground has been ignored.
- For the calculation of Safe Working Load, a factor of safety of 3 was used on the skin friction and 5 on end bearing loads.
- No account has been taken of any additional loadings on the pile due to soil desiccation, heave, settlement of Made Ground or the like.

Settlement of single piles is generally assumed to be less than 10mm where pile diameters do not exceed 600mm. For piles of larger diameter, settlement can become a critical factor.

The bearing values given are applicable to single vertically loaded piles. BRE Research indicates that where groups of piles are to be constructed at 2 * pile diameter centre to centre spacing or less, the bearing value of each individual pile should be reduced by a factor of 0.8 and a calculation made to check for the factor of safety against block failure.

The piling contractor should be aware that groundwater ingresses occurred within the Chalk in the deeper boreholes and that casing was required which could have masked other groundwater inflows. Additionally, the piling contractor should be made aware of the potential presence of obstructions, both within Made Ground and Chalk, within the construction depth zone, which could require chiselling to advance the pile to the required depth.

Given the presence of deep Made Ground partially infilling a former chalk quarry, the underlying aquifer status and site's location within Zone 1 of a groundwater abstraction source protection zone, it will be necessary to consult with and gain approval from the Environment Agency with regards to the selection and use of piled foundations on this site. At this stage, it is considered that continuous flight auger (CFA) piles are likely to be acceptable due to the short construction time, the pile bore being full of arisings or concrete at all times during construction and concrete being pumped into the bore under pressure from the base up thereby closing any potential migration pathways between Made Ground and the aquifer beneath the site.

The piling contractor should ensure that the piles are constructed satisfactorily and that necking or other damage to the pile shaft does not arise during construction.

5.3 Floor Slabs

Given the variable thickness and composition of Made Ground, it is recommended that a suspended ground floor slab is used.

5.4 Excavations

Shallow excavations on level ground should remain stable in the short term assuming an absence of water ingress, although may require battering to a safe angle if open in the medium to long term. It is anticipated that all excavations would become unstable where water ingress occurs without measures to control water and support excavation faces. In addition, deep excavations within the Made Ground are likely to become unstable. As such excavations in Made Ground should be kept to as short a distance as possible to avoid stability issues and associated collapse. An allowance for overdig should also be made.

Ground works should be designed in such a manner to avoid man entry into excavations.

5.5 Pavements

In-situ CBR tests were undertaken using a Mexecone adjacent to investigation locations. As stated in Section 4.6, the CBR value measured at shallow depth was typically less than 2%. The lower bound CBR value of 2% is recommended for the Made Ground soils encountered.

In addition, the Made Ground soils and Chalk present at shallow depth are considered to be frost susceptible and as such, a minimum pavement thickness of 450mm is recommended.

Any hard or soft spots in the formation level may induce reflective cracking in the pavement and allowance should be made for removing hard spots that may be present. In addition, an allowance

should be made for proof rolling, coupled with excavation and replacement of soft spots or other unsuitable materials such as organic material exposed at formation level.

5.6 Sub-Surface Concrete

The results of the water soluble sulphate and pH analyses indicate that buried concrete should be designed in accordance with Class DS-1 of BRE Special Digest 1, with an ACEC class of AC-1. This is based on the mean concentration of the top 20% of sulphate concentrations from testing. The advice of this publication should be taken for the design and specification of all sub surface concrete.

5.7 Soakaways

Falling head permeability tests were undertaken within boreholes during the previous phase of investigation but were unsuccessful in determining a permeability. As stated above, trial pit soakage tests have been undertaken as part of the supplementary investigation. Tests were undertaken at five locations where soakaways are proposed within the new development. With the exception of the test in TP4 where water levels did not fall, each test was completed and permeabilities in the range $7.0 \times 10^{-4} \text{m/s}$ to $6.4 \times 10^{-6} \text{m/s}$ were derived from the test results.

On the basis of the testing undertaken to date, it is considered that conventional soakaways are unlikely to perform satisfactorily in achieving a 50% volume discharge within any given 24 hour period and that storage and peak flow attenuation would thus be required.

Under no circumstances should soakaways be permitted to discharge in to Made Ground as this can result in inundation collapse settlement and catastrophic loss of ground. In addition, it is understood that give the sensitivity of the eastern portion of the site, i.e. being within Zone 1 of a groundwater Source Protection Zone, that no soakaways will be permitted within the eastern portion of the site.

6.0 ENVIRONMENTAL CONSIDERATIONS

A Generic Quantitative Risk Assessment (GQRA) incorporating the results of the desk study and both phases of ground investigation was undertaken, the findings of which are presented in the following sections.

As stated in Section 3, site workers involved in the preparation and construction of the development have not been considered further in this assessment as the Principal Contractor is duty bound under the current CDM Regulations to undertake their own risk assessments with respect to their employees.

6.1 Outline Risk Assessment

A number of plausible pollutant linkages were identified through the preliminary risk assessment (PRA) process. The investigation did not encounter conditions that warranted a revision of the preliminary Conceptual Site Model but did clarify several aspects of the PRA.

6.2 Ground Gases vs. End Users

The site was located within a former chalk quarry and the intrusive investigation confirmed the presence of areas of deep Made Ground, which were generally of a clay composition with subordinate inclusions of brick, concrete and the like. No readily putrescible matter was identified within the Made Ground.

The ground gas assessment has utilised data gathered from a combination of spot monitoring and continuous ground gas monitoring and under conditions which accord with best practice guidance.

On the basis of the gas monitoring undertaken, the site's gassing regime has been classified, from the monitoring data, as being Characteristic Situation 1 in accordance with CIRIA C665 and Green in accordance with the NHBC's Traffic Light system.

On-site screening of soils and monitoring of well vapours has not identified the presence of gross concentrations of VOCs which would warrant the incorporation of vapour protection measures.

It is therefore concluded that ground gas protection measures are not required within the proposed development on this site.

6.3 Ground Gases vs. Soft Landscaping

In the absence of any source of hazardous ground gas, it is considered that no specific action is warranted in this respect.

6.4 Ground Gases vs. Adjacent Land Users

In the absence of any source of hazardous ground gas, it is considered that no specific action is warranted in this respect.

6.5 Soil Contamination vs. End Users

The presence of a possible contaminant does not necessarily imply that a site or area is contaminated or that there is any unacceptable risk to human health. A Preliminary Quantitative Risk Assessment has been undertaken in order to evaluate any unacceptable risks posed to human health with respect to the proposed redevelopment. It should be noted that this assessment is protective of the chronic long-term effects of contaminants, which is also likely to be protective of any possible immediate acute effects.

Site Specific Assessment Criteria (SSAC) have been derived using CLEA v1.06 and augmented by reference to the respective Soil Guideline Values (SGVs), Generic Assessment Criteria (GAC) published (LQM 2009) and GAC published by CL:AIRE (2010). The respective SSAC have been derived based on site specific data for soil pH and Soil Organic Matter (SOM) was estimated from Total Organic Carbon content as reported for each individual sample.

In the case of Lead, the former SGV of 450mg/kg was withdrawn and no replacement value published. This has resulted in numerous possible GAC being proposed, several of which are in the range 200-350mg/kg. The assessment has assumed a conservative GAC of 200mg/kg for Lead.

The exploratory holes were located to provide general coverage of the site but also to target specific former land uses and proposed garden areas. As such, the analytical results have been compared by a statistical assessment process and also individually against the respective SSAC.

In addition to comparison of statistical and individual data against SSAC, asbestos screening was also undertaken. In this case, the assessment process has been based on whether asbestos was present or not. Whilst it may be possible to undertake additional testing to consider this in greater detail, it is anticipated that the outcome and remedial action required would remain similar and thus is not warranted.

The assumptions made as part of the CLEA V1.06 calculations for a residential end use with plant uptake are presented in Table 6.1. Copies of the CLEA calculations are enclosed in Appendix E.

	Assumptions			Comments
Land Use	Residential with home grown produce			Commensurate with proposed redevelopment.
Receptor	Female (res)			A conservative assumption using the most sensitive possible receptor.
Receptor Age	1 to 6			Critical receptor age from birth to age 6.
Building	Detached House			A conservative assumption of the private residence proposed.
Soil Type	Sandy clay loam	pH 8.0	SOM 3.84%	Based on an average of the chemical laboratory results.
Exposure Pathways	Oral	Direct soil & dust ingestion; consumption of home grown produce; soil attached to home grown produce		Default setting for land use.
	Dermal	Indoor & outdoor		Default setting for land use.
	Inhalation	Indoor & outdoor dust & vapour		Default setting for land use.
Occupancy	days/year	hours/day (indoors)	hour/day (outdoors)	Default settings for the critical receptor.
	180 - 365	19 - 23	1	

Table 6.1 Assumptions for SSAC Calculation (CLEA v1.06 Software) – Private Gardens

Statistical analysis of the samples within the dataset was undertaken in accordance with guidance contained in the CIEH/CL:AIRE report '*Comparing Soil Contamination Data with a Critical Concentration*' (May 2008). If the contamination status of the soils is considered in a planning context, the null hypothesis tested by the analysis is whether the true mean concentration is equal to or greater than the critical concentration for a given determinand, with the critical concentration being the relevant SSAC or GAC (the soil screening value) for that determinand in the context of the intended end use of the site. If the analysis shows that the true mean concentration is less than the critical concentration the null hypothesis can be rejected. The guidance recommends that for the null hypothesis to be rejected the analysis should show that there is a 95% (or higher) likelihood that the true mean concentration is below

the critical concentration. Where this is the case the site is considered to be acceptable for the planned end use without any necessary remedial measures. The statistical analysis summary sheets are included in Appendix E and the outcomes are summarised in Table 6.2.

Determinant	SSAC (mg/kg)	Sample Mean (mg/kg)	Upper Confidence Limit (mg/kg)	Evidence Level (%)	Reject null hypothesis?
Arsenic	32.4	6.14	8.87	100	Yes
Cadmium	5.17	0.85	1.33	100	Yes
Chromium	3010	13.2	17.9	100	Yes
Lead	200	71.5	133.4	99	Yes
Mercury	169	0.26	0.32	100	Yes
Nickel	127	10.4	14.1	100	Yes
Copper	3200	53.7	122.5	100	Yes
Zinc	19400	117.4	200.8	100	Yes
Selenium	350	0.38	0.48	100	Yes
Chromium VI	489	1.00	1.00	100	Yes
Boron	291	0.97	1.24	100	Yes
Barium	1330	109.6	157.2	100	Yes
Beryllium	148	0.55	0.70	100	Yes
Vanadium	118	19.25	27.00	100	Yes
Naphthalene	3.7	0.13	0.25	100	Yes
Acenaphthylene	584	0.10	0.17	100	Yes
Acenaphthene	703	0.14	0.35	100	Yes
Fluorene	545	0.14	0.35	100	Yes
Phenanthrene	278	0.79	2.14	100	Yes
Anthracene	6820	0.26	0.68	100	Yes
Fluoranthene	570	1.31	3.36	100	Yes
Pyrene	1300	1.13	2.93	100	Yes
Benz(a)anthracene	5.25	0.78	1.99	100	Yes
Chrysene	8.72	0.86	2.06	100	Yes
Benzo(b)fluoranthene	6.81	0.78	1.79	100	Yes
Benzo(k)fluoranthene	9.83	0.81	1.82	100	Yes
Benzo(a)pyrene	0.97	0.80	1.99	30	No (See Table 6.3)
Benzo(a)pyrene (outliers removed)	0.97	0.20	0.33	100	Yes (See Table 6.3)
Indeno(123-cd)pyrene	4.04	0.71	1.58	100	Yes
Dibenz(ah)anthracene	0.88	0.21	0.43	99	Yes
Benzo(ghi)perylene	46.4	0.73	1.58	100	Yes

Table 6.2 Summary of Statistical Analysis of Chemical Test Results

Whilst the statistical analysis revealed a few statistical outliers, the majority were below the respective SSAC and thus the majority of the outliers were significantly below the SSAC. Thus, in general, the statistical analysis showed that the null hypothesis could be rejected with >95% confidence in most cases.

The exception to this was for where the statistical assessment identified several statistical outliers for Benzo(a)pyrene where reported concentrations exceeded the critical concentration (SSAC of 0.97mg/kg) and skewed the mean value concentration. In these cases the exceedances were considered to represent localised areas of contamination and were removed from the dataset. Copies of the statistical assessment output are presented in Appendix E. The Benzo(a)pyrene exceedances are summarised in Table 6.3.

Location	Depth (m bgl)	Concentration (mg/kg)
WS6	0.7	2.6
WS9	0.2	1.4
WS9	1.0	16.1
WS112	1.0	7.9
WS112	3.0	2.4
WS126	1.0	4.2
WS130	1.0	1.1
WS137	0.7	2.0
WS145	0.4-0.7	4.3

Table 6.3 Benzo(a)pyrene exceedances identified from statistical assessment

Assessment of the data individually, i.e. due to adopting a targeted assessment approach, also identified several exceedances against the SSAC derived. These are summarised in Table 6.4.

Location	Depth (m bgl)	Contaminant	SSAC (mg/kg)	Reported Concentration (mg/kg)
WS6	0.7	Lead	200	336
		Benzo(a)pyrene	0.97	2.6
		Dibenz(ah)anthracene	0.88	1.0
WS9	0.2	Benzo(a)pyrene	0.97	1.4
WS9	1.0	Benz(a)anthracene	5.25	16.2
		Chrysene	8.72	15.8
		Benzo(b)fluoranthene	6.81	13.7
		Benzo(k)fluoranthene	9.83	13.5
		Benzo(a)pyrene	0.97	16.1
		Indeno(123-cd)pyrene	4.04	11.6
		Dibenz(ah)anthracene	0.88	2.8
WS112	1.0	Benz(a)anthracene	5.25	8.3
		Benzo(a)pyrene	0.97	7.9
		Indeno(123-cd)pyrene	4.04	5.2
		Dibenz(ah)anthracene	0.88	1.2
WS112	3.0	Lead	200	208
		Benzo(a)pyrene	0.97	2.4
WS113	1.0	Lead	200	554
WS117	0.5	Chrysotile (white asbestos)	-	-
WS126	1.0	Benzo(a)pyrene	0.97	4.2
		Dibenz(ah)anthracene	0.88	1.0
WS129	1.0	Chrysotile (white asbestos)	-	-
WS130	1.0	Benzo(a)pyrene	0.97	1.1
		Chrysotile (white asbestos)	-	-
WS134	1.0	Lead	200	226
WS137	0.7	Benzo(a)pyrene	0.97	2.0
WS140	0.5-0.7	Amosite (brown asbestos)	-	-
WS145	0.4-0.7	Benzo(a)pyrene	0.97	4.3
		Dibenz(ah)anthracene	0.88	0.9
WS153	0.9	Lead	200	718

Table 6.4 Summary of individual exceedances

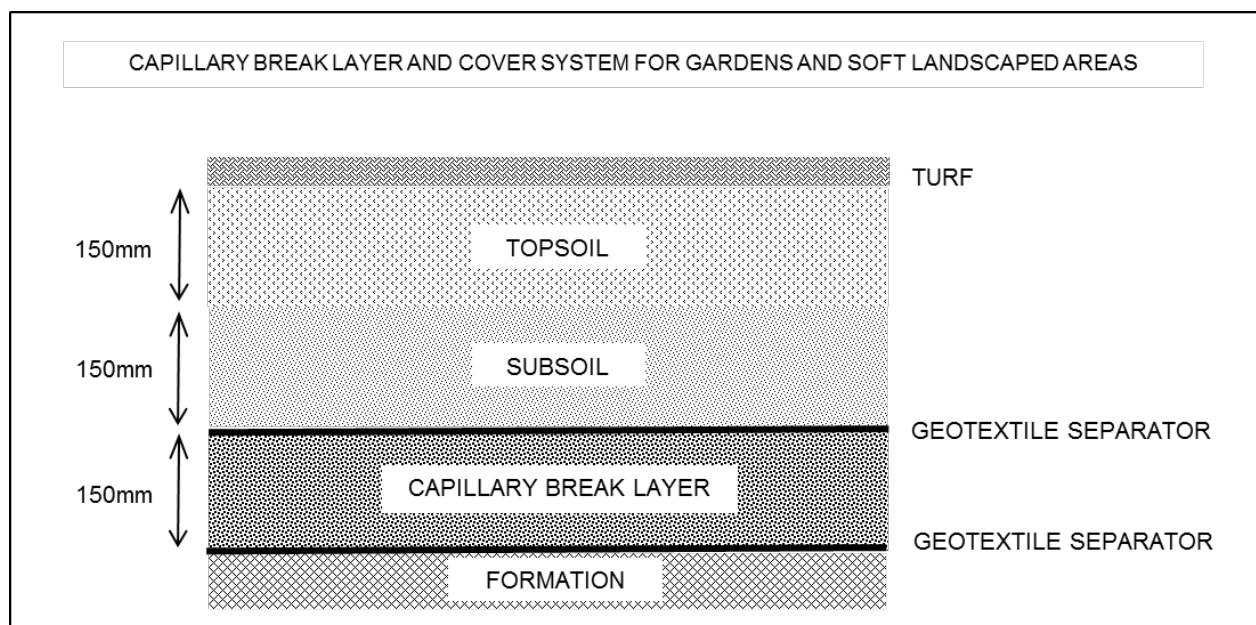
Given the findings of the soil contamination assessment, it is considered that risk mitigation measures will be required to protect human health. Whilst this could possibly be achieved by

undertaking action on individual plots, this could lead to onerous site controls and an increased potential for failing to achieve the remedial objectives. As such, it is recommended that remedial measures are adopted for specific groups of gardens/areas of the site.

The contamination assessment has not identified any exceedances within the overall footprints to Plots 1 to 16 or Plots 84-86. As such, it is recommended that the gardens to these plots are completed by placing imported subsoil and topsoil to a minimum thickness of 150mm for each soil type (i.e. minimum overall cover thickness of 300mm).

In the remaining gardens, i.e. Plots 17-46 and the amenity soft landscaping for Plots 50-83, the following engineered cover system is recommended:

- Removal of hardstanding for off-site disposal or crushing (concrete) to reveal the top of the Made Ground;
- Lay a basal geotextile separator to prevent cover system mixing with Made Ground;
- Place 0.15m thick layer of crushed concrete to act as a capillary break layer and physical dig barrier;
- Lay a second geotextile separator over the crushed concrete to prevent infiltration by subsoil;
- Place subsoil (certified uncontaminated subsoil only) to a minimum thickness of 0.15m;
- Finish to ground level with certified uncontaminated (chemically and physically) Topsoil with a minimum thickness of 0.15m.



In the event that Chalk is encountered directly beneath the current hardcover, then placement of a clean soil cover solution (as described for Plots 1-16 and 84-86) would be considered appropriate.

Figure 12 shows the gardens and soft landscaping where the above measures should be applied.

Where a working platform is required, e.g. for piling, this could be retained to form the capillary break layer.

Where the end use comprises permanent hard cover, e.g. roads, parking and houses, this hard cover would serve to block exposure pathways and thus break the potential pollutant linkages. As such no further action would be required in hard landscaped areas.

Given the absence of Topsoil and subsoil on the site, it will be necessary to import Topsoil and subsoil on to the development. Prior to importation, the chemical, physical and nutritional suitability of all Topsoil and subsoil should be verified. Importation of topsoil or subsoil from unverified or unsuitable sources would require their removal from site and replacement with suitable materials. All topsoil and subsoil to be placed in gardens and soft landscaping must be able to support plant life. Materials such as aggregate are not suitable for use either as Topsoil or subsoil. As a matter of good practice, it is recommended that the location, approximate extent and thickness of any imported subsoil and/or topsoil are recorded and presented in the Validation/Verification Report to be prepared by the Environmental Consultant. A copy of the recommended specification for imported subsoil and topsoil is provided in Appendix G.

6.6 Soil Contamination vs. Soft Landscaping

British Standard BS3882:2007 *Specification for topsoil and requirements for use* provides assessment criteria for a number of potentially phytotoxic contaminants in terms of new planting.

The results of the chemical analysis for determinants known to pose a potential phytotoxic risk to plant growth are summarised in Table 6.5, together with the respective adopted Generic Assessment Criteria (GAC) for plant growth. The compliance criteria set out in BS3882:2007 are pH dependent and thus the GAC used relate to the pH range measured on samples recovered from the site.

Determinant	Phytotoxicity GAC (mg/kg) for pH>7	GAC Exceedances
Zinc	<200	Yes
Copper	<135	Yes
Nickel	<75	No

Table 6.5 Summary of Plant Phytotoxicity Assessment

The phytotoxicity assessment indicated the presence of sporadic exceedances of the respective GAC for Zinc and Copper. As such, it is considered that the remediation recommendations set out in Section 6.5 would also be protective of plants.

Depending on the planting scheme it may be necessary to construct tree pits backfilled with suitable imported subsoil/topsoil.

6.7 Soil Contamination vs. Built Environment

Recommendations with respect to pH and sulphate in relation to buried concrete are made in Section 5.6.

Given the ground conditions encountered on site, it is recommended that barrier pipe is used for potable water supply. However, the utility company should be consulted in order to confirm their specific requirements in this respect. As a matter of good practice and to maximise the protection to maintenance workers, it is recommended that clean, granular backfill is used in service runs and that marker tapes are used for all buried services.

6.8 Soil Contamination vs. Adjacent Land Users

Whilst soil contamination has been identified, it was not considered to be readily mobile either in its current or post development state and thus, it is considered that the remedial measures recommended to protect end users would also be protective of adjacent land users.

Nonetheless, during construction the Made Ground soils would be prone to drying and release of soil dust. It is therefore recommended that dust suppression techniques, e.g. damping down exposed soils, are employed during the demolition and construction phases on site in order to minimise the

potential for airborne migration of specific hazards and to manage potential nuisance issues for adjacent land users.

6.9 Soil Contamination vs. Groundwater

The investigation did not identify any mobile contamination and thus in the absence of a pollutant linkage, no further action is warranted.

Leachability tests were undertaken on various samples of Made Ground and the results compared with the relevant water quality standards for controlled waters. Given that the eastern portion of the site was located within a groundwater source protection zone, standards for potable water were used. This is a highly conservative approach given the unsaturated zone beneath the site, and potential for dilution and attenuation prior to the point of consumption. The assessment did not identify the presence of significant contamination or potential contamination and thus no further action is considered to be warranted.

6.10 Groundwater Contamination vs. Human Health

End users would not come in to contact with groundwater and thus in the absence of a plausible pollutant linkage between groundwater and end-users, no specific protection measures are considered likely to be required in this respect.

6.11 Groundwater Contamination vs. Soft Landscaping

Whilst water was encountered at depth within some of the exploratory holes, it was beyond the depth to which plants would be affected. As such, it is considered that no specific action is warranted with respect to soft landscaping.

6.12 Groundwater Contamination vs. Built Environment

Protection measures for the Built Environment as discussed in Section 6.7 are considered appropriate.

6.13 Groundwater Contamination vs. Controlled Waters

In the absence of any evidence of groundwater contamination, no remedial action is considered to be warranted.

6.14 Waste Disposal

It is understood that the proposed development incorporates a waste minimisation strategy which extends to reusing surplus spoil, where suitable) and thus minimising the volume of soil to be removed from site. In line with the CL:AIRE Code of Practice on the 'Definition of Waste', it may be prudent to prepare a Materials Management plan and associated assessment/declaration to be undertaken by a 'Qualified Person' as defined with the code of practice.

Waste Acceptance Criteria (WAC) testing was undertaken on selected samples of Made Ground. The tests indicate that a range of Inert to Hazardous Waste could be produced if surplus soils are not retained as part of the development. The Hazardous Waste threshold was exceeded only for Total Organic Carbon and it is possible that the waste classification can be re-evaluated by the receiving/disposal site.

It is recommended that a materials management and handling plan is developed for the construction works on this site. This should include contingency plans in case asbestos is encountered during the development.

Other materials disposed of from site as part of the demolition or remediation process may require disposal separately. All materials containing dangerous substances e.g. tar or bitumen, asbestos, mercury, hydrocarbons and PCBs are likely to be classified as Hazardous Waste and therefore susceptible to the relevant legislative controls.

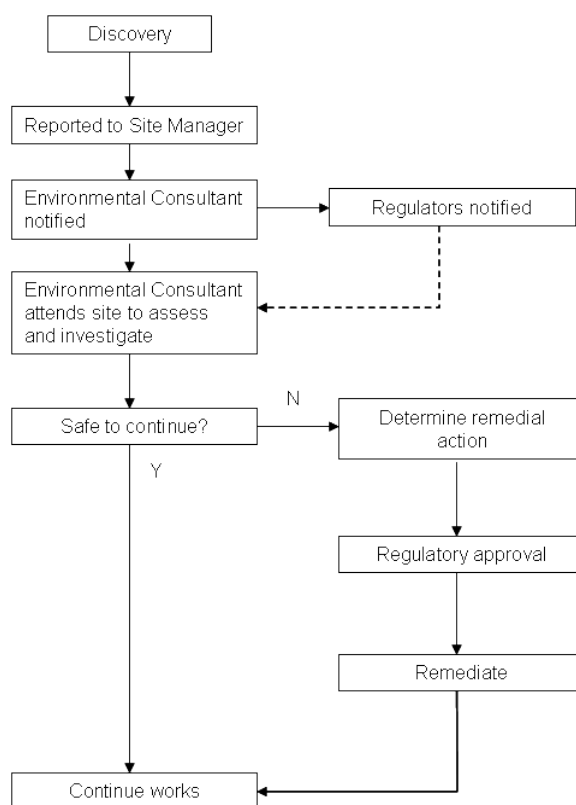
6.15 Discovery Strategy

Whilst an investigation has been undertaken on the site, it remains possible that unexpected soil conditions may be encountered during the process of site demolition, clearance and construction.

Examples may include oily pockets within the soil, pockets of cement boarding or fibrous materials within the soil, black ashy materials, soils exhibiting strong odours, brightly coloured materials and former structures or brickwork.

Should previously undiscovered contamination be encountered during construction by the ground workers, this should be reported to the Site Manager immediately in order that any necessary inspection may be made. Records should be kept and samples submitted for analysis where conditions encountered are not as anticipated. The results of any such testing should be sent to the authorities for consultation.

The process is shown below.



Discovery Strategy Process

A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

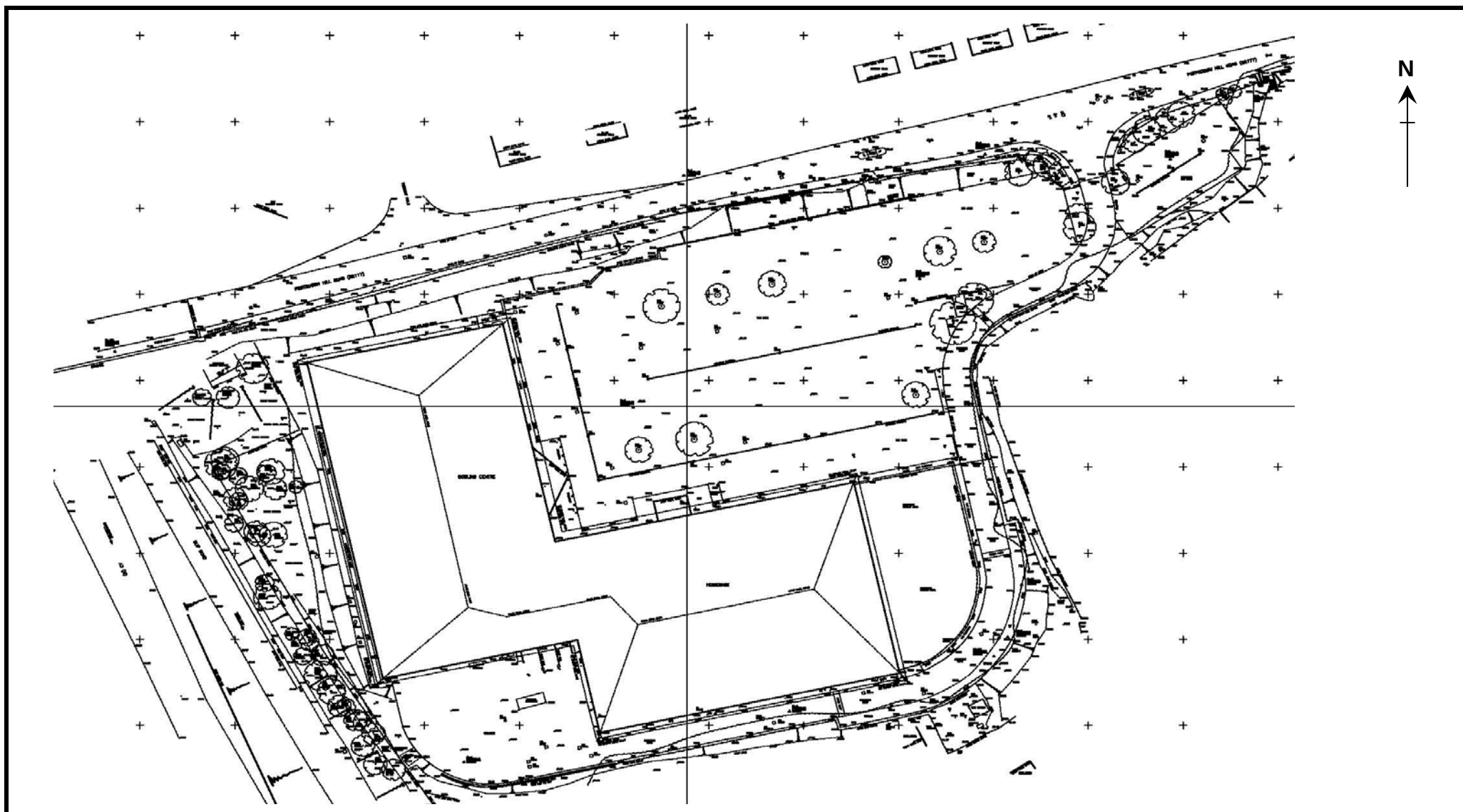


FIGURES

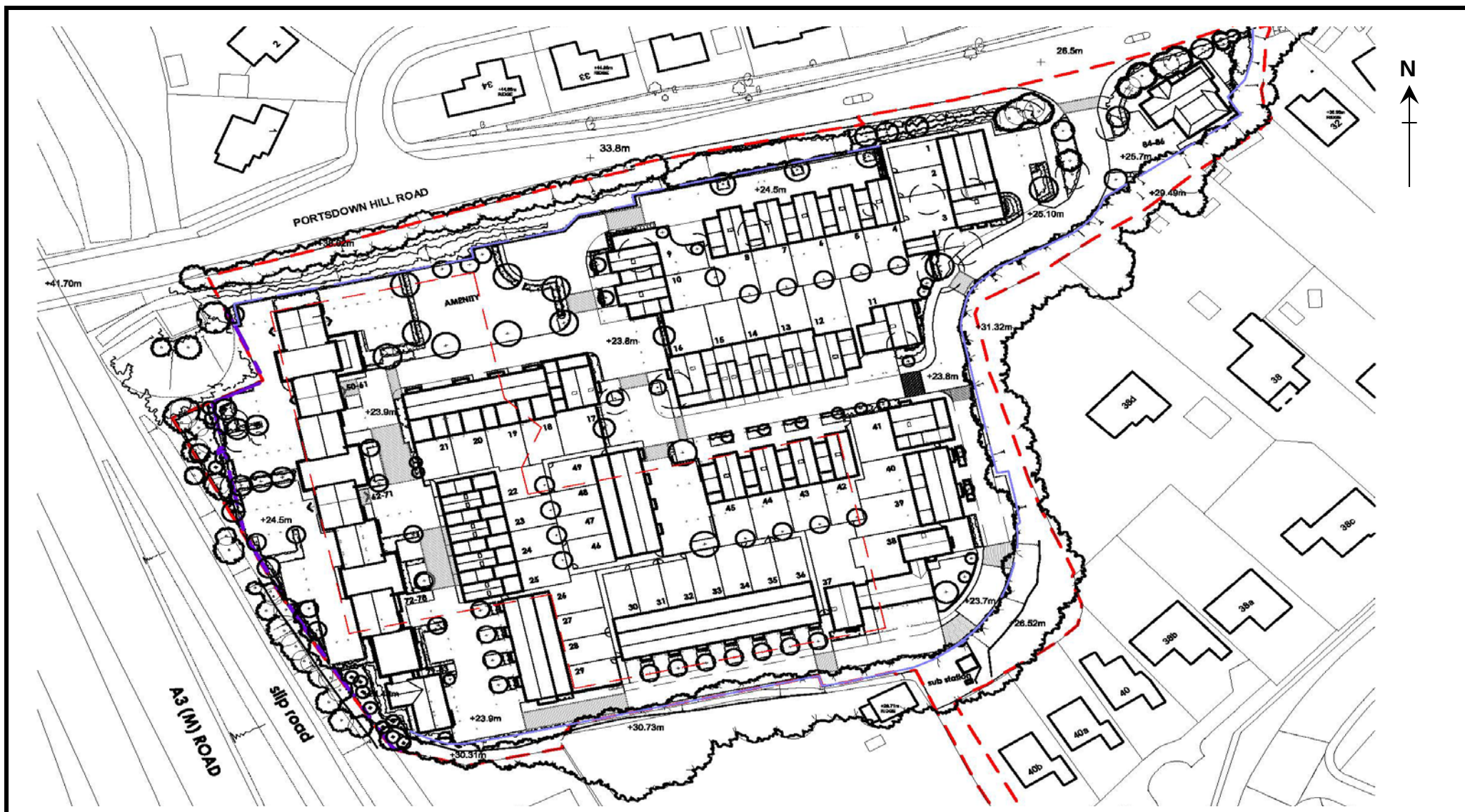




Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Site Location Plan		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net	 Geo-Environmental		
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	22/01/2014				
Figure:	1	Scale:	Not To Scale				



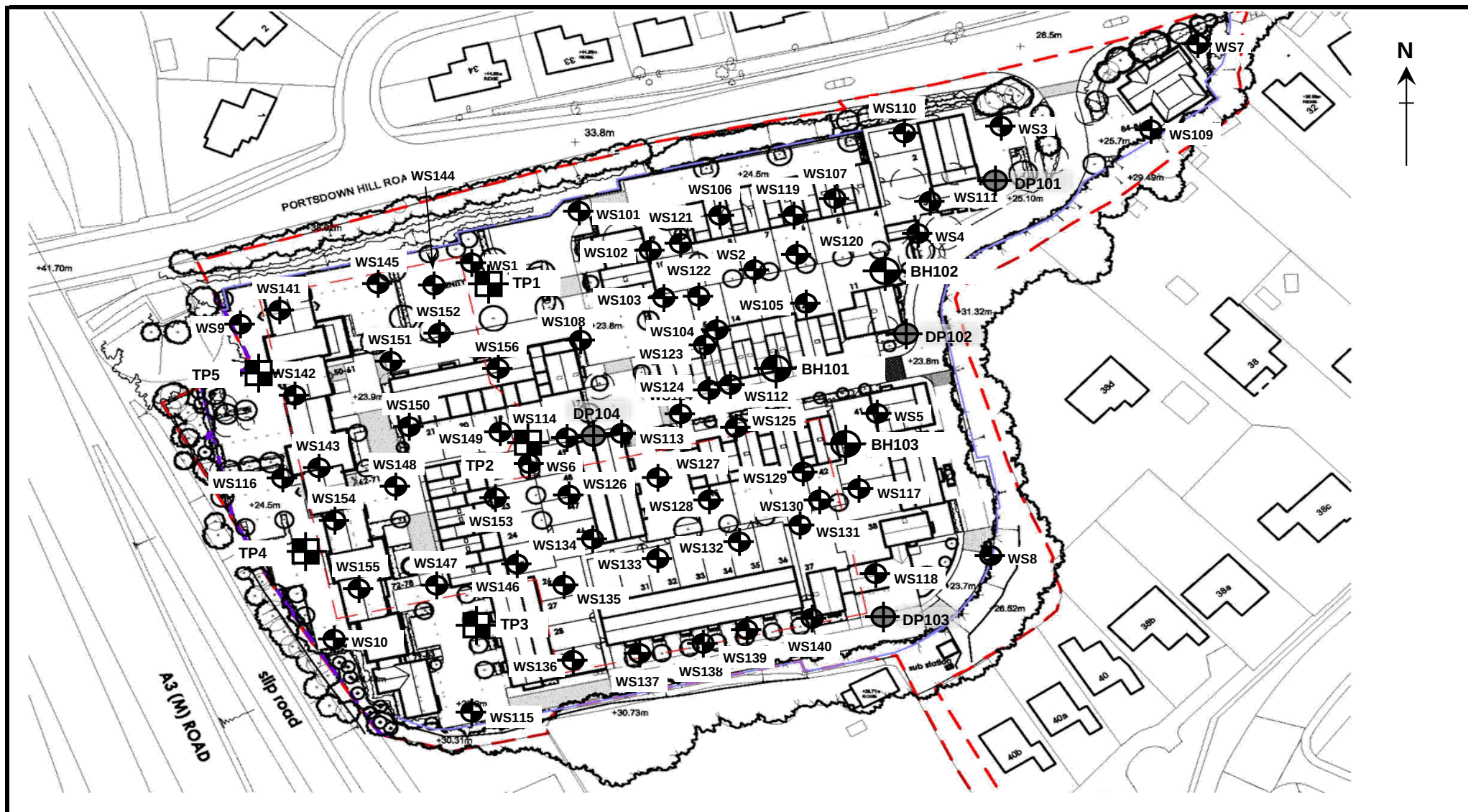
Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Site Plan (Exisiting Layout)		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net	 Geo-Environmental		
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	22/01/2014				
Figure:	2	Scale:	Not To Scale				



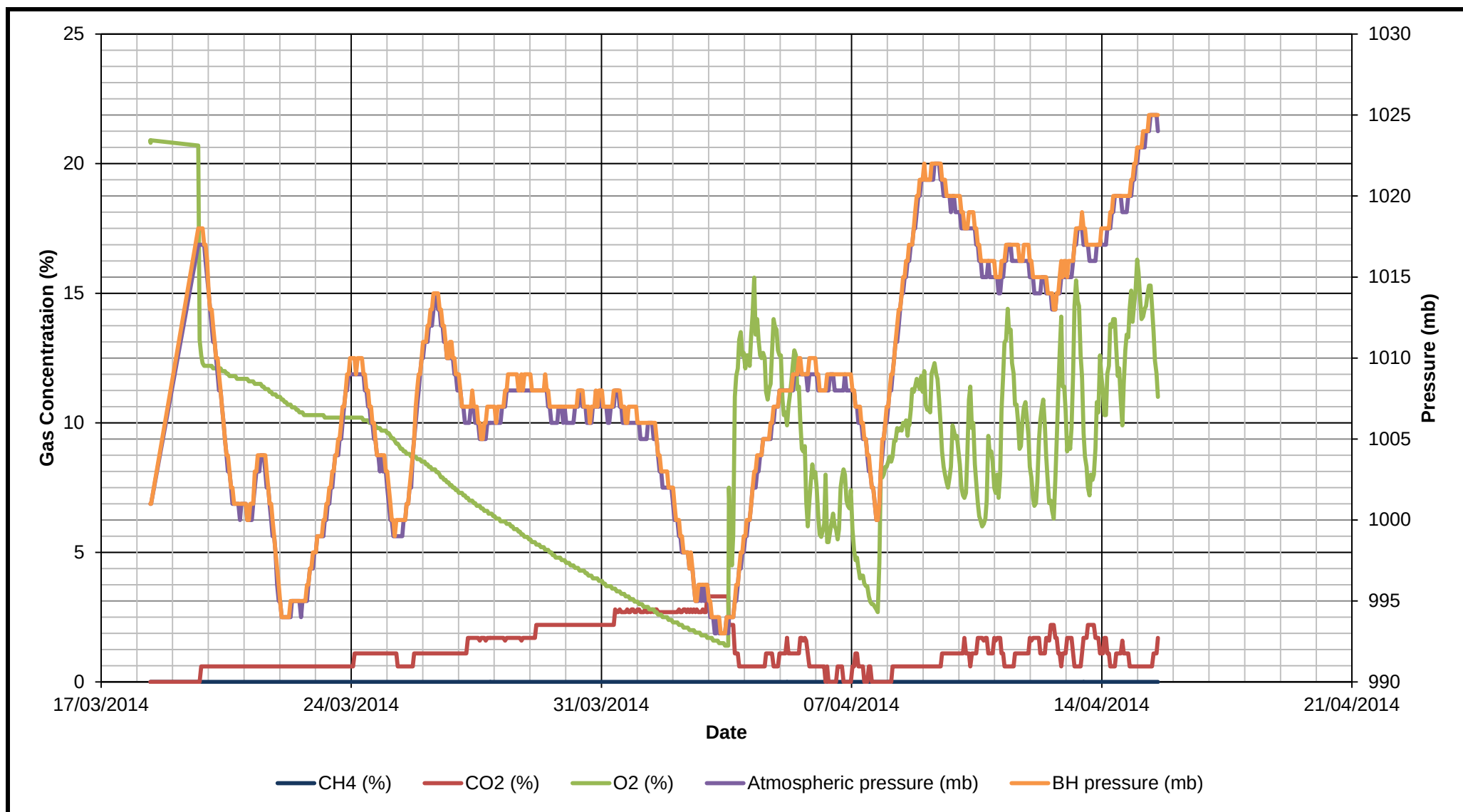
Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Site Plan (Exisiting Layout)		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net	 Geo-Environmental		
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	22/01/2014				
Figure:	3	Scale:	Not To Scale				



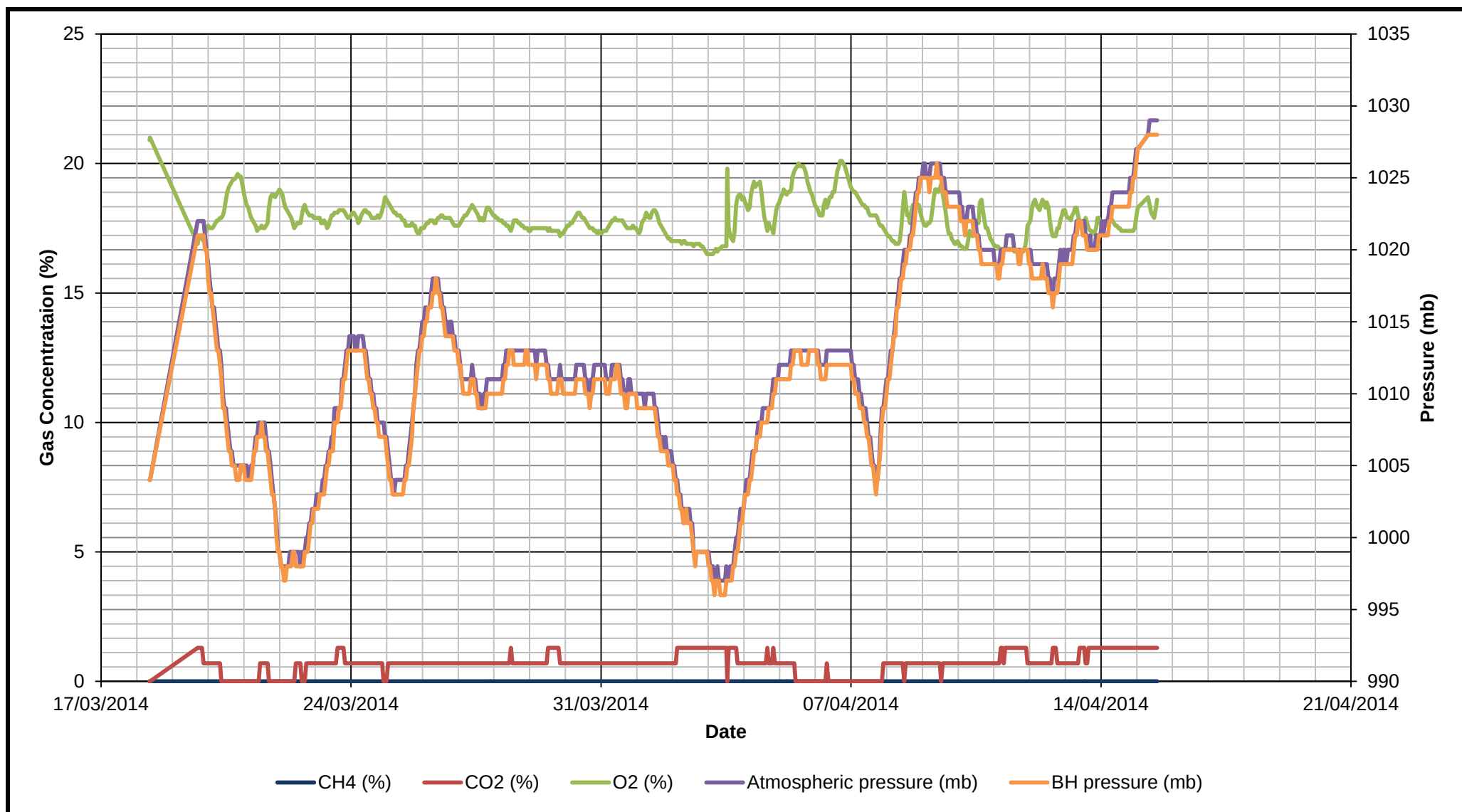
Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Exploratory Hole Location Plan (current site layout)		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net		 Geo-Environmental	
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	23/4/2014				
Figure:	6	Scale:	Not To Scale				



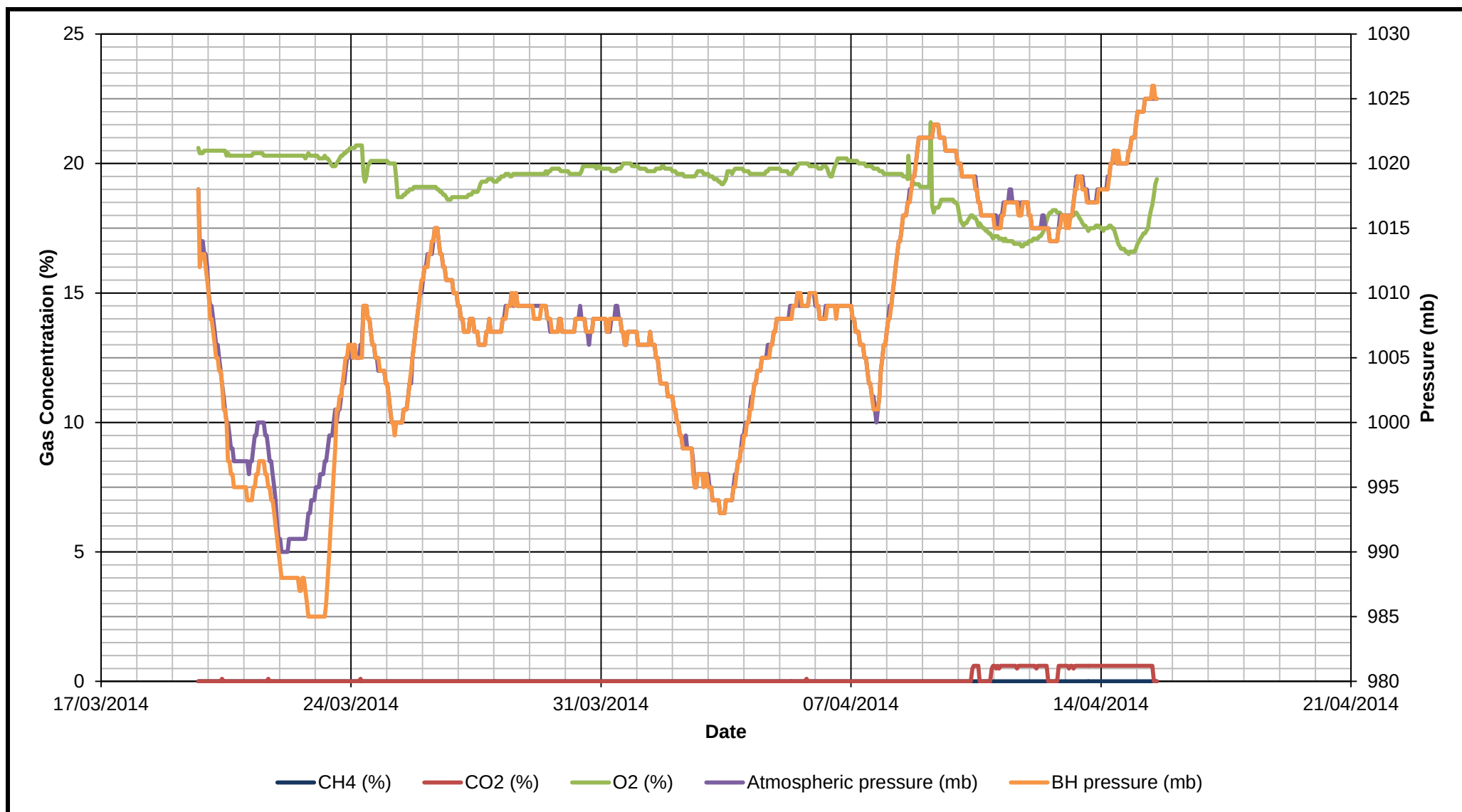
Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Exploratory Hole Location Plan (proposed site layout)		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net		 Geo-Environmental	
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	12/03/2014				
Figure:		Scale:	Not To Scale				



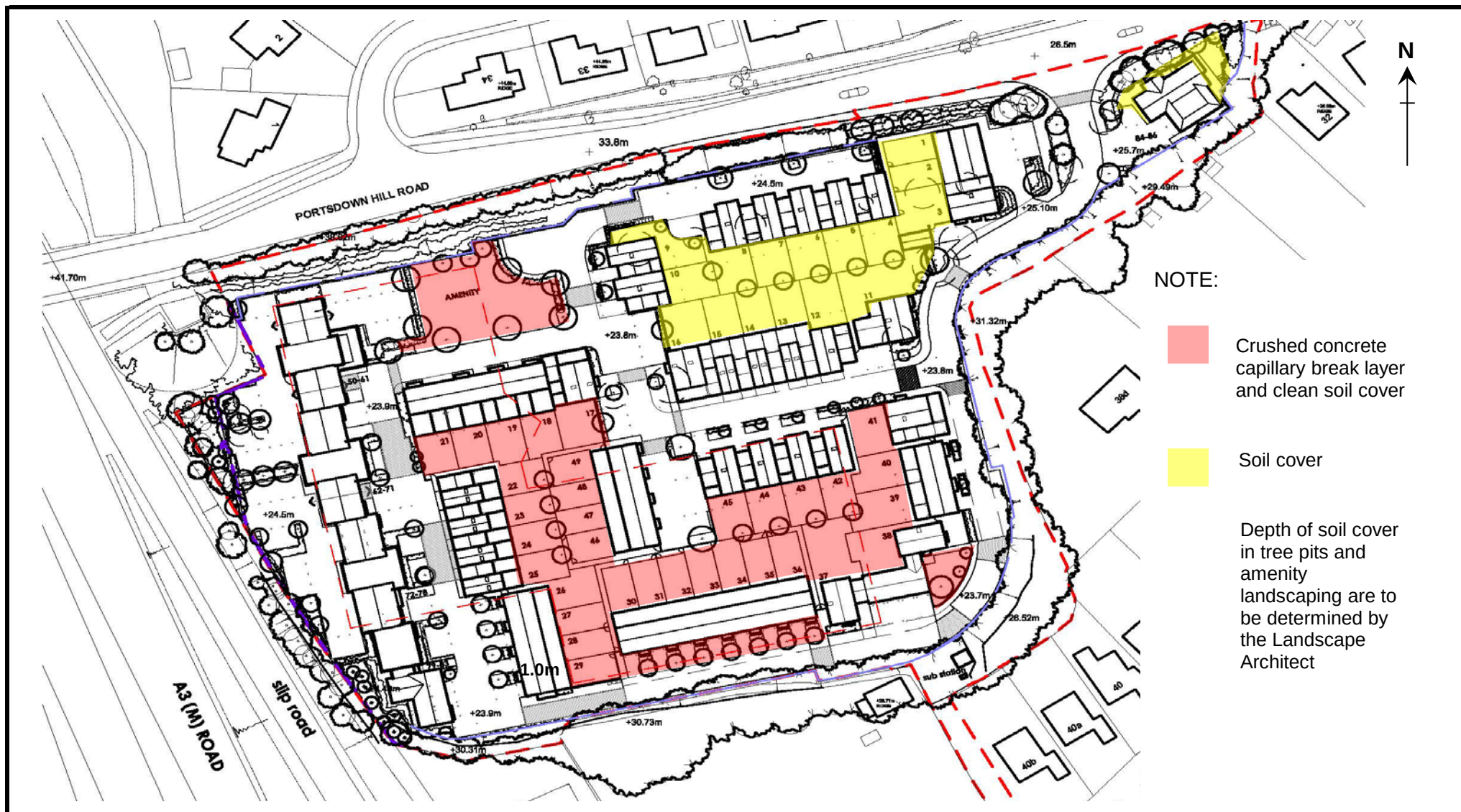
Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Continuous Gas Monitoring Plot BH101		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net	 Geo-Environmental		
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	23/04/2014				
Figure:	8	Scale:	Not To Scale				



Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Continuous Gas Monitoring Plot BH102		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net		 Geo-Environmental	
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	23/04/2014				
Figure:	9	Scale:	Not To Scale				



Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Continuous Gas Monitoring Plot WS122		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net	 Geo-Environmental		
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	23/04/2014				
Figure:	10	Scale:	Not To Scale				



Project:	Havant Retail Park, Portsdown Hill Road PO9 3NA			Title	Remediation Recommendations		
Client:	Linden Homes Southern Limited			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL 01273 832972 www.gesl.net		 Geo-Environmental	
Ref No:	GE9752	Revision:	0				
Drawn:	GR	Date:	09/04/2014				
Figure:	11	Scale:	Not To Scale				

APPENDIX A

Exploratory Hole Logs and In-situ Test Results





Geo-Environmental

Borehole Log

Borehole No.

BH101

Sheet 1 of 2

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469706.00 - 106430.00

Hole Type
CP

Location: Havant

Level: 23.78

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 27/02/2014 - 27/02/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40 - 0.70	B		0.20 0.40	23.58 23.38		Tarmac MADE GROUND	
		0.70 - 1.00	B		0.70	23.08		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		1.20 1.20	D	N=2 (1,1/1,0,1,0)				Yellow-brown medium sand and fine to medium sub-angular flint gravel MADE GROUND	
		2.00	D					Brown silty clay with fine brick gravel MADE GROUND	
		2.50 - 3.00	B						
		3.00 3.00	D	N=5 (2,2/2,1,1,1)					
		4.00	D						
		4.50 4.50 4.50 - 5.00	D D B	N=4 (2,1/1,0,1,2)					
		6.00 6.00 6.00 6.50 - 6.90	D D D B	N=15 (2,2/3,4,4,4)	6.00	17.78		Brown silty clay with fine brick gravel and metal fragments MADE GROUND	
		7.00	D		6.90	16.88		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		7.50 7.50	D	0 (25 for 90mm/0 for 0mm)	7.40	16.38		White CHALK with occasional flint cobbles. Possible CIRIA GRADE C/B UPPER CHALK	
		8.00	D						
		8.50 - 9.00	B						
		9.00 9.00	D	N=22 (4,5/4,6,6,6)					
		10.00	D						

Continued on next sheet

10

Remarks

Surface broken out.





Borehole No.

BH101

Sheet 2 of 2

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469706.00 - 106430.00

Hole Type
CP

Location: Havant

Level:	23.78
--------	-------

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 27/02/2014 - 27/02/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		10.50	D		17.00	6.78			11		
		10.50 - 11.00	B								
		12.00	D	0 (75 for 125mm/0 for 0mm)							12
		12.00	D								
		12.00									
		12.50 - 13.00	B								13
		13.50	D	N=26 (3,4/4,6,8,8)							
		13.50									
		14.00									
		14.50 - 15.00	B								
		15.00	D	N=25 (3,4/5,6,6,8)							
		15.00									
		16.00	D								16
		16.50	B	0 (25 for 85mm/0 for 0mm)							
		16.50 - 16.80									
		16.80	D	0 (25 for 85mm/0 for 0mm)							17
		16.80									
		16.80 - 17.00	B	50 (11,14/50 for 90mm)							
17.00	D										
17.00											
							End of borehole at 17.00 m	18			
								19			
								20			

Remarks

Remarks	Surface broken out.
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Geo-Environmental

Borehole Log

Borehole No.

BH102

Sheet 1 of 3

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469726.00 - 106450.00

Hole Type
CP

Location: Havant

Level: 24.14

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 04/03/2014 - 04/03/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.70	B	N=5 (3,2/1,1,1,2)	0.20	23.94		Tarmac	1
					0.30	23.84		MADE GROUND	
		0.70 - 1.20	B					Yellow-brown medium sand and fine to medium sub-angular gravel	
								MADE GROUND	
		1.20	D	N=6 (2,1/2,2,1,1)				Brown-grey silty clay with scattered brick and flint gravel	2
		1.20	D					MADE GROUND	
		1.20 - 1.70	B						
		2.00	D	N=10 (2,2/3,3,2,2)					3
		3.00	D						
		3.00	D						
		3.00	D						
		3.00 - 3.50	B						
				N=7 (1,1/1,2,2,2)					4
		4.00	D						
		4.50	D						
		4.50	D	N=8 (1,2/2,2,2,2)					5
		5.00	D						
		5.00 - 5.50	B						
				N=16 (2,2/3,3,4,6)					6
		6.00	D		6.00	18.14		Light brown clay	
		6.00	D					MADE GROUND	
		6.00	D						
		7.00	D	N=8 (1,2/2,2,2,2)					7
		7.00 - 7.50	B		7.00	17.14		Brown-grey clay	
								MADE GROUND	
		7.50	D						
		7.50	D	N=16 (2,2/3,3,4,6)					8
		8.00	D						
		8.50	D	N=16 (2,2/3,3,4,6)	8.50	15.64		Brown clay with scattered chalk and flint gravel	9
								MADE GROUND	
		9.00	D		9.00	15.14		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	
		9.00	D	N=16 (2,2/3,3,4,6)				UPPER CHALK	10
		9.00 - 9.50	B						
				N=16 (2,2/3,3,4,6)					
		10.00	D		10.00	14.14			

Continued on next sheet

Remarks

Surface broken out.





Geo-Environmental

Borehole Log

Borehole No.

BH102

Sheet 2 of 3

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469726.00 - 106450.00

Hole Type
CP

Location: Havant

Level: 24.14

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 04/03/2014 - 04/03/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50	D	N=47 (2,4/10,10,12,15)					11
		11.00 11.00 - 11.50	D B						12
		12.00 12.00	D	N=44 (4,5/10,10,11,13)					13
		13.00 13.00 - 13.50	D B						14
		13.50		N=27 (3,4/5,6,7,9)					15
		14.00	D						16
		15.00 15.00 15.00 15.00 - 15.50	D D D B	N=20 (2,3/4,5,5,6)					17
		16.00	D						18
		16.50 16.50	D	N=50 (3,4/10,12,13,15)					19
		17.00	D						20
		17.50	B						
		18.00 18.00	D	N=43 (3,6/9,9,10,15)					
		19.00 19.00 - 19.50	D B						
		19.50 19.50	D	N=50 (4,7/50 for 275mm)					
					20.00	4.14		Continued on next sheet	20

Remarks

Surface broken out.





Geo-Environmental

Borehole Log

Borehole No.

BH102

Sheet 3 of 3

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469726.00 - 106450.00

Hole Type
CP

Location: Havant

Level: 24.14

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 04/03/2014 - 04/03/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								White CHALK with occasional flint cobbles. Possible CIRIA GRADE C/B UPPER CHALK End of borehole at 20.00 m	21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Remarks

Surface broken out.





Geo-Environmental

Borehole Log

Borehole No.

BH103

Sheet 1 of 2

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469717.00 - 106408.00

Hole Type
CP

Location: Havant

Level: 23.95

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 06/03/2014 - 06/03/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40 - 0.80	B		0.20 0.40	23.75 23.55		Reinforced concrete	
								MADE GROUND	
								Yellow-brown medium sand and fine to medium sub-angular flint gravel	
								MADE GROUND	
		1.00	D		1.00	22.95		Off white reworked chalk	1
								MADE GROUND	
		1.50 1.50	D	N=11 (2,2/2,3,3,3)				Black sandy silty clay with abundant clinker and brick gravel	
								MADE GROUND	
		2.00 2.00 - 2.50	D B						2
		3.00 3.00 3.00 - 3.45	D D	N=7 (2,2/2,1,1,3)					3
		4.00 4.00 - 4.50	D B		4.00	19.95		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	4
								UPPER CHALK	
		4.50 4.50 - 4.95	D	N=26 (6,6/6,6,6,8)					
		5.00	D		5.00	18.95		White CHALK with occasional flint cobbles. Possible CIRIA GRADE C/B	5
								UPPER CHALK	
		6.00 6.00 6.00 - 6.45 6.00 - 6.50	D D B	N=29 (4,6/6,7,8,8)					6
		7.00	D						7
		7.50 7.50 - 7.95 8.00 8.00 - 8.50	D D B	N=78 (4,6/78 for 230mm)					8
		9.00 9.00 9.00 - 9.45	D D	N=50 (5,8/50 for 230mm)					9
		10.00	D						10

Continued on next sheet

Remarks

Surface broken out.





Geo-Environmental

Borehole Log

Borehole No.

BH103

Sheet 2 of 2

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469717.00 - 106408.00

Hole Type
CP

Location: Havant

Level: 23.95

Scale
1:50

Client: Linden Homes Southern Limited

Dates: 06/03/2014 - 06/03/2014

Logged By
AR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.00 - 10.50	B						11
					12.00	11.95			12
								End of borehole at 12.00 m	13
									14
									15
									16
									17
									18
									19
									20

Remarks

Surface broken out.





Geo-Environmental

Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469644.00 - 106452.00

Hole Type
WLS

Location: Havant

Level: 23.89

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 29/05/2012 - 29/05/2012

Logged By
NH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	23.79		Tarmac	1
								MADE GROUND	
								Grey and pink sandy gravel of limestone	
								MADE GROUND	
		0.55	D		0.40	23.49		Yellow sandy flint gravel	
					0.50	23.39		MADE GROUND	
								Grey sandy flint gravel with rare gravel of limestone	
					0.65	23.24		MADE GROUND	
								Light grey and white chalk sand with flint gravel	
								MADE GROUND	
		1.00	D		1.00				2
		1.20 - 1.60	D		1.20	22.69		Black ash and clinker with occasional fine and medium flint gravel	
								MADE GROUND	
		1.60 - 1.80	D		1.60	22.29		White silty putty chalk with occasional fragments of concrete and asbestos cement	
					1.80	22.09		MADE GROUND	
		1.90	D		2.00	21.89		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
								White CHALK with flint. Possible CIRIA GRADE C/B. Unable to penetrate flint nodule at 2.3m bgl UPPER CHALK	
					2.30	21.59		End of borehole at 2.30 m	

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469699.00 - 106449.00

Hole Type
WLS

Location: Havant

Level: 24.25

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 29/05/2012 - 29/05/2012

Logged By
NH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	24.15		Tarmac MADE GROUND	
					0.35	23.90		Grey and pink sandy gravel of limestone MADE GROUND	
		0.50	D		0.55	23.70		Light brown SAND with much fine to coarse flint gravel MADE GROUND	
		1.00	D					Light grey and red mottled clay (as clods) with much fine to coarse flint gravel MADE GROUND	1
		1.50	D		1.20	23.05		White silty putty chalk with occasional fragments of red brick entrained throughout MADE GROUND	
		2.00	D						2
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D						4
		4.50	D						
		5.00	D		5.00	19.25		End of borehole at 5.00 m	5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469747.00 - 106484.00

Hole Type
WLS

Location: Havant

Level: 25.70

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 29/05/2012 - 29/05/2012

Logged By
NH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	25.60		Tarmac MADE GROUND	
		0.50	D					Reddish brown sandy gravel of flint and limestone MADE GROUND	
		0.70			0.70	25.00		White silty putty chalk with occasional red brick fragments and pockets of brown sandy flint gravel MADE GROUND	1
		1.00	D						
		1.50	D						
		1.60			1.60	24.10		White silty putty chalk with occasional brick fragments and rare fine to medium flint gravel MADE GROUND	2
		2.00	D						
		2.10			2.10	23.60		White CHALK with flint. Possible CIRIA GRADE C/B Unable to penetrate beyond 2.7m bgl UPPER CHALK	
		2.50	D						
		2.70			2.70	23.00		End of borehole at 2.70 m	3
									4
									5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS4

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469733.00 - 106458.00

Hole Type
WLS

Location: Havant

Level: 24.50

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 29/05/2012 - 29/05/2012

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	24.40		Tarmac MADE GROUND	
		0.50	D					Greyish brown sandy fine and medium flint gravel with occasional fragments of red brick MADE GROUND	
		0.70			0.70	23.80		Grey and greenish grey slightly sandy clay with rare fine flint gravel rare timber and pockets of charcoal MADE GROUND	1
		1.00	D						
		1.50	D						
		1.80			1.80	22.70		Black ash and glass MADE GROUND	
		2.00			2.00	22.50		Brown clay with occasional fine and medium chalk gravel rare charcoal fragments and red brick fragments MADE GROUND	2
		2.30 - 2.60	D						
		3.50 - 3.80	D						3
		4.00			4.00	20.50		Light greenish brown sandy flint gravel MADE GROUND	4
		4.30			4.30	20.20		Brown clay with occasional medium flint gravel MADE GROUND	
		4.50			4.50	20.00		Off white silty putty chalk with pockets of grey-brown sandy clay MADE GROUND	
		5.00			5.00	19.50		End of borehole at 5.00 m	5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS5

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469721.00 - 106421.00

Hole Type
WLS

Location: Havant

Level: 23.85

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 29/05/2012 - 29/05/2012

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	23.75		Tarmac	
								MADE GROUND	
					0.40	23.45		Grey and pink sandy gravel of limestone	
					0.60	23.25		MADE GROUND	
		0.70	D					Light grey silty sandy fine gravel of flint concrete and red brick	
								MADE GROUND	
		1.00 - 1.30	D		0.90	22.95		Greenish grey silty clay with occasional coarse sand to fine gravel of flint and chalk with rare red brick fragments. Becoming greenish grey and brown from 3m bgl	1
								MADE GROUND	
								Greenish grey silty clay with occasional coarse sand to fine gravel of flint and chalk with rare red brick fragments. Becoming greenish grey and brown from 3m bgl	2
								MADE GROUND	
		2.50	D					Greenish grey silty clay with occasional coarse sand to fine gravel of flint and chalk with rare red brick fragments. Becoming greenish grey and brown from 3m bgl	3
								MADE GROUND	
		3.10 - 3.40	D					Greenish grey silty clay with occasional coarse sand to fine gravel of flint and chalk with rare red brick fragments. Becoming greenish grey and brown from 3m bgl	4
								MADE GROUND	
					3.90	19.95		Brown clay with some fine and medium flint gravel and occasional slate	
								MADE GROUND	
		4.50 - 5.00	D					Brown clay with some fine and medium flint gravel and occasional slate	
								MADE GROUND	
					5.00	18.85		End of borehole at 5.00 m	5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Borehole No.

WS6

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.	GE9752
-------------	--------

Co-ords: 469653.00 - 106409.00

Hole Type	WLS
1	0.0000
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	0.0000
7	0.0000
8	0.0000
9	0.0000
10	0.0000
11	0.0000
12	0.0000
13	0.0000
14	0.0000
15	0.0000
16	0.0000
17	0.0000
18	0.0000
19	0.0000
20	0.0000
21	0.0000
22	0.0000
23	0.0000
24	0.0000
25	0.0000
26	0.0000
27	0.0000
28	0.0000
29	0.0000
30	0.0000
31	0.0000
32	0.0000
33	0.0000
34	0.0000
35	0.0000
36	0.0000
37	0.0000
38	0.0000
39	0.0000
40	0.0000
41	0.0000
42	0.0000
43	0.0000
44	0.0000
45	0.0000
46	0.0000
47	0.0000
48	0.0000
49	0.0000
50	0.0000
51	0.0000
52	0.0000
53	0.0000
54	0.0000
55	0.0000
56	0.0000
57	0.0000
58	0.0000
59	0.0000
60	0.0000
61	0.0000
62	0.0000
63	0.0000
64	0.0000
65	0.0000
66	0.0000
67	0.0000
68	0.0000
69	0.0000
70	0.0000
71	0.0000
72	0.0000
73	0.0000
74	0.0000
75	0.0000
76	0.0000
77	0.0000
78	0.0000
79	0.0000
80	0.0000
81	0.0000
82	0.0000
83	0.0000
84	0.0000
85	0.0000
86	0.0000
87	0.0000
88	0.0000
89	0.0000
90	0.0000
91	0.0000
92	0.0000
93	0.0000
94	0.0000
95	0.0000
96	0.0000
97	0.0000
98	0.0000
99	0.0000
100	0.0000

Location: Havant

Level: 23.86

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 30/05/2012 - 30/05/2012

Logged By
NH

[illegible]

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS7

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469785.00 - 106500.00

Hole Type
WLS

Location: Havant

Level: 25.48

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 30/05/2012 - 30/05/2012

Logged By
NH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D		0.65	24.83		Brown sandy clay/clayey sand with some fine to medium gravel of flint occasional fine gravel of chalk and red brick and roots MADE GROUND	1
		1.00	D					White CHALK with occasional flint. Possible CIRIA GRADE C/B UPPER CHALK	
		1.50	D						
		2.00	D		2.00	23.48		End of borehole at 2.00 m	2
									3
									4
									5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS8

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469746.00 - 106390.00

Hole Type
WLS

Location: Havant

Level: 23.75

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 30/05/2012 - 30/05/2012

Logged By
NH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	23.60		Tarmac MADE GROUND	
								Grey and pink sandy gravel of limestone MADE GROUND	
		0.40	D		0.45	23.30		Orange-brown sand. Pipe bedding MADE GROUND	
					0.60	23.15		Brown sandy gravel of flint and red brick with rare fragments of asbestos cement MADE GROUND	
		1.00	D		1.20	22.55		White chalk with occasional red brick fragments entrained throughout MADE GROUND	1
					1.45	22.30		White and light grey putty chalk. Possible reworked chalk MADE GROUND	
		2.00	D		2.10	21.65		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	2
					2.40	21.35		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	
		3.00	D		3.00	20.75		End of borehole at 3.00 m	3
									4
									5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow. Gas pipe and duct encountered in inspection pit.





Geo-Environmental

Borehole Log

Borehole No.

WS9

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469587.00 - 106442.00

Hole Type
WLS

Location: Havant

Level: 24.10

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 30/05/2012 - 30/05/2012

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	24.00		Medium and coarse flint gravel MADE GROUND	
		0.20	D		0.30	23.80		Brown sandy silt with roots occasional red brick fragments and fine to medium gravel of flint and chalk MADE GROUND	
		0.50	D		0.80	23.30		White silty putty chalk with rare wood fragments and pockets of light grey clayey silt MADE GROUND	
		1.00	D		1.40	22.70		Brown clay with some fine and medium flint gravel and rare charcoal MADE GROUND	1
		1.50	D		1.60	22.50		White chalk and grey silt MADE GROUND	
		2.00	D					White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	2
		2.50	D						
		3.00	D		3.00	21.10		End of borehole at 3.00 m	3
									4
									5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS10

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469614.00 - 106367.00

Hole Type
WLS

Location: Havant

Level: 24.40

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 30/05/2012 - 30/05/2012

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.30	24.10		Brown sandy silt with occasional fine and medium flint gravel and rare brick fragments MADE GROUND	1
		0.50	D					White and off-white chalk with some fine and medium gravel of flint and red brick and rare bitumen bound aggregate MADE GROUND	
		1.00	D		1.10	23.30		Brown clay with abundant chalk and rare clinker MADE GROUND	
		1.50	D		1.40	23.00		White putty chalk with brown silty clay MADE GROUND	
		2.00	D						2
		2.50 - 3.00	D						3
		3.50	D		3.10	21.30		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	4
					4.00	20.40		End of borehole at 4.00 m	5

Remarks

Service inspection pit excavated to 1m bgl. No water inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469662.00 - 106462.00

Hole Type
WLS

Location: Havant

Level: 24.00

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2012 - 24/02/2012

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	23.92		Tarmac	
								MADE GROUND	
					0.30	23.70		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.50	D					Orange-brown silty sandy clay with frequent medium to coarse sub-rounded flint gravel and pockets of clinker and chalk gravel	
								MADE GROUND	
					0.80	23.20		Grey-brown silt with occasional flint cobbles frequent clinker and white medium to coarse flint gravel	
		1.00	ES					MADE GROUND	1
					1.10	22.90		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	
								UPPER CHALK	
		1.50	D		1.40	22.60		White CHALK. Possible CIRIA GRADE C/B (CHALK)	
								UPPER CHALK	
		2.00	D		2.00	22.00			2
		2.50	D						
		3.00	D						
								End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Borehole No.

WS102

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469676.00 - 106456.00

Hole Type
WLS

Location: Havant

Level: 24.10

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

[illegible]

Remarks

Remarks
Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469678.00 - 106445.00

Hole Type
WLS

Location: Havant

Level: 24.02

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.06			0.06	23.96		Tarmac	
		0.10			0.10	23.92		MADE GROUND	
		0.30			0.30	23.72		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.50	ES		0.50	23.52		Yellow-brown medium sand and fine to medium sub-angular gravel	
								MADE GROUND	
								Black ash and clinker	
								MADE GROUND	
								Light grey silt with scattered fine brick gravel	
								MADE GROUND	
		1.00	D		1.00	23.02		Off white and light grey putty chalk with occasional fine brick gravel	1
								MADE GROUND	
		1.50	D						
		2.00	D						2
					2.20	21.82		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	
								UPPER CHALK	
		2.50	D						
					2.70	21.32			
								End of borehole at 2.70 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469689.00 - 106440.00

Hole Type
WLS

Location: Havant

Level: 23.92

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	23.84		Tarmac MADE GROUND	
					0.30	23.62		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		0.50	ES		0.50	23.42		Yellow-brown medium sand and fine to medium sub-angular flint gravel MADE GROUND	
								Dark red-brown silty clay with occasional fine to medium red brick gravel and and rare clinker MADE GROUND	
		1.00	D						1
		1.50	D						
		2.00	D						2
		2.50	D						
		3.00	D		3.00	20.92		Grey-brown silty clay with occasional fine to medium red brick gravel and rare clinker MADE GROUND	3
		3.50	D						
		4.00	D		4.00	19.92		End of borehole at 4.00 m	4
									5

Remarks

Surface cored out. No groundwater inflow.



 Geo-Environmental					Borehole Log			Borehole No. WS105 Sheet 1 of 1	
Project Name: Havant Retail Park					Project No. GE9752		Co-ords: 469710.00 - 106445.00		Hole Type WLS
Location: Havant					Level: 24.05		Scale 1:25		Logged By EN
Client: Linden Homes Southern Limited					Dates: 24/02/2014 - 24/02/2014				

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			23.97		Tarmac		
							MADE GROUND		
					0.30	23.75	Pink sandy silt and grey medium to coarse sub-angular limestone gravel		
							MADE GROUND		
		0.50	D		0.50	23.55	Yellow-brown medium sand and fine to medium sub-angular flint gravel		
							MADE GROUND		
							Very dark grey-brown and black silty clay with rare fine clinker and medium rounded flint gravel		
							MADE GROUND		
		1.00	ES		1.00	23.05	Brown silty clay with fine chalk gravel and and rare fine clinker and brick gravel	1	
							MADE GROUND		
		1.50	D						
		2.00	D					2	
		2.50	D						
		2.80			21.25		Off white putty chalk. Possibly reworked or disturbed chalk.		
		3.00	D		3.00	21.05	MADE GROUND	3	
							End of borehole at 3.00 m		
								4	
								5	

Remarks Surface cored out. No groundwater inflow.								
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Geo-Environmental

Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469691.00 - 106462.00

Hole Type
WLS

Location: Havant

Level: 24.45

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description							
		Depth (m)	Type	Results											
		0.50	D		0.08	24.37		Tarmac	1						
					0.30	24.15		MADE GROUND							
								Pink sandy silt and grey medium to coarse sub-angular limestone gravel							
		1.00	D			MADE GROUND	2								
						Yellow-brown medium sand and fine to medium sub-angular flint gravel									
								MADE GROUND							
		1.50	D		0.70	23.75		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	3						
								UPPER CHALK							
								2.00		D	1.20	23.25		White CHALK. Possible CIRIA GRADE C/B	4
			UPPER CHALK												
			2.50		D	3.00	21.45							5	
															
															
		3.00	D		3.00	21.45			6						
															
															
End of borehole at 3.00 m															



Geo-Environmental

Borehole Log

Borehole No.

WS107

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469712.00 - 106467.00

Hole Type
WLS

Location: Havant

Level: 24.65

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	24.57		Tarmac	
								MADE GROUND	
					0.30	24.35		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.50	D		0.60	24.05		Yellow-brown medium sand and fine to medium sub-angular flint gravel	
								MADE GROUND	
					0.80	23.85		Brown silty fine sandy clay with abundant fine brick and white chalk gravel	
								MADE GROUND	
		1.00	D					Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	1
								UPPER CHALK	
					1.40	23.25		White CHALK. Possible CIRIA GRADE C/B	
		1.50	D					UPPER CHALK	
					1.70	22.95		End of borehole at 1.70 m	2
									3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS108

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469668.00 - 106438.00

Hole Type
WLS

Location: Havant

Level: 23.85

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/02/2014 - 24/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.07			0.07	23.78		Tarmac	
					0.20	23.65		MADE GROUND	
								Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.50	D		0.50	23.35		Grey sandy clayey silt with abundant clinker and white chalk gravel	
								MADE GROUND	
								Light grey silt with abundant chalk gravel and rare medium flint and brick gravel	
								MADE GROUND	
		1.00	ES						1
					1.40	22.45		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm	
		1.50	D					UPPER CHALK	
					1.80	22.05		White CHALK. Possible CIRIA GRADE C/B	
		2.00	D					UPPER CHALK	2
		2.50	D						
					2.70	21.15		End of borehole at 2.70 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS109

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469780.00 - 106483.00

Hole Type
WLS

Location: Havant

Level: 25.70

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.07			0.07	25.63		Tarmac	
					0.20	25.50		MADE GROUND	
					0.30	25.40		Lean mix concrete	
								MADE GROUND	
								Brown silty sandy rounded fine to medium flint gravel	
		0.50	D					MADE GROUND	
								Pink sandy silt and grey medium to coarse sub-angular limestone gravel over geotextile	
								MADE GROUND	
		0.80			0.80	24.90		Off white chalk gravel with scattered clinker and medium brick gravel	1
		1.00	ES					MADE GROUND	
					1.20	24.50		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		1.50	D					White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	
		2.00	D		1.60	24.10		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	2
		2.50	D					White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	
		3.00	D		3.00	22.70		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	3
								End of borehole at 3.00 m	
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS110

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469728.00 - 106481.00

Hole Type
WLS

Location: Havant

Level: 25.20

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.12			0.12	25.08		Tarmac	
		0.20			0.20	25.00		MADE GROUND	
								Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.40			0.40	24.80		Yellow-brown medium sand and fine to medium sub-angular flint gravel	
								MADE GROUND	
								White orange-brown and light grey putty chalk	
								MADE GROUND	
		1.00	D						1
		1.50	D						
		2.00	D						2
		2.50	D						
		3.00	D						3
		3.20			3.20	22.00		White CHALK. Possible GIRIA GRADE C/B UPPER CHALK	
		3.50	D						
		3.60			3.60	21.60		End of borehole at 3.60 m	
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS111

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469732.00 - 106467.00

Hole Type
WLS

Location: Havant

Level: 24.80

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	24.72		Tarmac MADE GROUND	
					0.40	24.40		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		0.50	D					Light grey-brown silt with fine to medium white chalk gravel MADE GROUND	
		1.00	D						1
		1.50	ES		1.50	23.30			
		2.00	D						2
		2.50	D						
		3.00	D		3.00	21.80		Off white and orange-brown putty chalk. Possible reworked or disturbed chalk MADE GROUND	
								End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS112

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469692.00 - 106424.00

Hole Type
WLS

Location: Havant

Level: 23.75

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	23.67		Tarmac	
								MADE GROUND	
					0.30	23.45		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
					0.40	23.35		MADE GROUND	
		0.50	D					Yellow-brown medium sand and fine to medium sub-angular flint gravel	
								MADE GROUND	
					0.70	23.05		Light grey silt with abundant flint gravel and occasional clinker	
								MADE GROUND	
		1.00	ES		0.95	22.80		Medium to coarse red brick gravel	
								MADE GROUND	
		1.50	D					Dark grey-brown silty clay with frequent white chalk flint brick and concrete gravel. Slight hydrocarbon odour becoming fainter with depth	1
								MADE GROUND	
		2.00	ES						2
		2.50	D						
		3.00	ES		3.00	20.75		End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS113

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469672.00 - 106415.00

Hole Type
WLS

Location: Havant

Level: 23.80

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	23.72		Tarmac	
								MADE GROUND	
					0.20	23.60		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.40	D		0.40	23.40		Yellow-brown medium sand and fine to medium sub-angular flint gravel	
								MADE GROUND	
								Dark grey-brown silty clay with frequent clinker and scattered fine brick gravel	
								MADE GROUND	
		0.90	ES		0.90	22.90		Black clinker and medium flint gravel	1
								MADE GROUND	
		1.50	D						
		2.00	D		2.00	21.80		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	2
		2.50	D		2.50	21.30		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	
		3.00	D		3.00	20.80		End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS114

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469661.00 - 106411.00

Hole Type
WLS

Location: Havant

Level: 23.84

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.08			0.08	23.76		Tarmac	
								MADE GROUND	
		0.20			0.20	23.64		Pink sandy silt and grey medium to coarse sub-angular limestone gravel	
								MADE GROUND	
		0.40			0.40	23.44		Black clinker with fine to medium white chalk gravel	
								MADE GROUND	
								Off white putty chalk with pockets of light grey-brown silt	
								MADE GROUND	
		1.00	D						1
		1.50	D						
					1.60	22.24		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		2.00	D		2.00	21.84		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	2
		2.50	D						
		3.00	D		3.00	20.84			3
								End of borehole at 3.00 m	
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS115

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469636.00 - 106348.00

Hole Type
WLS

Location: Havant

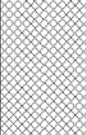
Level: 23.90

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.22	23.68		Reinforced concrete MADE GROUND	
					0.40	23.50		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		0.50	ES					White and light grey putty chalk with occasional clinker and fine brick gravel MADE GROUND	
					0.90	23.00		Brown sandy silt with frequent fine chalk gravel and clinker MADE GROUND	1
		1.00	D		1.00	22.90		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		1.50	D		1.50	22.40		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	
		2.00	D						2
		2.50	D						
		3.00	D		3.00	20.90			
							End of borehole at 3.00 m		3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS116

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469601.00 - 106405.00

Hole Type
WLS

Location: Havant

Level: 23.80

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/02/2014 - 25/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20	23.60		Rounded pebbles over pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
					0.40	23.40		Yellow-brown medium sand and fine to medium sub-angular flint gravel MADE GROUND	
		0.50	D					Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		1.00	D		1.00	22.80		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	1
		1.50	D						
		2.00	D						2
		2.50	D						
		3.00	D		3.00	20.80			3
								End of borehole at 3.00 m	
									4
									5

Remarks

No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS117

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469719.00 - 106402.00

Hole Type
WLS

Location: Havant

Level: 23.95

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/02/2014 - 26/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	23.77		Reinforced concrete MADE GROUND	
					0.40	23.55		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		0.50	ES					Black clayey sandy silt with abundant clinker and brick gravel MADE GROUND	
					0.80	23.15		Light grey and off white silt with scattered clinker and brick gravel MADE GROUND	
		1.00	D		1.00	22.95		Brown silty sandy clay with scattered clinker chalk and brick gravel MADE GROUND	1
		1.50	D						
		2.00	D						2
		2.50	D						
		3.00	D		3.00	20.95		End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Geo-Environmental

Borehole Log

Borehole No.

WS118

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469722.00 - 106383.00

Hole Type
WLS

Location: Havant

Level: 23.95

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/02/2014 - 26/02/2014

Logged By
EN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.17			0.17	23.78		Reinforced concrete MADE GROUND	
		0.40			0.40	23.55		Pink sandy silt and grey medium to coarse sub-angular limestone gravel MADE GROUND	
		0.50	D		0.60	23.35		Grey clayey silt with abundant white chalk gravel and scattered clinker MADE GROUND	
		1.00	ES					Black clayey silt with abundant clinker brick and flint gravel MADE GROUND	1
		1.50	D		1.50	22.45		Structureless CHALK composed of white silt size putty CHALK. CIRIA GRADE Dm UPPER CHALK	
		2.00	D		2.00	21.95		White CHALK. Possible CIRIA GRADE C/B UPPER CHALK	2
		2.50	D						
		3.00	D		3.00	20.95		End of borehole at 3.00 m	3
									4
									5

Remarks

Surface cored out. No groundwater inflow.





Borehole No.

WS119

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469704.00 - 106463.00

Hole Type	WLS
1	0.0000
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	0.0000
7	0.0000
8	0.0000
9	0.0000
10	0.0000
11	0.0000
12	0.0000
13	0.0000
14	0.0000
15	0.0000
16	0.0000
17	0.0000
18	0.0000
19	0.0000
20	0.0000
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22	0.0000
23	0.0000
24	0.0000
25	0.0000
26	0.0000
27	0.0000
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29	0.0000
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34	0.0000
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39	0.0000
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41	0.0000
42	0.0000
43	0.0000
44	0.0000
45	0.0000
46	0.0000
47	0.0000
48	0.0000
49	0.0000
50	0.0000
51	0.0000
52	0.0000
53	0.0000
54	0.0000
55	0.0000
56	0.0000
57	0.0000
58	0.0000
59	0.0000
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65	0.0000
66	0.0000
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73	0.0000
74	0.0000
75	0.0000
76	0.0000
77	0.0000
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80	0.0000
81	0.0000
82	0.0000
83	0.0000
84	0.0000
85	0.0000
86	0.0000
87	0.0000
88	0.0000
89	0.0000
90	0.0000
91	0.0000
92	0.0000
93	0.0000
94	0.0000
95	0.0000
96	0.0000
97	0.0000
98	0.0000
99	0.0000
100	0.0000

Location: Havant

Level:	24.50
--------	-------

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	24.40		Tarmac	1
								MADE GROUND	
					0.35	24.15		Brown sandy flint gravel	
								MADE GROUND	
					0.50	24.00		Black ash and clinker	
								MADE GROUND	
					0.60	23.90		Lean mix concrete	
								MADE GROUND	
					0.80	23.70		White CHALK CIRIA Grade C/B	
								UPPER CHALK	
					2.00	22.50			
									
									
									
									
									
									
									
									
									
End of borehole at 2.00 m								2	
								3	
								4	
								5	

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS120

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469708.00 - 106454.00

Hole Type
WLS

Location: Havant

Level: 24.30

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	24.20		Tarmac MADE GROUND Brown sandy flint gravel MADE GROUND	
					0.70	23.60		Brown clayey gravel MADE GROUND	
					0.90	23.40		Brown clay with occasional flint gravel MADE GROUND	1
					2.10	22.20		Red brick fragments MADE GROUND	2
					2.50	21.80		White silty chalk with brick fragments MADE GROUND	3
					3.20	21.10		Off white silty chalk with pockets of red brick and brown clay MADE GROUND	4
					5.00	19.30		End of borehole at 5.00 m	5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS121

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469681.00 - 106456.00

Hole Type
WLS

Location: Havant

Level: 24.10

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	24.00		Tarmac	
								MADE GROUND	
								Grey crushed limestone gravel with occasional brown sand and flint gravel	
								MADE GROUND	
					0.60	23.50		Off white silty chalk with brown sandy clay and occasional fine to medium flint gravel	1
								MADE GROUND	
					2.50	21.60		White CHALK CIRIA Grade C/B	3
								UPPER CHALK	
					4.00	20.10		End of borehole at 4.00 m	4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS122

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469684.00 - 106442.00

Hole Type
WLS

Location: Havant

Level: 24.00

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	23.90		Tarmac MADE GROUND Grey crushed limestone gravel with occasional brown sand and flint gravel MADE GROUND	
					0.60	23.40		Brown grey-brown and red mottled clay with some gravel of flint and red brick MADE GROUND	1
					1.70	22.30		Off white silty chalk with pockets of red brick and brown clay MADE GROUND	2
					2.80	21.20		White CHALK CIRIA Grade C/B UPPER CHALK	3
					3.45	20.55		End of borehole at 3.45 m	4
									5

Remarks





Borehole No.

WS123

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469683.00 - 106435.00

Hole Type
WLS

Location: Havant

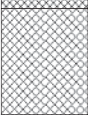
Level:	23.90
--------	-------

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	23.80		Tarmac	1
					0.45	23.45		MADE GROUND	
								Grey crushed limestone gravel with occasional brown sand and flint gravel	
					2.70	21.20		MADE GROUND	
								Brown grey-brown and red mottled clay with some gravel of flint and red brick	
								MADE GROUND	
3.50	20.40		White CHALK CIRIA Grade C/B	3					
			UPPER CHALK						
							End of borehole at 3.50 m	4	
								5	

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS124

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469686.00 - 106424.00

Hole Type
WLS

Location: Havant

Level: 23.75

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	23.65		Tarmac MADE GROUND	
								Grey crushed limestone gravel with occasional brown sand and flint gravel MADE GROUND	
					0.60	23.15		Brown grey-brown and red mottled clay with some gravel of flint and red brick MADE GROUND	
					1.00	22.75		Off white silty chalk with brown sandy clay and occasional fine to medium flint gravel MADE GROUND	1
									2
					2.90	20.85		White CHALK CIRIA Grade C/B UPPER CHALK	3
					4.00	19.75		End of borehole at 4.00 m	4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS125

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469693.00 - 106415.00

Hole Type
WLS

Location: Havant

Level: 23.80

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 13/03/2014 - 13/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	23.70		Tarmac MADE GROUND	
								Grey crushed limestone gravel with occasional brown sand and flint gravel MADE GROUND	
					0.40	23.40		Grey silty chalk with occasional ash and clinker MADE GROUND	
					0.70	23.10		Black ash and clinker MADE GROUND	
					0.80	23.00		Grey sandy clay with fine gravel of flint brick concrete and rare clinker MADE GROUND	1
					1.40	22.40		Light grey chalky silt with much red brick dust MADE GROUND	
					1.70	22.10		Off white silty chalk with pockets of brown clay MADE GROUND	2
								Red brick MADE GROUND	
					3.90 4.00	19.90 19.80		End of borehole at 4.00 m	4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS126

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469656.00 - 106399.00

Hole Type
WLS

Location: Havant

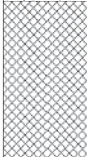
Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/03/2014 - 24/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.50	J		0.35	23.62				
								Concrete MADE GROUND		
		1.00	J		0.90 1.00	23.07 22.97		Pink and grey sandy limestone gravel MADE GROUND		
								Off white chalk with occasional fine and medium gravel size flint and red brick and pockets of black ash MADE GROUND		
		1.50	D		1.30	22.67		Red brick fragments MADE GROUND		
								Grey silty fine and medium sandy flint gravel MADE GROUND		
		1.70	22.27			White CHALK CIRIA Grade C/B UPPER CHALK				
					3.00	20.97		End of borehole at 3.00 m		

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS127

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469675.00 - 106404.00

Hole Type
WLS

Location: Havant

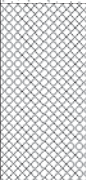
Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/03/2014 - 24/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.26	23.71		Reinforced concrete slab MADE GROUND	
		0.50	J					Off white chalk with occasional pockets of fine sand and black ash MADE GROUND	
		1.00	J		0.90	23.07		Black and grey silty fine sandy flint gravel MADE GROUND	1
					1.10	22.87		Red brick fragments MADE GROUND	
					1.60	22.37		Off white chalk with frequent fine sandy pockets of back ash MADE GROUND	2
		2.00	J		2.10	21.87		White CHALK with occasional flint. CIRIA Grade C/B UPPER CHALK	
		2.50	J						
		3.00	D		3.10	20.87		End of borehole at 3.10 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS128

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469684.00 - 106398.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/03/2014 - 02/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	23.79		Concrete slab MADE GROUND	
					0.40	23.57		Pink and grey silty fine to coarse sandy limestone gravel MADE GROUND	
		0.50	J					Off white chalk with abundant fine sandy pockets of black ash and frequent fine to coarse flint gravel MADE GROUND	
		1.00	J		0.90	23.07		Grey red and black silty sandy fine to coarse gravel with frequent fine to coarse gravel sized brick fragments MADE GROUND	1
		1.50	J		1.60	22.37		White CHALK CIRIA Grade C/B UPPER CHALK	2
		2.00	J						
		2.50	J						
		3.00	J						3
		3.50	J						
					3.90	20.07		End of borehole at 3.90 m	4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS129

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469699.00 - 106403.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/03/2014 - 24/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.23	23.74		Concrete HEAD DEPOSITS	
		0.50	ES		0.45	23.52		Light brown to grey silty sandy crushed concrete gravel overlain by a blue membrane MADE GROUND	
		1.00	ES					Off-white chalk composed of a silty matrix and rare fine to coarse weak chalk clasts frequent brick and clinker gravel and occasional pockets of ash MADE GROUND	1
		1.50	ES		1.30	22.67			
		2.00	ES					Off-white chalk composed of silty sandy matrix and occasional fine to coarse weak chalk clasts with occasional fine to coarse angular flint gravel frequent pockets of brown to grey silty sand and occasional brick gravel and ash MADE GROUND	2
		2.50	ES		2.60	21.37			
								End of borehole at 2.60 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS130

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469706.00 - 106397.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 24/03/2014 - 24/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	23.79		Concrete MADE GROUND	
					0.40	23.57		Pink and grey sandy limestone gravel MADE GROUND	
		0.50	ES		0.60	23.37		Off white chalk composed of silty sandy matrix and occasional fine to coarse weak chalk clasts with frequent pockets of grey sand and rare fine brick gravel MADE GROUND	
		1.00	ES		1.10	22.87		Brown sandy clay with frequent ash and clinker fine to coarse angular flint gravel and occasional pockets of soft white chalk MADE GROUND	1
		1.50	ES					Off white chalk composed of sandy silty matrix and frequent fine to coarse chalk clasts with rare pockets of brown sandy clay MADE GROUND	
		2.00	ES		2.20	21.77		White CHALK with occasional flint. CIRIA Grade C/B UPPER CHALK	2
		2.50	ES						
		3.00	ES		3.00	20.97			
								End of borehole at 3.00 m	3
									4
									5

Remarks



 Geo-Environmental					Borehole Log			Borehole No. WS131 Sheet 1 of 1	
Project Name: Havant Retail Park					Project No. GE9752		Co-ords: 469700.00 - 106390.00		Hole Type WLS
Location: Havant					Level: 23.97		Scale 1:25		Logged By
Client: Linden Homes Southern Limited					Dates: 25/03/2014 - 25/03/2014				

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.16	23.81		Concrete	
					0.25	23.72		MADE GROUND	
		0.30	ES					Pink and grey sandy limestone gravel	
								MADE GROUND	
		0.60	ES					Off white chalk composed of slightly sandy silty matrix and rare fine to coarse chalk gravel with frequent pockets of ash occasional crushed brick gravel and clinker rare pockets of brown sandy clay and rare fine to coarse angular flint gravel	
		1.00	ES						
		1.50	ES						
		2.00	ES						
		2.60	ES		2.50	21.47		White CHALK CIRIA Grade C/B UPPER CHALK	
		3.00	ES		3.00	20.97			
								End of borehole at 3.00 m	
Remarks									





Geo-Environmental

Borehole Log

Borehole No.

WS132

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469686.00 - 106387.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	23.79		Concrete MADE GROUND	
					0.40	23.57		Pink to grey sandy silty crushed limestone gravel overlain by blue membrane MADE GROUND	
		0.50	ES					Off-white chalk composed of slightly sandy silty matrix and rare fine to coarse chalk clasts with frequent brick gravel ash pockets of brown sandy clay and occasional fine to coarse angular flint gravel MADE GROUND	1
		1.00	ES						
		1.50	ES						
					1.70	22.27		Brown sandy silty clay with frequent fine chalk clasts and occasional fine to coarse clinker gravel and ash	
					1.80				
		2.00	ES			22.07		MADE GROUND White CHALK CIRIA Grade C/B UPPER CHALK	2
		2.50	ES		2.50	21.47		End of borehole at 2.50 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS133

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469676.00 - 106385.00

Hole Type
WLS

Location: Havant

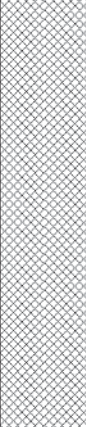
Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18 0.25	23.79 23.72		Concrete MADE GROUND	
		0.30	ES					Crushed brick gravel MADE GROUND	
		0.60	ES					Off white chalk composed of silty slightly sandy matrix and occasional weak fine to coarse chalk clasts with frequent crushed brick gravel occasional clinker ash and pockets of light brown sandy clay and rare fine to coarse angular flint gravel MADE GROUND	1
		1.00	ES						
		1.50	ES						
		2.00	ES		1.80	22.17		White CHALK with rare flint. CIRIA Grade C/B UPPER CHALK	2
		2.50	ES						
		3.00	ES		3.00	20.97			
								End of borehole at 3.00 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS134

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469665.00 - 106388.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.18	23.79		Concrete MADE GROUND	
					0.30	23.67		Red and grey sandy silty crushed brick and concrete gravel. (MADE GROUND).	
		0.50	ES					MADE GROUND Brown sandy clay with frequent fine to coarse sub-angular to angular flint gravel frequent pockets of soft chalk ash and clinker	
		0.65	ES		0.60	23.37		MADE GROUND Black fine to coarse clinker gravel and ash	
		0.80	ES		0.70	23.27		MADE GROUND Off white chalk composed of silty sandy matrix and rare fine chalk clasts with occasional ash	
		1.00	ES		0.90	23.07		MADE GROUND Dark brown to black sandy silty gravel of fine to coarse angular flint with frequent brick gravel and ash	1
					1.20	22.77		MADE GROUND Brown and light brown sandy silty clay with frequent fine chalk gravel and fine to coarse clinker gravel	
		1.50	ES		1.70	22.27		MADE GROUND White CHALK CIRIA Grade C/B UPPER CHALK	2
		2.00	ES						
		2.50	ES		2.50	21.47		End of borehole at 2.50 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS135

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469658.00 - 106377.00

Hole Type
WLS

Location: Havant

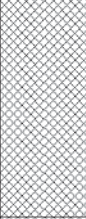
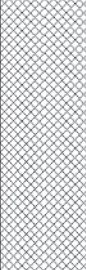
Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.19	23.78		Concrete MADE GROUND	
					0.30	23.67		Pink sandy limestone gravel MADE GROUND	
		0.50	ES					Off white chalk composed of silty slightly sandy matrix and frequent fine to coarse chalk clasts with frequent pockets of brown sandy clay brick and clinker gravel and occasional ash MADE GROUND	1
		1.00	ES		1.10	22.87		Brown to grey gravel sub-angular to sub-rounded flint MADE GROUND	
		1.50	ES						
		2.10	ES		2.00	21.97		White CHALK CIRIA Grade C/B UPPER CHALK	2
		2.50	ES						
		3.00	ES		3.00	20.97		End of borehole at 3.00 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS136

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469661.00 - 106361.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.21	23.76		Concrete MADE GROUND	
		0.30	ES					Brown and light brown sandy crushed concrete gravel with frequent fine to coarse angular flint gravel underlain by blue membrane MADE GROUND	
		0.70	ES		0.60	23.37		Off white chalk composed of silty sandy matrix and occasional weak fine to coarse chalk clasts with frequent pockets of light brown sand and occasional ash and clinker MADE GROUND	
		1.00	ES		0.90	23.07		White CHALK CIRIA Grade C/B UPPER CHALK	1
		1.50	ES						
		2.00	ES		2.00	21.97			
								End of borehole at 2.00 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS137

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469674.00 - 106365.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.18 0.25	ES		0.18 0.25	23.79 23.72		Concrete MADE GROUND	
		0.30	ES		0.30			Pink sandy limestone gravel overlain by blue membrane MADE GROUND	
		0.70	ES		0.60	23.37		Off white chalk composed of silty sandy matrix and frequent fine to coarse weak chalk clasts with fine to coarse angular flint gravel pockets of brown sandy clay and ash MADE GROUND	
		1.00	ES		0.90	23.07		Brown silty sandy clay with frequent brick and clinker gravel fine chalk gravel and occasional ash MADE GROUND	1
		1.50	ES		1.50	22.47		White CHALK CIRIA Grade C/B UPPER CHALK	
								End of borehole at 1.50 m	
									2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS138

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469685.00 - 106368.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.18			0.18	23.79		Concrete MADE GROUND	
		0.30			0.30	23.67		Pink and grey sandy limestone gravel MADE GROUND	
		0.40	ES					Off white chalk composed of silty matrix and frequent moderately weak fine to coarse chalk clasts with frequent fine to coarse angular flint gravel ash and occasional crushed brick gravel MADE GROUND	
		0.80			0.80	23.17		White CHALK CIRIA Grade C/B UPPER CHALK	1
		1.00	ES						
		1.50	ES		1.50	22.47		End of borehole at 1.50 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS139

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469695.00 - 106370.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.30	ES		0.10 0.20	23.87 23.77	 	Concrete MADE GROUND	
		0.50 - 0.70	ES		0.40 0.70	23.57 23.27	     	Pink sandy gravel of limestone MADE GROUND Off white silty chalk MADE GROUND Brown clay with some medium to coarse gravel of flint red brick and clinker MADE GROUND	
		1.50	D		1.15	22.82	  	Off white silty chalk and brown clay with occasional flint gravel MADE GROUND White CHALK CIRIA GRADE C/B UPPER CHALK	1
					2.00	21.97	                                  	End of borehole at 2.00 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS140

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469704.00 - 106373.00

Hole Type
WLS

Location: Havant

Level: 23.97

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 25/03/2014 - 25/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	23.82		Concrete	
								MADE GROUND	
		0.30 - 0.40	ES		0.30	23.67		Pink sandy gravel of limestone	
								MADE GROUND	
		0.50 - 0.70	ES		0.50	23.47		Off white silty chalk	
								MADE GROUND	
					0.70	23.27		Brown clay with some medium to coarse gravel of flint red brick and rare clinker	
								MADE GROUND	
		0.90 - 1.10	ES		0.90	23.07		Red brick fragments	
								MADE GROUND	
								Black ash and clinker	
								MADE GROUND	
		1.30 - 1.50	D		1.20	22.77		White CHALK CIRIA Grade C/B	
								UPPER CHALK	
					2.00	21.97		End of borehole at 2.00 m	

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS141

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469597.00 - 106440.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/03/2014 - 26/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	23.83		Concrete MADE GROUND	
		0.40 - 0.60	ES		0.40	23.58		Brown sandy flint gravel MADE GROUND	
		0.80 - 1.00	ES					Off white silty chalk and brown clay with some medium to coarse gravel of flint red brick and rare clinker MADE GROUND	1
		1.30 - 1.50	ES		1.30	22.68		Off white silty reworked chalk with occasional grey silt pockets MADE GROUND	
		1.80	D		1.60	22.38		White CHALK CIRIA Grade C/B UPPER CHALK	
					2.00	21.98		End of borehole at 2.00 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS142

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469602.00 - 106420.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/03/2014 - 26/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.15	23.83		Concrete	
					0.25	23.73		MADE GROUND	
		0.80	ES			Brown sandy flint gravel			
						MADE GROUND			
						White CHALK CIRIA Grade C/B			
						UPPER CHALK			
		1.20	D						
									
									
									
1.50									
									
End of borehole at 1.50 m									
</									

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS143

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469605.00 - 106406.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/03/2014 - 26/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	23.83		Concrete	
								MADE GROUND	
								Brown sandy flint gravel	
		0.40 - 0.60	ES		0.30	23.68		MADE GROUND	
								White CHALK CIRIA Grade C/B	
								UPPER CHALK	
		0.80 - 1.00	ES						
					1.00	22.98			
								End of borehole at 1.00 m	1
									2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS144

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469636.00 - 106448.00

Hole Type
WLS

Location: Havant

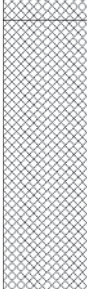
Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/03/2014 - 26/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.40 - 0.60	ES		0.15	23.83		Concrete MADE GROUND	1		
					0.30	23.68		Brown sandy flint gravel MADE GROUND			
								Off white silty chalk. Possibly disturbed or reworked chalk MADE GROUND			
		0.90 - 1.20	ES		1.20	22.78		White CHALK CIRIA Grade C/B UPPER CHALK	2		
		1.50	D		2.50	21.48		End of borehole at 2.50 m	3		
											4
											5



Geo-Environmental

Borehole Log

Borehole No.

WS145

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469618.00 - 106448.00

Hole Type
WLS

Location: Havant

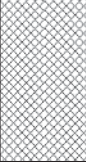
Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 26/03/2014 - 26/03/2014

Logged By
GR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	23.83		Concrete MADE GROUND	
		0.30			0.30	23.68		Brown sandy flint gravel MADE GROUND	
		0.40 - 0.70	ES					Grey off white and black sandy clay and silty chalk with much ash and clinker and occasional medium gravel size flint and red brick MADE GROUND	
		0.80			0.80	23.18		Off white silty chalk with occasional to rare ash clinker and concrete fragments MADE GROUND	1
		0.90 - 1.20	ES					White CHALK CIRIA Grade C/B UPPER CHALK	2
		1.60			1.60	22.38			
		3.00			3.00	20.98		End of borehole at 3.00 m	3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS146

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469647.00 - 106381.00

Hole Type
WLS

Location: Havant

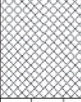
Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 27/03/2014 - 27/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	23.83		Concrete slab	
								MADE GROUND	
					0.40	23.58		Pink and grey sandy limestone gravel	
		0.50	ES					MADE GROUND	
					0.75	23.23		Off white chalk composed of a silty putty matrix with fine to coarse flint gravel and pockets of fine sandy black ash with occasional fine crushed brick	
								MADE GROUND	
		1.00	ES					White to off white CHALK CIRIA GRADE C/B UPPER CHALK	1
									
									
									
		1.50	D		1.50	22.48			
								End of borehole at 1.50 m	
									2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS147

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469629.00 - 106380.00

Hole Type
WLS

Location: Havant

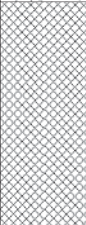
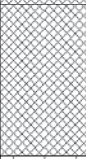
Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 27/03/2014 - 27/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	23.83		Concrete slab MADE GROUND	
		0.50	ES					Off white and dark grey mottled chalk composed of a silty sandy matrix and abundant fine and medium flint gravel pockets of black fine sandy ash and occasional fine crushed brick MADE GROUND	
		1.00	ES		0.90	23.08		Pink and grey silty fine sandy fine and medium gravel of limestone and flint MADE GROUND	1
		1.50	D		1.40	22.58		White CHALK CIRIA GRADE C/B. UPPER CHALK	
					1.70	22.28		End of borehole at 1.70 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS148

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469624.00 - 106400.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 27/03/2014 - 27/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20	23.78		Concrete slab MADE GROUND	
		0.30	ES						
		0.50	D		0.50	23.48		White and brown mottled chalk composed of a silty fine sandy matrix and frequent fine to coarse gravel size weak chalk fragments MADE GROUND	
								White CHALK CIRIA Grade C/B UPPER CHALK	
		1.00	D						1
		1.50	D		1.50	22.48		End of borehole at 1.50 m	2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS149

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469646.00 - 106416.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 27/03/2014 - 27/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.17 0.40 0.40	23.81 23.58 23.58	  	Concrete slab MADE GROUND Pink and grey silty fine sandy fine to coarse gravel of limestone and flint MADE GROUND Concrete. Unable to penetrate. MADE GROUND End of borehole at 0.40 m	1 2 3 4 5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS150

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469626.00 - 106413.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 27/03/2014 - 27/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20	23.78		Concrete slab MADE GROUND	
		0.50	D					White CHALK CIRIA GRADE C/B UPPER CHALK	
		1.00	D		1.10	22.88		End of borehole at 1.10 m	1
									2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS151

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469622.00 - 106428.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 28/03/2014 - 28/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20	23.78		Concrete slab MADE GROUND	
		0.50	D					White CHALK CIRIA GRADE C/B UPPER CHALK	
		1.00	D						1
					1.20	22.78		End of borehole at 1.20 m	
									2
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS152

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469632.00 - 106434.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 28/03/2014 - 28/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15	23.83		Concrete slab	
		0.30	ES					MADE GROUND	
		0.50	ES		0.40	23.58		Pink and grey mottled silty fine sandy fine to coarse gravel of limestone and occasional to some flint	
								MADE GROUND	
		1.00	ES					Off white locally dark grey mottled chalk composed of a silty fine sandy matrix and frequent fine to coarse white weak chalk fragments. Possibly reworked or disturbed Chalk	1
								MADE GROUND	
					1.80	22.18		White CHALK CIRIA GRADE C/B	
		1.90	D		1.90	22.08		UPPER CHALK	2
								End of borehole at 1.90 m	
									3
									4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS153

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469646.00 - 106400.00

Hole Type
WLS

Location: Havant

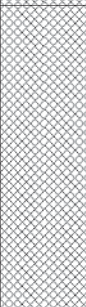
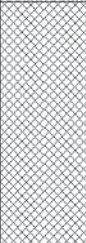
Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 28/03/2014 - 28/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20	23.78		Concrete slab MADE GROUND	
		0.30	ES		0.40	23.58		Pink and grey silty fine sandy gravel of limestone MADE GROUND	
		0.90	ES		1.40	22.58		Dark grey off white and black mottled chalk composed of a fine to medium sandy silty matrix and frequent white weak coarse chalk fragments and frequent fine and medium flint gravel and frequent pockets of fine sandy black ash MADE GROUND	1
		1.80	ES		2.20	21.78		Off white chalk composed of a silty matrix and frequent fine to coarse weak chalk fragments and frequent fine to coarse flint fragments. Possibly reworked or disturbed Chalk MADE GROUND	2
		2.50	D		3.00	20.78		White CHALK CIRIA GRADE C/B. UPPER CHALK	3
		3.20			3.20	20.78		End of borehole at 3.20 m	4
									5

Remarks





Geo-Environmental

Borehole Log

Borehole No.

WS154

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469606.00 - 106390.00

Hole Type
WLS

Location: Havant

Level: 23.98

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 28/03/2014 - 28/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30	23.68		Pink and light brown mottled fine sandy gravel of flint and limestone MADE GROUND	1
		0.40	ES					Off white chalk composed of a silty fine sandy matrix and frequent fine to coarse weak chalk fragments and frequent fine to coarse flint gravel MADE GROUND	
		0.80	ES					Pink and light brown silty fine sandy gravel of flint and limestone MADE GROUND	
					1.10	22.88		Off white chalk composed of a silty matrix and frequent medium and coarse weak chalk fragments and frequent fine sandy pockets of black ash MADE GROUND	2
		1.50	ES						
		2.00	D		1.85	22.13		White CHALK CIRIA GRADE C/B UPPER CHALK	
					2.20	21.78		End of borehole at 2.20 m	5

Remarks



 Geo-Environmental					Borehole Log			Borehole No. WS155 Sheet 1 of 1	
Project Name: Havant Retail Park					Project No. GE9752		Co-ords: 469608.00 - 106377.00		Hole Type WLS
Location: Havant					Level: 23.98		Scale 1:25		Logged By
Client: Linden Homes Southern Limited					Dates: 28/03/2014 - 28/03/2014				

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.15	23.83		Light brown silty fine sand with occasional cobble size flint	1 2 3 4 5
		0.20	ES					MADE GROUND	
		0.50	ES		0.35	23.63		White and grey mottled chalk composed of a silty matrix and frequent fine weak white chalk fragments and occasional fine and medium flint gravel	
								MADE GROUND	
		1.00	ES		1.20	22.78		Light brown grey and pink fine sandy gravel of limestone and occasional flint	
								MADE GROUND	
		1.50	ES		1.85	22.13		Off white chalk composed of a silty matrix and frequent fine and medium weak white chalk fragments and occasional fine sandy pockets of black ash	
								MADE GROUND	
		2.00	D		2.20	21.78		White CHALK CIRIA GRADE C/B UPPER CHALK	
								End of borehole at 2.20 m	

Remarks
 



Geo-Environmental

Borehole Log

Borehole No.

WS156

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469647.00 - 106427.00

Hole Type
WLS

Location: Havant

Level: 23.95

Scale
1:25

Client: Linden Homes Southern Limited

Dates: 28/03/2014 - 28/03/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.15	23.80		Tarmac MADE GROUND	
					Pink and grey sandy gravel of limestone MADE GROUND				
		0.90	ES		0.55	23.40		Off white and grey chalk composed of a silty matrix and frequent fine and medium gravel size chalk fragments and occasional fine to coarse flint gravel. Possibly reworked/disturbed Chalk. MADE GROUND	1
					1.50	ES			
		2.00	D		1.70	22.25		White CHALK with occasional gravel size flint CIRIA GRADE C/B UPPER CHALK	2
		3.10	20.85				3		
							End of borehole at 3.10 m	4	
								5	



Trialpit No

TP1

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469642.00 - 106450.00

Level:	23.90
--------	-------

Date _____

08/04/2014

Location: Havant

Dimensions

1.7

Depth
1.40

0.6

Scale

1:25

Logged
JO

Client: Linden Homes Southern Limited

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10	23.80		Tarmacadam.
				0.20	23.70		MADE GROUND
							Grey and pink sandy gravel of limestone.
							MADE GROUND
							Yellow sandy flint gravel.
				0.45	23.45		MADE GROUND
							White moderately strong CHALK with closely spaced joints and localised discolouration.
							UPPER CHALK
				1.40	22.50		End of pit at 1.40 m

Remarks:

Stability:





Geo-Environmental

Trial Pit Log

Trialpit No

TP2

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469651.00 - 106409.00
Level: 23.95

Date
08/04/2014

Location: Havant

Dimensions
(m):

1.4

Depth
1.85

0.6

Scale

1:25

Logged
JO

Client: Linden Homes Southern Limited

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.05	23.90		Pavement slab. MADE GROUND	
				0.10	23.85		Yellow silty sand. MADE GROUND	
				0.45	23.50		Grey and pink sandy gravel of limestone. MADE GROUND	
							Grey ashy silty sand with frequent fragments of cloth and occasional chalk gravel. MADE GROUND	
				1.15	22.80		White slightly weathered moderately weak CHALK with closely spaced joints and frequent fine to cobble size flint nodules. UPPER CHALK	1
				1.85	22.10		End of pit at 1.85 m	2
								3
								4
								5

Remarks: Clay drain pipe at 1m bgl.

Stability:



 Geo-Environmental				Trial Pit Log				Trialpit No TP3 Sheet 1 of 1	
Project Name: Havant Retail Park				Project No. GE9752		Co-ords: 469652.00 - 106371.00 Level: 23.85		Date 08/04/2014	
Location: Havant				Dimensions (m): 1.3 0.6		Scale 1:25		Logged JO	
Client: Linden Homes Southern Limited				Depth 1.60					

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.15	23.70		Reinforced concrete slab. MADE GROUND	1
				0.40	23.45		Grey and pink sandy gravel of limestone underlain by a blue plastic membrane. MADE GROUND	
				0.75 0.80	23.10 23.05		Grey ashy silty sand with frequent chalk gravel. MADE GROUND	
							Light brown weakly cemented sandy flint gravel. MADE GROUND White slightly weathered moderately weak CHALK with closely spaced joints, frequent fine to cobble size flint nodules and occasional iron staining around the flint. UPPER CHALK	2
				1.60	22.25		End of pit at 1.60 m	
								3
								4
								5

Remarks:		
Stability:		



Geo-Environmental

Trial Pit Log

Trialpit No

TP4

Sheet 1 of 1

Project Name: Havant Retail Park

Project No.
GE9752

Co-ords: 469602.00 - 106395.00

Level: 23.76

Date

08/04/2014

Location: Havant

Dimensions
(m):

1.6

Scale

1:25

Client: Linden Homes Southern Limited

Depth
2.20

0.6

Logged
JO

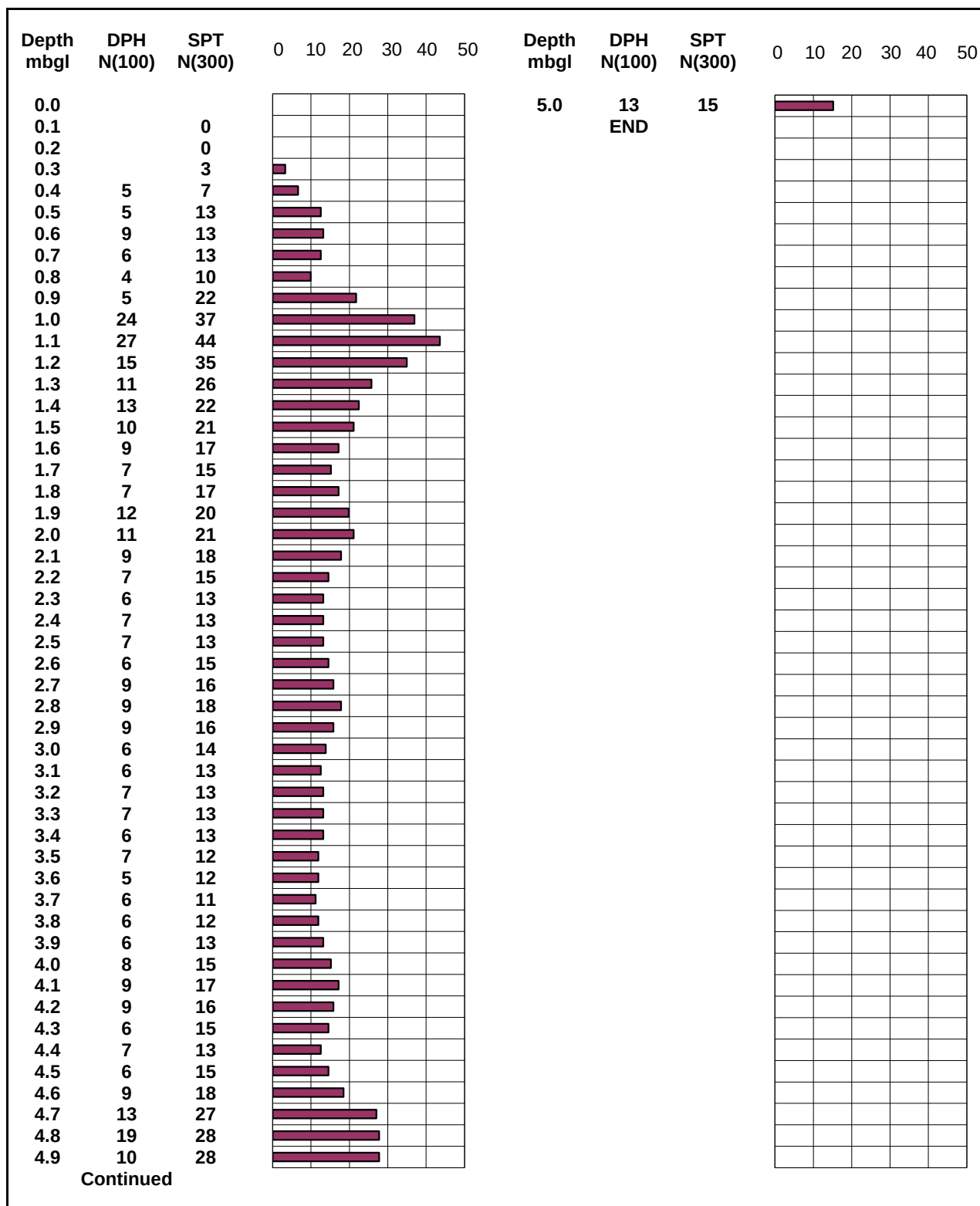
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.05	23.71		Pavement slab. MADE GROUND	
				0.25	23.51		Brown to pink sandy gravel of limestone. MADE GROUND	
							Grey sandy chalk with frequent ash and occasional brick gravel. MADE GROUND	
				0.90	22.86		Brown to dark brown clay with frequent fine to coarse chalk and flint gravel, crushed concrete gravel, clinker, ash and brick fragments. MADE GROUND	1
				2.10	21.66		White moderately strong CHALK with closely spaced joints. UPPER CHALK	2
				2.20	21.56		End of pit at 2.20 m	
								3
								4
								5

Remarks:

Stability:

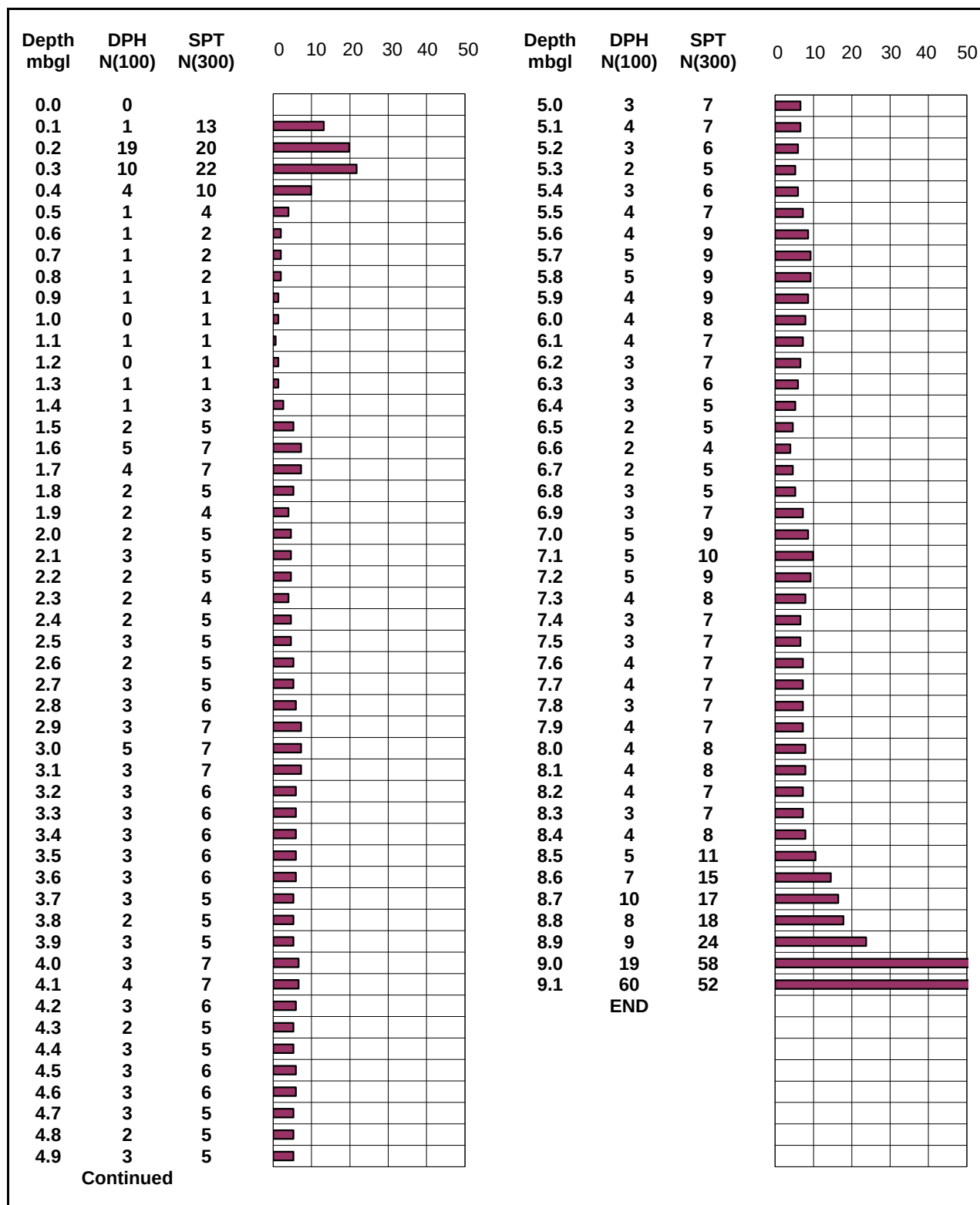


 Geo-Environmental				Trial Pit Log				Trialpit No TP5 Sheet 1 of 1							
Project Name: Havant Retail Park				Project No. GE9752		Co-ords: 469594.00 - 106427.00 Level: 24.00		Date 08/04/2014							
Location: Havant				Client: Linden Homes Southern Limited		Dimensions (m): Depth 0.80		1.15 0.6		Scale 1:25 Logged JO					
Water Strike		Samples and In Situ Testing				Depth (m)		Level (m)		Legend		Stratum Description			
		Depth		Type		Results		0.10		23.90		 Flint gravel.  MADE GROUND  White moderately strong CHALK with closely spaced joints and localised discolouration.  UPPER CHALK			
								0.80		23.20				1	
														2	
														3	
														4	
														5	
Remarks:															
Stability:															



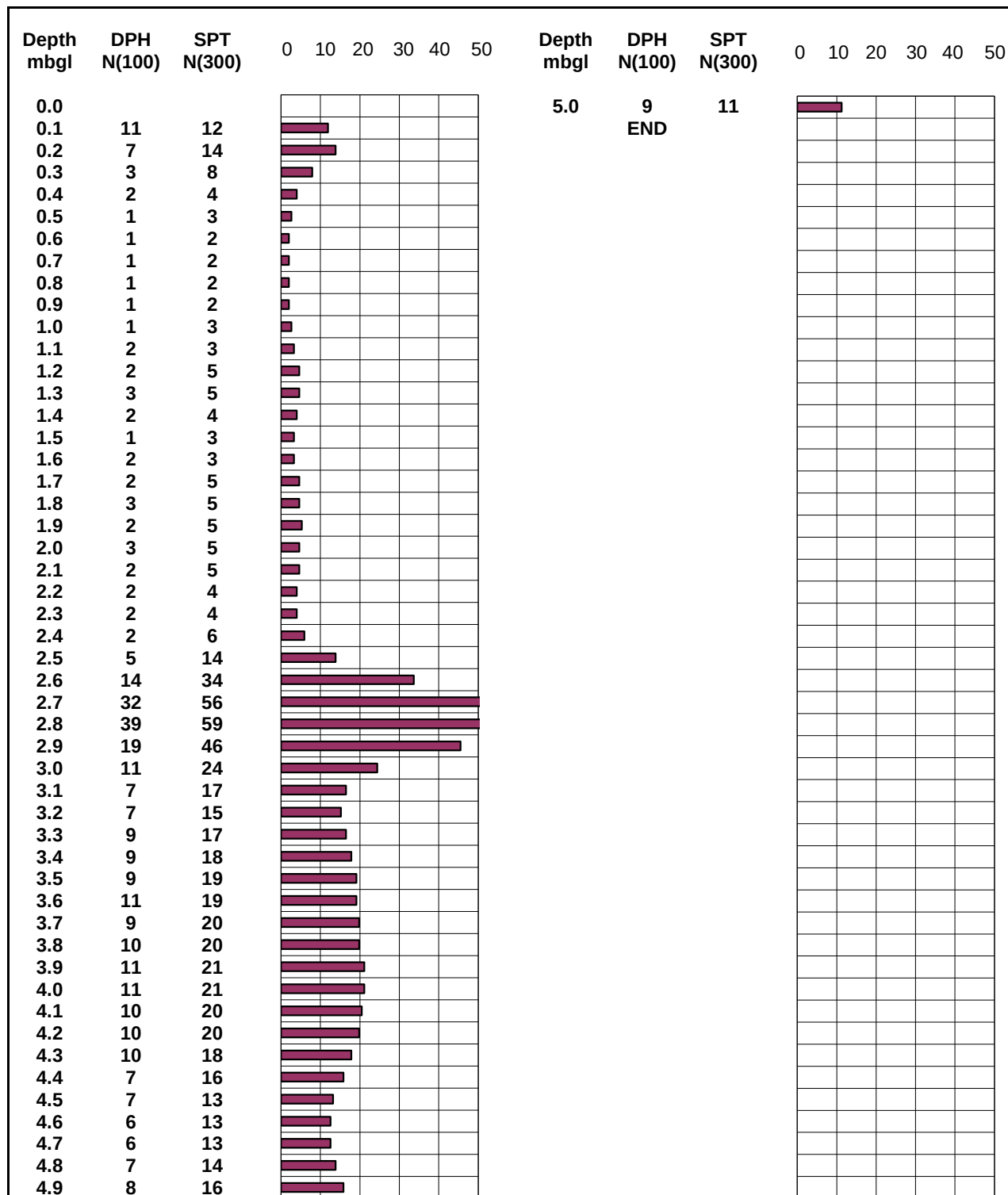
Note: DPH 'N(100)' converted to SPT 'N(300)' by using factor of 0.66. Average taken over 300mm

Project:	Havant Retail Park			Title:	DP101
Client:	Linden Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex, BN6 9GL mail@gesl.net - www.gesl.net - 01273 832972	
Ref No:	GE9752	Rev:	V1		
Drawn:	EGMN	Date:	March 2014		
Figure:	N/A	Scale:	Not To Scale		



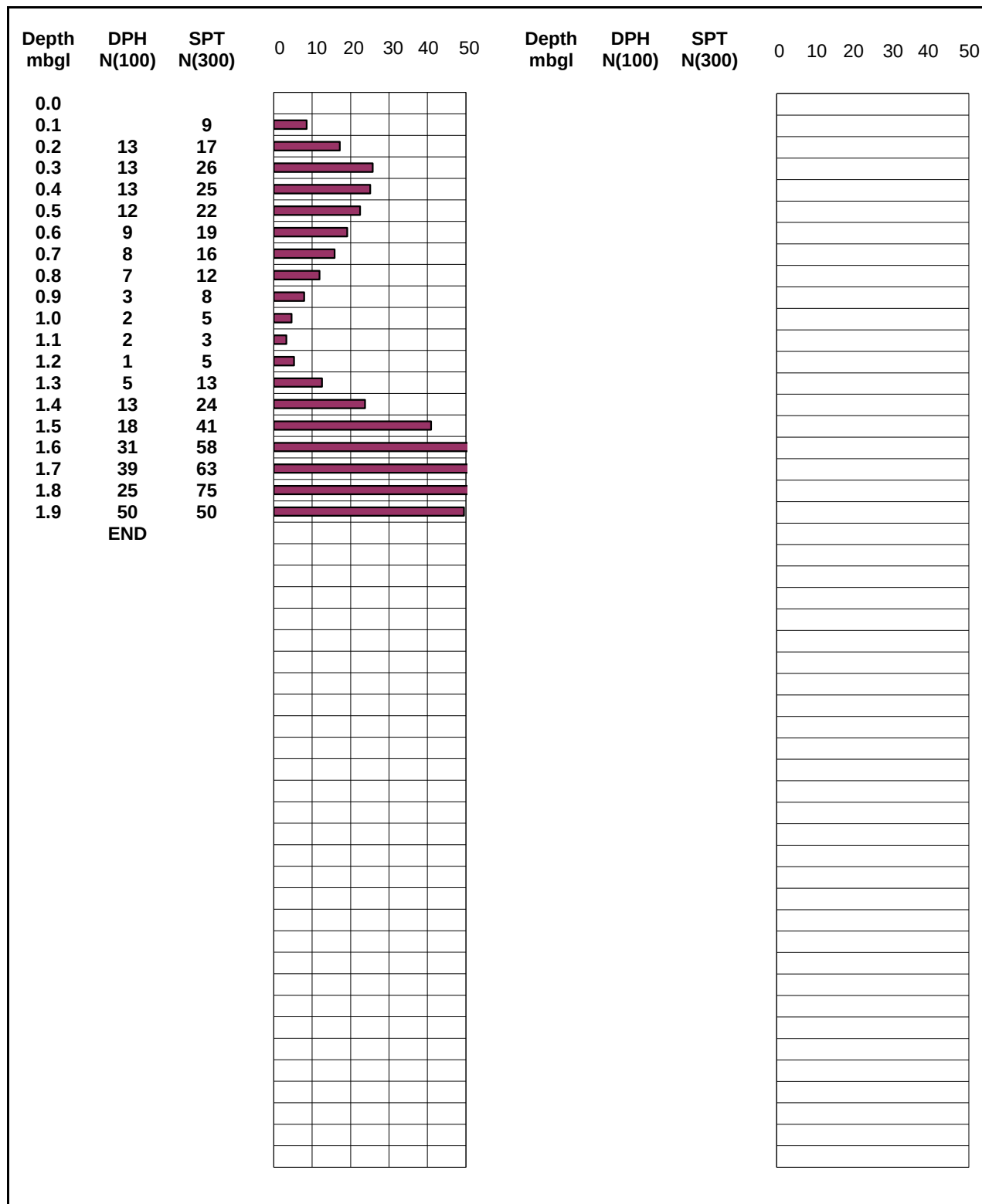
Note: DPH 'N(100)' converted to SPT 'N(300)' by using factor of 0.66. Average taken over 300mm

Project:	Havant Retail Park			Title:	DP 102	
Client:	Linden Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex, BN6 9GL mail@gesl.net - www.gesl.net - 01273 832972		
Ref No:	GE9752	Rev:	V1			
Drawn:	EGMN	Date:	March 2014			
Figure:	N/A	Scale:	Not To Scale			



Note: DPH 'N(100)' converted to SPT 'N(300)' by using factor of 0.66. Average taken over 300mm

Project:	Havant Retail Park			Title:	DP103
Client:	Linden Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex, BN6 9GL mail@gesl.net - www.gesl.net - 01273 832972	
Ref No:	GE9752	Rev:	V1		
Drawn:	EGMN	Date:	March 2014		
Figure:	N/A	Scale:	Not To Scale		



Note: DPH 'N(100)' converted to SPT 'N(300)' by using factor of 0.66. Average taken over 300mm

Project:	Havant Retail Park			Title:	DP104
Client:	Linden Homes			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex, BN6 9GL mail@gesl.net - www.gesl.net - 01273 832972	
Ref No:	GE9752	Rev:	V1		
Drawn:	EGMN	Date:	March 2014		
Figure:	N/A	Scale:	Not To Scale		

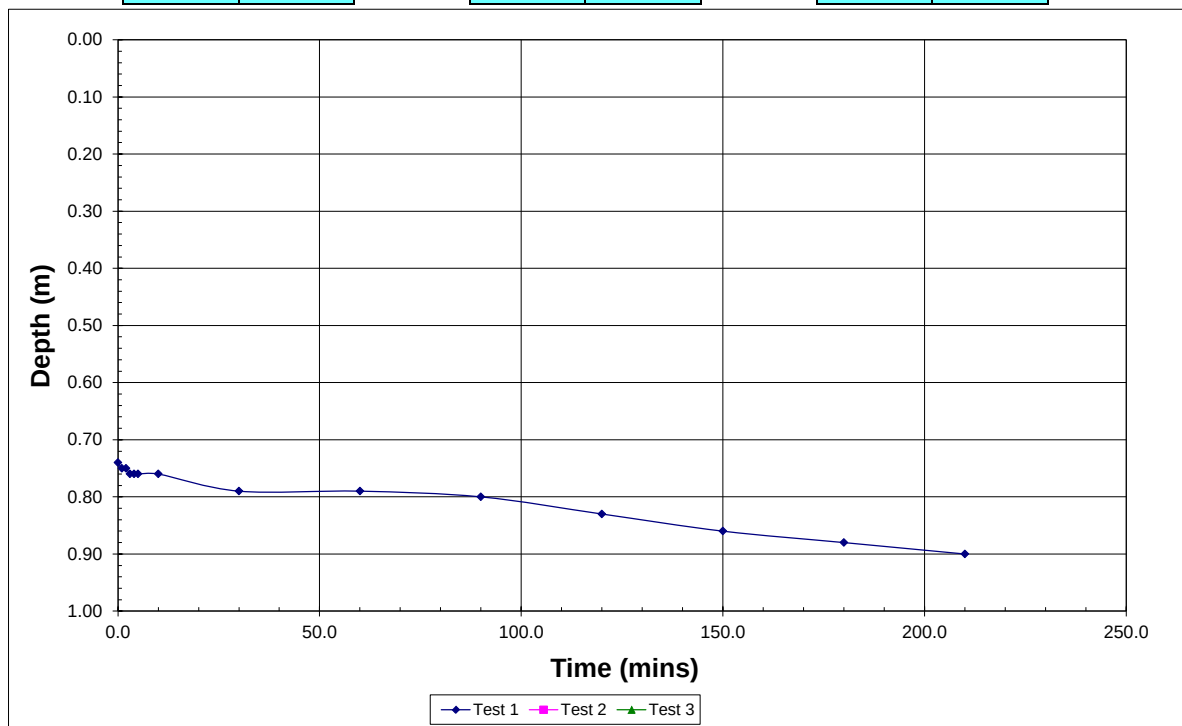
 Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-Environmental Services Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net
Project Name : Havant Retail Park II		Job No. : GE9752
Client : Linden Homes Southern Limited		Date : 08/04/2014

Pit reference	TP1
Pit depth (m)	0.90
Pit width (m)	0.60
Pit length (m)	1.70
Depth to standing water (m)	

Test 1	
Time (min)	Depth (m)
0.0	0.74
1.0	0.75
2.0	0.75
3.0	0.76
4.0	0.76
5.0	0.76
10.0	0.76
30.0	0.79
60.0	0.79
90.0	0.80
120.0	0.83
150.0	0.86
180.0	0.88
210.0	0.90

Test 2	
Time (min)	Depth (m)

Test 3	
Time (min)	Depth (m)



Max. depth (m)	0.90	0.90	0.90
Effective depth (m)	0.16	0.90	0.90
75% effective depth (m)	0.78	0.23	0.23
50% effective depth (m)	0.82	0.45	0.45
25% effective depth (m)	0.86	0.68	0.68
t75 (min)	25.00		
t50 (min)	110.00		
t25 (min)	150.00		
Vp 75-25	0.08	0.46	0.46
ap 50	1.388	3.09	3.09
tp 75-25	125.00	0.00	0.00

Soil infiltration rate (m/s)	7.8E-06	#DIV/0!	#DIV/0!
Soil infiltration rate (mm/hr)	2.82E+01	#DIV/0!	#DIV/0!

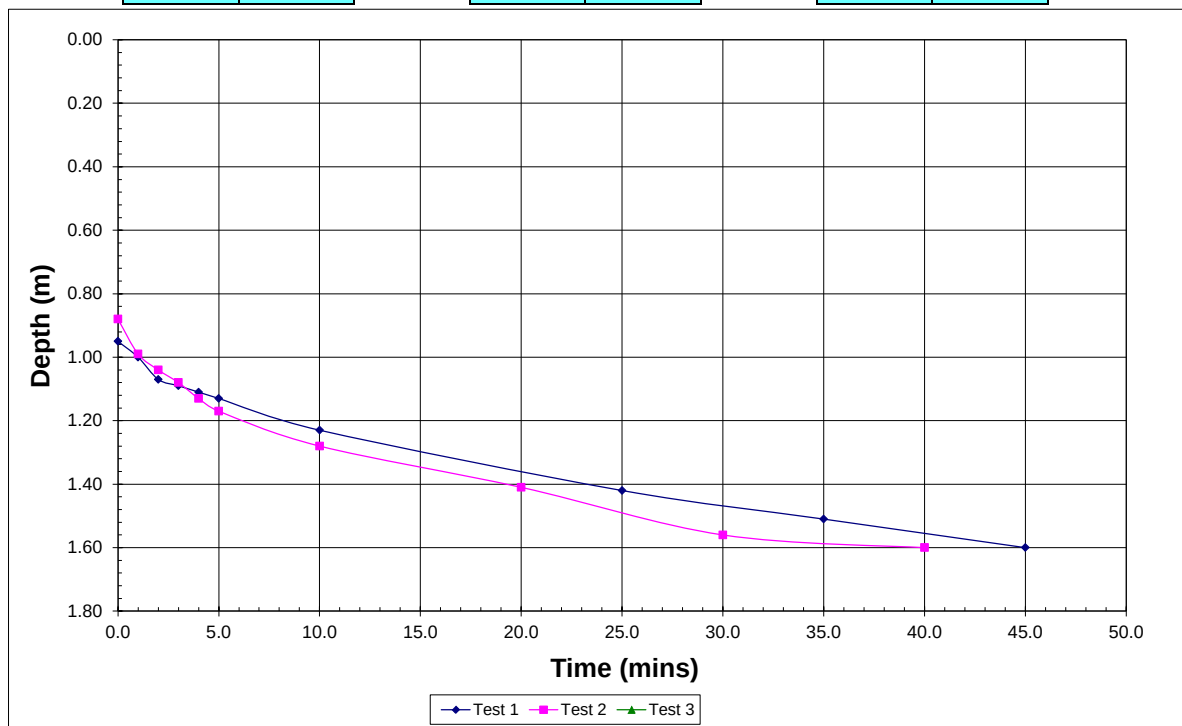
 Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-Environmental Services Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net
Project Name : Havant Retail Park II		Job No. : GE9752
Client : Linden Homes Southern Limited		Date : 08/04/2014

Pit reference	TP3
Pit depth (m)	1.60
Pit width (m)	0.60
Pit length (m)	1.30
Depth to standing water (m)	

Test 1	
Time (min)	Depth (m)
0.0	0.95
1.0	1.00
2.0	1.07
3.0	1.09
4.0	1.11
5.0	1.13
10.0	1.23
25.0	1.42
35.0	1.51
45.0	1.60

Test 2	
Time (min)	Depth (m)
0.0	0.88
1.0	0.99
2.0	1.04
3.0	1.08
4.0	1.13
5.0	1.17
10.0	1.28
20.0	1.41
30.0	1.56
40.0	1.60

Test 3	
Time (min)	Depth (m)



Max. depth (m)	1.60	1.60	1.60
Effective depth (m)	0.65	0.72	1.60
75% effective depth (m)	1.11	1.06	0.40
50% effective depth (m)	1.28	1.24	0.80
25% effective depth (m)	1.44	1.42	1.20
t75 (min)	3.50	2.50	
t50 (min)	14.00	8.00	
t25 (min)	27.00	21.00	
Vp 75-25	0.25	0.28	0.62
ap 50	2.015	2.148	3.82
tp 75-25	23.50	18.50	0.00

Soil infiltration rate (m/s)	8.9E-05	1.2E-04	#DIV/0!
Soil infiltration rate (mm/hr)	3.21E+02	4.24E+02	#DIV/0!



Soakaway Test Results (after BRE Digest 365)

Geo-EnvironmentalServices Limited

**Unit 7 Danworth Farm, Cuckfield Road,
Hurstpierpoint, West Sussex BN6 9GL
+44(0)1273 832972 www.qesl.net**

Project Name : Havant Retail Park II

Job No. : GE9752

Client : Linden Homes Southern Limited

Date : 08/04/2014

Pit reference	TP5
Pit depth (m)	0.50
Pit width (m)	0.60
Pit length (m)	1.15
Depth to standing water (m)	

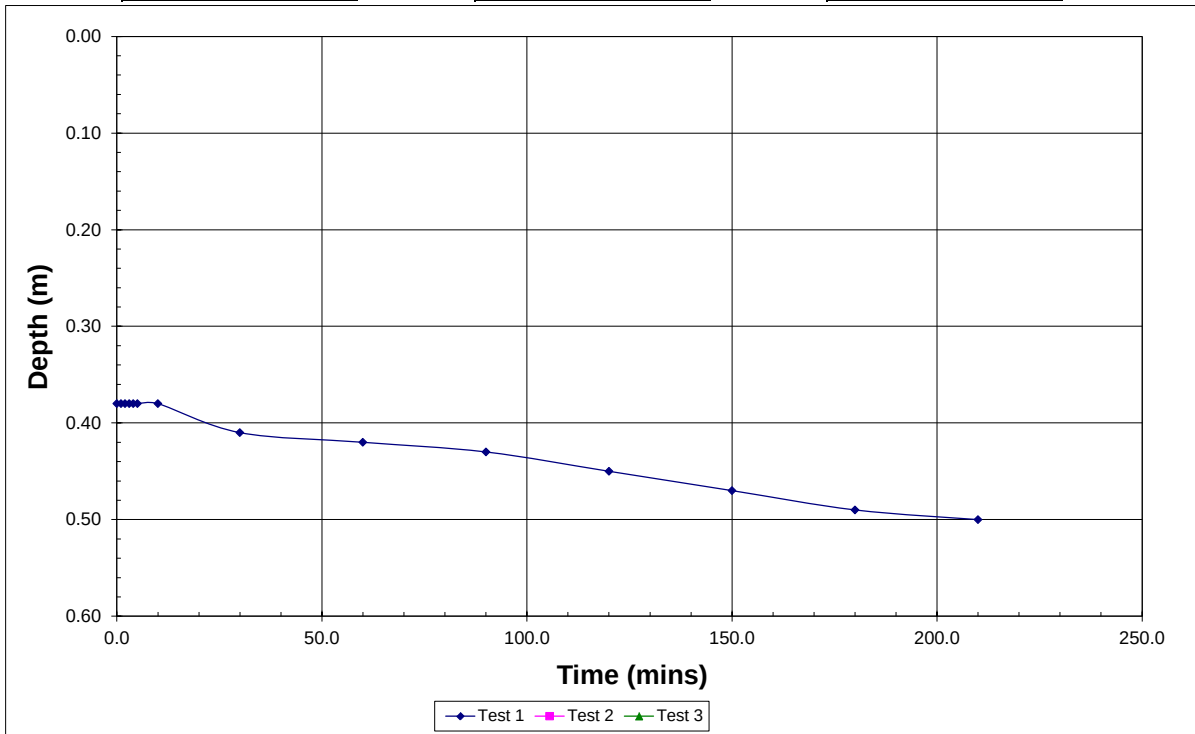
Test 1

Time (min)	Depth (m)
0.0	0.38
1.0	0.38
2.0	0.38
3.0	0.38
4.0	0.38
5.0	0.38
10.0	0.38
30.0	0.41
60.0	0.42
90.0	0.43
120.0	0.45
150.0	0.47
180.0	0.49
210.0	0.50

Test 2

[illegible]

Test 3

[illegible]

Max. depth (m)	0.50	0.50	0.50
Effective depth (m)	0.12	0.50	0.50
75% effective depth (m)	0.41	0.13	0.13
50% effective depth (m)	0.44	0.25	0.25
25% effective depth (m)	0.47	0.38	0.38
t75 (min)	30.00		
t50 (min)	110.00		
t25 (min)	150.00		
Vp 75-25	0.04	0.17	0.17
ap 50	0.9	1.565	1.565
tp 75-25	120.00	0.00	0.00

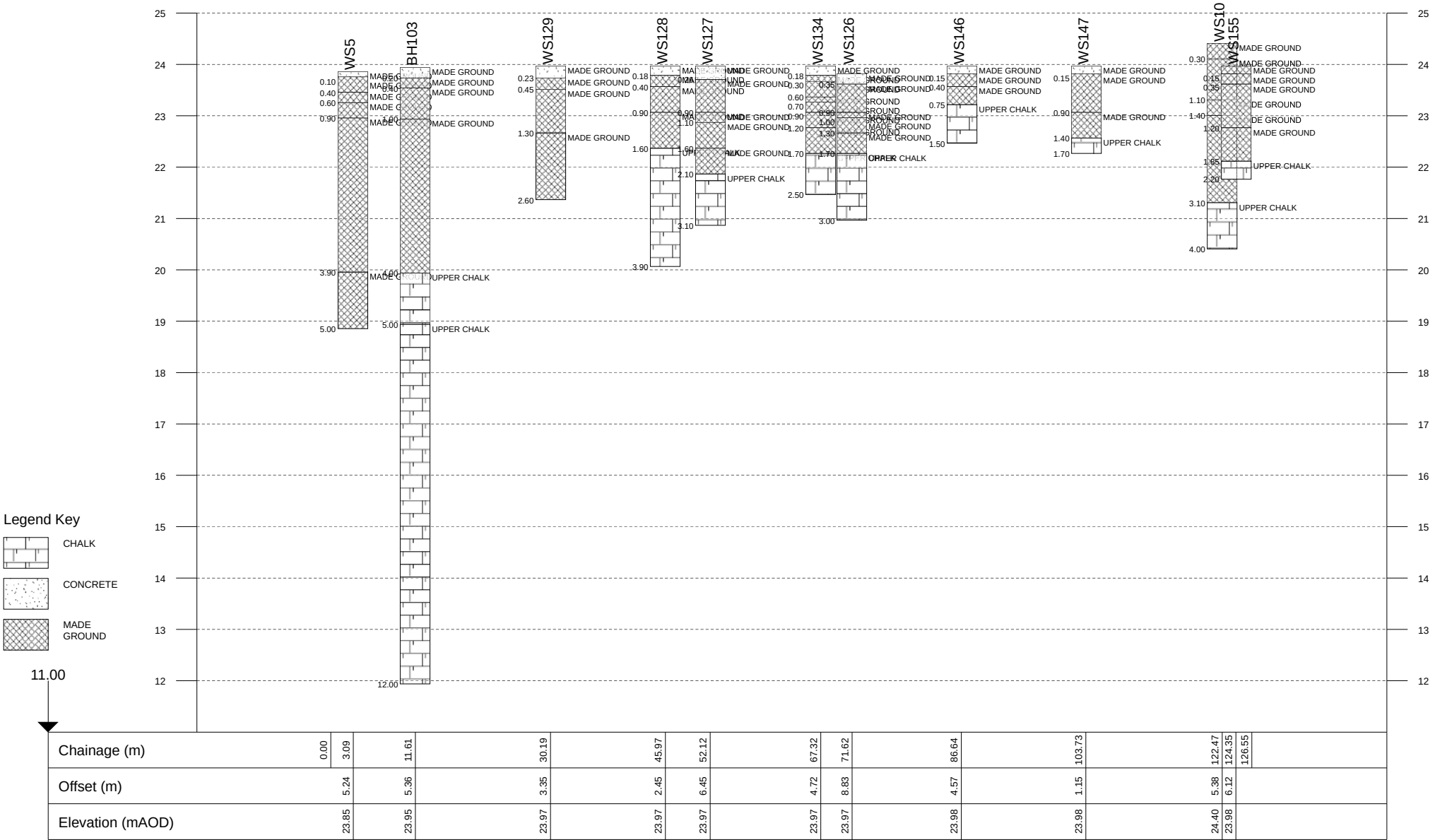
Soil infiltration rate (m/s)	6.4E-06	#DIV/0!	#DIV/0!
Soil infiltration rate (mm/hr)	2.30E+01	#DIV/0!	#DIV/0!

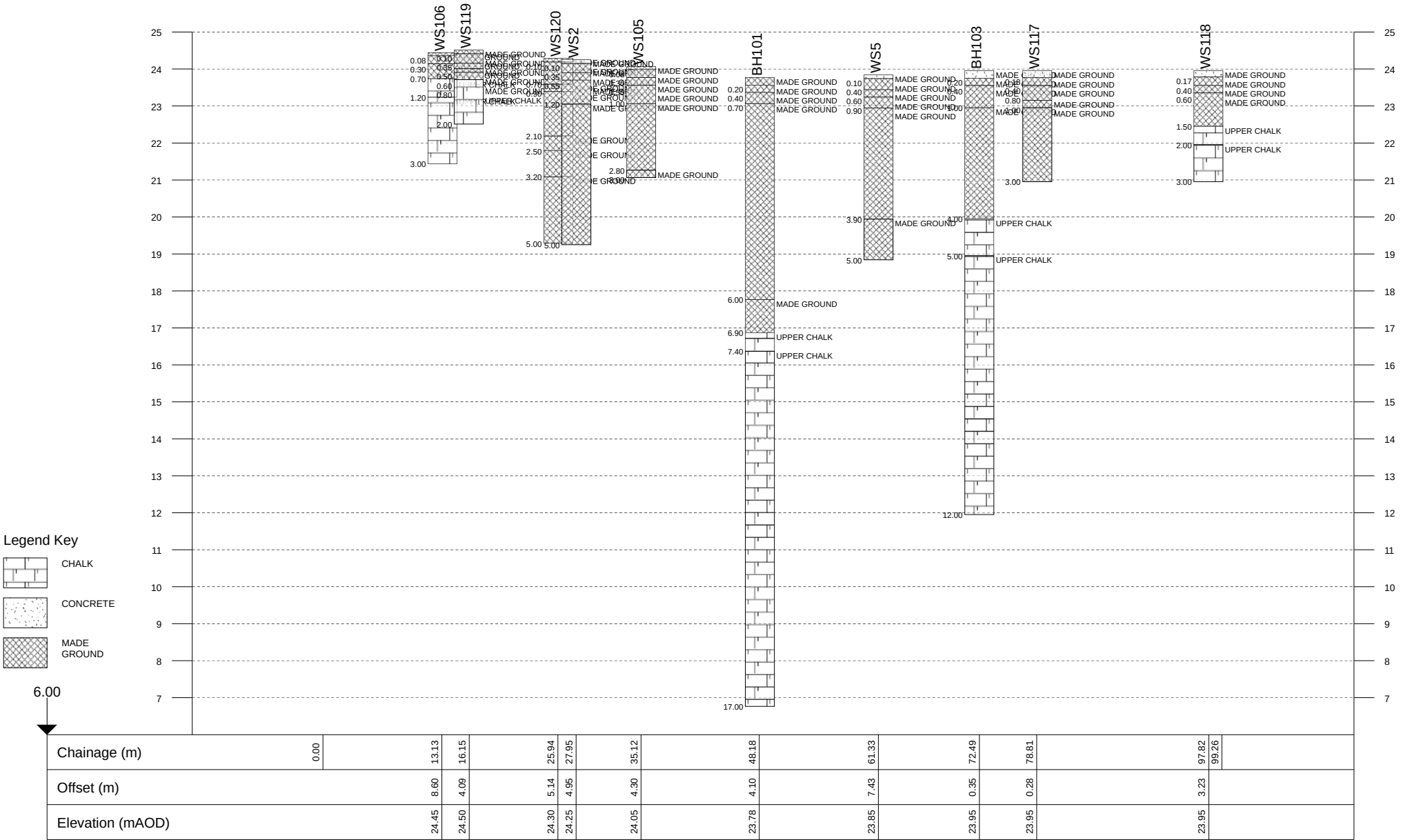


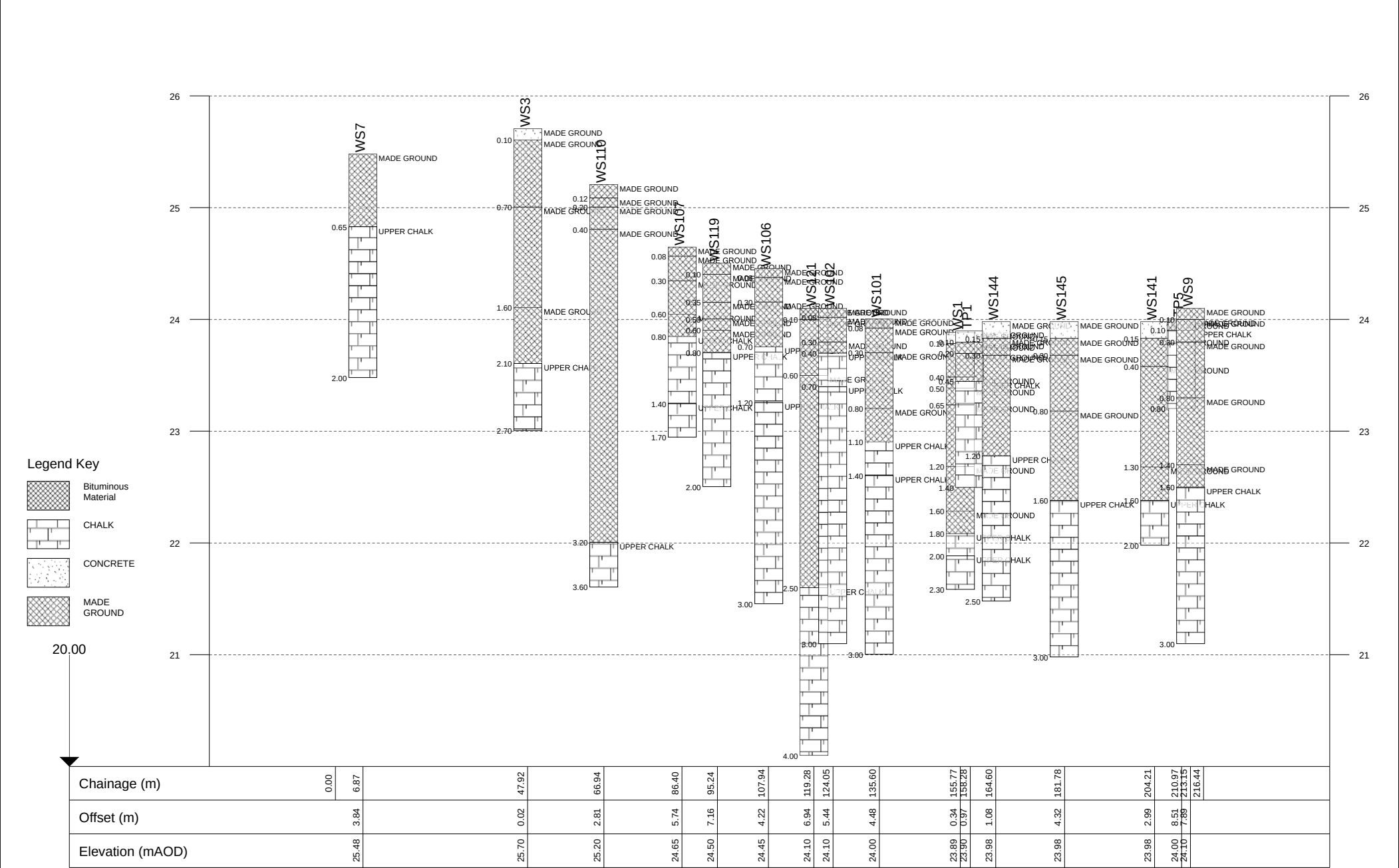
APPENDIX B

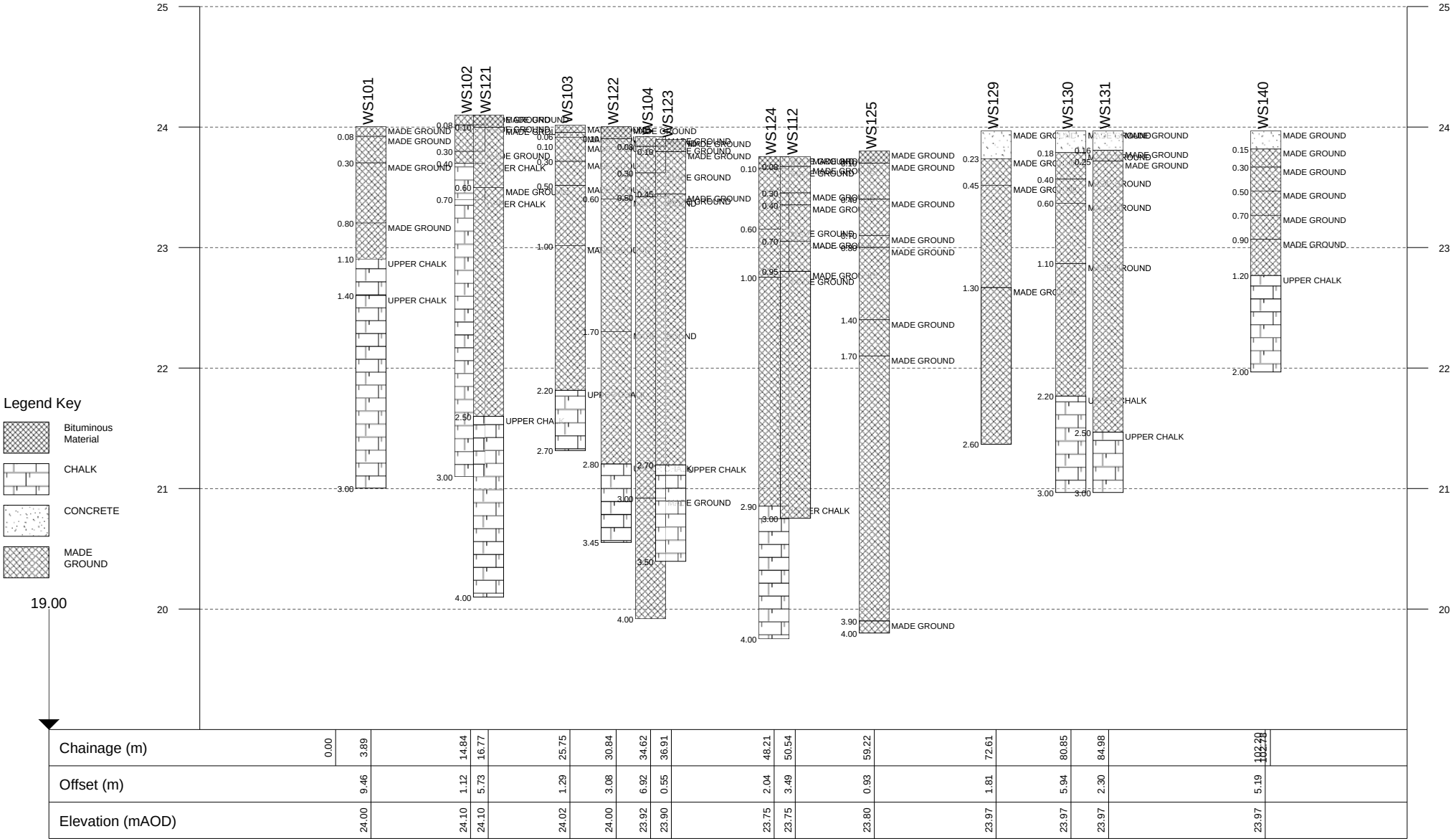
Ground Model Sections











APPENDIX C

Geotechnical Laboratory Testing Results



Project Name: Havant Retail Park					K4 SOILS	
Client: Geo-Environmental Services Ltd					Project no: GE9852	
					Our job no: 16427	
Borehole No:	Sample No:	Depth m	Description	pH	Sulphate content (g/l)	
BH101	D	1.50	Greenish brown gravelly SAND (gravel is fmc and sub-angular)	7.8	1.49	
BH101	D	4.00	Dark bluish grey slightly gravelly CLAY (gravel is fm and sub-angular)	8.2	0.83	
BH101	B	6.50	Dark grey and greenish grey slightly gravelly silty CLAY (gravel is fmc and sub-angular)	7.9	0.24	
BH101	B	12.50	Off white gravelly putty CHALK with occasional fmc intact chalk fragments (gravel is fmc and sub-angular to angular)	8.1	0.10	
BH102	B	1.20	Dark brown slightly sandy silty gravelly CLAY with occasional fmc brick and tile fragments (gravel is fmc and sub-angular to sub-rounded)	7.5	0.98	
BH102	B	3.00	Dark grey and greyish brown slightly sandy gravelly silty CLAY with occasional brick and chalk fragments (gravel is fmc and sub-angular to sub-rounded)	7.6	0.26	
BH102	D	6.00	Brown slightly gravelly silty CLAY (gravel is fm and sub-angular)	7.6	0.23	
BH102	B	7.00	Brown slightly gravelly silty CLAY (gravel is fm and sub-angular)	7.5	0.21	
BH102	D	14.00	Fmc CHALK fragments in a chalk slurry	7.6	0.05	
BH102	B	17.00	Off white slightly gravelly fmc CHALK fragments (gravel is fmc and sub-angular to angular)	7.7	0.09	
BH103	D	1.20	Brown CLAY with occasional fm brick fragments and chalk deposits	7.6	0.16	
BH103	D	3.00	Brown CLAY with occasional fm brick fragments and chalk deposits	7.7	0.09	
BH103	D	4.50	Off white putty CHALK with traces of fm chalk fragments	7.6	0.19	
BH103	B	6.00	Off white slightly gravelly putty CHALK with numerous fmc chalk fragments (gravel is fmc and sub-angular to angular)	7.6	0.14	
BH103	D	10.00	Off white slightly gravelly putty CHALK with numerous fmc chalk fragments (gravel is fmc and sub-angular to angular)	7.7	0.12	
Summary of Test Results						Checked and Approved Initials : kp
Date 25/04/2014	BS 1377 : Part 3 :Clause 5 : 1990 Determination of sulphate content of soil and ground water : gravimetric method					

APPENDIX D

Geochemical Laboratory Testing Results





Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone (01424) 718618
Facsimile (01424) 729911

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Reporting Date: 19/06/12

ANALYTICAL REPORT No. AR38970

Samples Received By:-	Laboratory Courier
Samples Received:-	01/06/12
Your Job No:	GE8756
Site Location:	Havant Retail Park
No Samples Received:-	25
Date of Sampling	30/05/12

Report Checked By:-

Steve Knight
Director

Authorised By:-

Mike Varley BSc, CChem, CSci, FRSC
Chief Chemist



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Soils	Characteristic	Silt Loam	Silt Loam	Chalk	Silty clay loam	Chalk	Silt Loam	Silt Loam	Silt Loam	Chalk	Silt Loam
	Date Sampled	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12
	TP/BH	WS1	WS1	WS1	WS2	WS3	WS4	WS5	WS6	WS6	WS7
	Depth (m)	0.55	1.20-1.60	1.90	1.00	2.50	1.00	1.00-1.30	0.70	2.50	0.50
	Our ref	39050	39051	39052	39053	39056	39057	39060	39062	39063	39064
Stone Content	(%)	31	45	<1	24	<1	<1	42	37	6	39
Arsenic**	(mg/kg)	7.9	10.4	n/t	7.4	n/t	9.6	<5	9.0	n/t	<5
Cadmium**	(mg/kg)	4.9	2.3	n/t	0.8	n/t	0.6	0.5	4.6	n/t	0.6
Chromium**	(mg/kg)	27	16	n/t	33	n/t	32	18	23	n/t	10
Lead**	(mg/kg)	29	44	n/t	30	n/t	38	34	336	n/t	56
Mercury**	(mg/kg)	<0.5	<0.5	n/t	<0.5	n/t	<0.5	<0.5	<0.5	n/t	<0.5
Nickel**	(mg/kg)	10	19	n/t	16	n/t	15	10	20	n/t	7
Copper**	(mg/kg)	48	139	n/t	20	n/t	16	28	580	n/t	27
Zinc**	(mg/kg)	134	835	n/t	76	n/t	76	156	830	n/t	73
Selenium**	(mg/kg)	<0.5	0.6	n/t	0.8	n/t	0.8	<0.5	<0.5	n/t	0.6
Hexavalent Chromium	(mg/kg)	<2	<2	n/t	<2	n/t	<2	<2	<2	n/t	<2
Water Soluble Boron	(mg/kg)	0.7	0.8	n/t	1.1	n/t	1.0	1.1	0.6	n/t	0.6
Barium*	(mg/kg)	141	103	n/t	251	n/t	85	42	206	n/t	93
Beryllium*	(mg/kg)	<1	<1	n/t	<1	n/t	<1	<1	<1	n/t	<1
Vanadium**	(mg/kg)	13	15	n/t	46	n/t	48	16	18	n/t	16
pH Value**	(Units)	9.0	10.6	9.2	8.8	9.1	8.4	8.6	8.5	8.8	8.3
Total Sulphate	(% as SO ₄)	<0.05	<0.05	n/t	<0.05	n/t	<0.05	<0.05	<0.05	n/t	<0.05
Water Soluble Sulphate**	(mg/l as SO ₄)	14	62	24	30	20	16	54	49	10	<10
Water Soluble Chloride	(mg/l)	17	18	n/t	17	n/t	7	9	8	n/t	9
Total Cyanide**	(mg/kg)	<1	<1	n/t	<1	n/t	<1	<1	3.6	n/t	<1
Sulphide	(mg/kg)	<2	<2	n/t	<2	n/t	<2	3.1	<2	n/t	<2
Elemental Sulphur**	(mg/kg)	<10	<10	n/t	<10	n/t	<10	<10	<10	n/t	<10
Total Monohydric Phenols**	(mg/kg)	<1	<1	n/t	<1	n/t	<1	<1	<1	n/t	<1
Total Organic Carbon	(%)	0.5	17.8	n/t	0.3	n/t	1.2	0.8	4.5	n/t	1.4

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

GM



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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Soils	Characteristic	Chalk	Silt Loam	Chalk	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam
	Date Sampled	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12
	TP/BH	WS7	WS8	WS8	WS9	WS9	WS9	WS10	WS10	WS10
	Depth (m)	1.50	1.00	2.50	0.20	1.00	2.00	0.20	0.50	3.50
	Our ref	39065	39066	39067	39068	39069	39070	39071	39072	39074
Stone Content	(%)	<1	24	<1	32	49	<1	9	23	<1
Arsenic**	(mg/kg)	n/t	7.0	n/t	<5	6.8	n/t	7.3	5.9	n/t
Cadmium**	(mg/kg)	n/t	0.8	n/t	0.7	<0.5	n/t	0.8	1.2	n/t
Chromium**	(mg/kg)	n/t	29	n/t	4	14	n/t	18	13	n/t
Lead**	(mg/kg)	n/t	119	n/t	14	41	n/t	109	72	n/t
Mercury**	(mg/kg)	n/t	<0.5	n/t	<0.5	<0.5	n/t	<0.5	<0.5	n/t
Nickel**	(mg/kg)	n/t	8	n/t	3	11	n/t	13	12	n/t
Copper**	(mg/kg)	n/t	26	n/t	10	16	n/t	26	90	n/t
Zinc**	(mg/kg)	n/t	95	n/t	42	36	n/t	74	148	n/t
Selenium**	(mg/kg)	n/t	<0.5	n/t	<0.5	<0.5	n/t	0.6	0.5	n/t
Hexavalent Chromium	(mg/kg)	n/t	<2	n/t	<2	<2	n/t	<2	<2	n/t
Water Soluble Boron	(mg/kg)	n/t	<0.5	n/t	<0.5	1.4	n/t	0.9	0.7	n/t
Barium*	(mg/kg)	n/t	119	n/t	34	76	n/t	63	288	n/t
Beryllium*	(mg/kg)	n/t	<1	n/t	<1	<1	n/t	<1	<1	n/t
Vanadium**	(mg/kg)	n/t	17	n/t	5	30	n/t	28	19	n/t
pH Value**	(Units)	8.9	8.8	9.0	8.6	9.1	8.9	7.9	8.9	8.5
Total Sulphate	(% as SO ₄)	n/t	<0.05	n/t	<0.05	<0.05	n/t	<0.05	<0.05	n/t
Water Soluble Sulphate**	(mg/l as SO ₄)	11	22	<10	<10	48	10	<10	22	31
Water Soluble Chloride	(mg/l)	n/t	8	n/t	8	8	n/t	7	20	n/t
Total Cyanide**	(mg/kg)	n/t	<1	n/t	<1	<1	n/t	<1	<1	n/t
Sulphide	(mg/kg)	n/t	<2	n/t	<2	<2	n/t	<2	<2	n/t
Elemental Sulphur**	(mg/kg)	n/t	<10	n/t	<10	11	n/t	<10	<10	n/t
Total Monohydric Phenols**	(mg/kg)	n/t	<1	n/t	<1	<1	n/t	<1	<1	n/t
Total Organic Carbon	(%)	n/t	0.6	n/t	0.8	1.1	n/t	5.0	1.0	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Soils	Characteristic	Silt Loam	Silt Loam	Silty clay loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam
	Date Sampled	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12
	TP/BH	WS1	WS1	WS2	WS4	WS5	WS6	WS7	WS8	WS9	WS9
	Depth (m)	0.55	1.20-1.60	1.00	1.00	1.00-1.30	0.70	0.50	1.00	0.20	1.00
	Our ref	39050	39051	39053	39057	39060	39062	39064	39066	39068	39069
Naphthalene**	(mg/kg)	<0.1	1.4	<0.1	<0.1	<0.1	0.7	<0.1	<0.1	<0.1	0.4
Acenaphthylene**	(mg/kg)	<0.1	0.1	<0.1	<0.1	0.3	0.2	<0.1	<0.1	0.1	0.9
Acenaphthene**	(mg/kg)	<0.1	0.3	<0.1	<0.1	<0.1	0.3	0.2	<0.1	<0.1	0.8
Fluorene**	(mg/kg)	<0.1	0.1	<0.1	<0.1	<0.1	0.2	0.3	<0.1	<0.1	0.7
Phenanthrene**	(mg/kg)	<0.1	0.9	<0.1	<0.1	0.6	1.3	0.1	0.1	0.2	9.4
Anthracene**	(mg/kg)	<0.1	0.1	<0.1	<0.1	0.2	0.5	<0.1	<0.1	0.3	3.8
Fluoranthene**	(mg/kg)	0.1	0.7	<0.1	<0.1	1.0	2.1	0.6	0.7	2.7	25.6
Pyrene**	(mg/kg)	<0.1	0.4	<0.1	<0.1	1.1	1.7	0.2	0.6	2.1	22.8
Benz(a)anthracene**	(mg/kg)	<0.1	0.3	<0.1	<0.1	0.6	1.3	0.1	0.3	1.5	16.2
Chrysene**	(mg/kg)	<0.1	0.7	<0.1	<0.1	0.8	2.3	0.2	0.6	1.6	15.8
Benzo(b)fluoranthene**	(mg/kg)	0.1	0.3	<0.1	<0.1	0.5	3.0	0.3	0.5	1.2	13.7
Benzo(k)fluoranthene**	(mg/kg)	0.1	0.2	<0.1	<0.1	0.8	2.1	0.6	0.8	1.8	13.5
Benzo(a)pyrene**	(mg/kg)	<0.1	0.4	<0.1	<0.1	0.5	2.6	0.3	0.5	1.4	16.1
Indeno(123-cd)pyrene**	(mg/kg)	<0.1	0.3	<0.1	<0.1	0.3	3.4	0.1	0.6	1.0	11.6
Dibenz(ah)anthracene**	(mg/kg)	<0.1	0.1	<0.1	<0.1	<0.1	1.0	<0.1	<0.1	0.1	2.8
Benzo(ghi)perylene**	(mg/kg)	<0.1	0.6	<0.1	<0.1	0.5	5.0	<0.1	0.2	1.0	10.1
Total PAH**	(mg/kg)	0.3	7.1	<0.1	<0.1	7.2	27.8	3.2	4.8	15.3	164.1

All results expressed on dry weight basis

** - MCERTS accredited test

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

<u>Soils</u>	Characteristic	Silt Loam	Silt Loam
	Date Sampled	30/05/12	30/05/12
	TP/BH	WS10	WS10
	Depth (m)	0.20	0.50
	Our ref	39071	39072
Naphthalene**	(mg/kg)	<0.1	<0.1
Acenaphthylene**	(mg/kg)	<0.1	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1
Fluorene**	(mg/kg)	<0.1	<0.1
Phenanthrene**	(mg/kg)	0.2	<0.1
Anthracene**	(mg/kg)	0.1	<0.1
Fluoranthene**	(mg/kg)	0.7	0.1
Pyrene**	(mg/kg)	0.5	0.9
Benzo(a)anthracene**	(mg/kg)	0.6	0.1
Chrysene**	(mg/kg)	0.5	0.1
Benzo(b)fluoranthene**	(mg/kg)	0.3	0.1
Benzo(k)fluoranthene**	(mg/kg)	0.3	0.1
Benzo(a)pyrene**	(mg/kg)	0.5	<0.1
Indeno(123-cd)pyrene**	(mg/kg)	0.1	<0.1
Dibenz(ah)anthracene**	(mg/kg)	<0.1	<0.1
Benzo(ghi)perylene**	(mg/kg)	0.1	<0.1
Total PAH**	(mg/kg)	3.8	1.5

All results expressed on dry weight basis

** - MCERTS accredited test

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Reporting Date: 19/06/12

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Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

TPH CWG - Soil

Characteristic		Silt Loam	Silt Loam	Silty clay loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam
Date Sampled		30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12	30/05/12
TP/BH		WS1	WS1	WS2	WS4	WS5	WS6	WS7	WS8	WS9	WS9
Depth (m)		0.55	1.20-1.60	1.00	1.00	1.00-1.30	0.70	0.50	1.00	0.20	1.00
Our ref		39050	39051	39053	39057	39060	39062	39064	39066	39068	39069
Aromatic											
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	0.1	<0.1	1.3	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	0.2	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.3
>EC ₁₂ -EC ₁₆	(mg/kg)	0.1	0.4	<0.1	<0.1	0.3	<0.1	0.3	<0.1	0.1	4.0
>EC ₁₆ -EC ₂₁	(mg/kg)	0.2	1.3	<0.1	<0.1	3.3	4.7	0.3	<0.1	0.1	31.4
>EC ₂₁ -EC ₃₅	(mg/kg)	4.2	20.0	1.5	0.4	9.4	93.6	2.2	1.5	1.6	135.8
Aliphatic											
>EC ₅ -EC ₇	(mg/kg)	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	2.2	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	<0.1	0.8	<0.1	<0.1	1.2	0.9	0.9	<0.1	0.3	1.3
>EC ₁₆ -EC ₂₁	(mg/kg)	0.2	3.7	<0.1	<0.1	8.1	10.7	<0.1	<0.1	<0.1	5.2
>EC ₂₁ -EC ₃₅	(mg/kg)	3.4	31.1	<0.1	0.4	12.0	82.6	<0.1	<0.1	<0.1	11.8
TPH (C ₅ - C ₃₅)	(mg/kg)	8.1	57.6	1.5	0.9	34.2	196.5	3.8	1.5	2.1	189.8

All results expressed on dry weight basis

GM

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ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

TPH CWG - Soil

Characteristic		Silt Loam	Silt Loam
Date Sampled		30/05/12	30/05/12
TP/BH		WS10	WS10
Depth (m)		0.20	0.50
Our ref		39071	39072
<u>Aromatic</u>			
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	0.4	0.3
>EC ₁₆ -EC ₂₁	(mg/kg)	0.4	1.0
>EC ₂₁ -EC ₃₅	(mg/kg)	5.1	12.4
<u>Aliphatic</u>			
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	0.5	0.5
>EC ₁₆ -EC ₂₁	(mg/kg)	0.2	0.4
>EC ₂₁ -EC ₃₅	(mg/kg)	<0.1	2.0
TPH (C ₅ - C ₃₅)	(mg/kg)	6.7	16.7

All results expressed on dry weight basis

GM



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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Your Job No: GE8756

Reporting Date: 19/06/12

Asbestos Identification

Sample ref:	WS1
Depth (m)	0.55
Our ref:	39050
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS1
Depth (m)	1.20-1.60
Our ref:	39051
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS2
Depth (m)	1.00
Our ref:	39053
#Description of Sample Matrix:	Silty clay loam
Result	No asbestos identified

Sample ref:	WS4
Depth (m)	1.00
Our ref:	39057
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

* = UKAS accredited

Analytical result only applies to the sample as submitted by the client

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Your Job No: GE8756

Reporting Date: 19/06/12

Asbestos Identification

Sample ref:	WS5
Depth (m)	1.00-1.30
Our ref:	39060
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS6
Depth (m)	0.70
Our ref:	39062
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS7
Depth (m)	0.50
Our ref:	39064
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS8
Depth (m)	1.00
Our ref:	39066
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

*= UKAS accredited

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Your Job No: GE8756

Reporting Date: 19/06/12

Asbestos Identification

Sample ref:	WS9
Depth (m)	0.20
Our ref:	39068
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS9
Depth (m)	1.00
Our ref:	39069
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS10
Depth (m)	0.20
Our ref:	39071
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

Sample ref:	WS10
Depth (m)	0.50
Our ref:	39072
#Description of Sample Matrix:	Silt Loam
Result	No asbestos identified

*= UKAS accredited

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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR38970				Page 11 of 19		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	39054				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	30/05/12				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS2						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	0.2				3%	5%	6%
Loss on Ignition (%)**	0.7				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	<5				500	–	–
Total PAH (mg/kg)**	<0.5				100	–	–
pH (Units)**	8.4				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
	mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.013	0.012		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	<0.005	<0.005		<0.1	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	<0.005	<0.005		<0.1	0.5	10	30
Nickel*	<0.005	<0.005		<0.1	0.4	10	40
Lead*	<0.005	0.008		<0.1	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.007	0.012		<0.1	4	50	200
Chloride*	11	6		39	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	15	4		39	1000	20000	50000
TDS	160	220		1089	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	12.1	10.4		58	500	800	1000
Leach Test Information							
pH *	7.4	8.1					
EC*	215	109					
Sample Mass (kg)	0.206						
Dry Matter (%)	85						
Moisture (%)	20						
Stage 1							
Volume Eluate L2 (litres)	0.315						
Filtered Eluate VE1 (litres)	0.250						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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** - MCERTS accredited test



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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR38970				Page 12 of 19		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	39058				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	30/05/12				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS4						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	3.6				3%	5%	6%
Loss on Ignition (%)**	7.6				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	<5				500	–	–
Total PAH (mg/kg)**	<0.5				100	–	–
pH (Units)**	7.6				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.023	0.009		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	<0.005	<0.005		<0.1	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.006	<0.005		<0.1	0.5	10	30
Nickel*	<0.005	<0.005		<0.1	0.4	10	40
Lead*	<0.005	0.006		<0.1	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.013	0.011		<0.1	4	50	200
Chloride*	11	5		26	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	146	15		201	1000	20000	50000
TDS	330	190		894	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	26.0	10.3		57	500	800	1000
Leach Test Information							
pH *	7.6	8.0					
EC*	484	145					
Sample Mass (kg)	0.231						
Dry Matter (%)	76						
Moisture (%)	36						
Stage 1							
Volume Eluate L2 (litres)	0.288						
Filtered Eluate VE1 (litres)	0.190						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/2012

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Waters	Date Sampled				
	30/05/12				
	TP/BH				
	Depth				
	Our ref	39055	39059	39061	39073
Arsenic*	(µg/l)	<5	<5	<5	<5
Cadmium*	(µg/l)	<1	<1	<1	<1
Chromium*	(µg/l)	<5	<5	<5	<5
Lead*	(µg/l)	<1	<1	<1	2
Nickel*	(µg/l)	<1	<1	2	<1
Copper*	(µg/l)	<5	<5	<5	<5
Zinc*	(µg/l)	<5	6	5	8
Mercury*	(µg/l)	<0.1	<0.1	<0.1	<0.1
Selenium*	(µg/l)	<5	<5	<5	<5
Boron	(µg/l)	33	34	63	38
Barium*	(µg/l)	<5	7	11	17
Beryllium*	(µg/l)	<5	<5	<5	<5
Vanadium	(µg/l)	<5	<5	5	<5
pH Value*	(Units)	7.3	7.4	7.6	7.5
Sulphate*	(mg/l)	6	<5	13	10
Chloride*	(mg/l)	<5	<5	<5	8
Total Cyanide	(µg/l)	<5	<5	<5	<5
Sulphide	(mg/l)	0.1	0.1	0.1	<0.1
Total Phenols	(µg/l)	<0.5	<0.5	<0.5	<0.5
Hexavalent Chromium	(µg/l)	<20	<20	<20	<20
TOC (In filtered samples)*	(mg/l)	4.3	6.9	10.2	6.6
Elemental Sulphur	(mg/l)	<0.1	<0.1	<0.1	<0.1

* = UKAS Accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

Waters	Date Sampled				
	30/05/12				
	TP/BH				
	Depth				
	Our ref	39055	39059	39061	39073
Naphthalene	(µg/l)	0.28	0.13	0.25	0.14
Acenaphthylene	(µg/l)	<0.01	<0.01	0.01	<0.01
Acenaphthene	(µg/l)	0.04	<0.01	0.36	<0.01
Fluorene	(µg/l)	<0.01	<0.01	0.33	<0.01
Phenanthrene	(µg/l)	0.40	<0.01	1.35	<0.01
Anthracene	(µg/l)	0.17	0.03	0.40	<0.01
Fluoranthene	(µg/l)	0.37	0.09	0.81	0.03
Pyrene	(µg/l)	0.27	0.06	0.56	0.01
Benz(a)anthracene	(µg/l)	0.05	0.01	0.11	<0.01
Chrysene	(µg/l)	0.05	0.01	0.12	<0.01
Benzo(b)fluoranthene	(µg/l)	0.01	0.01	0.02	<0.01
Benzo(k)fluoranthene	(µg/l)	0.02	0.01	0.03	<0.01
Benzo(a)pyrene	(µg/l)	0.02	0.01	0.02	<0.01
Indeno(123-cd)pyrene	(µg/l)	0.01	<0.01	<0.01	<0.01
Dibenz(ah)anthracene	(µg/l)	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene	(µg/l)	0.01	<0.01	<0.01	<0.01
Total PAH	(µg/l)	1.70	0.36	4.37	0.18

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR38970

Location: Havant Retail Park



Your Job No: GE8756

Reporting Date: 19/06/12

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
28 Crescent Road
Brighton, East Sussex
BN2 3RP

<u>Waters</u>	Date Sampled	30/05/12	30/05/12	30/05/12	30/05/12
	TP/BH	WS2	WS4	WS5	WS10
	Depth	3.00	2.30-2.60	2.50	1.00
	Our ref	39055	39059	39061	39073

Aromatic

>C ₅ -C ₇	(µg/l)	<10	<10	<10	<10
>C ₇ -C ₈	(µg/l)	<10	<10	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	<10	<10	<10	<10
>C ₁₂ -C ₁₆	(µg/l)	<10	<10	<10	<10
>C ₁₆ -C ₂₁	(µg/l)	16	<10	<10	<10
>C ₂₁ -C ₃₅	(µg/l)	<10	<10	<10	<10

Aliphatic

>C ₅ -C ₆	(µg/l)	<10	<10	<10	<10
>C ₆ -C ₈	(µg/l)	<10	<10	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	<10	<10	<10	19
>C ₁₂ -C ₁₆	(µg/l)	<10	<10	<10	50
>C ₁₆ -C ₂₁	(µg/l)	<10	<10	<10	49
>C ₂₁ -C ₃₅	(µg/l)	<10	<10	<10	74
TPH (C ₅ - C ₃₅)	(µg/l)	16	<10	<10	193

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SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR38970
Your Job No: GE8756
Sample Receipt Date: 01/06/12
Reporting Date: 19/06/12

Registered: 01/06/12
Prepared: 02/06/12
Analysis complete: 19/06/12

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	09/06/12	118	ICPMS
Cadmium**	Air dried sample	09/06/12	118	ICPMS
Chromium**	Air dried sample	09/06/12	118	ICPMS
Lead**	Air dried sample	09/06/12	118	ICPMS
Mercury**	Air dried sample	09/06/12	118	ICPMS
Nickel**	Air dried sample	09/06/12	118	ICPMS
Copper**	Air dried sample	09/06/12	118	ICPMS
Zinc**	Air dried sample	09/06/12	118	ICPMS
Selenium**	Air dried sample	09/06/12	118	ICPMS
Hexavalent Chromium	As submitted sample	08/06/12	110	Colorimetry
Water Soluble Boron	Air dried sample	12/06/12	202	Colorimetry AA3
Barium*	Air dried sample	09/06/12	118	ICPMS
Beryllium*	Air dried sample	09/06/12	118	ICPMS
Vanadium**	Air dried sample	09/06/12	118	ICPMS
pH Value**	Air dried sample	08/06/12	113	Probe
Total Sulphate	Air dried sample	12/06/12	208	Colorimetry
Water Soluble Sulphate**	Air dried sample	13/06/12	172	Ion Chromatography
Water Soluble Chloride	Air dried sample	13/06/12	172	Ion Chromatography
Total Cyanide**	As submitted sample	12/06/12	204	Colorimetry
Sulphide	As submitted sample	13/06/12	109	Colorimetry
Elemental Sulphur**	Air dried sample	12/06/12	122	HPLC
Total Monohydric Phenols**	As submitted sample	12/06/12	121	HPLC
Total Organic Carbon	Air dried sample	14/06/12	210	Automated IR Adsorption
Speciated PAH**	As submitted sample	12/06/12	133	Gas Chromatography
Carbon Banding (TPH)	As submitted sample	12/06/12	117	Gas chromatography
Asbestos*	As submitted sample	13/06/12	179	see note

Asbestos analysis qualitative only

Note:- Documented In-house procedure based on HSG 248 2005

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Determinands not marked with * or ** are non accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types



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THE ENVIRONMENTAL LABORATORY LTD

WATER SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR38970
Your Ref No: GE8756
Sample Receipt Date: 01/06/12
Reporting Date: 19/06/12

Registered: 01/06/12
Prepared: 02/06/12
Analysis complete: 19/06/12

WATER TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium*	101	ICPMS
Boron	203	Colorimetry
Barium*	101	ICPMS
Beryllium*	101	ICPMS
Vanadium	101	ICPMS
pH Value*	113	Electrometric
Sulphate*	131	Ion Chromatography
Chloride*	131	Ion Chromatography
Total Cyanide	130	Colorimetry
Sulphide	134	Colorimetry
Total Phenols	121	HPLC
Hexavalent Chromium	110	Colorimetry
TOC (In filtered samples)*	102	TOC Analyser
Elemental Sulphur	122	HPLC
Speciated PAH	135	GCMS
Carbon Banding (TPH)	117	Gas chromatography

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR38970
Your Ref No: GE8756
Sample Receipt Date: 01/06/12
Reporting Date: 19/06/12

Registered: 01/06/12
Prepared: 02/06/12
Analysis complete: 19/06/12

TEST METHOD SUMMARY

PARAMETER	Undertaken on	Date Tested	Method Number	Technique
pH Value**	Air dried sample	07/06/12	113	Electrometric
Total Organic Carbon	Air dried sample	14/06/12	210	Automated IR Absorption
Loss on Ignition**	Air dried sample	07/06/12	129	Gravimetric
Neutralization Capacity to pH 7	Air dried sample	07/06/12	-	EA
Benzene**	As submitted sample	08/06/12	181	GCMS
Toluene**	As submitted sample	08/06/12	181	GCMS
Ethyl Benzene**	As submitted sample	08/06/12	181	GCMS
Xylenes**	As submitted sample	08/06/12	181	GCMS
Mineral Oil**	As submitted sample	11/06/12	117	GCFID
PCB 28**	Air dried sample	11/06/12	120	GCMS
PCB 52**	Air dried sample	11/06/12	120	GCMS
PCB 101**	Air dried sample	11/06/12	120	GCMS
PCB 118**	Air dried sample	11/06/12	120	GCMS
PCB 138**	Air dried sample	11/06/12	120	GCMS
PCB 153**	Air dried sample	11/06/12	120	GCMS
PCB 180**	Air dried sample	11/06/12	120	GCMS
Speciated PAH**	As submitted sample	12/06/12	133	GCFID

The analysts' guide for sampling, analysis and clearance procedures

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** - MCERTS Accredited test

Determinands not marked with a * or ** are not accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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THE ENVIRONMENTAL LABORATORY LTD

LEACHATE SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR38970
Your Ref No: GE8756
Sample Receipt Date: 01/06/12
Reporting Date: 19/06/12

Registered: 01/06/12
Prepared: 02/06/12
Analysis complete: 19/06/12

LEACHATE TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium	101	ICPMS
Antimony	101	ICPMS
Barium*	101	ICPMS
Molybdenum*	101	ICPMS
pH Value*	113	Electrometric
Electrical Conductivity*	136	Probe
Dissolved Organic Carbon	102	TOC analyser
Chloride*	131	Ion Chromatography
Fluoride*	131	Ion Chromatography
Sulphate*	131	Ion Chromatography
Total Dissolved Solids	144	Gravimetric
Phenol Index	121	HPLC

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THE ENVIRONMENTAL LABORATORY LTD

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Reporting Date: 14 March 2014

ANALYTICAL REPORT No. AR53240

Samples Received By: Laboratory Courier
Sample Receipt Date: 04/03/14
Your Job No: GE9752
Your Order No: 2249
Site Location: Havant Retail Park
No Samples Received: 16
Date of Sampling: 24-26/02/14

This report was written by: G Rouse

Authorised By;

Steve Knight
Reporting Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Sandy silt loam	Sandy silt loam	Silt loam	Chalk	Chalk	Silt loam	Silt loam	Silt loam	Silt loam
	Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
	TP/BH	WS101	WS103	WS104	WS105	WS108	WS109	WS110	WS111	WS112	WS112
	Depth (m)	1.00	0.50	0.50	1.00	1.00	1.00	0.50	1.50	1.00	2.00
	Our ref	11965	11966	11967	11968	11969	11970	11971	11972	11973	11974
Stone Content	(%)	<1	31	47	12	13	16	<1	15	15	13
Arsenic**	(mg/kg)	7.9	6.6	6.6	6.9	<5	<5	<5	<5	15.0	22.5
Cadmium**	(mg/kg)	0.8	<0.5	<0.5	<0.5	0.6	0.8	1.0	0.7	0.5	<0.5
Chromium**	(mg/kg)	9	11	15	24	6	6	4	4	29	22
Lead**	(mg/kg)	27	43	10	23	18	29	5	5	69	179
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	10	15	8	8	8	6	5	5	20	15
Copper**	(mg/kg)	14	30	8	9	10	11	7	6	20	20
Zinc**	(mg/kg)	112	69	27	36	29	68	21	23	85	78
Selenium**	(mg/kg)	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)	1.0	0.6	1.0	1.8	<0.5	<0.5	<0.5	<0.5	1.4	1.1
Barium*	(mg/kg)	64	129	26	49	35	57	35	21	195	111
Beryllium*	(mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vanadium**	(mg/kg)	41	20	23	37	17	10	7	7	44	33
pH Value**	(Units)	8.7	8.8	8.5	7.7	8.5	8.2	8.4	8.5	8.0	8.0
Total Sulphate	(% as SO ₄)	0.12	0.09	0.11	0.15	0.10	0.05	<0.05	<0.05	0.12	0.13
Water Soluble Sulphate**	(mg/l as SO ₄)	206	28	42	22	20	15	16	10	26	44
Water Soluble Chloride	(mg/l)	47	13	15	13	12	13	9	10	20	18
Total Cyanide**	(mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide	(mg/kg)	<2	<2	<2	<2	<2	<2	<2	<2	19.6	6.0
Elemental Sulphur**	(mg/kg)	<10	<10	98	441	<10	<10	<10	<10	103	14
Total Monohydric Phenols**	(mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Organic Carbon	(%)	0.8	10.5	0.4	1.2	1.0	0.9	<0.1	0.1	0.6	0.8

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Silty clay loam	Sandy silt loam	Sandy silt loam	Chalk	Sandy silt loam	Sandy silt loam
	Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
	TP/BH	WS112	WS113	WS114	WS115	WS117	WS118
	Depth (m)	3.00	1.00	0.50	0.50	0.50	1.00
	Our ref	11975	11976	11977	11978	11979	11980
Stone Content	(%)	12	39	21	4	16	58
Arsenic**	(mg/kg)	23.1	19.7	22.5	<5	11.2	5.2
Cadmium**	(mg/kg)	<0.5	0.7	1.4	0.9	0.8	<0.5
Chromium**	(mg/kg)	32	20	22	8	12	12
Lead**	(mg/kg)	208	554	178	35	80	64
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	21	29	12	8	13	12
Copper**	(mg/kg)	23	323	37	18	50	22
Zinc**	(mg/kg)	80	386	260	95	215	103
Selenium**	(mg/kg)	0.9	0.8	0.6	<0.5	0.7	<0.5
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)	0.8	1.5	1.2	<0.5	1.3	1.1
Barium*	(mg/kg)	122	323	305	61	177	86
Beryllium*	(mg/kg)	<1	2	<1	<1	<1	<1
Vanadium**	(mg/kg)	47	41	20	10	18	18
pH Value**	(Units)	7.8	8.0	7.8	8.2	8.4	8.1
Total Sulphate	(% as SO ₄)	0.12	0.09	0.07	<0.05	0.07	<0.05
Water Soluble Sulphate**	(mg/l as SO ₄)	20	61	23	25	49	23
Water Soluble Chloride	(mg/l)	13	54	19	9	30	39
Total Cyanide**	(mg/kg)	<1	3.2	<1	<1	<1	<1
Sulphide	(mg/kg)	<2	<2	<2	<2	4.4	<2
Elemental Sulphur**	(mg/kg)	<10	28	12	<10	40	<10
Total Monohydric Phenols**	(mg/kg)	<1	<1	<1	<1	<1	<1
Total Organic Carbon	(%)	0.8	6.7	7.7	0.9	7.9	3.4

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

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ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Sandy silt loam	Sandy silt loam	Silt loam	Chalk	Chalk	Silt loam	Silt loam	Silt loam	Silt loam
	Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
	TP/BH	WS101	WS103	WS104	WS105	WS108	WS109	WS110	WS111	WS112	WS112
	Depth (m)	1.00	0.50	0.50	1.00	1.00	1.00	0.50	1.50	1.00	2.00
	Our ref	11965	11966	11967	11968	11969	11970	11971	11972	11973	11974
Naphthalene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1
Acenaphthylene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.7	<0.1
Fluorene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.2	<0.1
Phenanthrene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	16.3	0.1
Anthracene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.7	<0.1
Fluoranthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	16.0	1.1
Pyrene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	13.8	1.1
Benz(a)anthracene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.3	0.7
Chrysene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.0	0.9
Benzo(b)fluoranthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6.0	1.2
Benzo(k)fluoranthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.3	0.8
Benzo(a)pyrene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.9	0.9
Indeno(123-cd)pyrene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.2	0.7
Dibenz(ah)anthracene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.2	0.2
Benzo(ghi)perylene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5.9	0.6
Total PAH**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	107.7	8.4

All results expressed on dry weight basis

** - MCERTS accredited test

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ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

<u>Soils</u>	Characteristic	Silty clay loam	Sandy silt loam	Sandy silt loam	Chalk	Sandy silt loam	Sandy silt loam
Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
TP/BH	WS112	WS113	WS114	WS115	WS117	WS118	
Depth (m)	3.00	1.00	0.50	0.50	0.50	1.00	
Our ref	11975	11976	11977	11978	11979	11980	
Naphthalene**	(mg/kg)	<0.1	0.2	<0.1	<0.1	0.2	<0.1
Acenaphthylene**	(mg/kg)	0.1	0.5	<0.1	<0.1	0.1	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Fluorene**	(mg/kg)	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Phenanthrene**	(mg/kg)	0.7	1.3	<0.1	<0.1	0.7	<0.1
Anthracene**	(mg/kg)	0.2	0.8	<0.1	<0.1	0.1	<0.1
Fluoranthene**	(mg/kg)	2.4	0.8	<0.1	0.1	1.1	0.2
Pyrene**	(mg/kg)	2.3	1.2	<0.1	0.1	1.1	0.2
Benz(a)anthracene**	(mg/kg)	1.7	0.6	<0.1	<0.1	0.8	0.1
Chrysene**	(mg/kg)	2.0	0.5	<0.1	<0.1	1.1	0.2
Benzo(b)fluoranthene**	(mg/kg)	1.7	0.6	<0.1	0.1	0.9	0.2
Benzo(k)fluoranthene**	(mg/kg)	2.1	1.2	<0.1	<0.1	1.2	0.3
Benzo(a)pyrene**	(mg/kg)	2.4	0.5	<0.1	<0.1	0.9	0.1
Indeno(123-cd)pyrene**	(mg/kg)	1.9	0.7	<0.1	0.4	1.2	0.3
Dibenz(ah)anthracene**	(mg/kg)	0.4	0.3	<0.1	<0.1	0.7	0.2
Benzo(ghi)perylene**	(mg/kg)	2.1	0.8	<0.1	0.1	1.2	0.2
Total PAH**	(mg/kg)	20.3	10.4	<0.1	0.8	11.3	2.2

All results expressed on dry weight basis

** - MCERTS accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil

Characteristic	Chalk	Sandy silt loam	Sandy silt loam	Silt loam	Chalk	Chalk	Silt loam	Silt loam	Silt loam	Silt loam
Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
TP/BH	WS101	WS103	WS104	WS105	WS108	WS109	WS110	WS111	WS112	WS112
Depth (m)	1.00	0.50	0.50	1.00	1.00	1.00	0.50	1.50	1.00	2.00
Our ref	11965	11966	11967	11968	11969	11970	11971	11972	11973	11974
Aromatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	0.7	0.7	<0.1	0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9.6	0.1
>EC ₁₆ -EC ₂₁	(mg/kg)	<0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	78.5	2.6
>EC ₂₁ -EC ₃₅	(mg/kg)	0.9	1.7	2.6	1.2	0.3	8.7	<0.1	<0.1	716.8
Aliphatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	2.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	11.1	0.2
>EC ₁₆ -EC ₂₁	(mg/kg)	<0.1	0.4	<0.1	0.3	<0.1	0.1	<0.1	<0.1	94.4
>EC ₂₁ -EC ₃₅	(mg/kg)	0.8	1.3	2.3	2.5	1.0	4.4	<0.1	1.0	880.8
TPH (C ₅ - C ₃₅)	(mg/kg)	1.7	3.5	7.6	4.1	1.3	14.1	0.7	1.1	1791.2

All results expressed on dry weight basis

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ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil

Characteristic	Silty clay loam	Sandy silt loam	Sandy silt loam	Chalk	Sandy silt loam	Sandy silt loam
Date Sampled	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14	24-26/02/14
TP/BH	WS112	WS113	WS114	WS115	WS117	WS118
Depth (m)	3.00	1.00	0.50	0.50	0.50	1.00
Our ref	11975	11976	11977	11978	11979	11980

Aromatic

>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	1.4	0.6	<0.1	0.1	0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	0.4	15.3	4.7	<0.1	5.2	1.3
>EC ₁₆ -EC ₂₁	(mg/kg)	4.7	44.4	11.0	0.1	16.6	5.2
>EC ₂₁ -EC ₃₅	(mg/kg)	52.8	170.5	100.1	1.9	33.7	60.5

Aliphatic

>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	3.1	0.6	<0.1	0.3	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	0.7	34.2	6.5	<0.1	9.0	1.2
>EC ₁₆ -EC ₂₁	(mg/kg)	8.1	75.6	16.7	0.1	20.9	4.4
>EC ₂₁ -EC ₃₅	(mg/kg)	89.4	143.2	125.3	2.0	41.1	54.6

TPH (C ₅ - C ₃₅)	(mg/kg)	155.9	487.9	265.6	4.1	126.9	127.3
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All results expressed on dry weight basis

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ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

Asbestos Identification

Sample ref:	WS101
Depth (m)	1.00
Our ref:	11965
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS103
Depth (m)	0.50
Our ref:	11966
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

Sample ref:	WS104
Depth (m)	0.50
Our ref:	11967
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

Sample ref:	WS105
Depth (m)	1.00
Our ref:	11968
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

*= UKAS accredited

Analytical result only applies to the sample as submitted by the client

Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client

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Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

Asbestos Identification

Sample ref:	WS108
Depth (m)	1.00
Our ref:	11969
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS109
Depth (m)	1.00
Our ref:	11970
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS110
Depth (m)	0.50
Our ref:	11971
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS111
Depth (m)	1.50
Our ref:	11972
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

*= UKAS accredited

Analytical result only applies to the sample as submitted by the client

Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client

G Rouse



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

Asbestos Identification

Sample ref:	WS112
Depth (m)	1.00
Our ref:	11973
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS112
Depth (m)	2.00
Our ref:	11974
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS112
Depth (m)	3.00
Our ref:	11975
#Description of Sample Matrix:	Silty clay loam
Result	No asbestos identified

Sample ref:	WS113
Depth (m)	1.00
Our ref:	11976
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

*= UKAS accredited

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53240

Location: Havant Retail Park



F.A.O. Ed Newman
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2249
Reporting Date: 14/03/14

Asbestos Identification

Sample ref:	WS114
Depth (m)	0.50
Our ref:	11977
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

Sample ref:	WS115
Depth (m)	0.50
Our ref:	11978
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS117
Depth (m)	0.50
Our ref:	11979
#Description of Sample Matrix:	Sandy silt loam
Result	Chrysotile (White Asbestos)

Sample ref:	WS118
Depth (m)	1.00
Our ref:	11980
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

*= UKAS accredited

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G Rouse

THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR53240
Your Job No: GE9752
Sample Receipt Date: 04/03/14
Reporting Date: 14/03/14

Registered: 04/03/14
Prepared: 05/03/14
Analysis complete: 14/03/14

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	11/03/14	118	ICPMS
Cadmium**	Air dried sample	11/03/14	118	ICPMS
Chromium**	Air dried sample	11/03/14	118	ICPMS
Lead**	Air dried sample	11/03/14	118	ICPMS
Mercury**	Air dried sample	11/03/14	118	ICPMS
Nickel**	Air dried sample	11/03/14	118	ICPMS
Copper**	Air dried sample	11/03/14	118	ICPMS
Zinc**	Air dried sample	11/03/14	118	ICPMS
Selenium**	Air dried sample	11/03/14	118	ICPMS
Hexavalent Chromium	As submitted sample	06/03/14	110	Colorimetry
Water Soluble Boron	Air dried sample	11/03/14	202	Colorimetry
Barium*	Air dried sample	11/03/14	118	ICPMS
Beryllium*	Air dried sample	11/03/14	118	ICPMS
Vanadium**	Air dried sample	11/03/14	118	ICPMS
pH Value**	Air dried sample	10/03/14	113	Probe
Total Sulphate	Air dried sample	11/03/14	208	Colorimetry
Water Soluble Sulphate**	Air dried sample	11/03/14	172	Ion Chromatography
Water Soluble Chloride	Air dried sample	11/03/14	172	Ion Chromatography
Total Cyanide**	As submitted sample	07/03/14	204	Colorimetry
Sulphide	As submitted sample	13/03/14	109	Colorimetry
Elemental Sulphur**	Air dried sample	11/03/14	122	HPLC
Total Monohydric Phenols**	As submitted sample	11/03/14	121	HPLC
Total Organic Carbon	Air dried sample	14/03/14	210	Automated IR Adsorption
TPH (> C8 - < C40)**	As submitted sample	00/01/00	117	Gas chromatography
Speciated PAH**	As submitted sample	07/03/14	133	Gas Chromatography
Carbon Banding (TPH)	As submitted sample	11/03/14	214	Gas chromatography
Asbestos*	As submitted sample	13/03/14	179	see note

Asbestos analysis qualitative only

Note:- Documented In-house procedure based on HSG 248 2005

* = UKAS Accredited test

** - MCERTS Accredited test

Determinands not marked with * or ** are not accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

All results have been expressed on a dry weight basis and where appropriate have been corrected for moisture and stone content accordingly

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



2683



Unit A2
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THE ENVIRONMENTAL LABORATORY LTD

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Reporting Date: 16 April 2014

ANALYTICAL REPORT No. AR53800

Samples Received By: Laboratory Courier
Sample Receipt Date: 01/04/14
Your Job No: GE9752
Your Order No: 2348
Site Location: Havant Retail Park
No Samples Received: 64
Date of Sampling: 24-28/03/14

This report was written by: G Rouse

Authorised By;

Steve Knight
Reporting Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Brick	Chalk	Loamy sand	Chalk	Sandy loam	Sandy silt loam	Silt loam	Chalk	Chalk	Chalk
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS126	WS127	WS127	WS127	WS128	WS128	WS129	WS129	WS129	WS129
	Depth (m)	1.00	5.00	1.00	2.50	5.00	1.00	5.00	1.00	1.50	2.00
	Our ref	15416	15417	15418	15419	15420	15421	15422	15423	15424	15425
Stone Content	(%)	24	6	48	34	32	14	10	13	5	13
Arsenic**	(mg/kg)	6.7	<5	6.5	n/t	9.5	<5	<5	<5	<5	n/t
Cadmium**	(mg/kg)	1.2	0.7	1.8	n/t	1.0	0.7	0.7	0.7	0.5	n/t
Chromium**	(mg/kg)	38	4	19	n/t	10	10	7	6	4	n/t
Lead**	(mg/kg)	129	19	110	n/t	45	45	25	27	7	n/t
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	<0.5	n/t
Nickel**	(mg/kg)	17	5	10	n/t	7	9	11	6	5	n/t
Copper**	(mg/kg)	100	11	42	n/t	13	17	18	14	7	n/t
Zinc**	(mg/kg)	245	43	147	n/t	98	103	84	53	22	n/t
Selenium**	(mg/kg)	0.6	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	<0.5	n/t
Hexavalent Chromium	(mg/kg)	<2	<2	<2	n/t	<2	<2	<2	<2	<2	n/t
Water Soluble Boron	(mg/kg)	1.5	0.8	1.0	n/t	0.7	1.0	1.3	0.9	0.8	n/t
Barium*	(mg/kg)	140	99	136	n/t	483	99	88	101	22	n/t
Beryllium*	(mg/kg)	<1	<1	<1	n/t	<1	<1	<1	<1	<1	n/t
Vanadium**	(mg/kg)	26	6	13	n/t	13	14	12	9	8	n/t
pH Value**	(Units)	8.5	8.4	7.9	9.4	8.1	8.5	10.3	10.6	10.2	8.2
Total Sulphate	(% as SO ₄)	0.17	0.05	0.07	n/t	0.08	0.05	<0.05	0.05	<0.05	n/t
Water Soluble Sulphate**	(mg/l as SO ₄)	58	121	111	87	148	141	178	158	136	134
Water Soluble Chloride	(mg/l)	14	17	14	n/t	23	15	14	43	22	n/t
Total Cyanide**	(mg/kg)	2.8	<1	3.0	n/t	<1	<1	<1	<1	<1	n/t
Sulphide	(mg/kg)	<2	2.6	<2	n/t	<2	2.5	<2	<2	<2	n/t
Elemental Sulphur**	(mg/kg)	<10	<10	<10	n/t	<10	<10	<10	<10	<10	n/t
Total Monohydric Phenols**	(mg/kg)	<1	<1	<1	n/t	<1	<1	<1	<1	<1	n/t
Total Organic Carbon	(%)	1.1	0.5	0.5	n/t	0.8	3.3	3.6	2.1	0.3	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

G Rouse



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Silt loam	Chalk	Chalk	Chalk	Silt loam	Chalk	Chalk	Chalk	Chalk
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS130	WS130	WS130	WS130	WS131	WS131	WS132	WS132	WS132	WS132
	Depth (m)	0.50	1.00	2.00	2.50	0.30	0.60	0.50	1.00	1.50	2.00
	Our ref	15426	15427	15429	15430	15431	15432	15435	15436	15437	15439
Stone Content	(%)	<1	30	<1	<1	16	20	21	8	19	<1
Arsenic**	(mg/kg)	<5	7.2	n/t	n/t	5.2	<5	<5	<5	n/t	n/t
Cadmium**	(mg/kg)	0.9	0.6	n/t	n/t	0.9	0.6	<0.5	0.5	n/t	n/t
Chromium**	(mg/kg)	7	22	n/t	n/t	12	8	6	6	n/t	n/t
Lead**	(mg/kg)	36	39	n/t	n/t	81	25	17	16	n/t	n/t
Mercury**	(mg/kg)	<0.5	<0.5	n/t	n/t	<0.5	<0.5	<0.5	<0.5	n/t	n/t
Nickel**	(mg/kg)	7	13	n/t	n/t	9	8	4	6	n/t	n/t
Copper**	(mg/kg)	17	22	n/t	n/t	26	10	6	9	n/t	n/t
Zinc**	(mg/kg)	65	94	n/t	n/t	122	47	30	42	n/t	n/t
Selenium**	(mg/kg)	<0.5	0.5	n/t	n/t	<0.5	<0.5	<0.5	<0.5	n/t	n/t
Hexavalent Chromium	(mg/kg)	<2	<2	n/t	n/t	<2	<2	<2	<2	n/t	n/t
Water Soluble Boron	(mg/kg)	0.7	1.3	n/t	n/t	1.0	1.0	0.9	0.8	n/t	n/t
Barium*	(mg/kg)	108	76	n/t	n/t	72	35	46	53	n/t	n/t
Beryllium*	(mg/kg)	<1	<1	n/t	n/t	<1	<1	<1	<1	n/t	n/t
Vanadium**	(mg/kg)	10	31	n/t	n/t	17	13	10	9	n/t	n/t
pH Value**	(Units)	8.0	8.0	8.0	8.2	7.7	7.8	7.8	7.9	7.8	8.0
Total Sulphate	(% as SO ₄)	<0.05	0.07	n/t	n/t	<0.05	<0.05	<0.05	<0.05	n/t	n/t
Water Soluble Sulphate**	(mg/l as SO ₄)	114	141	51	23	164	189	185	130	146	53
Water Soluble Chloride	(mg/l)	20	20	n/t	n/t	16	15	17	12	n/t	n/t
Total Cyanide**	(mg/kg)	<1	<1	n/t	n/t	<1	<1	<1	<1	n/t	n/t
Sulphide	(mg/kg)	<2	<2	n/t	n/t	<2	<2	<2	<2	n/t	n/t
Elemental Sulphur**	(mg/kg)	<10	<10	n/t	n/t	<10	<10	<10	<10	n/t	n/t
Total Monohydric Phenols**	(mg/kg)	<1	<1	n/t	n/t	<1	<1	<1	<1	n/t	n/t
Total Organic Carbon	(%)	4.6	0.7	n/t	n/t	1.2	1.1	0.2	0.6	n/t	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

G Rouse



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Silty clay loam	Chalk	Silty clay loam	Loamy sand	Chalk	Sandy silt loam	Silt loam	Silt loam	Chalk
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS133	WS133	WS133	WS134	WS134	WS134	WS134	WS134	WS135	WS135
	Depth (m)	0.30	0.60	1.00	0.50	0.65	0.80	1.00	1.50	0.50	1.00
	Our ref	15440	15441	15442	15444	15445	15446	15447	15448	15449	15450
Stone Content	(%)	6	25	9	29	22	2	24	14	24	11
Arsenic**	(mg/kg)	<5	7.7	<5	7.5	15.3	<5	8.9	<5	<5	<5
Cadmium**	(mg/kg)	0.8	<0.5	0.8	<0.5	<0.5	1.3	4.2	0.9	<0.5	0.6
Chromium**	(mg/kg)	9	22	10	18	24	8	24	11	11	8
Lead**	(mg/kg)	17	22	30	34	40	35	226	42	20	21
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	7	15	7	13	48	7	23	10	8	6
Copper**	(mg/kg)	11	20	14	12	59	32	282	34	11	15
Zinc**	(mg/kg)	62	58	58	53	59	86	620	86	43	61
Selenium**	(mg/kg)	<0.5	<0.5	<0.5	0.5	1.0	<0.5	0.6	0.6	<0.5	<0.5
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)	0.6	1.1	0.6	3.3	1.2	1.1	1.8	1.4	1.1	0.9
Barium*	(mg/kg)	52	47	43	71	254	42	359	69	139	105
Beryllium*	(mg/kg)	<1	<1	<1	<1	2	<1	1	<1	<1	<1
Vanadium**	(mg/kg)	15	36	11	29	88	11	33	19	18	12
pH Value**	(Units)	7.9	7.7	7.8	7.7	7.7	7.8	7.9	7.7	7.9	8.3
Total Sulphate	(% as SO ₄)	<0.05	<0.05	<0.05	<0.05	0.38	0.11	<0.05	<0.05	<0.05	<0.05
Water Soluble Sulphate**	(mg/l as SO ₄)	109	99	85	203	1021	186	360	149	91	51
Water Soluble Chloride	(mg/l)	14	12	12	16	14	16	16	19	10	11
Total Cyanide**	(mg/kg)	<1	<1	<1	<1	#	<1	<1	<1	<1	<1
Sulphide	(mg/kg)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Elemental Sulphur**	(mg/kg)	<10	<10	<10	<10	20	<10	<10	<10	<10	<10
Total Monohydric Phenols**	(mg/kg)	<1	<1	<1	<1	#	<1	<1	<1	<1	<1
Total Organic Carbon	(%)	0.7	0.8	1.8	0.8	11.1	1.0	3.2	2.5	3.5	1.3

All results expressed on dry weight basis

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* = UKAS accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Stones	Chalk	Chalk	Chalk	Chalk	Silt loam	Silty clay loam	Silt loam	Chalk	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS135	WS135	WS136	WS136	WS136	WS137	WS137	WS138	WS138	WS139
	Depth (m)	1.50	2.10	0.70	1.00	1.50	0.30	0.70	0.40	1.00	0.50-0.70
	Our ref	15451	15452	15453	15454	15455	15456	15457	15458	15459	15460
Stone Content	(%)	69	22	<1	<1	<1	12	26	18	10	13
Arsenic**	(mg/kg)	n/t	n/t	<5	<5	n/t	<5	8.4	<5	n/t	7.9
Cadmium**	(mg/kg)	n/t	n/t	0.9	0.5	n/t	0.6	<0.5	0.6	n/t	0.7
Chromium**	(mg/kg)	n/t	n/t	3	2	n/t	6	22	5	n/t	19
Lead**	(mg/kg)	n/t	n/t	176	7	n/t	26	34	15	n/t	67
Mercury**	(mg/kg)	n/t	n/t	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	n/t	<0.5
Nickel**	(mg/kg)	n/t	n/t	4	2	n/t	7	10	7	n/t	16
Copper**	(mg/kg)	n/t	n/t	81	41	n/t	10	11	10	n/t	19
Zinc**	(mg/kg)	n/t	n/t	94	20	n/t	48	53	60	n/t	156
Selenium**	(mg/kg)	n/t	n/t	<0.5	<0.5	n/t	<0.5	0.6	<0.5	n/t	0.6
Hexavalent Chromium	(mg/kg)	n/t	n/t	<2	<2	n/t	<2	<2	<2	n/t	<2
Water Soluble Boron	(mg/kg)	n/t	n/t	0.8	0.6	n/t	0.9	1.2	0.7	n/t	1.5
Barium*	(mg/kg)	n/t	n/t	148	61	n/t	66	38	76	n/t	76
Beryllium*	(mg/kg)	n/t	n/t	<1	<1	n/t	<1	<1	<1	n/t	<1
Vanadium**	(mg/kg)	n/t	n/t	6	3	n/t	11	34	10	n/t	30
pH Value**	(Units)	8.9	8.3	8.8	8.4	8.3	7.9	7.6	7.9	8.1	7.7
Total Sulphate	(% as SO ₄)	n/t	n/t	<0.05	<0.05	n/t	<0.05	<0.05	<0.05	n/t	<0.05
Water Soluble Sulphate**	(mg/l as SO ₄)	70	<10	71	36	23	152	150	97	46	175
Water Soluble Chloride	(mg/l)	n/t	n/t	35	28	n/t	31	19	14	n/t	13
Total Cyanide**	(mg/kg)	n/t	n/t	<1	<1	n/t	<1	<1	<1	n/t	<1
Sulphide	(mg/kg)	n/t	n/t	<2	<2	n/t	<2	2.5	<2	n/t	<2
Elemental Sulphur**	(mg/kg)	n/t	n/t	<10	<10	n/t	<10	<10	<10	n/t	<10
Total Monohydric Phenols**	(mg/kg)	n/t	n/t	<1	<1	n/t	<1	<1	<1	n/t	<1
Total Organic Carbon	(%)	n/t	n/t	<0.1	<0.1	n/t	2.0	0.3	1.3	n/t	1.4

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

G Rouse



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Silt loam	Chalk	Chalk	Chalk	Chalk	Silt loam	Silt loam	Chalk	Chalk	Chalk
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS140	WS140	WS141	WS142	WS144	WS145	WS146	WS147	WS147	WS148
	Depth (m)	0.50-0.70	1.30-1.50	0.40-0.60	0.30	0.40-0.60	0.40-0.70	0.50	0.50	1.50	0.50
	Our ref	15461	15463	15464	15465	15466	15467	15468	15469	15470	15471
Stone Content	(%)	20	3	16	6	<1	38	35	25	<1	<1
Arsenic**	(mg/kg)	12.9	n/t	<5	n/t	<5	7.6	<5	<5	n/t	n/t
Cadmium**	(mg/kg)	<0.5	n/t	0.6	n/t	0.7	<0.5	<0.5	1.0	n/t	n/t
Chromium**	(mg/kg)	14	n/t	1	n/t	2	8	11	12	n/t	n/t
Lead**	(mg/kg)	79	n/t	3	n/t	3	18	20	89	n/t	n/t
Mercury**	(mg/kg)	<0.5	n/t	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	n/t	n/t
Nickel**	(mg/kg)	10	n/t	2	n/t	5	10	8	12	n/t	n/t
Copper**	(mg/kg)	22	n/t	4	n/t	6	16	13	85	n/t	n/t
Zinc**	(mg/kg)	112	n/t	17	n/t	50	42	41	216	n/t	n/t
Selenium**	(mg/kg)	<0.5	n/t	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	n/t	n/t
Hexavalent Chromium	(mg/kg)	<2	n/t	<2	n/t	<2	<2	<2	<2	n/t	n/t
Water Soluble Boron	(mg/kg)	1.8	n/t	1.0	n/t	0.5	1.1	1.2	2.0	n/t	n/t
Barium*	(mg/kg)	83	n/t	19	n/t	15	108	103	152	n/t	n/t
Beryllium*	(mg/kg)	<1	n/t	<1	n/t	<1	<1	<1	<1	n/t	n/t
Vanadium**	(mg/kg)	22	n/t	2	n/t	4	13	14	14	n/t	n/t
pH Value**	(Units)	7.6	8.7	8.2	8.4	8.2	9.9	9.5	7.9	8.2	8.0
Total Sulphate	(% as SO ₄)	<0.05	n/t	<0.05	n/t	<0.05	<0.05	<0.05	<0.05	n/t	n/t
Water Soluble Sulphate**	(mg/l as SO ₄)	203	128	31	<10	38	123	152	80	26	<10
Water Soluble Chloride	(mg/l)	17	n/t	12	n/t	31	27	21	16	n/t	n/t
Total Cyanide**	(mg/kg)	<1	n/t	<1	n/t	<1	<1	<1	<1	n/t	n/t
Sulphide	(mg/kg)	<2	n/t	<2	n/t	<2	<2	5.6	3.6	n/t	n/t
Elemental Sulphur**	(mg/kg)	<10	n/t	<10	n/t	<10	<10	14	<10	n/t	n/t
Total Monohydric Phenols**	(mg/kg)	<1	n/t	<1	n/t	<1	<1	<1	<1	n/t	n/t
Total Organic Carbon	(%)	0.9	n/t	1.3	n/t	1.8	1.1	0.9	4.3	n/t	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Chalk	Chalk	Silt loam	Chalk	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS150	WS151	WS152	WS153	WS154	WS156
	Depth (m)	0.50	0.50	0.50	0.90	0.40	0.90
	Our ref	15472	15473	15474	15475	15476	15479
Stone Content	(%)	<1	<1	<1	65	13	18
Arsenic**	(mg/kg)	<5	n/t	<5	<5	n/t	<5
Cadmium**	(mg/kg)	0.6	n/t	0.7	1.4	n/t	0.5
Chromium**	(mg/kg)	1	n/t	3	9	n/t	5
Lead**	(mg/kg)	3	n/t	8	718	n/t	42
Mercury**	(mg/kg)	<0.5	n/t	<0.5	<0.5	n/t	<0.5
Nickel**	(mg/kg)	2	n/t	3	7	n/t	5
Copper**	(mg/kg)	4	n/t	6	855	n/t	31
Zinc**	(mg/kg)	20	n/t	28	338	n/t	44
Selenium**	(mg/kg)	<0.5	n/t	<0.5	<0.5	n/t	0.7
Hexavalent Chromium	(mg/kg)	<2	n/t	<2	<2	n/t	<2
Water Soluble Boron	(mg/kg)	<0.5	n/t	<0.5	1.0	n/t	0.9
Barium*	(mg/kg)	13	n/t	71	136	n/t	253
Beryllium*	(mg/kg)	<1	n/t	<1	<1	n/t	<1
Vanadium**	(mg/kg)	2	n/t	4	4	n/t	10
pH Value**	(Units)	8.2	8.2	8.0	7.9	8.2	8.4
Total Sulphate	(% as SO ₄)	<0.05	n/t	<0.05	<0.05	n/t	<0.05
Water Soluble Sulphate**	(mg/l as SO ₄)	17	<10	46	93	66	22
Water Soluble Chloride	(mg/l)	11	n/t	66	18	n/t	13
Total Cyanide**	(mg/kg)	<1	n/t	<1	<1	n/t	<1
Sulphide	(mg/kg)	<2	n/t	<2	<2	n/t	<2
Elemental Sulphur**	(mg/kg)	<10	n/t	<10	<10	n/t	<10
Total Monohydric Phenols**	(mg/kg)	<1	n/t	<1	<1	n/t	<1
Total Organic Carbon	(%)	1.4	n/t	0.5	0.7	n/t	0.6

All results expressed on dry weight basis

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Brick	Chalk	Loamy sand	Sandy loam	Sandy silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS126	WS127	WS127	WS128	WS128	WS129	WS129	WS129	WS130	WS130
	Depth (m)	1.00	5.00	1.00	5.00	1.00	5.00	1.00	1.50	0.50	1.00
	Our ref	15416	15417	15418	15420	15421	15422	15423	15424	15426	15427
Naphthalene**	(mg/kg)	1.0	<0.1	0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene**	(mg/kg)	1.7	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene**	(mg/kg)	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene**	(mg/kg)	10.2	<0.1	0.3	<0.1	1.0	0.1	<0.1	<0.1	<0.1	0.2
Anthracene**	(mg/kg)	2.9	<0.1	0.1	0.1	0.3	0.1	<0.1	<0.1	<0.1	0.1
Fluoranthene**	(mg/kg)	11.1	<0.1	0.3	<0.1	1.7	0.2	0.1	<0.1	<0.1	1.1
Pyrene**	(mg/kg)	9.3	<0.1	<0.1	<0.1	2.1	0.1	0.1	<0.1	0.1	1.0
Benz(a)anthracene**	(mg/kg)	5.0	<0.1	0.4	<0.1	1.2	0.1	<0.1	<0.1	<0.1	0.9
Chrysene**	(mg/kg)	5.8	<0.1	0.2	<0.1	1.8	0.2	0.1	<0.1	<0.1	1.1
Benzo(b)fluoranthene**	(mg/kg)	4.2	<0.1	1.3	0.1	1.8	0.1	0.1	<0.1	<0.1	1.1
Benzo(k)fluoranthene**	(mg/kg)	3.9	<0.1	1.1	0.1	1.8	0.2	0.1	<0.1	<0.1	1.0
Benzo(a)pyrene**	(mg/kg)	4.2	<0.1	0.5	<0.1	<0.1	0.1	0.1	<0.1	<0.1	1.1
Indeno(123-cd)pyrene**	(mg/kg)	3.1	<0.1	0.9	<0.1	2.0	0.2	0.2	<0.1	0.1	1.0
Dibenz(ah)anthracene**	(mg/kg)	1.0	<0.1	0.4	<0.1	0.6	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(ghi)perylene**	(mg/kg)	3.5	<0.1	0.4	0.1	3.1	0.1	0.1	<0.1	0.2	0.9
Total PAH**	(mg/kg)	67.9	<0.1	6.2	0.4	18.1	1.8	1.0	<0.1	0.5	9.8

All results expressed on dry weight basis

** - MCERTS accredited test

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Chalk	Silt loam	Chalk	Chalk	Chalk	Silty clay loam	Chalk	Silty clay loam	Loamy sand	Chalk
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS131	WS131	WS132	WS132	WS133	WS133	WS133	WS134	WS134	WS134
	Depth (m)	0.30	0.60	0.50	1.00	0.30	0.60	1.00	0.50	0.65	0.80
	Our ref	15431	15432	15435	15436	15440	15441	15442	15444	15445	15446
Naphthalene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene**	(mg/kg)	0.2	0.3	0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.1
Anthracene**	(mg/kg)	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene**	(mg/kg)	0.5	0.6	0.2	0.2	0.1	0.2	<0.1	0.7	<0.1	<0.1
Pyrene**	(mg/kg)	0.5	0.5	0.1	0.2	0.1	0.2	<0.1	0.6	<0.1	<0.1
Benz(a)anthracene**	(mg/kg)	0.2	0.3	0.1	0.1	<0.1	0.1	<0.1	0.5	<0.1	<0.1
Chrysene**	(mg/kg)	0.4	0.3	0.2	0.2	<0.1	0.2	<0.1	0.5	<0.1	<0.1
Benzo(b)fluoranthene**	(mg/kg)	0.4	0.3	0.2	0.2	<0.1	0.2	0.1	0.3	<0.1	<0.1
Benzo(k)fluoranthene**	(mg/kg)	0.4	0.3	0.2	0.2	0.1	0.2	<0.1	0.5	<0.1	<0.1
Benzo(a)pyrene**	(mg/kg)	0.4	0.3	0.2	0.2	<0.1	0.1	<0.1	0.5	<0.1	<0.1
Indeno(123-cd)pyrene**	(mg/kg)	0.4	0.3	0.2	0.2	<0.1	0.2	<0.1	0.3	0.1	<0.1
Dibenz(ah)anthracene**	(mg/kg)	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(ghi)perylene**	(mg/kg)	0.4	0.2	0.1	0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1
Total PAH**	(mg/kg)	3.7	3.9	1.9	1.9	0.4	2.0	0.1	4.4	0.1	<0.1

All results expressed on dry weight basis

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Sandy silt loam	Silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam	Silty clay loam	Silt loam	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS134	WS134	WS135	WS135	WS136	WS136	WS137	WS137	WS138	WS139
	Depth (m)	1.00	1.50	0.50	1.00	0.70	1.00	0.30	0.70	0.40	0.50-0.70
	Our ref	15447	15448	15449	15450	15453	15454	15456	15457	15458	15460
Naphthalene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6
Acenaphthylene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene**	(mg/kg)	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	0.3
Anthracene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1
Fluoranthene**	(mg/kg)	0.5	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	2.1	0.2	0.3
Pyrene**	(mg/kg)	0.6	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.1	<0.1
Benz(a)anthracene**	(mg/kg)	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	1.6	0.1	0.2
Chrysene**	(mg/kg)	0.6	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	1.7	0.1	0.2
Benzo(b)fluoranthene**	(mg/kg)	0.5	0.2	0.5	<0.1	<0.1	<0.1	<0.1	1.9	0.1	0.2
Benzo(k)fluoranthene**	(mg/kg)	0.5	0.5	0.1	<0.1	<0.1	<0.1	<0.1	1.7	0.1	0.2
Benzo(a)pyrene**	(mg/kg)	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.0	0.1	0.2
Indeno(123-cd)pyrene**	(mg/kg)	0.5	0.4	0.1	<0.1	<0.1	<0.1	<0.1	2.1	0.1	0.2
Dibenz(ah)anthracene**	(mg/kg)	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	0.1
Benzo(ghi)perylene**	(mg/kg)	0.9	0.5	0.2	<0.1	<0.1	<0.1	<0.1	2.0	0.1	0.2
Total PAH**	(mg/kg)	5.2	3.1	0.9	<0.1	<0.1	<0.1	<0.1	17.3	1.2	3.0

All results expressed on dry weight basis

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Soils	Characteristic	Silt loam	Chalk	Chalk	Silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS140	WS141	WS144	WS145	WS146	WS147	WS150	WS152	WS153	WS156
	Depth (m)	0.50-0.70	0.40-0.60	0.40-0.60	0.40-0.70	0.50	0.50	0.50	0.50	0.90	0.90
	Our ref	15461	15464	15466	15467	15468	15469	15472	15474	15475	15479
Naphthalene**	(mg/kg)	<0.1	<0.1	<0.1	0.2	0.1	0.3	<0.1	<0.1	<0.1	<0.1
Acenaphthylene**	(mg/kg)	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene**	(mg/kg)	<0.1	<0.1	<0.1	0.3	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Fluorene**	(mg/kg)	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene**	(mg/kg)	0.2	0.2	<0.1	3.6	0.5	0.9	<0.1	<0.1	0.3	<0.1
Anthracene**	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1
Fluoranthene**	(mg/kg)	0.6	0.6	<0.1	7.2	0.7	1.3	<0.1	<0.1	0.5	<0.1
Pyrene**	(mg/kg)	<0.1	<0.1	<0.1	6.2	0.6	1.1	<0.1	<0.1	0.5	<0.1
Benz(a)anthracene**	(mg/kg)	0.3	0.4	<0.1	4.4	0.4	0.9	<0.1	<0.1	0.3	<0.1
Chrysene**	(mg/kg)	0.5	0.4	<0.1	4.8	0.5	1.0	<0.1	<0.1	0.4	<0.1
Benzo(b)fluoranthene**	(mg/kg)	0.3	0.4	<0.1	4.1	0.6	1.0	<0.1	<0.1	0.4	<0.1
Benzo(k)fluoranthene**	(mg/kg)	0.5	0.4	<0.1	3.8	0.7	1.0	<0.1	<0.1	0.4	<0.1
Benzo(a)pyrene**	(mg/kg)	0.3	0.4	<0.1	4.3	0.4	0.9	<0.1	<0.1	0.4	<0.1
Indeno(123-cd)pyrene**	(mg/kg)	0.3	0.4	<0.1	3.4	0.4	0.9	<0.1	<0.1	0.4	<0.1
Dibenz(ah)anthracene**	(mg/kg)	0.1	0.1	<0.1	0.9	0.2	0.3	<0.1	<0.1	0.1	<0.1
Benzo(ghi)perylene**	(mg/kg)	0.3	0.4	<0.1	3.1	0.6	1.0	<0.1	<0.1	0.4	<0.1
Total PAH**	(mg/kg)	3.6	3.4	<0.1	46.9	6.1	11.6	<0.1	<0.1	4.5	<0.1

All results expressed on dry weight basis

** - MCERTS accredited test

G Rouse

THE ENVIRONMENTAL LABORATORY Limited

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil

Characteristic	Brick	Chalk	Loamy sand	Sandy loam	Sandy silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam
Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
TP/BH	WS126	WS127	WS127	WS128	WS128	WS129	WS129	WS129	WS130	WS130
Depth (m)	1.00	5.00	1.00	5.00	1.00	5.00	1.00	1.50	0.50	1.00
Our ref	15416	15417	15418	15420	15421	15422	15423	15424	15426	15427
Aromatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	0.2	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	2.0	0.5	<0.1	<0.1	0.3	0.1	<0.1	0.5	0.1
>EC ₁₆ -EC ₂₁	(mg/kg)	7.7	6.5	0.2	0.3	6.5	0.8	<0.1	2.0	0.2
>EC ₂₁ -EC ₃₅	(mg/kg)	47.8	77.0	5.3	9.9	157.9	5.4	6.3	13.6	2.6
Aliphatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	0.2	0.2	<0.1	<0.1	<0.1	<0.1	0.3	0.4	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	3.7	0.5	<0.1	<0.1	1.1	<0.1	0.2	<0.1	<0.1
>EC ₁₆ -EC ₂₁	(mg/kg)	42.6	9.1	0.2	0.2	5.5	0.6	1.1	0.2	0.2
>EC ₂₁ -EC ₃₅	(mg/kg)	215.0	101.3	1.1	2.6	43.8	3.7	5.4	6.0	<0.1
TPH (C ₅ - C ₃₅)	(mg/kg)	319.2	195.3	6.8	12.9	215.1	10.8	14.0	4.3	23.9

All results expressed on dry weight basis

G Rouse

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil

Characteristic	Chalk	Silt loam	Chalk	Chalk	Chalk	Silty clay loam	Chalk	Silty clay loam	Loamy sand	Chalk
Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
TP/BH	WS131	WS131	WS132	WS132	WS133	WS133	WS133	WS134	WS134	WS134
Depth (m)	0.30	0.60	0.50	1.00	0.30	0.60	1.00	0.50	0.65	0.80
Our ref	15431	15432	15435	15436	15440	15441	15442	15444	15445	15446
Aromatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	<0.1	0.1	0.3	0.3	<0.1	<0.1	0.2	0.2	0.2
>EC ₁₆ -EC ₂₁	(mg/kg)	0.7	0.6	1.3	0.7	<0.1	0.2	0.4	0.7	0.5
>EC ₂₁ -EC ₃₅	(mg/kg)	6.4	5.2	6.7	3.7	1.9	21.6	3.5	7.9	5.0
Aliphatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₆ -EC ₂₁	(mg/kg)	0.7	0.3	1.2	0.3	<0.1	0.5	<0.1	0.3	0.3
>EC ₂₁ -EC ₃₅	(mg/kg)	1.9	1.2	1.6	0.5	<0.1	11.9	0.9	3.3	2.0
TPH (C ₅ - C ₃₅)	(mg/kg)	9.7	7.4	11.5	5.5	1.9	34.3	5.0	12.3	7.8

All results expressed on dry weight basis

G Rouse

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil

Characteristic	Sandy silt loam	Silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam	Silty clay loam	Silt loam	Silt loam
Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
TP/BH	WS134	WS134	WS135	WS135	WS136	WS136	WS137	WS137	WS138	WS139
Depth (m)	1.00	1.50	0.50	1.00	0.70	1.00	0.30	0.70	0.40	0.50-0.70
Our ref	15447	15448	15449	15450	15453	15454	15456	15457	15458	15460
Aromatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.2	<0.1	0.2
>EC ₁₂ -EC ₁₆	(mg/kg)	0.2	<0.1	0.3	0.2	0.3	0.8	0.5	<0.1	0.7
>EC ₁₆ -EC ₂₁	(mg/kg)	6.7	0.3	0.2	0.3	0.3	0.8	0.7	0.8	0.8
>EC ₂₁ -EC ₃₅	(mg/kg)	82.3	4.2	0.2	2.4	2.1	3.5	2.5	33.0	2.5
Aliphatic										
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
>EC ₁₆ -EC ₂₁	(mg/kg)	8.8	0.2	0.2	0.2	<0.1	<0.1	<0.1	1.1	0.3
>EC ₂₁ -EC ₃₅	(mg/kg)	56.1	0.7	2.1	1.8	0.5	<0.1	<0.1	18.7	<0.1
TPH (C ₅ - C ₃₅)	(mg/kg)	155.6	5.4	3.0	4.9	3.4	5.5	3.9	53.6	4.7

All results expressed on dry weight basis

G Rouse

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

TPH CWG - Soil	Characteristic	Silt loam	Chalk	Chalk	Silt loam	Silt loam	Chalk	Chalk	Chalk	Silt loam	Silt loam
	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS140	WS141	WS144	WS145	WS146	WS147	WS150	WS152	WS153	WS156
	Depth (m)	0.50-0.70	0.40-0.60	0.40-0.60	0.40-0.70	0.50	0.50	0.50	0.50	0.90	0.90
	Our ref	15461	15464	15466	15467	15468	15469	15472	15474	15475	15479
Aromatic											
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	0.3	0.3	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2
>EC ₁₂ -EC ₁₆	(mg/kg)	0.1	0.6	0.5	0.4	<0.1	2.4	0.2	0.3	0.7	0.5
>EC ₁₆ -EC ₂₁	(mg/kg)	0.8	0.8	0.6	2.4	0.8	28.8	0.2	0.3	5.1	0.6
>EC ₂₁ -EC ₃₅	(mg/kg)	19.6	2.5	1.8	18.1	38.1	165.1	0.8	1.1	18.4	2.0
Aliphatic											
>EC ₅ -EC ₇	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₇ -EC ₈	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>EC ₈ -EC ₁₀	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₀ -EC ₁₂	(mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC ₁₂ -EC ₁₆	(mg/kg)	1.1	0.1	<0.1	0.2	0.5	3.9	<0.1	<0.1	0.7	0.1
>EC ₁₆ -EC ₂₁	(mg/kg)	2.9	0.6	<0.1	0.6	2.1	10.4	<0.1	0.2	2.5	0.2
>EC ₂₁ -EC ₃₅	(mg/kg)	33.2	2.4	<0.1	5.3	62.7	55.6	<0.1	<0.1	10.2	1.0
TPH (C ₅ - C ₃₅)	(mg/kg)	57.7	7.3	3.3	27.1	104.1	266.4	1.2	1.9	37.5	4.6

All results expressed on dry weight basis

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS126
Depth (m)	1.00
Our ref:	15416
#Description of Sample Matrix:	Brick
Result	No asbestos identified

Sample ref:	WS127
Depth (m)	5.00
Our ref:	15417
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS127
Depth (m)	1.00
Our ref:	15418
#Description of Sample Matrix:	Loamy sand
Result	No asbestos identified

Sample ref:	WS128
Depth (m)	5.00
Our ref:	15420
#Description of Sample Matrix:	Sandy loam
Result	No asbestos identified

Sample ref:	WS128
Depth (m)	1.00
Our ref:	15421
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

* = UKAS accredited

Analytical result only applies to the sample as submitted by the client

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Location: Havant Retail Park



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West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS129
Depth (m)	5.00
Our ref:	15422
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS129
Depth (m)	1.00
Our ref:	15423
#Description of Sample Matrix:	Chalk
Result	Chrysotile (White Asbestos)

Sample ref:	WS129
Depth (m)	1.50
Our ref:	15424
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS130
Depth (m)	0.50
Our ref:	15426
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS130
Depth (m)	1.00
Our ref:	15427
#Description of Sample Matrix:	Silt loam
Result	Chrysotile (White Asbestos)

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS131
Depth (m)	0.30
Our ref:	15431
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS131
Depth (m)	0.60
Our ref:	15432
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS132
Depth (m)	0.50
Our ref:	15435
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS132
Depth (m)	1.00
Our ref:	15436
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS133
Depth (m)	0.30
Our ref:	15440
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
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West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS133
Depth (m)	0.60
Our ref:	15441
#Description of Sample Matrix:	Silty clay loam
Result	No asbestos identified

Sample ref:	WS133
Depth (m)	1.00
Our ref:	15442
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS134
Depth (m)	0.50
Our ref:	15444
#Description of Sample Matrix:	Silty clay loam
Result	No asbestos identified

Sample ref:	WS134
Depth (m)	0.65
Our ref:	15445
#Description of Sample Matrix:	Loamy sand
Result	No asbestos identified

Sample ref:	WS134
Depth (m)	0.80
Our ref:	15446
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

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Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS134
Depth (m)	1.00
Our ref:	15447
#Description of Sample Matrix:	Sandy silt loam
Result	No asbestos identified

Sample ref:	WS134
Depth (m)	1.50
Our ref:	15448
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS135
Depth (m)	0.50
Our ref:	15449
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS135
Depth (m)	1.00
Our ref:	15450
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS136
Depth (m)	0.70
Our ref:	15453
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

* = UKAS accredited

Analytical result only applies to the sample as submitted by the client

Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client

G Rouse



THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS136
Depth (m)	1.00
Our ref:	15454
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS137
Depth (m)	0.30
Our ref:	15456
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS137
Depth (m)	0.70
Our ref:	15457
#Description of Sample Matrix:	Silty clay loam
Result	No asbestos identified

Sample ref:	WS138
Depth (m)	0.40
Our ref:	15458
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS139
Depth (m)	0.50-0.70
Our ref:	15460
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref: **WS140**
Depth (m) **0.50-0.70**
Our ref: **15461**
#Description of Sample Matrix: Silt loam
Result Amosite (Brown Asbestos)

Sample ref: **WS141**
Depth (m) **0.40-0.60**
Our ref: **15464**
#Description of Sample Matrix: Chalk
Result No asbestos identified

Sample ref: **WS144**
Depth (m) **0.40-0.60**
Our ref: **15466**
#Description of Sample Matrix: Chalk
Result No asbestos identified

Sample ref: **WS145**
Depth (m) **0.40-0.70**
Our ref: **15467**
#Description of Sample Matrix: Silt loam
Result No asbestos identified

Sample ref: **WS146**
Depth (m) **0.50**
Our ref: **15468**
#Description of Sample Matrix: Silt loam
Result No asbestos identified

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ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

Your Job No: GE9752
Your Order No: 2348
Reporting Date: 16/04/14

Asbestos Identification

Sample ref:	WS147
Depth (m)	0.50
Our ref:	15469
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS150
Depth (m)	0.50
Our ref:	15472
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS152
Depth (m)	0.50
Our ref:	15474
#Description of Sample Matrix:	Chalk
Result	No asbestos identified

Sample ref:	WS153
Depth (m)	0.90
Our ref:	15475
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

Sample ref:	WS156
Depth (m)	0.90
Our ref:	15479
#Description of Sample Matrix:	Silt loam
Result	No asbestos identified

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752

Your Order No: 2348

Reporting Date: 16/04/2014

F.A.O. Gavin Roberts

Geo-Environmental Services Limited

Unit 7 Danworth Farm

Cuckfield Road, Hurstpierpoint

West Sussex, BN6 9GL

<u>Waters</u>	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS128	WS129	WS130	WS131	WS132	WS134	WS137	WS140	WS153	WS155
	Depth	5.00	1.00	1.5	1.00	1.80	0.65	0.30	0.90-1.10	0.90	1.5
	Our ref	15420	15423	15428	15433	15438	15445	15456	15462	15475	15478
Arsenic*	(µg/l)	10	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium*	(µg/l)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium*	(µg/l)	6	<5	<5	<5	<5	<5	<5	<5	5	<5
Lead*	(µg/l)	15	<1	7	<1	<1	<1	<1	1	2	<1
Nickel*	(µg/l)	2	<1	<1	<1	1	<1	<1	<1	<1	<1
Copper*	(µg/l)	6	10	<5	<5	8	<5	<5	7	13	<5
Zinc*	(µg/l)	57	<5	<5	<5	<5	<5	<5	<5	9	<5
Mercury*	(µg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Selenium*	(µg/l)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Boron	(µg/l)	187	236	183	238	222	186	139	154	208	172
Barium*	(µg/l)	81	10	9	15	6	13	13	13	58	37
Beryllium*	(µg/l)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vanadium	(µg/l)	12	9	<5	<5	<5	9	<5	6	<5	<5
pH Value*	(Units)	9.4	9.9	8.7	7.5	8.3	8.4	8.6	8.2	7.9	7.4
Sulphate*	(mg/l)	12	14	17	25	14	59	27	16	17	23
Chloride*	(mg/l)	<5	<5	<5	<5	<5	<5	6	<5	<5	<5
Total Cyanide	(µg/l)	<5	<5	<5	<5	16	<5	<5	<5	<5	<5
Sulphide	(mg/l)	5.5	0.6	0.7	0.8	0.8	0.7	0.9	0.7	0.4	0.4
Total Phenols	(µg/l)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexavalent Chromium	(µg/l)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
TOC (In filtered samples)*	(mg/l)	4.4	5.8	4.1	7.0	4.2	4.2	7.4	6.7	3.5	3.5
Elemental Sulphur	(mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

* = UKAS Accredited test

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752

Your Order No: 2348

Reporting Date: 16/04/2014

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

<u>Waters</u>		Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS128	WS129	WS130	WS131	WS132	WS134	WS137	WS140	WS153	WS155
	Depth	5.00	1.00	1.50	1.00	1.80	0.65	0.30	0.90-1.10	0.90	1.50
	Our ref	15420	15423	15428	15433	15438	15445	15456	15462	15475	15478
Naphthalene	(µg/l)	0.16	0.15	0.06	0.15	0.20	0.14	0.15	0.16	0.19	0.15
Acenaphthylene	(µg/l)	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	0.01	0.02	<0.01
Acenaphthene	(µg/l)	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.01
Fluorene	(µg/l)	0.01	0.01	0.02	0.01	0.02	0.01	0.03	0.01	0.02	0.02
Phenanthrene	(µg/l)	0.04	0.03	0.09	0.07	0.11	0.04	0.13	0.04	0.09	0.07
Anthracene	(µg/l)	0.02	0.02	0.03	0.03	0.03	0.01	0.03	0.02	0.06	0.02
Fluoranthene	(µg/l)	0.03	0.01	0.07	0.02	0.02	0.01	0.04	0.01	0.03	0.02
Pyrene	(µg/l)	0.03	0.01	0.05	0.01	0.02	0.01	0.02	0.01	0.02	0.01
Benz(a)anthracene	(µg/l)	0.03	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Chrysene	(µg/l)	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Benzo(b)fluoranthene	(µg/l)	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Benzo(k)fluoranthene	(µg/l)	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Benzo(a)pyrene	(µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Indeno(123-cd)pyrene	(µg/l)	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Dibenz(ah)anthracene	(µg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(ghi)perylene	(µg/l)	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Total PAH	(µg/l)	0.40	0.24	0.47	0.30	0.43	0.24	0.43	0.27	0.53	0.30

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR53800

Location: Havant Retail Park



Your Job No: GE9752

Your Order No: 2348

Reporting Date: 16/04/2014

F.A.O. Gavin Roberts
Geo-Environmental Services Limited
Unit 7 Danworth Farm
Cuckfield Road, Hurstpierpoint
West Sussex, BN6 9GL

<u>Waters</u>	Date Sampled	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14	24-28/03/14
	TP/BH	WS128	WS129	WS130	WS131	WS132	WS134	WS137	WS140	WS153	WS155
	Depth	5.00	1.00	1.50	1.00	1.80	0.65	0.30	0.90-1.10	0.90	1.50
	Our ref	15420	15423	15428	15433	15438	15445	15456	15462	15475	15478

Aromatic

>C ₅ -C ₇	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₇ -C ₈	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₂ -C ₁₆	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₆ -C ₂₁	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₂₁ -C ₃₅	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Aliphatic

>C ₅ -C ₆	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₆ -C ₈	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₂ -C ₁₆	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₁₆ -C ₂₁	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C ₂₁ -C ₃₅	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH (C ₅ - C ₃₅)	(µg/l)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10



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THE ENVIRONMENTAL LABORATORY LTD

Waste Acceptance Criteria ANALYTICAL RESULTS								
Report No:		ANALYTICAL REPORT No. AR53800				Page 27 of 36		
						CLIENT:	Geo-Environmental Services Limited	
Project Name:		Location: Havant Retail Park						
Lab Reference		15417				Landfill Waste Acceptance Criteria		
						Limits		
Sampling Date		24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID		WS127						
Depth		5.00						
Solid Waste Analysis								
TOC (%)		0.5				3%	5%	6%
Loss on Ignition (%)**		1.1				-	-	10%
BTEX (mg/kg)**		<0.01				6	-	-
Sum of PCBs (mg/kg)**		<0.01				1	-	-
Mineral Oil (mg/kg)**		195				500	-	-
Total PAH (mg/kg)**		<0.1				100	-	-
pH (Units)**		8.3				-	-	-
Acid Neutralisation Capacity (mol/kg)		<0.1				-	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)			
	mg/l	mg/l		mg/kg				
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25	
Barium*	0.023	0.020		0.1	20	100	300	
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5	
Chromium*	<0.005	<0.005		<0.1	0.5	10	70	
Copper*	<0.005	<0.005		<0.1	2	50	100	
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2	
Molybdenum*	0.006	<0.005		<0.1	0.5	10	30	
Nickel*	<0.005	<0.005		<0.1	0.4	10	40	
Lead*	<0.005	<0.005		<0.1	0.5	10	50	
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5	
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7	
Zinc*	0.010	0.005		<0.1	4	50	200	
Chloride*	14	5		38	800	15000	25000	
Fluoride*	<1	<1		<1	10	150	500	
Sulphate*	104	11		191	1000	20000	50000	
TDS	300	<100		418	4000	60000	100000	
Phenol Index	<0.5	<0.5		<0.5	1	-	-	
DOC	23.0	8.1		64	500	800	1000	
Leach Test Information								
pH *		7.8	7.7					
EC*		446	117					
Sample Mass (kg)		0.208						
Dry Matter (%)		84						
Moisture (%)		20						
Stage 1								
Volume Eluate L2 (litres)		0.316						
Filtered Eluate VE1 (litres)		0.244						
Results are expressed on a dry weight basis, after correction for moisture content where applicable								
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation								

* = UKAS accredited

** - MCERTS accredited test



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Waste Acceptance Criteria ANALYTICAL RESULTS								
Report No:		ANALYTICAL REPORT No. AR53800				Page 28 of 36		
						CLIENT: Geo-Environmental Services Limited		
Project Name:		Location: Havant Retail Park						
Lab Reference		15427				Landfill Waste Acceptance Criteria		
						Limits		
Sampling Date		24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID		WS130						
Depth		1.00						
Solid Waste Analysis								
TOC (%)		1.0				3%	5%	6%
Loss on Ignition (%)**		3.1				-	-	10%
BTEX (mg/kg)**		<0.01				6	-	-
Sum of PCBs (mg/kg)**		<0.01				1	-	-
Mineral Oil (mg/kg)**		<5				500	-	-
Total PAH (mg/kg)**		9.8				100	-	-
pH (Units)**		8.0				-	-	-
Acid Neutralisation Capacity (mol/kg)		<0.1				-	To be evaluated	To be evaluated
Eluate Analysis		2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test		
		mg/l	mg/l		mg/kg	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic*		<0.005	<0.005		<0.1	0.5	2	25
Barium*		0.021	0.008		<0.1	20	100	300
Cadmium*		<0.001	<0.001		<0.01	0.04	1	5
Chromium*		<0.005	<0.005		<0.1	0.5	10	70
Copper*		<0.005	<0.005		<0.1	2	50	100
Mercury*		<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*		0.006	<0.005		<0.1	0.5	10	30
Nickel*		<0.005	<0.005		<0.1	0.4	10	40
Lead*		<0.005	<0.005		<0.1	0.5	10	50
Antimony		<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*		<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*		0.008	0.007		<0.1	4	50	200
Chloride*		11	4		37	800	15000	25000
Fluoride*		<1	<1		<1	10	150	500
Sulphate*		104	13		216	1000	20000	50000
TDS		440	130		1271	4000	60000	100000
Phenol Index		<0.5	<0.5		<0.5	1	-	-
DOC		27.2	11.1		93	500	800	1000
Leach Test Information								
pH *		7.9	7.7					
EC*		559	154					
Sample Mass (kg)		0.197						
Dry Matter (%)		89						
Moisture (%)		13						
Stage 1								
Volume Eluate L2 (litres)		0.327						
Filtered Eluate VE1 (litres)		0.256						
Results are expressed on a dry weight basis, after correction for moisture content where applicable								
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation								

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** - MCERTS accredited test



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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR53800				Page 29 of 36		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	15434				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS131						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	0.7				3%	5%	6%
Loss on Ignition (%)**	1.0				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	208				500	–	–
Total PAH (mg/kg)**	1.1				100	–	–
pH (Units)**	8.2				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.027	0.011		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	0.005	<0.005		<0.1	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.007	<0.005		<0.1	0.5	10	30
Nickel*	<0.005	<0.005		<0.1	0.4	10	40
Lead*	<0.005	0.007		<0.1	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.010	0.011		<0.1	4	50	200
Chloride*	11	4		33	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	156	23		317	1000	20000	50000
TDS	560	140		1363	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	25.6	7.7		67	500	800	1000
Leach Test Information							
pH *	7.8	7.6					
EC*	757	162					
Sample Mass (kg)	0.207						
Dry Matter (%)	85						
Moisture (%)	19						
Stage 1							
Volume Eluate L2 (litres)	0.317						
Filtered Eluate VE1 (litres)	0.250						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR53800				Page 30 of 36		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	15443				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS133						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	0.9				3%	5%	6%
Loss on Ignition (%)**	1.7				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	<5				500	–	–
Total PAH (mg/kg)**	<0.1				100	–	–
pH (Units)**	8.1				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.021	0.006		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	<0.005	<0.005		<0.1	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.008	<0.005		<0.1	0.5	10	30
Nickel*	<0.005	<0.005		<0.1	0.4	10	40
Lead*	<0.005	<0.005		<0.1	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.008	0.008		<0.1	4	50	200
Chloride*	10	5		35	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	55	7		109	1000	20000	50000
TDS	360	110		978	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	28.7	14.1		101	500	800	1000
Leach Test Information							
pH *	7.9	7.6					
EC*	467	133					
Sample Mass (kg)	0.202						
Dry Matter (%)	87						
Moisture (%)	16						
Stage 1							
Volume Eluate L2 (litres)	0.322						
Filtered Eluate VE1 (litres)	0.240						
Results are expressed on a dry weight basis, after correction for moisture content where applicable Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR53800				Page 31 of 36		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	15448				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS134						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	2.9				3%	5%	6%
Loss on Ignition (%)**	4.6				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	5				500	–	–
Total PAH (mg/kg)**	3.1				100	–	–
pH (Units)**	7.7				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.035	0.009		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	<0.005	<0.005		<0.1	0.5	10	70
Copper*	0.012	0.009		<0.1	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.008	<0.005		<0.1	0.5	10	30
Nickel*	<0.005	<0.005		<0.1	0.4	10	40
Lead*	<0.005	<0.005		<0.1	0.5	10	50
Antimony	<0.005	<0.005		<0.01	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.013	0.011		<0.1	4	50	200
Chloride*	12	5		35	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	122	15		213	1000	20000	50000
TDS	940	230		2080	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	39.3	19.1		124	500	800	1000
Leach Test Information							
pH *	7.7	7.6					
EC*	1184	219					
Sample Mass (kg)	0.210						
Dry Matter (%)	84						
Moisture (%)	21						
Stage 1							
Volume Eluate L2 (litres)	0.314						
Filtered Eluate VE1 (litres)	0.220						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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Waste Acceptance Criteria ANALYTICAL RESULTS							
Report No:	ANALYTICAL REPORT No. AR53800				Page 32 of 36		
					CLIENT:	Geo-Environmental Services Limited	
Project Name:	Location: Havant Retail Park						
Lab Reference	15477				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	24-28/03/14				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS154						
Depth	1.50						
Solid Waste Analysis							
TOC (%)	9.2				3%	5%	6%
Loss on Ignition (%)**	5.5				–	–	10%
BTEX (mg/kg)**	<0.01				6	–	–
Sum of PCBs (mg/kg)**	<0.01				1	–	–
Mineral Oil (mg/kg)**	<5				500	–	–
Total PAH (mg/kg)**	1.9				100	–	–
pH (Units)**	8.8				–	–	–
Acid Neutralisation Capacity (mol/kg)	<0.1				–	To be evaluated	To be evaluated
Eluate Analysis	2:1	8:1		Cumulative 10:1	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic*	<0.005	<0.005		<0.1	0.5	2	25
Barium*	0.015	0.009		<0.1	20	100	300
Cadmium*	<0.001	<0.001		<0.01	0.04	1	5
Chromium*	0.005	<0.005		<0.1	0.5	10	70
Copper*	0.031	0.027		0.2	2	50	100
Mercury*	<0.0001	<0.0001		<0.001	0.01	0.2	2
Molybdenum*	0.026	0.008		<0.1	0.5	10	30
Nickel*	0.008	<0.005		<0.1	0.4	10	40
Lead*	<0.005	<0.005		<0.1	0.5	10	50
Antimony	0.007	0.006		0.04	0.06	0.7	5
Selenium*	<0.005	<0.005		<0.01	0.1	0.5	7
Zinc*	0.015	0.012		<0.1	4	50	200
Chloride*	13	5		42	800	15000	25000
Fluoride*	<1	<1		<1	10	150	500
Sulphate*	81	19		200	1000	20000	50000
TDS	240	180		1138	4000	60000	100000
Phenol Index	<0.5	<0.5		<0.5	1	-	-
DOC	25.1	12.3		90	500	800	1000
Leach Test Information							
pH *	8.0	8.0					
EC*	340	131					
Sample Mass (kg)	0.201						
Dry Matter (%)	87						
Moisture (%)	16						
Stage 1							
Volume Eluate L2 (litres)	0.322						
Filtered Eluate VE1 (litres)	0.250						
Results are expressed on a dry weight basis, after correction for moisture content where applicable							
Stated limits are for guidance only and ELAB cannot be held responsible for any discrepancies with current legislation							

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR53800
Your Job No: GE9752
Sample Receipt Date: 01/04/14
Reporting Date: 16/04/14

Registered: 01/04/14
Prepared: 02/04/14
Analysis complete: 16/04/14

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	12/04/14	118	ICPMS
Cadmium**	Air dried sample	12/04/14	118	ICPMS
Chromium**	Air dried sample	12/04/14	118	ICPMS
Lead**	Air dried sample	12/04/14	118	ICPMS
Mercury**	Air dried sample	12/04/14	118	ICPMS
Nickel**	Air dried sample	12/04/14	118	ICPMS
Copper**	Air dried sample	12/04/14	118	ICPMS
Zinc**	Air dried sample	12/04/14	118	ICPMS
Selenium**	Air dried sample	12/04/14	118	ICPMS
Hexavalent Chromium	As submitted sample	09/04/14	110	Colorimetry
Water Soluble Boron	Air dried sample	11/04/14	202	Colorimetry
Barium*	Air dried sample	12/04/14	118	ICPMS
Beryllium*	Air dried sample	12/04/14	118	ICPMS
Vanadium**	Air dried sample	12/04/14	118	ICPMS
pH Value**	Air dried sample	11/04/14	113	Probe
Total Sulphate	Air dried sample	11/04/14	208	Colorimetry
Water Soluble Sulphate**	Air dried sample	15/04/14	172	Ion Chromatography
Water Soluble Chloride	Air dried sample	15/04/14	172	Ion Chromatography
Total Cyanide**	As submitted sample	11/04/14	204	Colorimetry
Sulphide	As submitted sample	14/04/14	109	Colorimetry
Elemental Sulphur**	Air dried sample	14/04/14	122	HPLC
Total Monohydric Phenols**	As submitted sample	11/04/14	121	HPLC
Total Organic Carbon	Air dried sample	08/04/14	210	Automated IR Adsorption
Speciated PAH**	As submitted sample	10/04/14	133	Gas Chromatography
Carbon Banding (TPH)	As submitted sample	09/04/14	214	Gas chromatography
Asbestos*	As submitted sample	12/04/14	179	see note

Asbestos analysis qualitative only

Note:- Documented In-house procedure based on HSG 248 2005

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All results have been expressed on a dry weight basis and where appropriate have been corrected for moisture and stone content accordingly

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THE ENVIRONMENTAL LABORATORY LTD

WATER SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR53800
Your Ref No: GE9752
Sample Receipt Date: 01/04/14
Reporting Date: 16/04/14

Registered: 01/04/14
Prepared: 02/04/14
Analysis complete: 16/04/14

WATER TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium*	101	ICPMS
Boron	203	Colorimetry
Barium*	101	ICPMS
Beryllium*	101	ICPMS
Vanadium	101	ICPMS
pH Value*	113	Electrometric
Sulphate*	131	Ion Chromatography
Chloride*	131	Ion Chromatography
Total Cyanide	130	Colorimetry
Sulphide	134	Colorimetry
Total Phenols	121	HPLC
Hexavalent Chromium	110	Colorimetry
TOC (In filtered samples)*	102	TOC Analyser
Elemental Sulphur	122	HPLC
Speciated PAH	135	GCMS
Carbon Banding (TPH)	117	Gas chromatography

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR53800
Your Job No: GE9752
Sample Receipt Date: 01/04/14
Reporting Date: 16/04/14

Registered: 01/04/14
Prepared: 02/04/14
Analysis complete: 16/04/14

TEST METHOD SUMMARY

PARAMETER	Undertaken on	Date Tested	Method Number	Technique
pH Value**	Air dried sample	07/04/14	113	Electrometric
Total Organic Carbon	Air dried sample	08/04/14	210	Automated IR Absorption
Loss on Ignition**	Air dried sample	07/04/14	129	Gravimetric
Neutralization Capacity to pH 7	Air dried sample	07/04/14	-	EA
Benzene**	As submitted sample	08/04/14	181	GCMS
Toluene**	As submitted sample	08/04/14	181	GCMS
Ethyl Benzene**	As submitted sample	08/04/14	181	GCMS
Xylenes**	As submitted sample	08/04/14	181	GCMS
Mineral Oil**	As submitted sample	08/04/14	117	GCFID
PCB 28**	Air dried sample	09/04/14	120	GCMS
PCB 52**	Air dried sample	09/04/14	120	GCMS
PCB 101**	Air dried sample	09/04/14	120	GCMS
PCB 118**	Air dried sample	09/04/14	120	GCMS
PCB 138**	Air dried sample	09/04/14	120	GCMS
PCB 153**	Air dried sample	09/04/14	120	GCMS
PCB 180**	Air dried sample	09/04/14	120	GCMS
Speciated PAH**	As submitted sample	10/04/14	133	GCFID

The analysts' guide for sampling, analysis and clearance procedures

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THE ENVIRONMENTAL LABORATORY LTD

LEACHATE SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR53800
Your Job No: GE9752
Sample Receipt Date: 01/04/14
Reporting Date: 16/04/14

Registered: 01/04/14
Prepared: 02/04/14
Analysis complete: 16/04/14

LEACHATE TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium*	101	ICPMS
Antimony	101	ICPMS
Barium*	101	ICPMS
Molybdenum*	101	ICPMS
pH Value*	113	Electrometric
Electrical Conductivity*	136	Probe
Dissolved Organic Carbon	102	TOC analyser
Chloride*	131	Ion Chromatography
Fluoride*	131	Ion Chromatography
Sulphate*	131	Ion Chromatography
Total Dissolved Solids	144	Gravimetric
Phenol Index	121	HPLC

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APPENDIX E

Statistical Assessment of Soil Contamination



STEP 5: RESULTS

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		Ratio of ADE to relevant Health Criteria Value			Soil Assessment Criteria			Soil Saturation Limit	Pathway Contributions (%)										
		oral HCV	inhal HCV	Combined	oral HCV	inhal HCV	Combined		direct soil ingestion	sum of consumption of homegrown produce and attached soil	dermal contact (indoor)	dermal contact (outdoor)	inhalation of dust (indoor)	inhalation of dust (outdoor)	inhalation of vapour (indoor)	inhalation of vapour (outdoor)	oral background	inhalation background	Total
Number	Chemical	(dimensionless)	(dimensionless)	(dimensionless)	mg kg ⁻¹	mg kg ⁻¹	mg kg ⁻¹	mg kg ⁻¹	%	%	%	%	%	%	%	%	%	%	%
1	Arsenic	1.00	0.38	NR	3.24E+01	8.50E+01	NR	NR	79.89	7.54	0.45	11.86	0.25	0.00	0.00	0.00	0.00	0.00	100.00
2	Cadmium	0.91	0.10	1.00	5.45E+00	2.97E+01	5.17E+00	NR	11.21	38.70	0.00	0.06	0.04	0.00	0.00	0.00	49.96	0.04	100.00
3	Chromium III	0.15	0.85	1.00	1.95E+04	3.55E+03	3.01E+03	NR	85.63	1.03	0.00	0.00	0.27	0.00	0.00	0.00	13.01	0.06	100.00
4	Mercury, inorganic	0.93	0.07	1.00	1.81E+02	2.55E+03	1.69E+02	NR	66.71	30.08	0.00	0.00	0.21	0.00	0.00	0.00	3.00	0.00	100.00
5	Nickel	0.14	1.00	NR	5.31E+02	1.27E+02	NR	NR	32.77	16.18	0.03	0.81	0.10	0.00	0.00	0.00	49.90	0.10	99.90
6	Copper	0.50	0.50	1.00	7.81E+03	1.04E+04	5.20E+03	NR	36.15	13.78	0.00	0.00	0.11	0.00	0.00	0.00	49.92	0.04	100.00
7	Zinc	1.00	0.00	1.00	1.94E+04	2.55E+07	1.94E+04	NR	23.95	26.00	0.00	0.00	0.08	0.00	0.00	0.00	49.95	0.02	100.00
8	Selenium	1.00	NR	NR	3.50E+02	NR	NR	NR	40.59	28.46	0.00	0.00	0.13	0.00	0.00	0.00	30.82	0.00	100.00
9	Chromium VI	1.00	NR	NR	4.89E+01	NR	NR	NR	36.29	26.02	0.00	0.00	0.00	0.00	0.00	0.00	37.70	0.00	100.00
10	Barium	1.00	NR	NR	1.33E+03	NR	NR	NR	49.28	0.57	0.00	0.00	0.16	0.00	0.00	0.00	50.00	0.00	100.00
11	Beryllium	0.19	0.81	1.00	1.48E+02	5.10E+01	4.12E+01	NR	47.43	2.49	0.00	0.00	0.15	0.00	0.00	0.00	49.92	0.00	100.00
12	Vanadium	0.90	0.10	1.00	1.18E+02	6.08E+02	1.07E+02	NR	27.91	26.36	0.00	0.00	0.09	0.00	0.00	0.00	45.56	0.09	100.00
13	Phenol	0.25	0.75	1.00	1.38E+03	4.72E+02	3.52E+02	1.19E+05	1.30	84.89	0.07	1.93	0.00	0.00	0.80	0.00	9.79	1.21	100.00
14	Acenaphthylene	0.96	0.04	1.00	6.11E+02	1.33E+04	5.84E+02	3.25E+02	7.22	83.53	0.18	4.65	0.02	0.00	4.38	0.00	0.01	0.00	100.00
15	Acenaphthene	0.95	0.05	1.00	7.37E+02	1.50E+04	7.03E+02	2.16E+02	8.69	80.75	0.21	5.59	0.03	0.00	4.64	0.00	0.09	0.00	100.00
16	Flourene	0.97	0.03	1.00	5.63E+02	1.67E+04	5.45E+02	1.17E+02	10.10	79.79	0.25	6.50	0.03	0.00	3.23	0.00	0.08	0.01	100.00
17	Phenanthrene	0.98	0.02	1.00	2.83E+02	1.69E+04	2.78E+02	1.37E+02	16.46	69.98	0.40	10.59	0.05	0.00	1.58	0.00	0.69	0.25	100.00
18	Anthracene	0.98	0.02	1.00	6.94E+03	3.67E+05	6.82E+03	4.46E+00	16.85	70.04	0.41	10.84	0.05	0.00	1.80	0.00	0.00	0.00	100.00
19	Flouranthene	0.99	0.01	1.00	5.74E+03	8.22E+04	5.70E+02	7.26E+01	33.79	42.76	0.82	21.74	0.11	0.00	0.58	0.00	0.16	0.04	100.00
20	Pyrene	0.99	0.01	1.00	1.31E+03	1.90E+05	1.30E+03	8.43E+00	32.06	45.76	0.78	20.64	0.10	0.00	0.58	0.00	0.07	0.01	100.00
21	Benzo(a)anthracene	0.55	0.45	1.00	6.57E+02	1.00E+01	3.00E+03	6.57E+00	51.54	13.74	1.25	33.17	0.16	0.00	0.12	0.00	0.00	0.00	100.00
22	Benzo(b)anthracene	0.66	0.34	1.00	1.31E+01	2.59E+01	8.72E+00	1.68E+00	48.64	18.70	1.30	31.30	0.15	0.00	0.02	0.00	0.00	0.00	100.00
23	Benzo(k)flouranthene	0.66	0.34	1.00	1.03E+01	2.01E+01	8.81E+00	4.66E+00	53.65	17.10	1.33	34.53	0.17	0.00	0.00	0.01	0.00	0.00	100.00
24	Benzo(c)flouranthene	0.66	0.34	1.00	1.50E+01	2.87E+01	9.83E+00	2.64E+00	55.35	7.51	1.35	35.62	0.18	0.00	0.00	0.00	0.00	0.00	100.00
25	Benzo(a)pyrene	0.66	0.34	1.00	1.48E+00	2.86E+00	9.74E+01	3.50E+00	54.71	8.56	1.33	35.21	0.17	0.00	0.01	0.00	0.00	0.00	100.00
26	Indeno(1,23-cd)pyrene	0.66	0.34	1.00	6.10E+00	1.20E+01	4.04E+00	2.36E+01	52.52	12.23	1.28	33.80	0.17	0.00	0.01	0.00	0.00	0.00	100.00
27	Dibenzo(ah)anthracene	0.65	0.35	1.00	1.37E+00	2.50E+00	8.84E+01	1.51E+02	56.24	6.00	1.37	36.19	0.18	0.00	0.01	0.00	0.00	0.00	100.00
28	Benzo(ghi)perylene	0.65	0.35	1.00	7.13E+01	1.33E+02	4.64E+01	5.91E+02	58.03	3.03	1.41	37.34	0.18	0.00	0.00	0.00	0.00	0.00	100.00
29																			
30																			

STEP 5: RESULTS

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[illegible]

Test Results

Arsenic**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

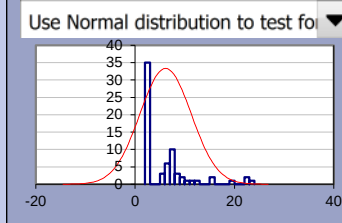
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

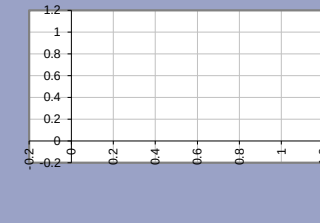
User details: GR

Dataset:	Arsenic** ▼	
Sample mean	$\bar{X}$	6.1354
Sample standard deviation, s		5.1717
Sample size, n		68
Critical concentration, Cc		32.4



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	35

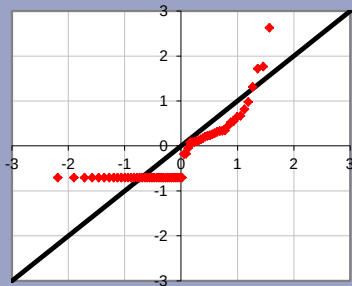


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

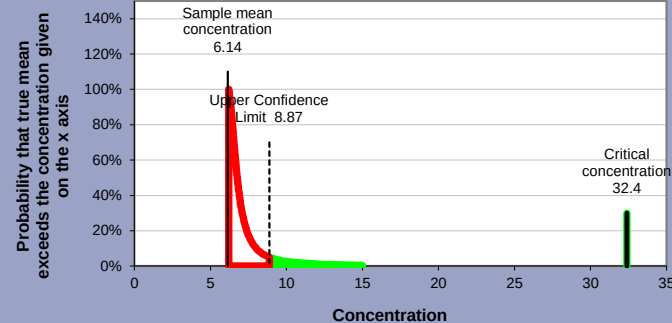


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)? ▼

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Barium*

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

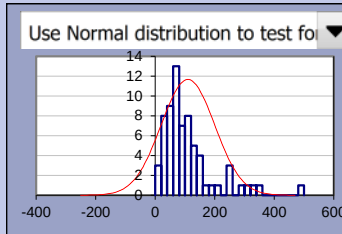
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

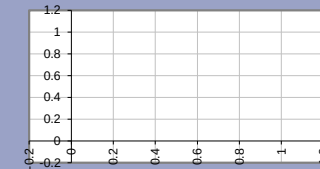
User details: GR

Dataset:	Barium*	
Sample mean	$\bar{X}$	109.63
Sample standard deviation, s		90.037
Sample size, n		68
Critical concentration, Cc		1330



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

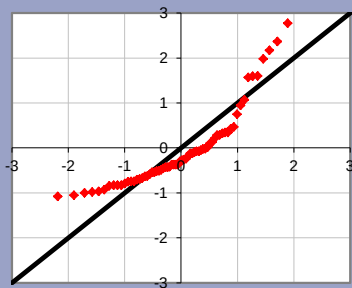


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

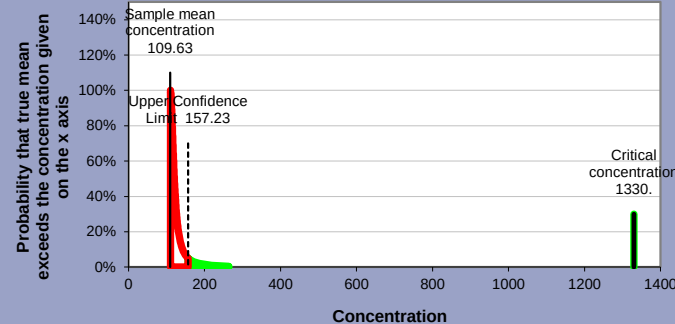


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Go to outlier test

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Test Results

Beryllium*

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

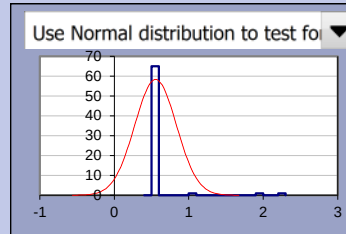
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

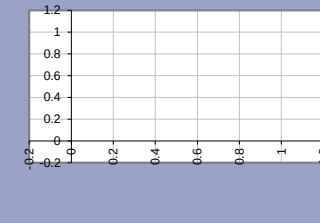
User details: GR

Dataset:	Beryllium*	
Sample mean	$\bar{X}$	0.5545
Sample standard deviation, s		0.2795
Sample size, n		68
Critical concentration, Cc		148



Outliers & non-detects

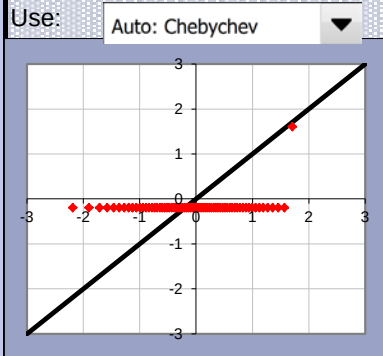
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



Normality test

Significance level: 5%

Non-normal distribution

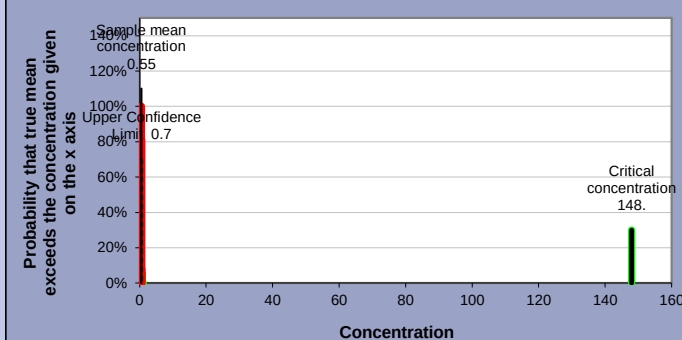


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

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Test Results

Water Soluble Boron

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

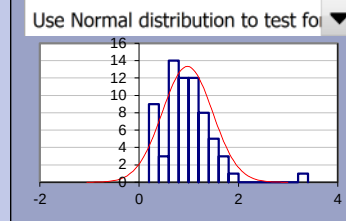
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

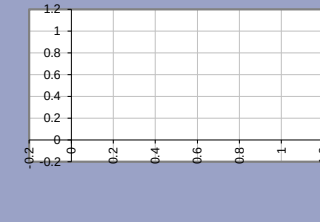
User details: GR

Dataset:	Water Soluble Boron ▼	
Sample mean	$\bar{X}$	0.9731
Sample standard deviation, s		0.5059
Sample size, n		68
Critical concentration, Cc		291



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

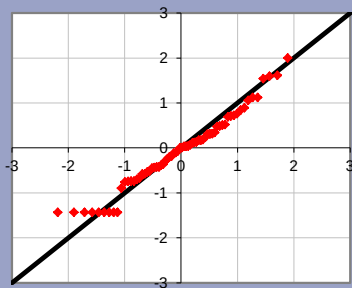


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

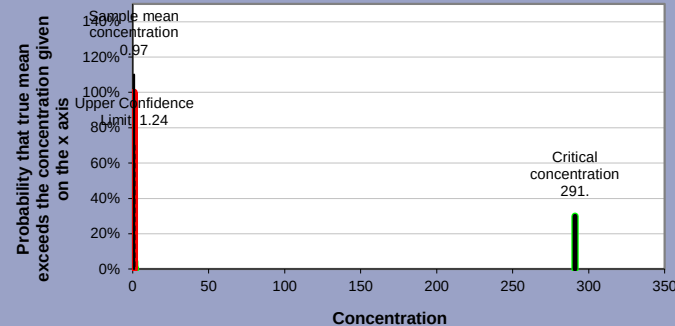


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Cadmium**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

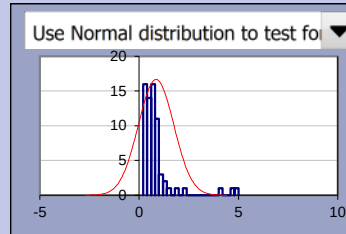
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

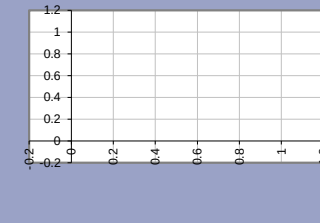
User details: GR

Dataset:	Cadmium** ▼	
Sample mean	$\bar{X}$	0.8537
Sample standard deviation, s		0.8934
Sample size, n		68
Critical concentration, Cc		5.17



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

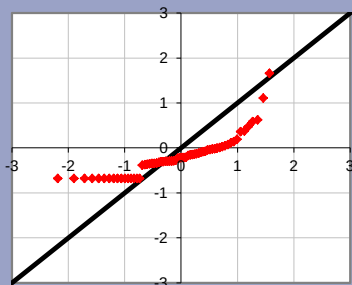


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

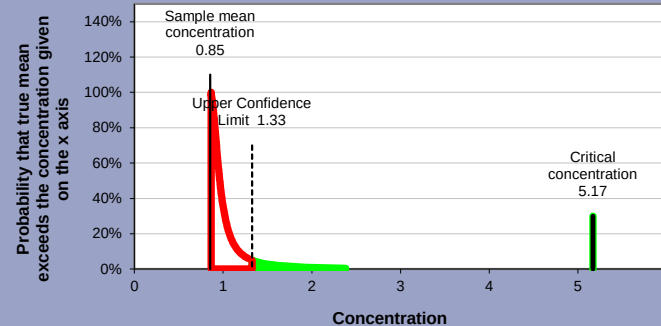


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)? ▼

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

Back to data

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Go to outlier test

Go to normality test

Test Results

Chromium**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

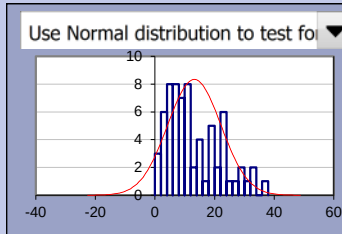
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

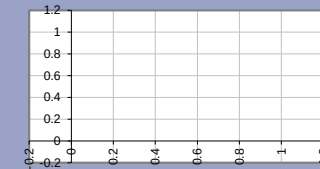
User details: GR

Dataset:	Chromium**
Sample mean $\bar{X}$	13.194
Sample standard deviation, s	8.9356
Sample size, n	68
Critical concentration, Cc	3010



Outliers & non-detects

Outliers present?	No
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

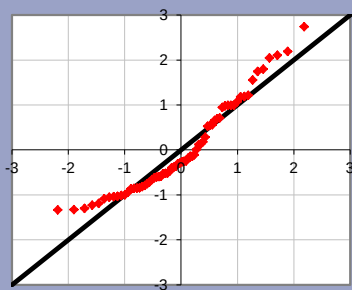


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

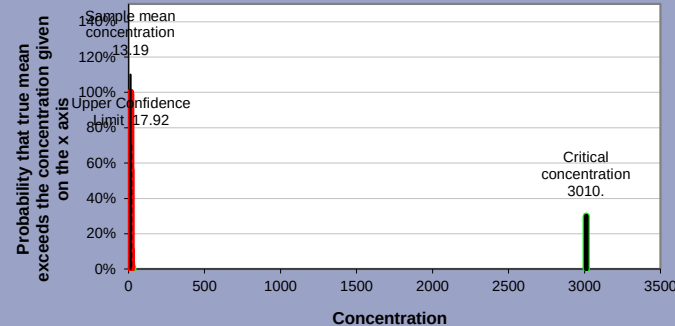


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

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Test Results

Copper**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

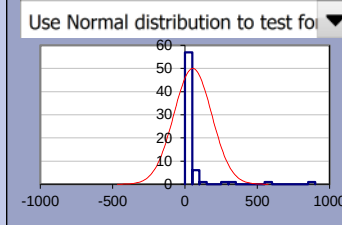
Project ref: GE9752

Data description: metals stats assessment

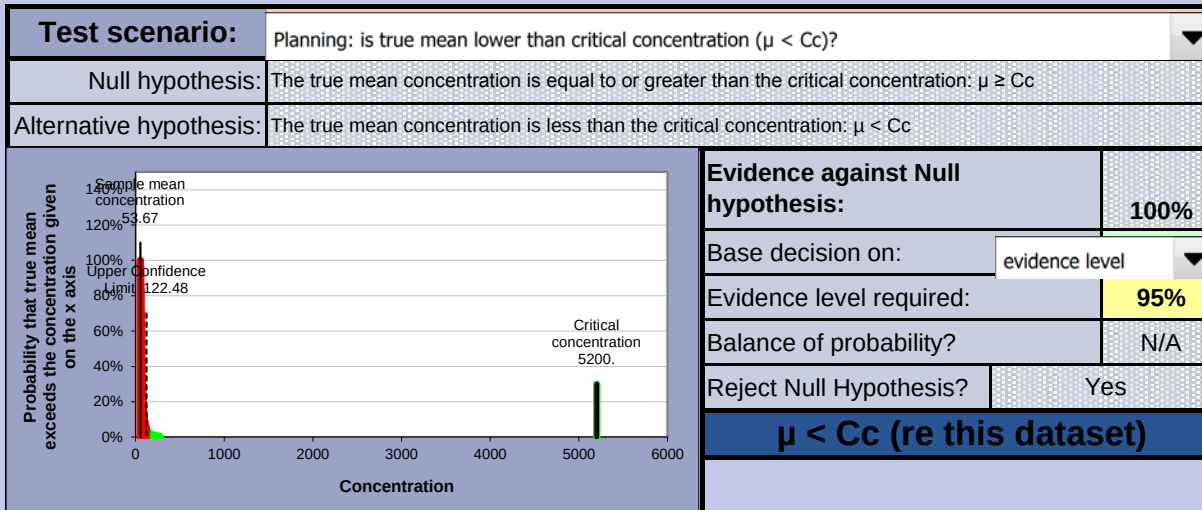
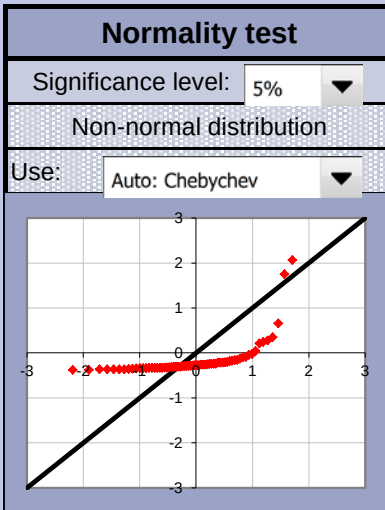
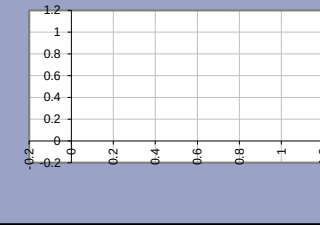
Date: 22-Apr-2014

User details: GR

Dataset:	Copper**	
Sample mean	$\bar{X}$	53.668
Sample standard deviation, s		130.18
Sample size, n		68
Critical concentration, Cc		5200



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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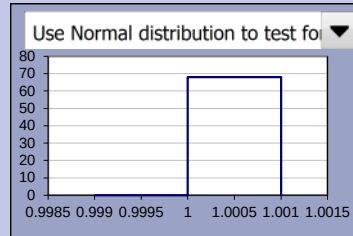
Test Results

Hexavalent Chromium

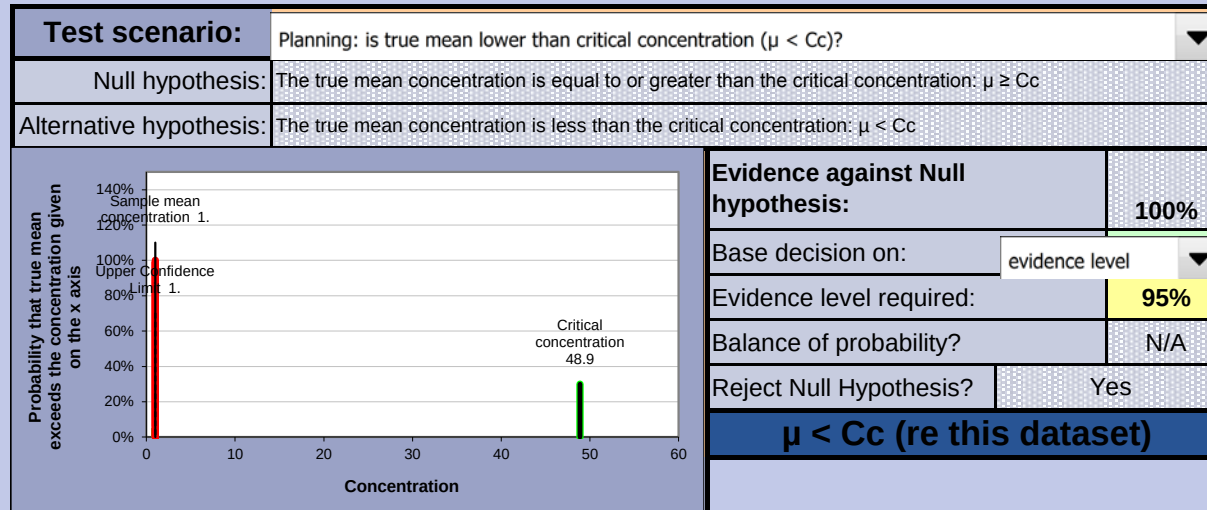
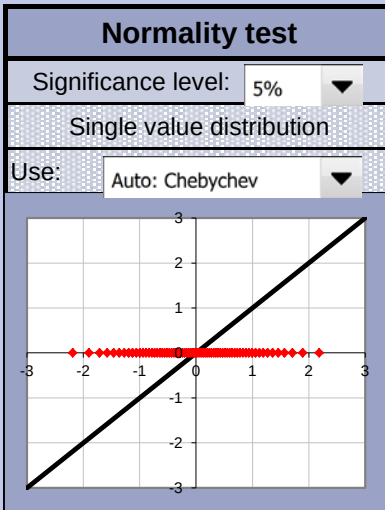
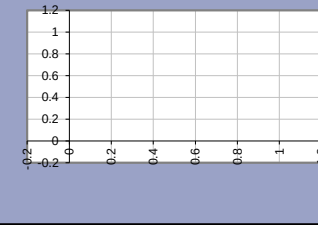
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA
Project ref: GE9752 Data description: metals stats assessment

Date: 22-Apr-2014
User details: GR

Dataset:	Hexavalent Chromium	
Sample mean	$\bar{X}$	1
Sample standard deviation, s		0
Sample size, n		68
Critical concentration, Cc		48.9



Outliers & non-detects	
Outliers present?	No
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Lead**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

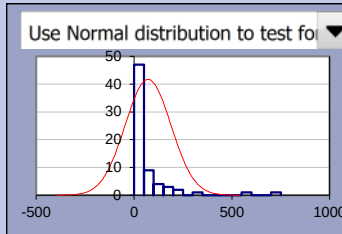
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

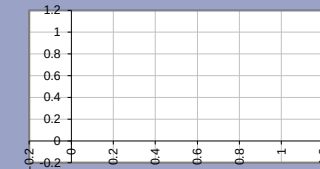
User details: GR

Dataset:	Lead**	
Sample mean	$\bar{X}$	71.539
Sample standard deviation, s		117.02
Sample size, n		68
Critical concentration, Cc		200



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

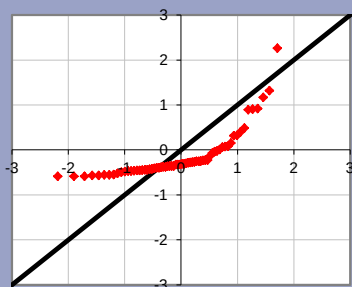


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

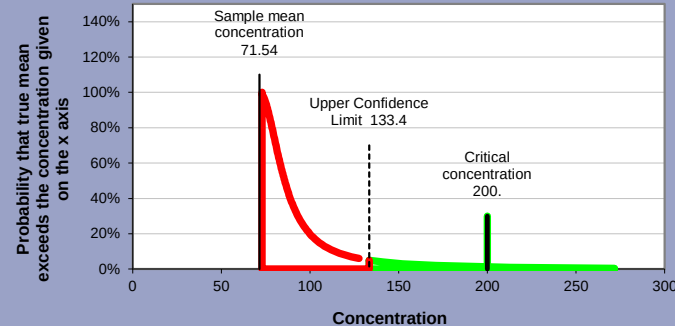


Test scenario:

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

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

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



Evidence against Null hypothesis:

99%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Test Results

Mercury**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

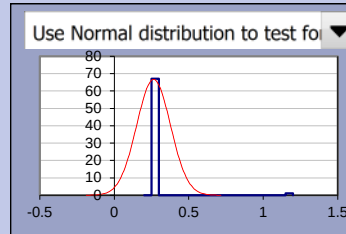
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

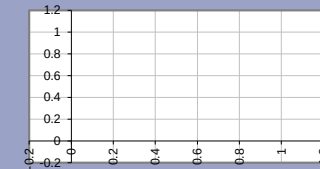
User details: GR

Dataset:	Mercury**
Sample mean $\bar{X}$	0.2637
Sample standard deviation, s	0.1133
Sample size, n	68
Critical concentration, Cc	169



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

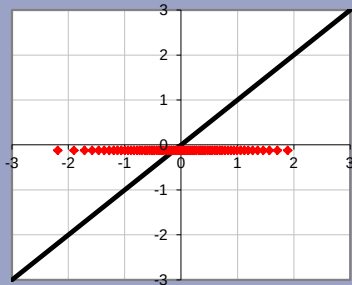


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

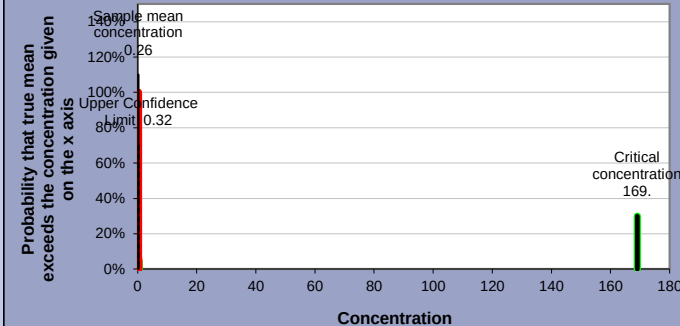


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Nickel**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

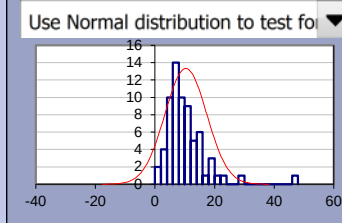
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

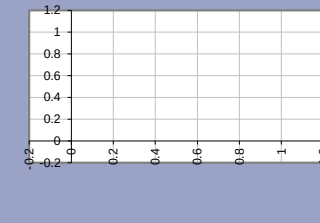
User details: GR

Dataset:	Nickel**	
Sample mean	$\bar{X}$	10.354
Sample standard deviation, s		7.0118
Sample size, n		68
Critical concentration, Cc		127



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

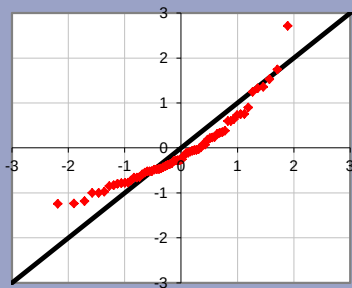


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

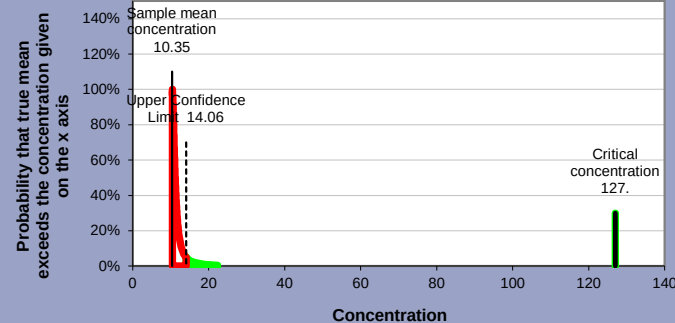


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Selenium**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

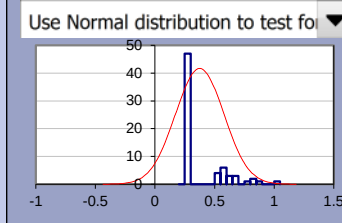
Project ref: GE9752

Data description: metals stats assessment

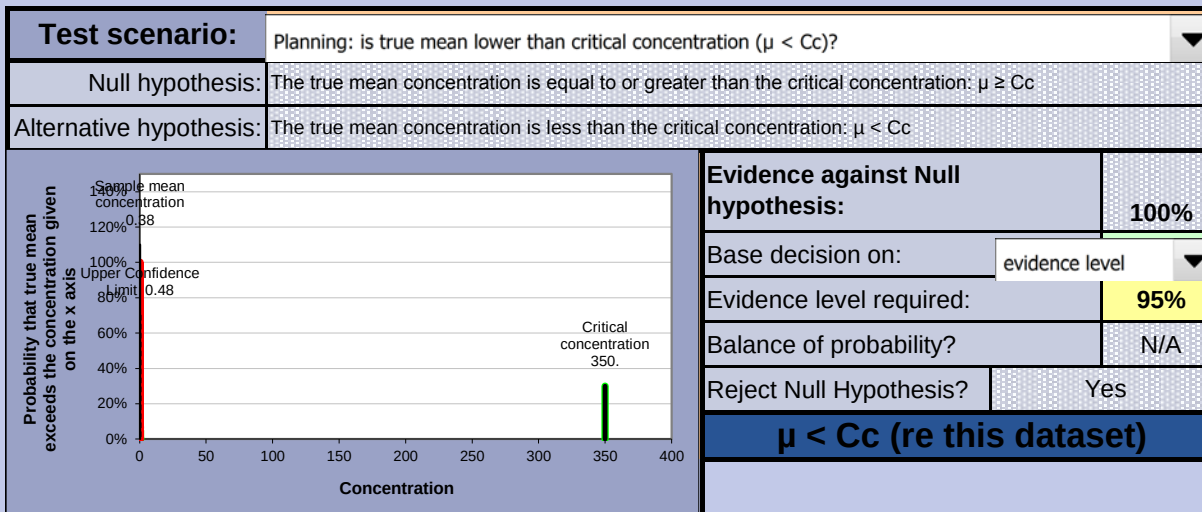
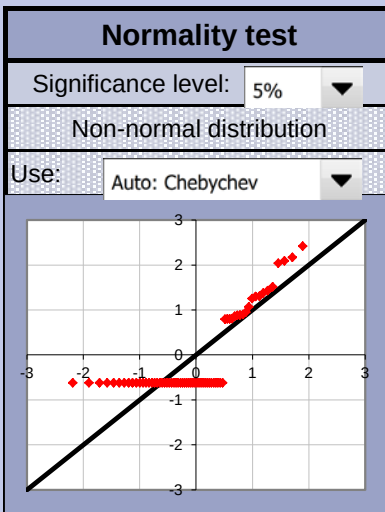
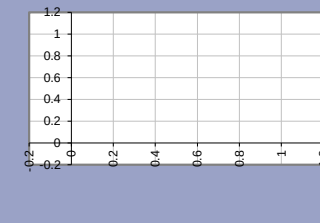
Date: 22-Apr-2014

User details: GR

Dataset:	Selenium**
Sample mean $\bar{X}$	0.3753
Sample standard deviation, s	0.2031
Sample size, n	68
Critical concentration, Cc	350



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Vanadium**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

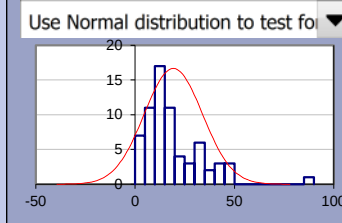
Project ref: GE9752

Data description: metals stats assessment

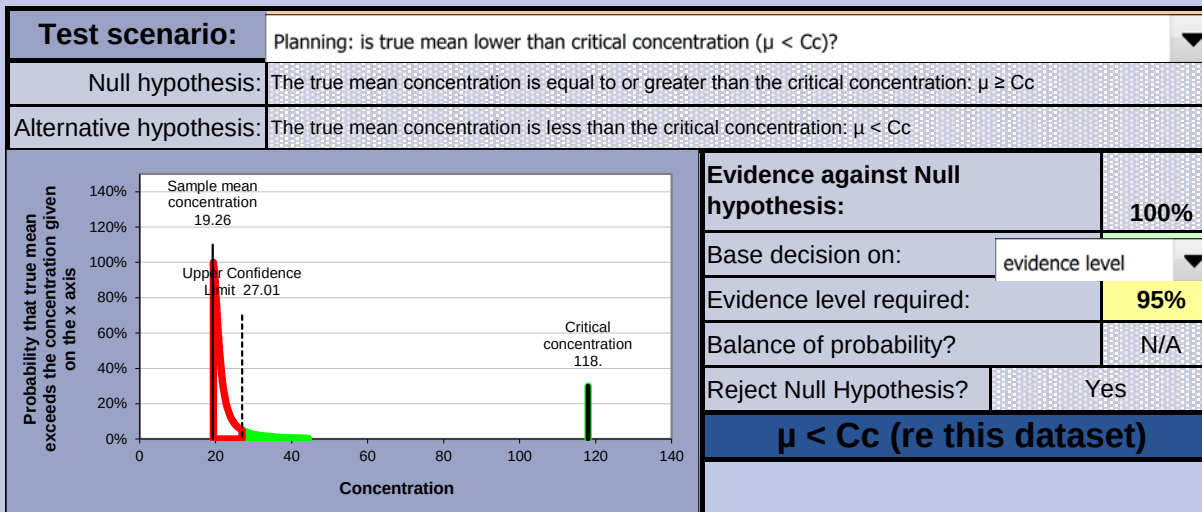
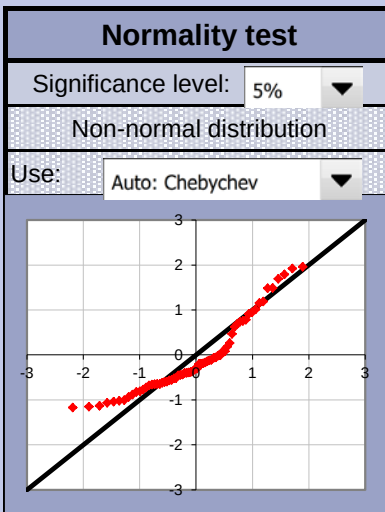
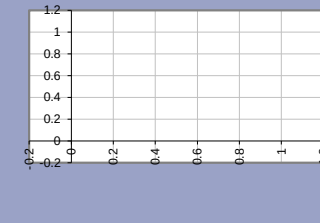
Date: 22-Apr-2014

User details: GR

Dataset:	Vanadium**
Sample mean $\bar{X}$	19.257
Sample standard deviation, s	14.66
Sample size, n	68
Critical concentration, Cc	118



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Zinc**

Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

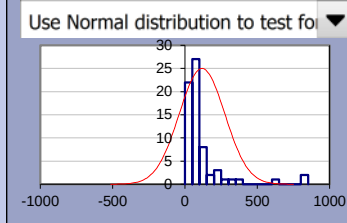
Project ref: GE9752

Data description: metals stats assessment

Date: 22-Apr-2014

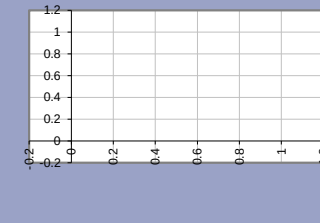
User details: GR

Dataset:	Zinc**	
Sample mean	$\bar{X}$	117.39
Sample standard deviation, s		157.86
Sample size, n		68
Critical concentration, Cc		19400



Outliers & non-detects

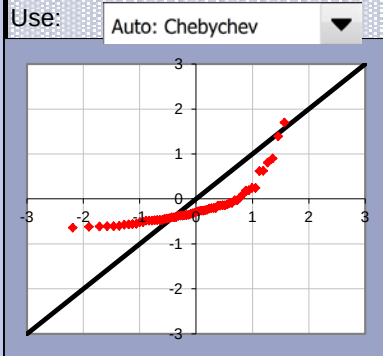
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



Normality test

Significance level: 5%

Non-normal distribution

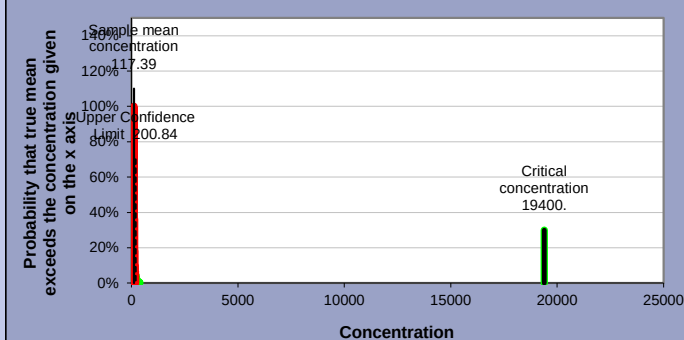


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Naphthalene**

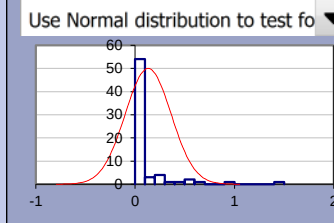
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

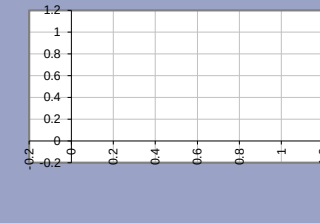
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Naphthalene**	▼
Sample mean	$\bar{X}$	0.1312
Sample standard deviation, s		0.2309
Sample size, n		68
Critical concentration, Cc		3.7



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	54

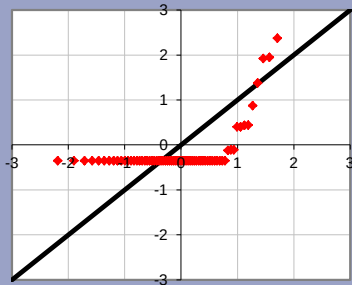


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

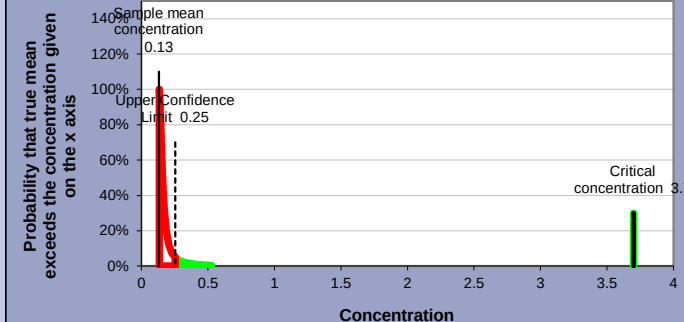


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Acenaphthylene**

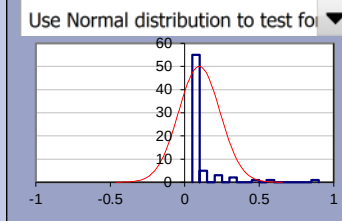
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

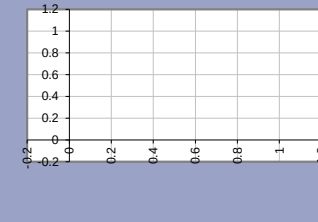
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Acenaphthylene**	
Sample mean	$\bar{X}$	0.0975
Sample standard deviation, s		0.1395
Sample size, n		68
Critical concentration, Cc		584



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

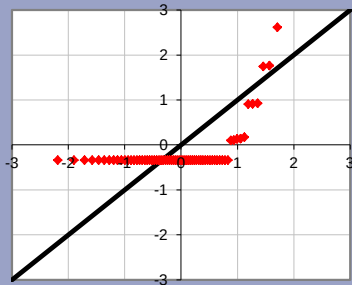


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

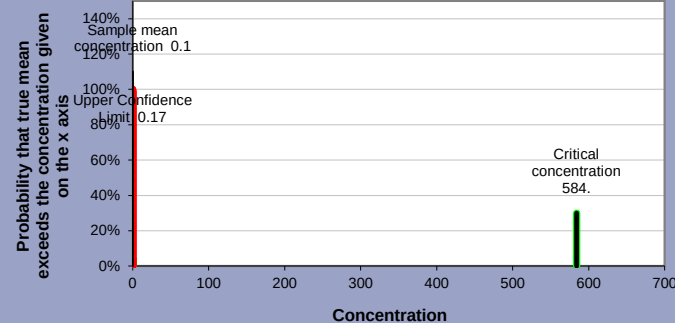


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Acenaphthene**

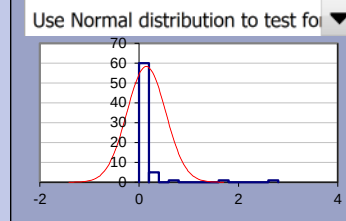
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

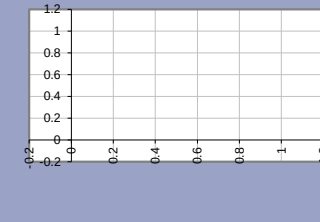
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Acenaphthene**	
Sample mean	$\bar{X}$	0.1449
Sample standard deviation, s		0.39
Sample size, n		68
Critical concentration, Cc		703



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

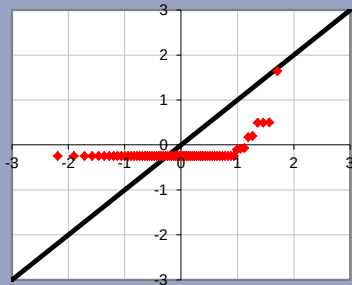


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

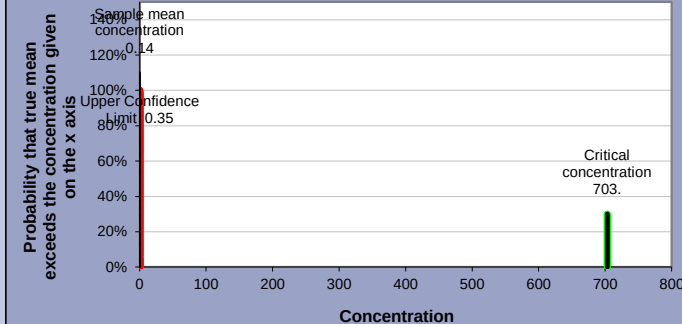


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Fluorene**

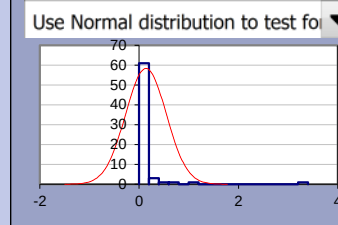
Client/client ref: Linden Homes Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

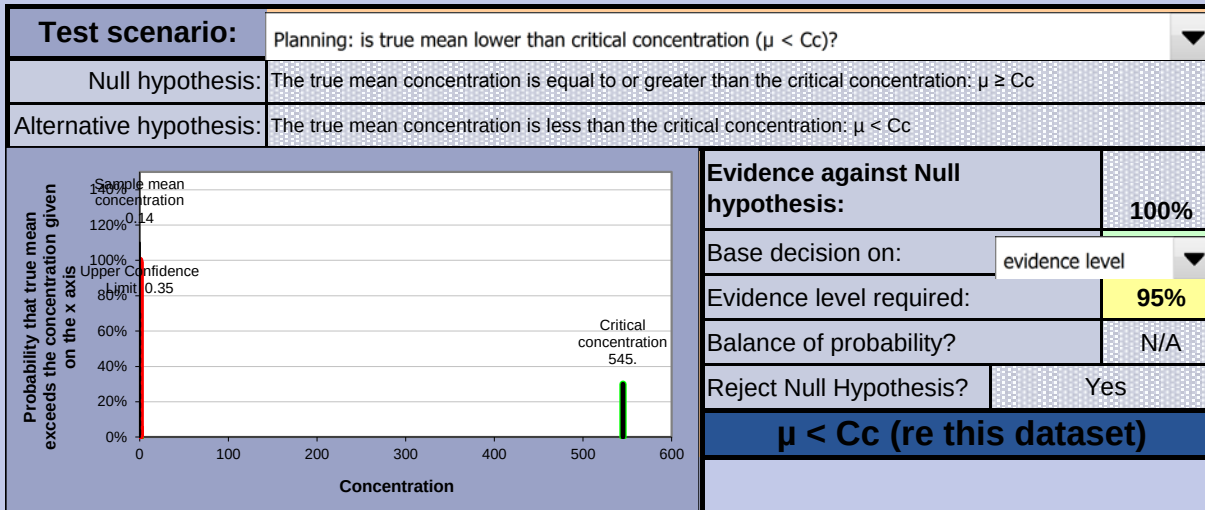
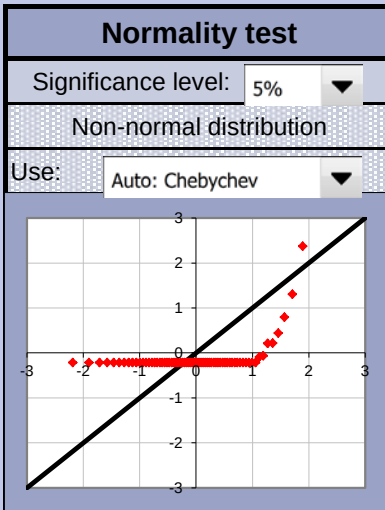
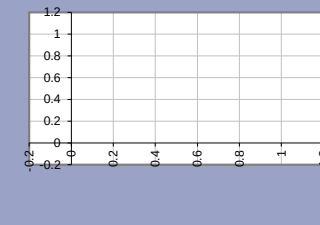
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Fluorene**
Sample mean $\bar{X}$	0.1379
Sample standard deviation, s	0.4092
Sample size, n	68
Critical concentration, Cc	545



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Phenanthrene**

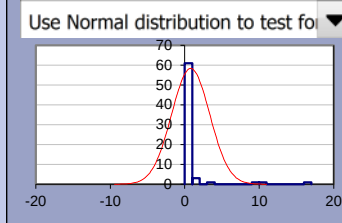
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

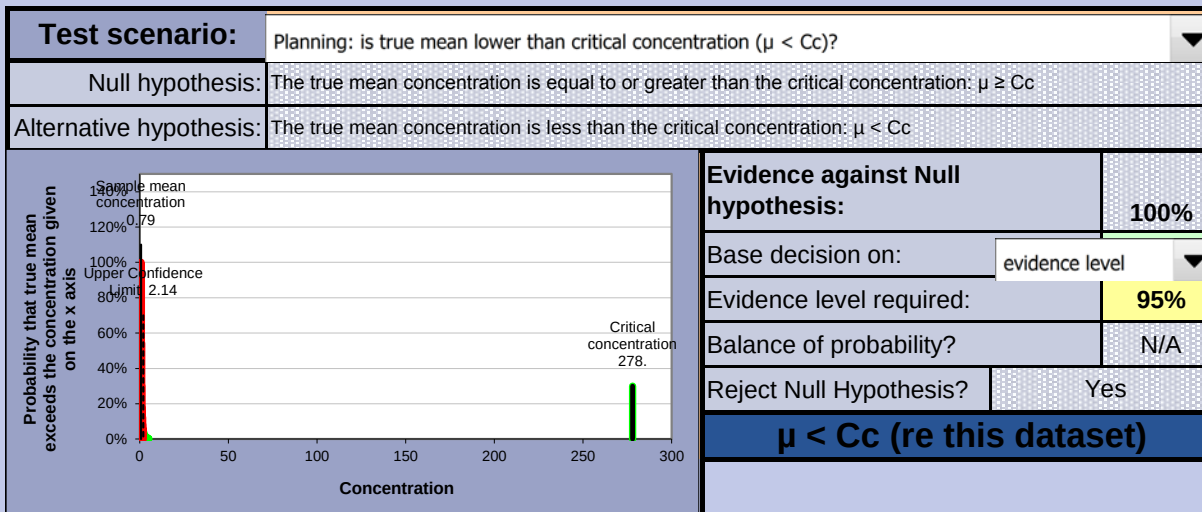
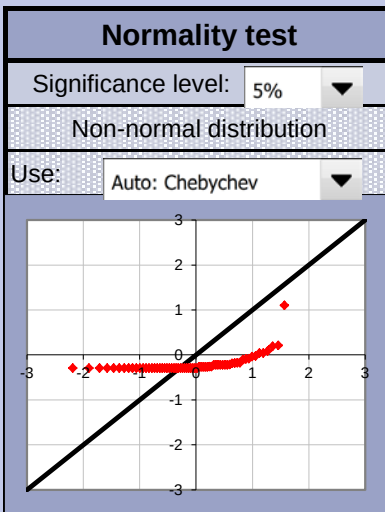
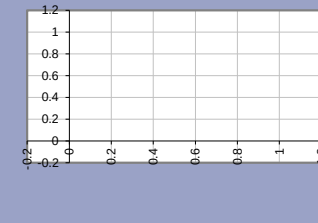
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Phenanthrene**	
Sample mean	$\bar{X}$	0.7891
Sample standard deviation, s		2.5502
Sample size, n		68
Critical concentration, Cc		278



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Anthracene**

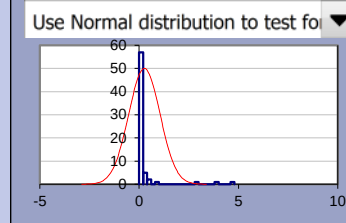
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

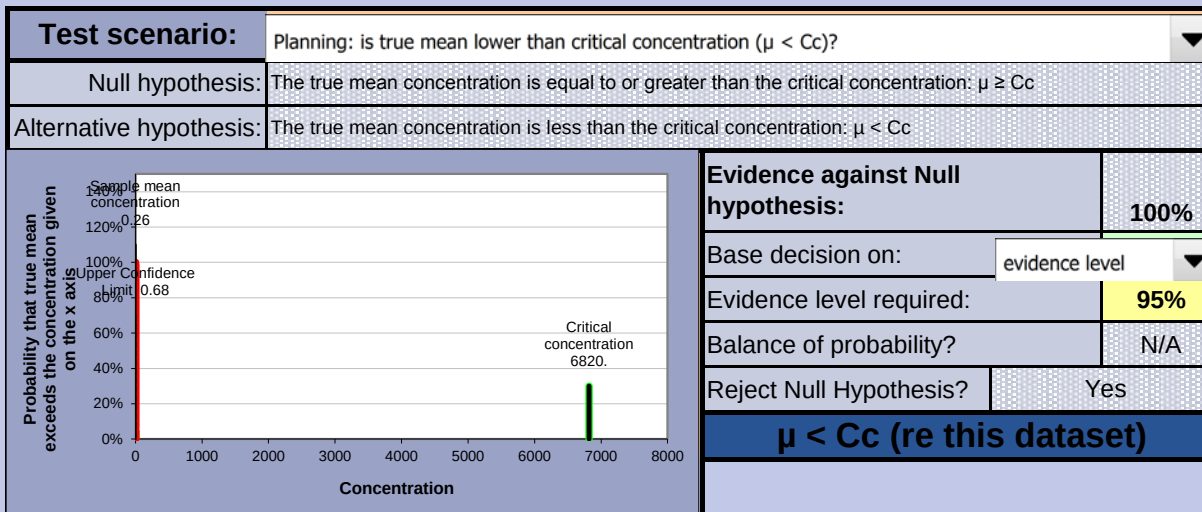
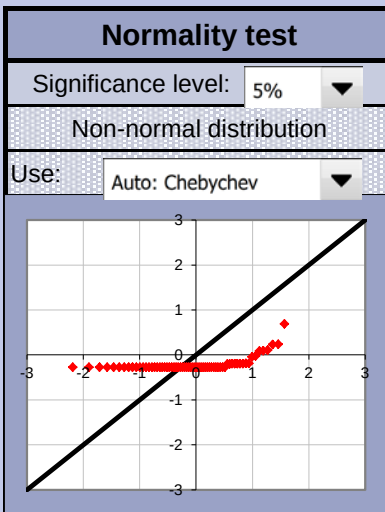
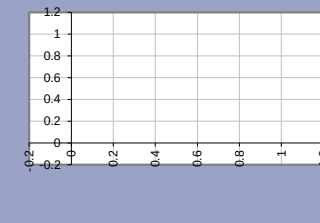
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Anthracene**	
Sample mean	$\bar{X}$	0.2645
Sample standard deviation, s		0.7885
Sample size, n		68
Critical concentration, Cc		6820



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Fluoranthene**

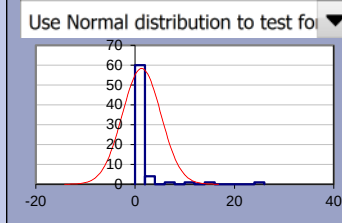
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

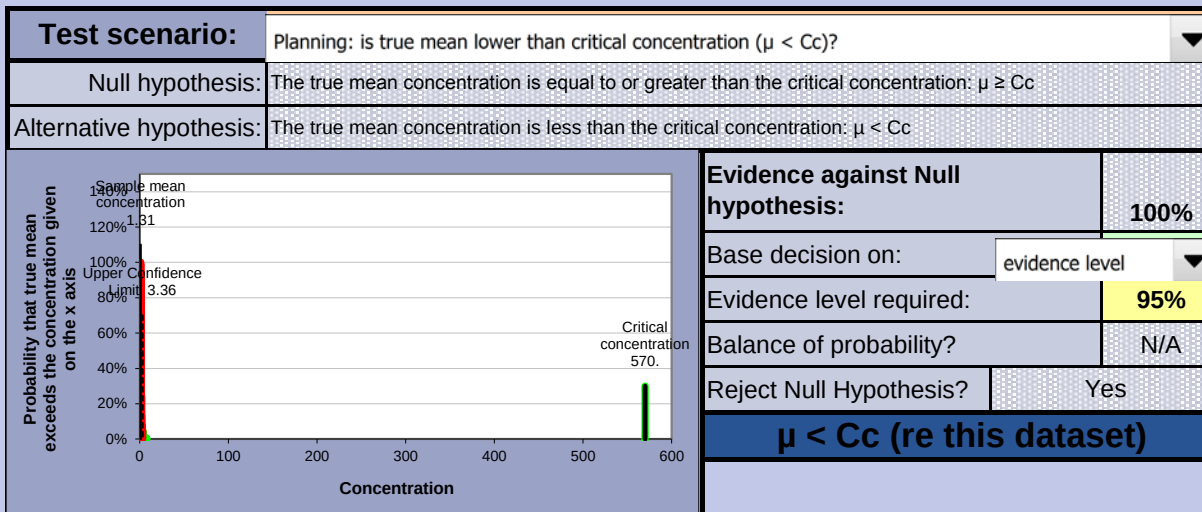
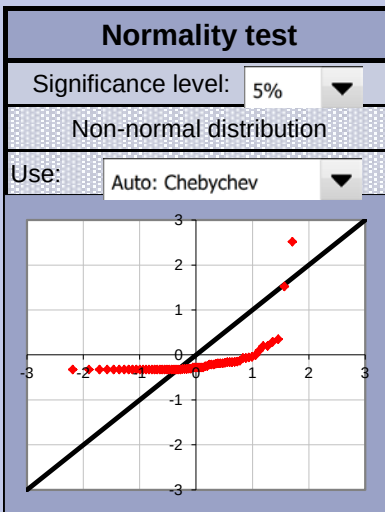
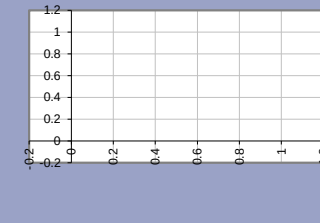
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Fluoranthene**
Sample mean $\bar{X}$	1.3097
Sample standard deviation, s	3.8754
Sample size, n	68
Critical concentration, Cc	570



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Pyrene**

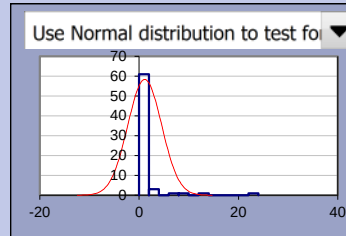
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

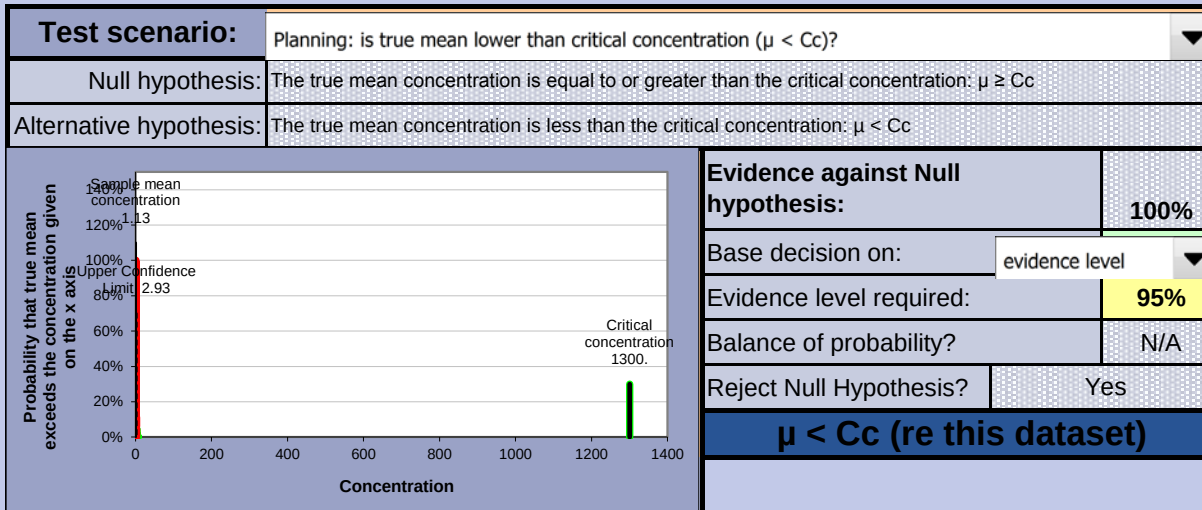
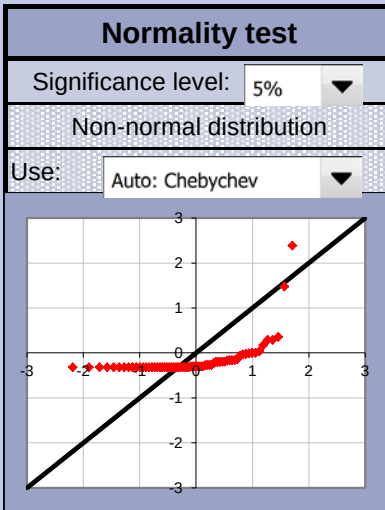
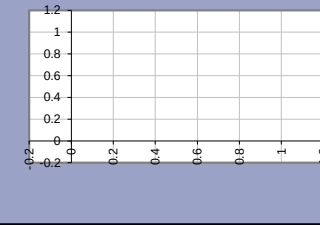
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Pyrene**
Sample mean	$\bar{X}$ 1.1289
Sample standard deviation, s	3.4034
Sample size, n	68
Critical concentration, Cc	1300



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Benz(a)anthracene**

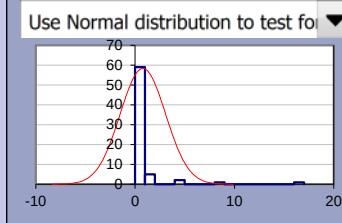
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

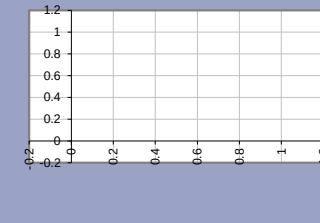
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benz(a)anthracene**	
Sample mean	$\bar{X}$	0.7797
Sample standard deviation, s		2.2856
Sample size, n		68
Critical concentration, Cc		5.25



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

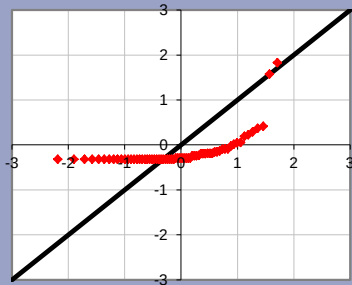


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

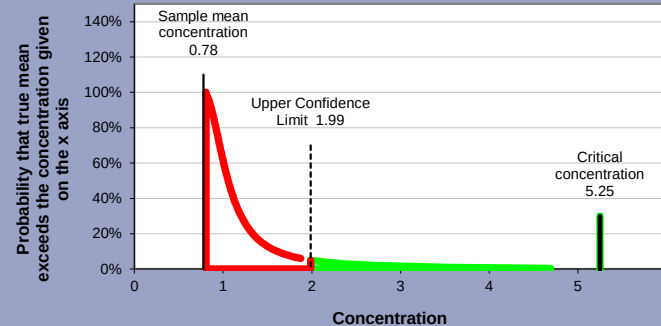


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Chrysene**

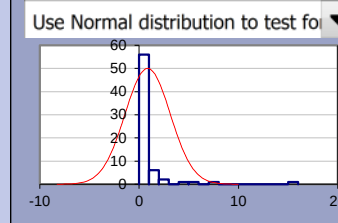
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

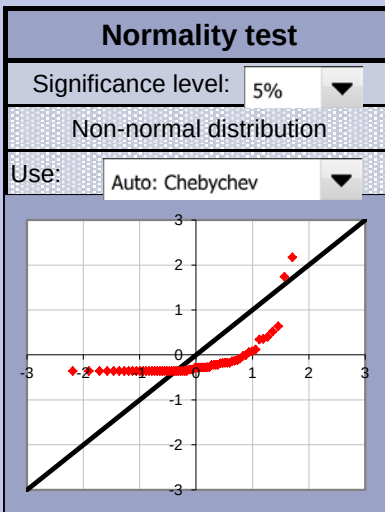
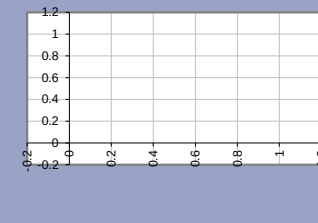
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Chrysene**
Sample mean $\bar{X}$	0.8591
Sample standard deviation, s	2.2776
Sample size, n	68
Critical concentration, Cc	8.72



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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

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

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

Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes
$\mu < C_c$ (re this dataset)	

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Back to summary

Go to outlier test

Go to normality test

Test Results

Benzo(b)fluoranthene**

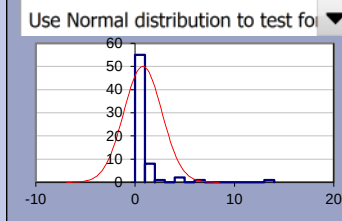
Client/client ref: Linden Homes Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

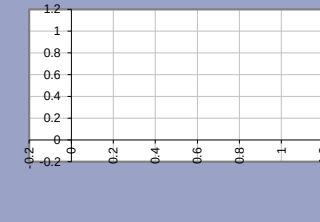
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benzo(b)fluoranthene** ▼	
Sample mean	$\bar{X}$	0.7803
Sample standard deviation, s		1.9188
Sample size, n		68
Critical concentration, Cc		6.81



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

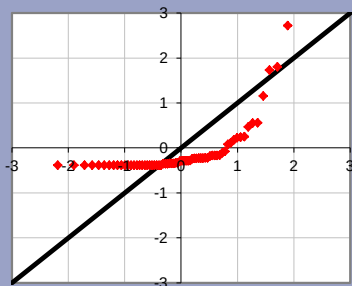


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

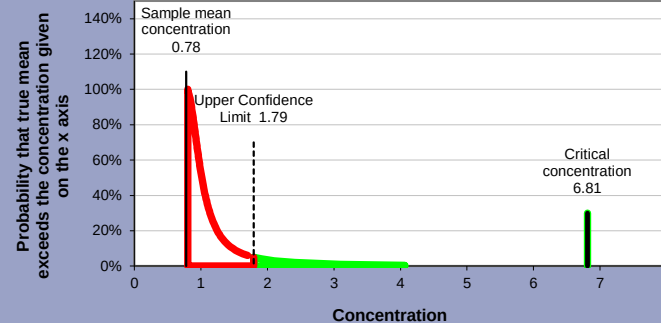


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Benzo(k)fluoranthene**

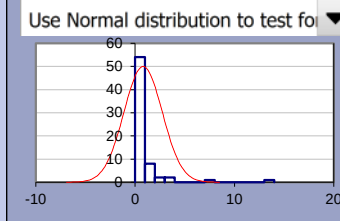
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

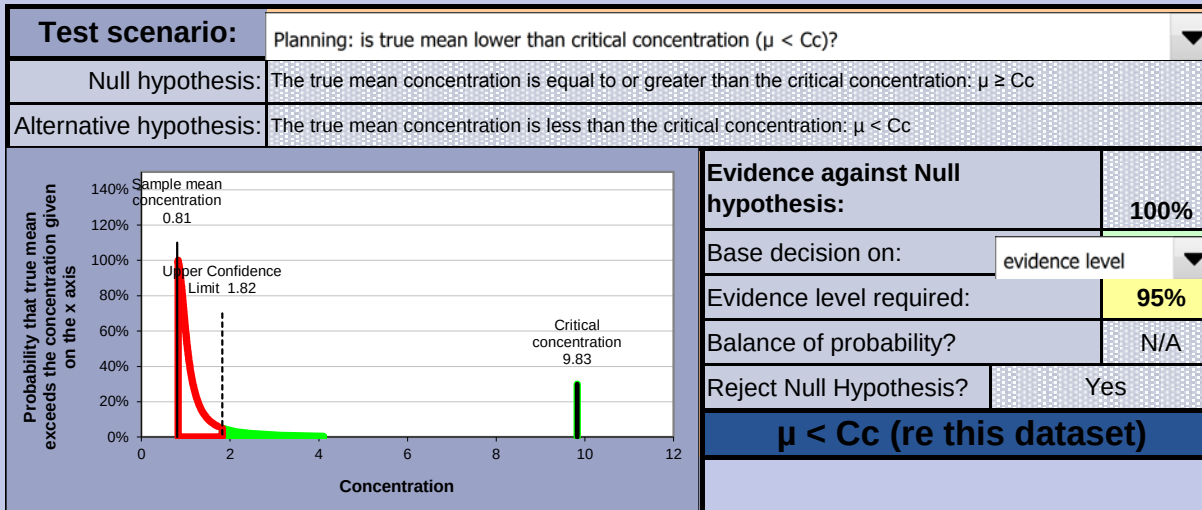
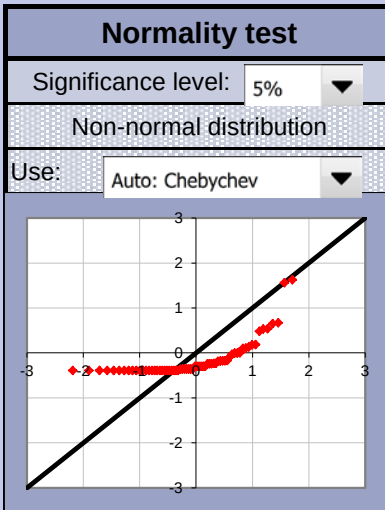
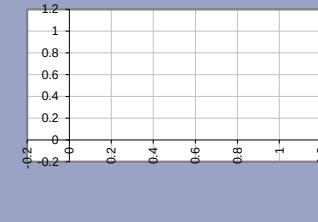
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benzo(k)fluoranthene**
Sample mean $\bar{X}$	0.8055
Sample standard deviation, s	1.9284
Sample size, n	68
Critical concentration, Cc	9.83



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



Back to data

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Go to outlier test

Go to normality test

Test Results

Benzo(a)pyrene**

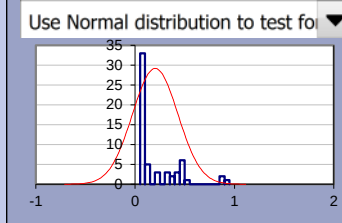
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

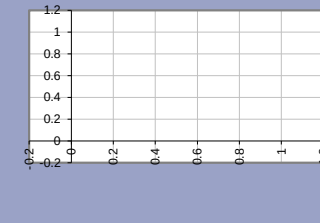
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benzo(a)pyrene**	
Sample mean	$\bar{X}$	0.2021
Sample standard deviation, s		0.2281
Sample size, n		59
Critical concentration, Cc		0.974



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

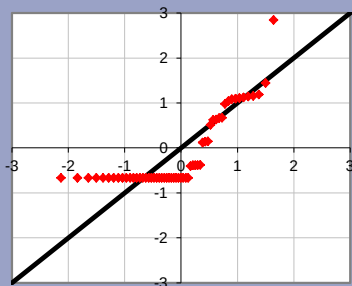


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

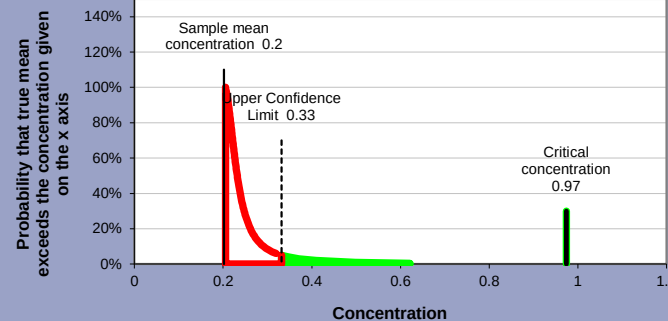


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Benzo(a)pyrene**

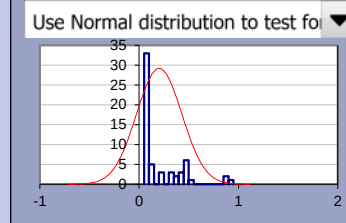
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

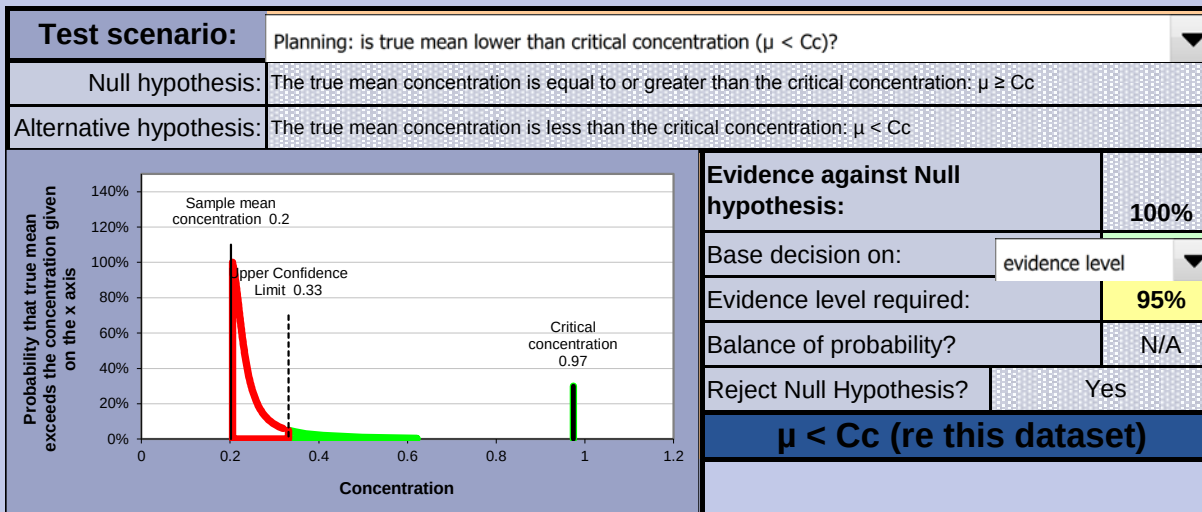
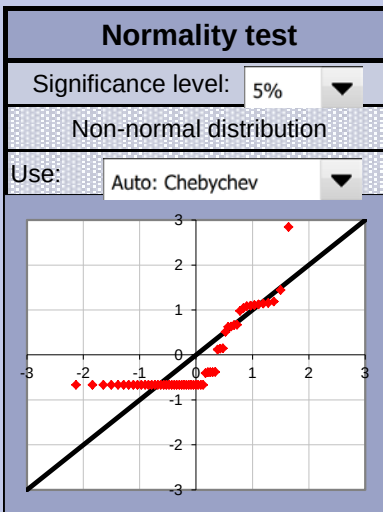
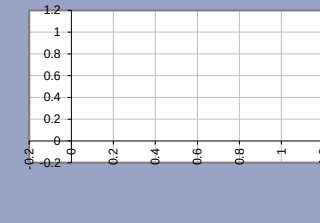
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benzo(a)pyrene**
Sample mean $\bar{X}$	0.2021
Sample standard deviation, s	0.2281
Sample size, n	59
Critical concentration, Cc	0.974



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Indeno(123-cd)pyrene**

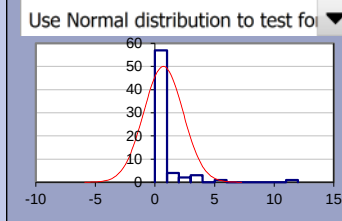
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

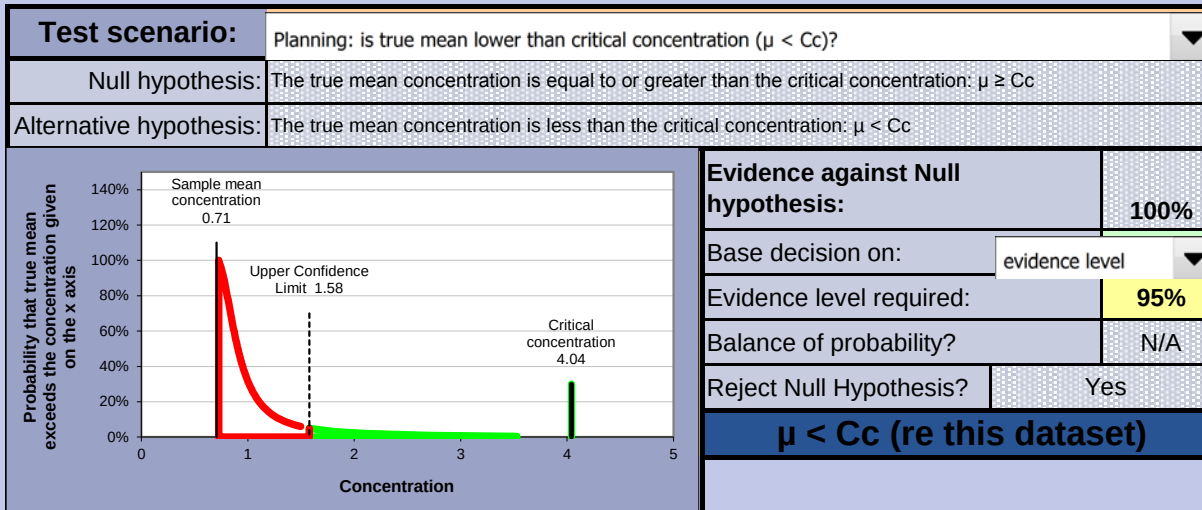
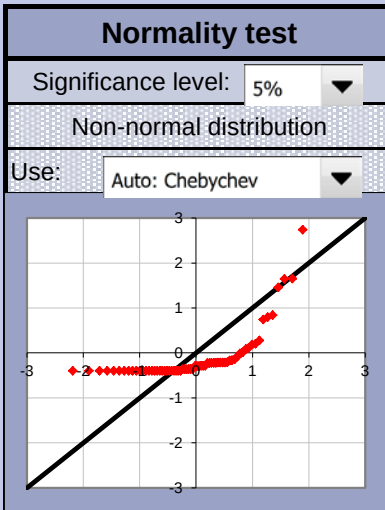
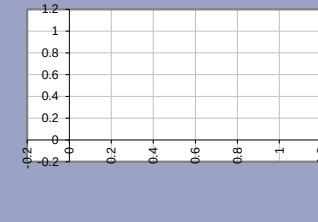
Project ref: GE9752

Data description: incorporates data from GE8756 a User details: GR

Dataset:	Indeno(123-cd)pyrene**
Sample mean $\bar{X}$	0.7064
Sample standard deviation, s	1.649
Sample size, n	68
Critical concentration, Cc	4.04



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Dibenz(ah)anthracene**

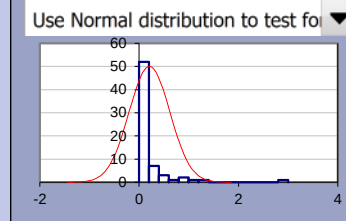
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

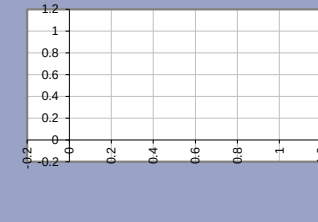
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Dibenz(ah)anthracene** ▼	
Sample mean	$\bar{X}$	0.2086
Sample standard deviation, s		0.4113
Sample size, n		68
Critical concentration, Cc		0.88



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

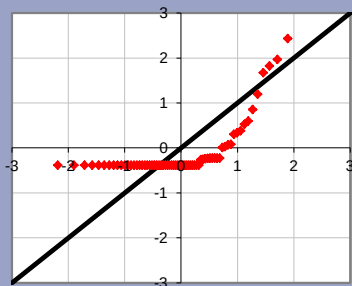


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

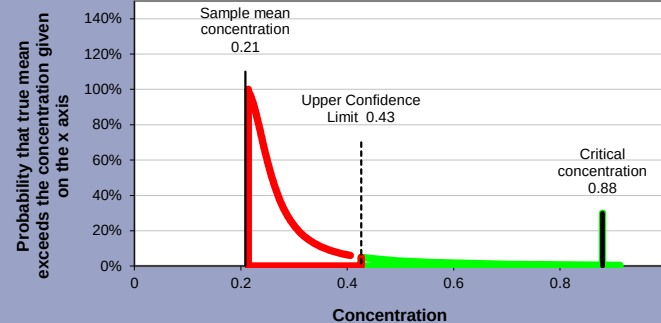


Test scenario:

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

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

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



Evidence against Null hypothesis:

99%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Back to summary

Go to outlier test

Go to normality test

Test Results

Benzo(ghi)perylene**

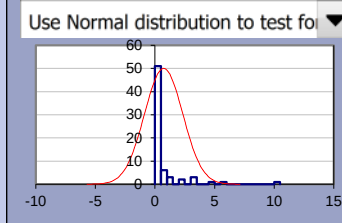
Client/client ref: Linden Homes ; Site ref: Havant Retail Park PO9 3NA

Date: 22-Apr-2014

Project ref: GE9752

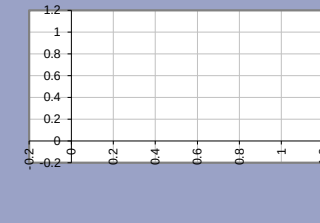
Data description: incorporates data from GE8756 a User details: GR

Dataset:	Benzo(ghi)perylene** ▼	
Sample mean	$\bar{X}$	0.727
Sample standard deviation, s		1.6079
Sample size, n		68
Critical concentration, Cc		46.4



Outliers & non-detects

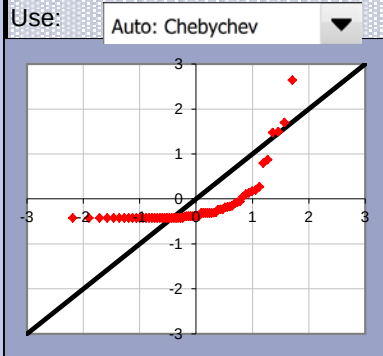
Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?



Normality test

Significance level: 5% ▼

Non-normal distribution

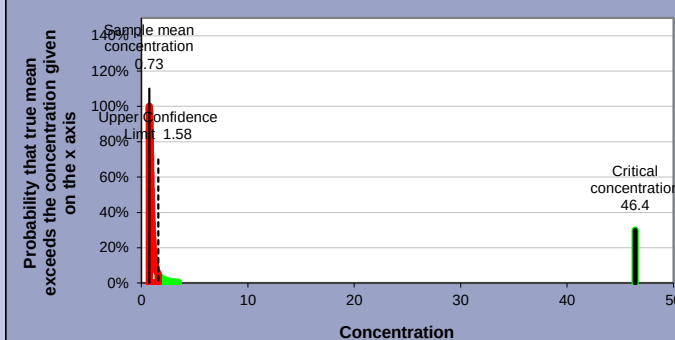


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC5-EC7

Client/client ref: Linden

Project ref: GE9752

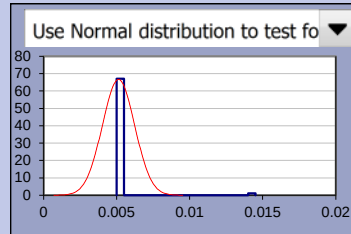
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

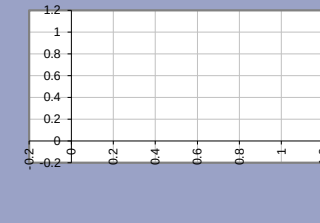
User details: GR

Dataset:	Ali EC5-EC7	
Sample mean	$\bar{X}$	0.0051
Sample standard deviation, s		0.0011
Sample size, n		68
Critical concentration, Cc		134



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

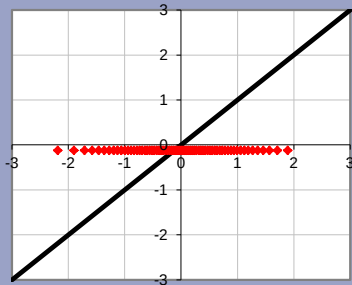


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev



Test scenario:

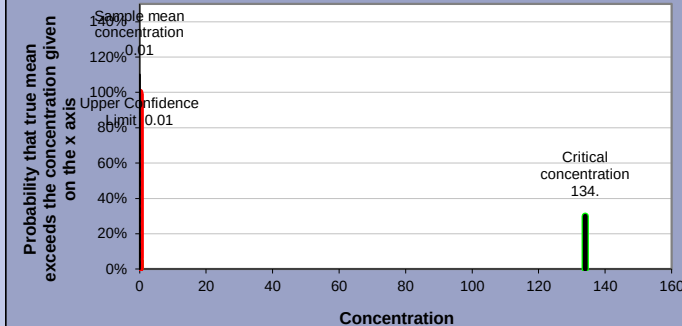
Planning: is true mean lower than critical concentration ($\mu < Cc$)?

Null hypothesis:

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

Alternative hypothesis:

The true mean concentration is less than the critical concentration: $\mu < Cc$



Evidence against Null hypothesis:

100%

Base decision on:

evidence level

Evidence level required:

95%

Balance of probability?

N/A

Reject Null Hypothesis?

Yes

$\mu < Cc$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC7-EC8

Client/client ref: Linden

Project ref: GE9752

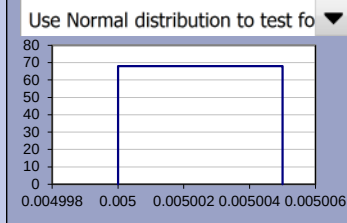
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

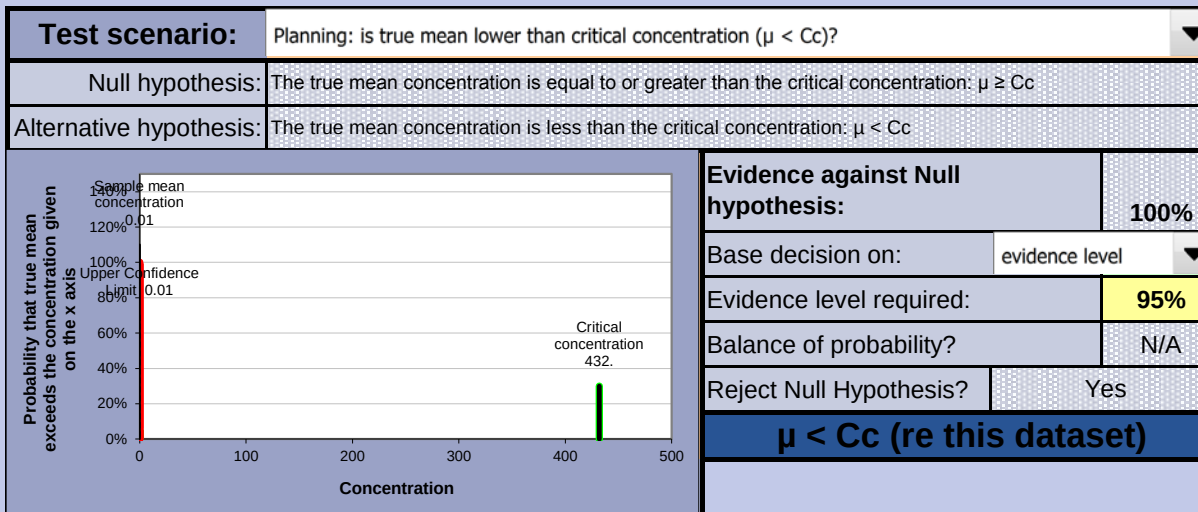
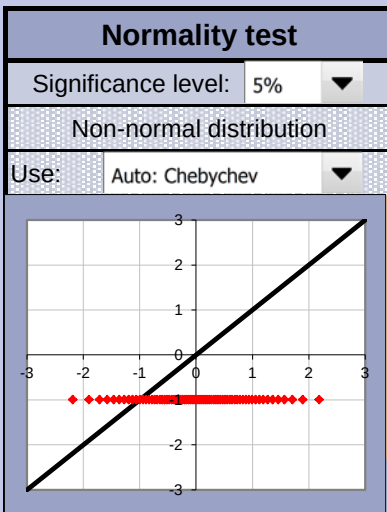
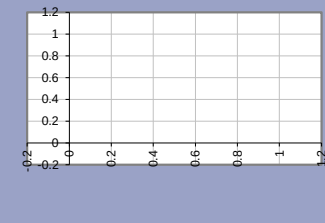
Date: 22-Apr-2014

User details: GR

Dataset:	Ali EC7-EC8	
Sample mean	$\bar{X}$	0.005
Sample standard deviation, s		3E-18
Sample size, n		68
Critical concentration, Cc		432



Outliers & non-detects	
Outliers present?	No
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC8-EC10

Client/client ref: Linden

Project ref: GE9752

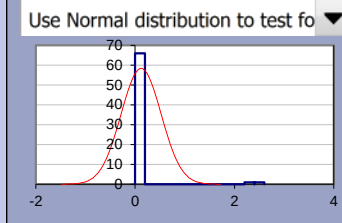
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

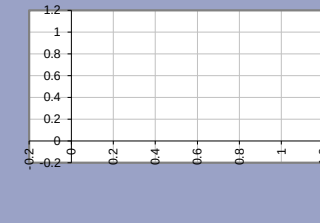
User details: GR

Dataset:	Ali EC8-EC10	
Sample mean	$\bar{X}$	0.1193
Sample standard deviation, s		0.4024
Sample size, n		68
Critical concentration, Cc		125



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

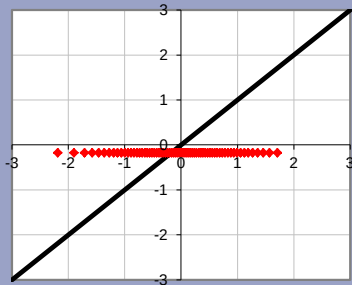


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev



Test scenario:

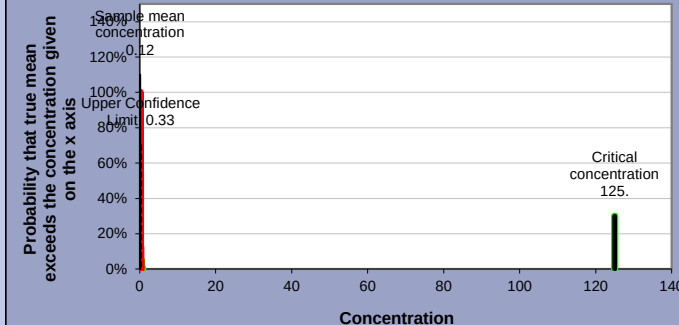
Planning: is true mean lower than critical concentration ($\mu < Cc$)?

Null hypothesis:

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

Alternative hypothesis:

The true mean concentration is less than the critical concentration: $\mu < Cc$



Evidence against Null hypothesis:

100%

Base decision on:

evidence level

Evidence level required:

95%

Balance of probability?

N/A

Reject Null Hypothesis?

Yes

$\mu < Cc$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC10-EC12

Client/client ref: Linden

Project ref: GE9752

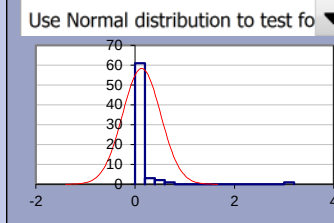
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

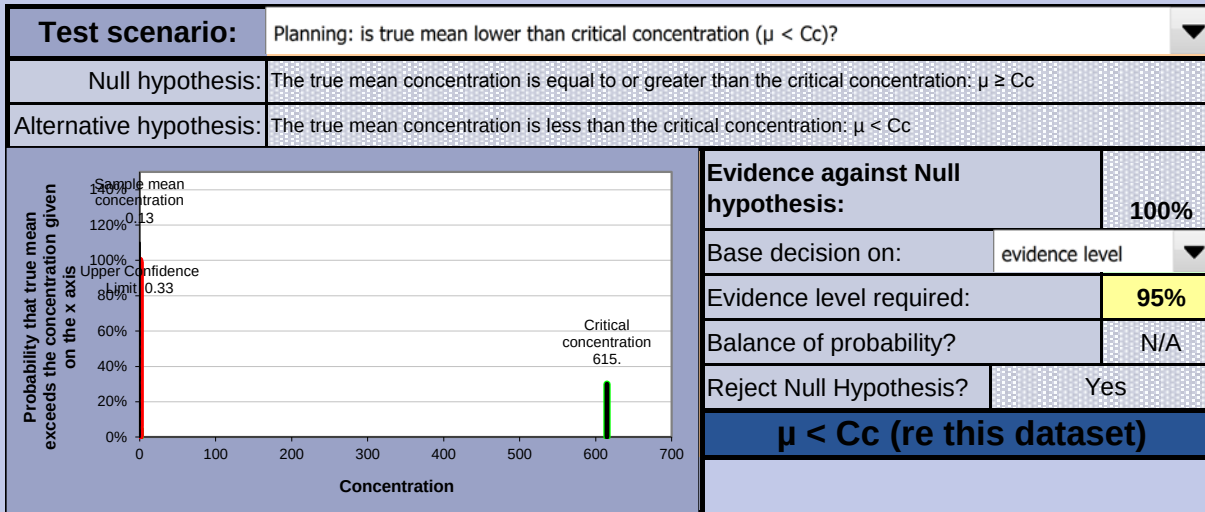
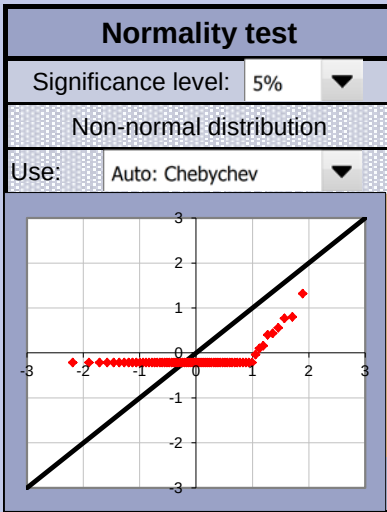
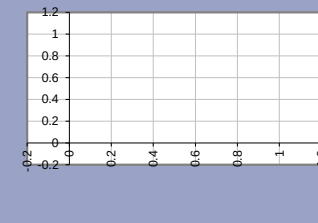
Date: 22-Apr-2014

User details: GR

Dataset:	Ali EC10-EC12
Sample mean $\bar{X}$	0.1312
Sample standard deviation, s	0.3828
Sample size, n	68
Critical concentration, Cc	615



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC12-EC16

Client/client ref: Linden

Project ref: GE9752

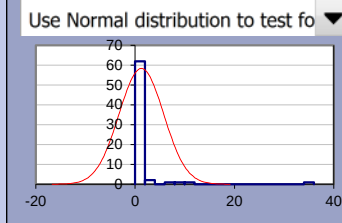
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

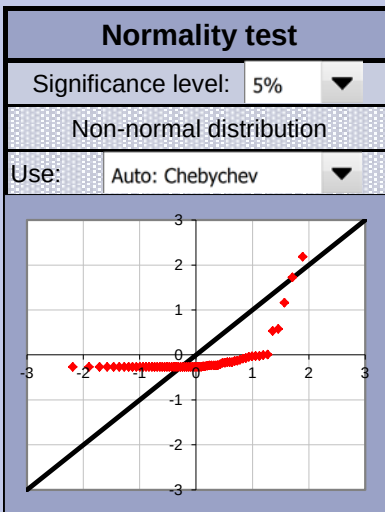
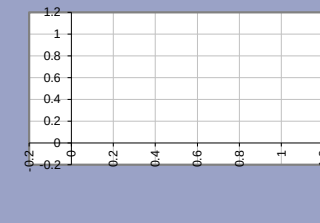
Date: 22-Apr-2014

User details: GR

Dataset:	Ali EC12-EC16
Sample mean $\bar{X}$	1.2565
Sample standard deviation, s	4.4922
Sample size, n	68
Critical concentration, Cc	3220



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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

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

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

A graph showing the probability that the true mean exceeds the concentration given on the x-axis. The x-axis is labeled 'Concentration' and ranges from 0 to 3500. The y-axis is labeled 'Probability that true mean exceeds the concentration given on the x axis' and ranges from 0% to 100%. A vertical green line is drawn at the critical concentration of 3220. The area under the curve to the left of 3220 is shaded in red, and the area to the right is shaded in blue. The sample mean concentration is 1.26, and the upper confidence limit is 3.63.

Evidence against Null hypothesis: 100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Ali EC16-EC21

Client/client ref: Linden

Project ref: GE9752

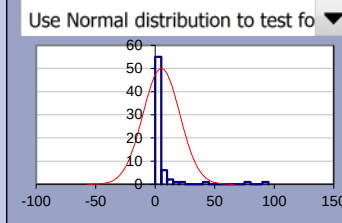
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

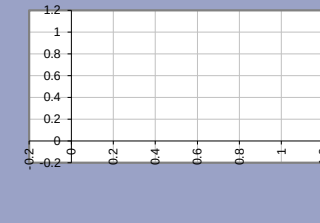
User details: GR

Dataset:	Ali EC16-EC21
Sample mean $\bar{X}$	5.1195
Sample standard deviation, s	15.462
Sample size, n	68
Critical concentration, Cc	88400



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

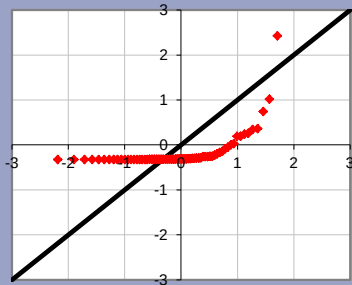


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

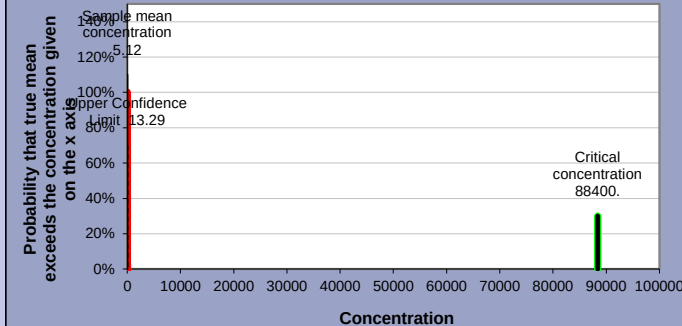


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

Back to data

Back to summary

Go to outlier test

Go to normality test

Test Results

Aro EC5-EC7

Client/client ref: Linden

Project ref: GE9752

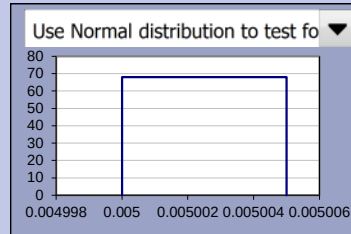
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

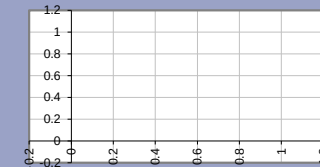
User details: GR

Dataset:	Aro EC5-EC7 ▼	
Sample mean	$\bar{X}$	0.005
Sample standard deviation, s		3E-18
Sample size, n		68
Critical concentration, Cc		214



Outliers & non-detects

Outliers present?	No
Significance level	5% ▼
Outliers excluded	0
Non-detects	68

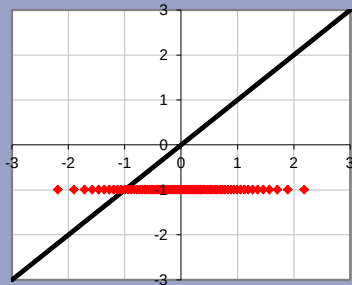


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

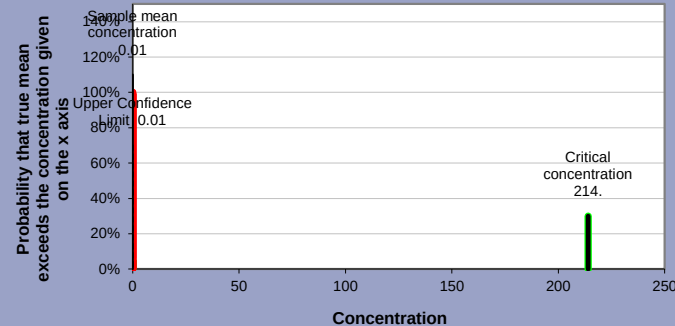


Test scenario:

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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < C_c$ (re this dataset)

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Back to summary

Go to outlier test

Go to normality test

Test Results

Aro EC7-EC8

Client/client ref: Linden

Project ref: GE9752

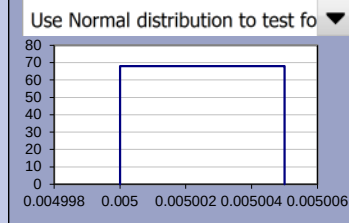
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

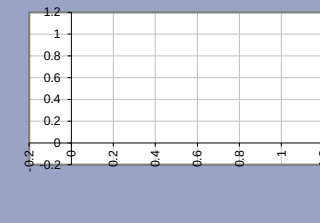
User details: GR

Dataset:	Aro EC7-EC8
Sample mean $\bar{X}$	0.005
Sample standard deviation, s	3E-18
Sample size, n	68
Critical concentration, Cc	444



Outliers & non-detects

Outliers present?	No
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

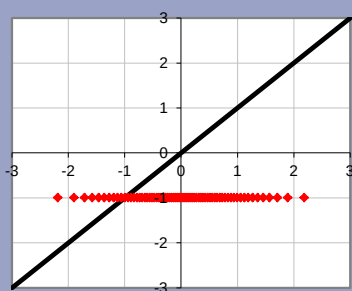


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

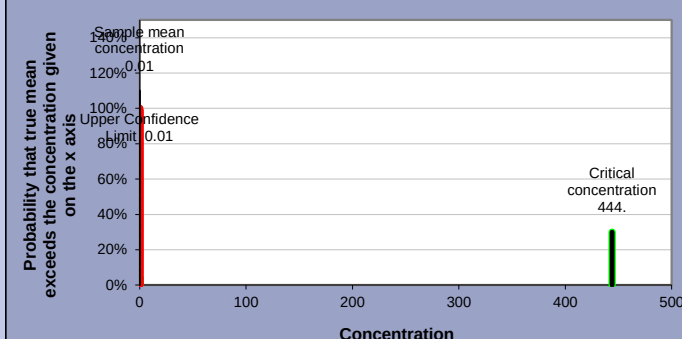


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Aro EC8-EC10

Client/client ref: Linden

Project ref: GE9752

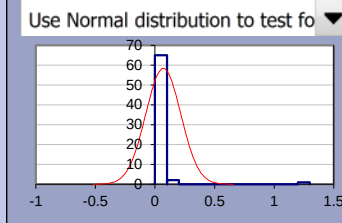
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

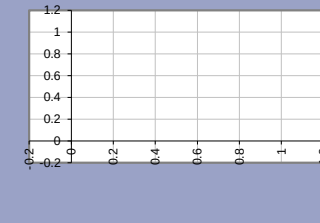
User details: GR

Dataset:	Aro EC8-EC10 ▼	
Sample mean	$\bar{X}$	0.0697
Sample standard deviation, s		0.1469
Sample size, n		68
Critical concentration, Cc		138



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

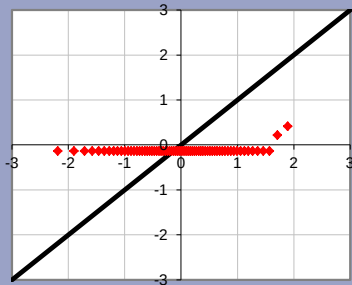


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼

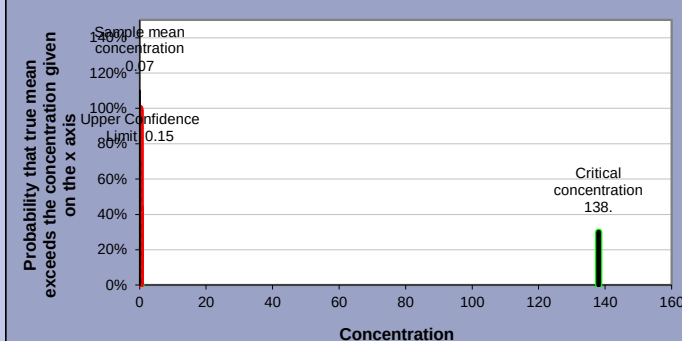


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)? ▼

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level ▼

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Aro EC10-EC12

Client/client ref: Linden

Project ref: GE9752

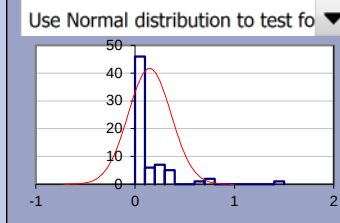
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

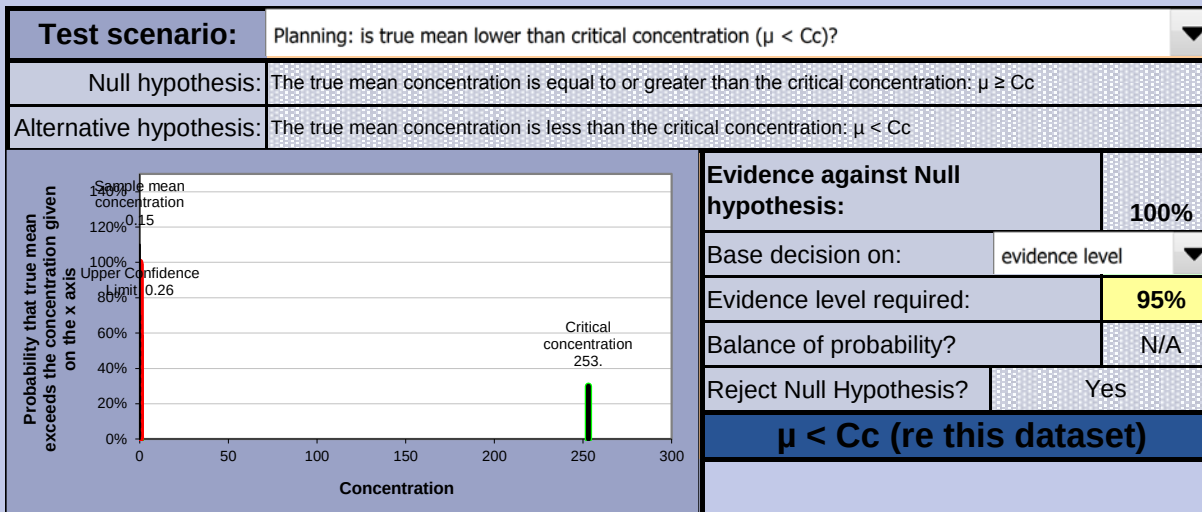
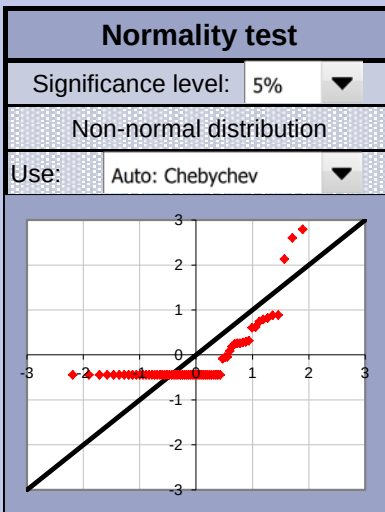
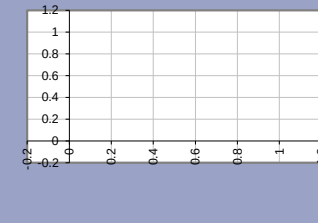
Date: 22-Apr-2014

User details: GR

Dataset:	Aro EC10-EC12
Sample mean $\bar{X}$	0.1461
Sample standard deviation, s	0.2158
Sample size, n	68
Critical concentration, Cc	253



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

Go to normality test

Test Results

Ali EC21-EC35

Client/client ref: Linden

Project ref: GE9752

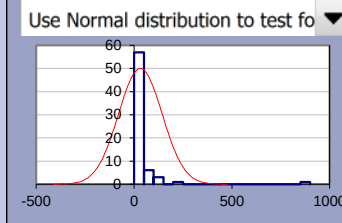
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

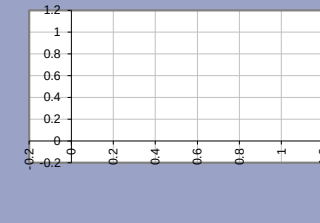
User details: GR

Dataset: Ali EC21-EC35 ▼		
Sample mean	$\bar{X}$	31.944
Sample standard deviation, s		111.58
Sample size, n		68
Critical concentration, Cc		88400



Outliers & non-detects

Outliers present?	Yes
Significance level	5% ▼
Outliers excluded	0
Non-detects	#NAME?

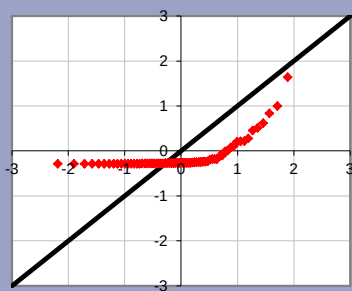


Normality test

Significance level: 5% ▼

Non-normal distribution

Use: Auto: Chebychev ▼



Test scenario:

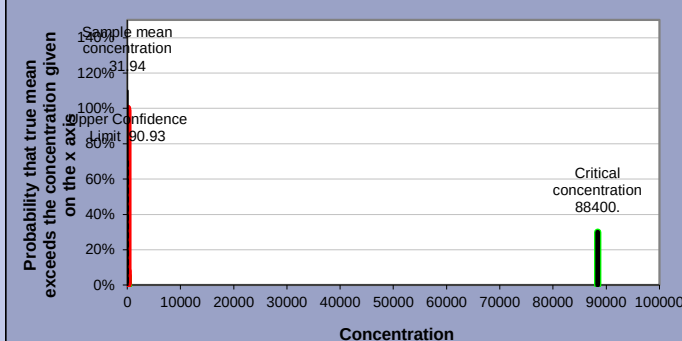
Planning: is true mean lower than critical concentration ($\mu < Cc$)? ▼

Null hypothesis:

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

Alternative hypothesis:

The true mean concentration is less than the critical concentration: $\mu < Cc$



Evidence against Null hypothesis:

100%

Base decision on:

evidence level ▼

Evidence level required:

95%

Balance of probability?

N/A

Reject Null Hypothesis?

Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Aro EC12-EC16

Client/client ref: Linden

Project ref: GE9752

Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

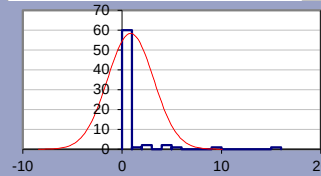
Date: 22-Apr-2014

User details: GR

Dataset: Aro EC12-EC16

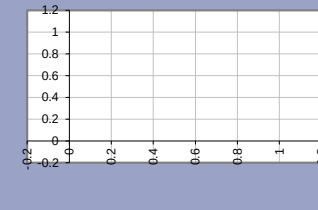
Sample mean	$\bar{X}$	0.8514
Sample standard deviation, s		2.3207
Sample size, n		68
Critical concentration, Cc		435

Use Normal distribution to test for



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

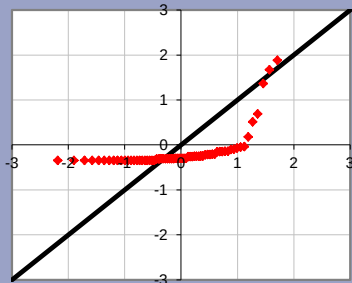


Normality test

Significance level: 5%

Non-normal distribution

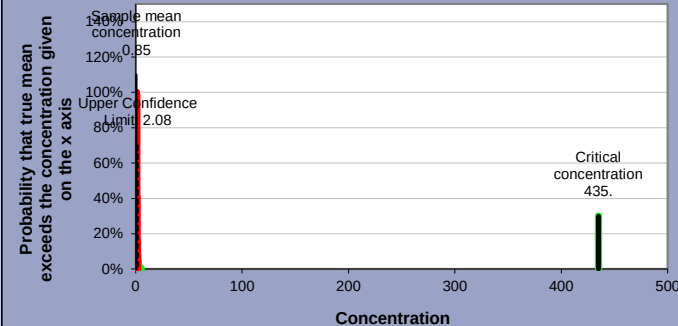
Use: Auto: Chebychev



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

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

Go to normality test

Test Results

Aro EC16-EC21

Client/client ref: Linden

Project ref: GE9752

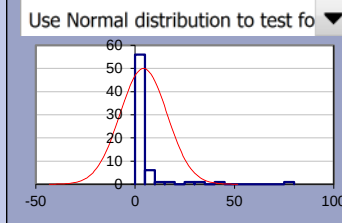
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

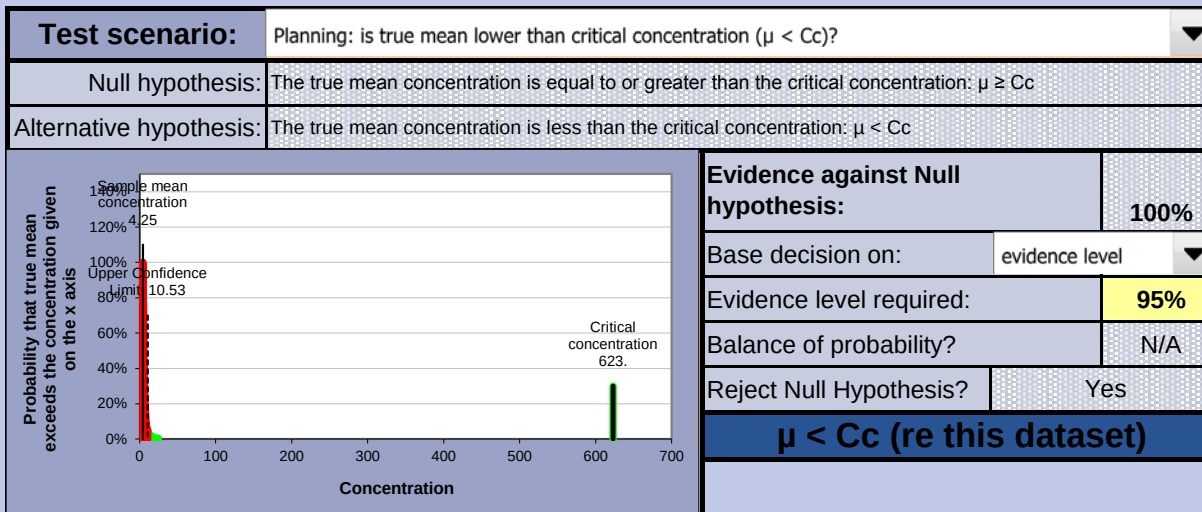
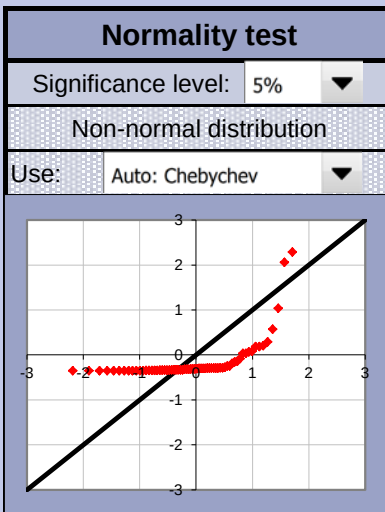
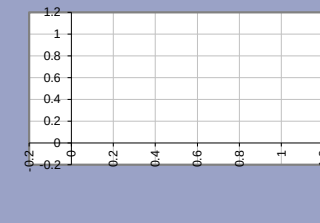
Date: 22-Apr-2014

User details: GR

Dataset:	Aro EC16-EC21
Sample mean $\bar{X}$	4.2517
Sample standard deviation, s	11.873
Sample size, n	68
Critical concentration, Cc	623



Outliers & non-detects	
Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?



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Go to outlier test

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Test Results

Aro EC21-EC35

Client/client ref: Linden

Project ref: GE9752

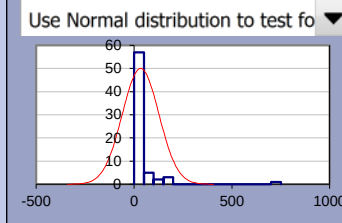
Site ref: Havant Retail Park PO9 3NA

Data description: Specaitd TPH

Date: 22-Apr-2014

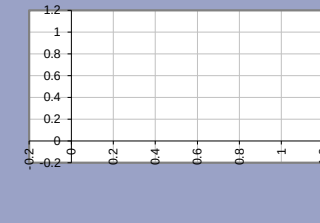
User details: GR

Dataset:	Aro EC21-EC35
Sample mean $\bar{X}$	33.354
Sample standard deviation, s	93.499
Sample size, n	68
Critical concentration, Cc	1180



Outliers & non-detects

Outliers present?	Yes
Significance level	5%
Outliers excluded	0
Non-detects	#NAME?

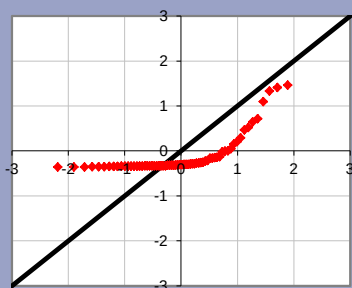


Normality test

Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev

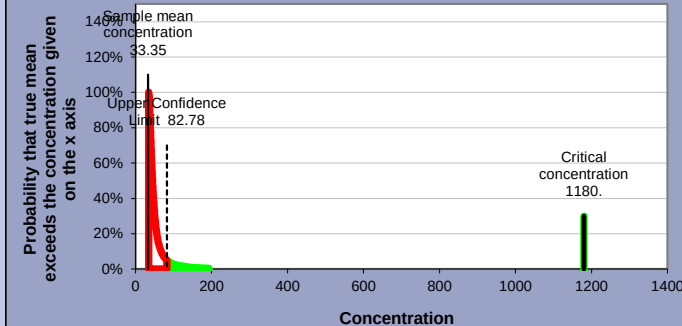


Test scenario:

Planning: is true mean lower than critical concentration ($\mu < Cc$)?

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

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



Evidence against Null hypothesis:

100%

Base decision on: evidence level

Evidence level required: 95%

Balance of probability? N/A

Reject Null Hypothesis? Yes

$\mu < Cc$ (re this dataset)

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Go to outlier test

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APPENDIX F

Ground Gas Spot Monitoring Data and Assessment



Project: Havant Retail Park
Ref: GE9752
Client: Linden Homes



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WSA	26/03/14	10	0.0	0.0	21.1	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	26/03/14	20	0.0	0.0	21.0	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	26/03/14	30	0.0	0.0	20.8	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	26/03/14	60	0.0	0.0	20.7	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	26/03/14	120	0.0	0.0	20.7	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	26/03/14	10	0.0	0.0	21.2	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	26/03/14	20	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	26/03/14	30	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	26/03/14	60	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	26/03/14	120	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	26/03/14	10	0.0	0.0	21.2	0.0	0.10	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	26/03/14	20	0.0	0.0	20.9	0.0	0.10	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	26/03/14	30	0.0	0.0	20.9	0.0	0.10	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	26/03/14	60	0.0	0.0	20.8	0.0	0.10	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	26/03/14	120	0.0	0.0	20.8	0.0	0.10	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	26/03/14	10	0.0	0.0	21.4	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	26/03/14	20	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	26/03/14	30	0.0	0.0	20.8	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	26/03/14	60	0.0	0.0	20.8	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	26/03/14	120	0.0	0.0	20.8	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	26/03/14	10	0.0	0.0	21.1	0.0	0.20	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	26/03/14	20	0.0	0.3	20.6	0.0	0.20	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	26/03/14	30	0.0	0.3	20.5	0.0	0.20	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	26/03/14	60	0.0	0.3	20.4	0.0	0.20	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	26/03/14	120	0.0	0.4	20.4	0.0	0.20	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	26/03/14	10	0.0	0.0	21.3	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	26/03/14	20	0.0	0.0	21.0	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	26/03/14	30	0.0	0.0	20.9	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	26/03/14	60	0.0	0.0	20.8	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	26/03/14	120	0.0	0.5	20.3	0.0	0.00	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	26/03/14	10	0.0	0.0	21.4	0.0	1.30	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	26/03/14	20	0.0	0.1	21.0	0.0	1.30	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	26/03/14	30	0.0	0.1	20.9	0.0	1.30	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	26/03/14	60	0.0	0.0	20.8	0.0	1.30	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	26/03/14	120	0.0	1.0	19.6	0.0	1.30	1013	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	03/04/14	10	0.0	0.0	21.2	0.0	0.20	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	03/04/14	20	0.0	0.7	20.1	0.0	0.20	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	03/04/14	30	0.0	0.8	19.7	0.0	0.20	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	03/04/14	60	0.0	0.8	19.7	0.0	0.20	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	03/04/14	120	0.0	0.8	19.5	0.0	0.20	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	03/04/14	10	0.0	0.0	21.4	0.1	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	03/04/14	20	0.0	2.0	17.4	0.1	0.00	995	DRY	0.000	0.002	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	03/04/14	30	0.0	2.0	16.8	0.1	0.00	995	DRY	0.000	0.002	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	03/04/14	60	0.0	2.3	16.5	0.1	0.00	995	DRY	0.000	0.002	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	03/04/14	120	0.0	1.4	17.8	0.1	0.00	995	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	03/04/14	10	0.0	0.0	21.4	0.0	0.50	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	03/04/14	20	0.0	0.0	21.0	0.0	0.50	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	03/04/14	30	0.0	0.1	20.7	0.0	0.50	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	03/04/14	60	0.0	0.1	20.7	0.0	0.50	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	03/04/14	120	0.0	0.0	20.8	0.0	0.50	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

Project: Havant Retail Park
 Ref: GE9752
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Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WSD	03/04/14	10	0.0	0.0	21.4	0.2	1.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	03/04/14	20	0.0	0.9	19.9	0.2	1.30	995	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	03/04/14	30	0.0	0.9	18.5	0.2	1.30	995	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	03/04/14	60	0.0	0.9	18.3	0.2	1.30	995	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	03/04/14	120	0.0	0.9	18.3	0.2	1.30	995	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	03/04/14	10	0.0	0.0	21.1	0.0	2.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	03/04/14	20	0.0	0.0	21.0	0.0	2.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	03/04/14	30	0.0	0.0	21.0	0.0	2.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	03/04/14	60	0.0	0.0	20.9	0.0	2.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	03/04/14	120	0.0	0.3	20.6	0.0	2.30	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	03/04/14	10	0.0	0.0	21.3	0.0	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	03/04/14	20	0.0	0.9	19.8	0.0	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	03/04/14	30	0.0	1.0	19.1	0.0	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	03/04/14	60	0.0	1.0	18.9	0.0	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	03/04/14	120	0.0	1.1	18.8	0.0	0.00	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	03/04/14	10	0.0	0.0	21.9	0.0	2.70	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	03/04/14	20	0.0	0.1	21.7	0.0	2.70	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	03/04/14	30	0.0	0.3	21.5	0.0	2.70	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	03/04/14	60	0.0	0.5	21.1	0.0	2.70	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	03/04/14	120	0.0	0.8	20.5	0.0	2.70	995	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/04/14	10	0.1	0.3	20.8	-0.1	0.10	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/04/14	20	0.1	0.3	20.6	-0.1	0.10	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/04/14	30	0.1	0.3	20.6	-0.1	0.10	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/04/14	60	0.1	0.3	20.5	-0.1	0.10	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	08/04/14	120	0.1	0.3	20.5	-0.1	0.10	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	08/04/14	10	0.1	0.0	20.9	-0.2	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	08/04/14	20	0.1	0.0	20.9	-0.2	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	08/04/14	30	0.1	0.0	21.0	-0.2	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	08/04/14	60	0.1	0.0	21.0	-0.2	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	08/04/14	120	0.1	1.0	20.4	-0.2	0.00	1021	DRY	0.000	-0.002	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/04/14	10	0.1	1.1	20.8	0.0	3.50	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/04/14	20	0.1	1.4	19.8	0.0	3.50	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/04/14	30	0.1	1.5	19.5	0.0	3.50	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/04/14	60	0.1	1.8	19.0	0.0	3.50	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	08/04/14	120	0.1	1.8	19.0	0.0	3.50	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	08/04/14	10	0.1	1.0	20.5	0.0	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	08/04/14	20	0.1	1.4	18.5	0.0	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	08/04/14	30	0.1	1.4	18.1	0.0	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	08/04/14	60	0.1	1.4	18.1	0.0	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	08/04/14	120	0.1	1.4	18.1	0.0	0.00	1021	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	08/04/14	10	0.1	0.2	20.8	0.1	0.00	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	08/04/14	20	0.1	0.4	20.5	0.1	0.00	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	08/04/14	30	0.1	0.6	20.3	0.1	0.00	1020	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	08/04/14	60	0.1	0.8	19.9	0.1	0.00	1020	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	08/04/14	120	0.1	0.8	20.0	0.1	0.00	1020	DRY	0.000	0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	08/04/14	10	0.1	0.0	20.9	0.0	0.10	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	08/04/14	20	0.1	0.0	20.9	0.0	0.10	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	08/04/14	30	0.1	0.1	20.8	0.0	0.10	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	08/04/14	60	0.1	0.1	20.6	0.0	0.10	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	08/04/14	120	0.1	0.2	20.6	0.0	0.10	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

Project: Havant Retail Park
 Ref: GE9752
 Client: Linden Homes



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WSC	08/04/14	10	0.1	0.0	21.0	0.0	0.20	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	08/04/14	20	0.1	0.0	21.1	0.0	0.20	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	08/04/14	30	0.1	0.0	21.1	0.0	0.20	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	08/04/14	60	0.1	0.0	21.1	0.0	0.20	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	08/04/14	120	0.1	0.0	21.0	0.0	0.20	1020	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	08/04/14	10	0.1	0.0	21.2	-0.5	0.20	1020	DRY	-0.001	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	08/04/14	20	0.1	0.0	21.2	-0.5	0.20	1020	DRY	-0.001	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	08/04/14	30	0.1	0.0	21.2	-0.5	0.20	1020	DRY	-0.001	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	08/04/14	60	0.1	0.1	21.1	-0.5	0.20	1020	DRY	-0.001	-0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	08/04/14	120	0.1	0.2	21.2	-0.5	0.20	1020	DRY	-0.001	-0.001	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	15/04/14	10	0.0	0.0	21.5	0.0	0.20	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	15/04/14	20	0.0	0.4	20.6	0.0	0.20	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	15/04/14	30	0.0	0.4	20.4	0.0	0.20	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	15/04/14	60	0.0	0.4	20.3	0.0	0.20	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	15/04/14	120	0.0	0.4	20.3	0.0	0.20	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	15/04/14	10	0.0	0.0	21.4	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	15/04/14	20	0.0	0.8	20.3	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	15/04/14	30	0.0	0.8	19.9	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	15/04/14	60	0.0	0.9	19.7	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	15/04/14	120	0.0	1.0	19.7	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	15/04/14	10	0.0	0.2	21.9	0.0	3.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	15/04/14	20	0.0	0.9	20.5	0.0	3.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	15/04/14	30	0.0	1.0	20.1	0.0	3.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	15/04/14	60	0.0	1.2	19.6	0.0	3.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	15/04/14	120	0.0	1.2	19.5	0.0	3.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	15/04/14	10	0.0	0.0	21.2	0.0	0.30	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	15/04/14	20	0.0	0.0	20.8	0.0	0.30	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	15/04/14	30	0.0	0.0	20.6	0.0	0.30	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	15/04/14	60	0.0	0.0	20.4	0.0	0.30	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	15/04/14	120	0.0	0.0	20.3	0.0	0.30	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	15/04/14	10	0.0	0.0	21.4	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	15/04/14	20	0.0	0.0	21.2	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	15/04/14	30	0.0	0.0	21.2	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	15/04/14	60	0.0	0.0	21.1	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	15/04/14	120	0.0	0.0	20.9	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	15/04/14	10	0.0	0.7	20.4	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	15/04/14	20	0.0	0.1	20.7	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	15/04/14	30	0.0	0.1	20.9	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	15/04/14	60	0.0	0.1	20.9	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	15/04/14	120	0.0	0.1	20.5	0.0	0.10	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	15/04/14	10	0.0	0.2	21.6	0.0	1.60	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	15/04/14	20	0.0	0.8	20.3	0.0	1.60	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	15/04/14	30	0.0	0.8	20.1	0.0	1.60	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	15/04/14	60	0.0	0.8	20.0	0.0	1.60	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	15/04/14	120	0.0	0.8	19.8	0.0	1.60	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	15/04/14	10	0.0	0.0	21.4	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	15/04/14	20	0.0	0.1	21.2	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	15/04/14	30	0.0	0.1	21.1	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	15/04/14	60	0.0	0.2	20.9	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	15/04/14	120	0.0	0.4	20.8	0.0	0.00	1026	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN

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 Ref: GE9752
 Client: Linden Homes



Location	Date	Time (sec)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	VOC (ppm)	Pressure (mb)	GWL (m bgl)	GSV/Qhgs		Characteristic Situation		CS1 Limiting Value Check			NHBC			
										CH ₄	CO ₂	BS8485 & C665		Flow	CH ₄	CO ₂	CH ₄		CO ₂	
												CH ₄	CO ₂				GSV	Conc.	GSV	Conc.
WS1	22/04/14	10	0.0	0.0	21.5	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/04/14	20	0.0	0.4	20.9	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/04/14	30	0.0	0.4	20.7	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/04/14	60	0.0	0.4	20.6	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS1	22/04/14	120	0.0	0.4	20.6	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/04/14	10	0.0	0.0	21.5	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/04/14	20	0.0	0.2	20.7	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/04/14	30	0.0	0.5	20.1	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/04/14	60	0.0	0.6	19.3	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS8	22/04/14	120	0.0	0.8	18.7	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/04/14	10	0.0	0.0	21.1	0.0	2.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/04/14	20	0.0	1.2	19.4	0.0	2.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/04/14	30	0.0	1.2	19.0	0.0	2.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/04/14	60	0.0	1.3	18.7	0.0	2.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WS10	22/04/14	120	0.0	1.5	18.5	0.0	2.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	22/04/14	10	0.0	0.0	21.4	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	22/04/14	20	0.0	0.4	20.6	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	22/04/14	30	0.0	0.4	20.4	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	22/04/14	60	0.0	0.6	20.1	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSA	22/04/14	120	0.0	0.7	19.7	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	22/04/14	10	0.0	0.0	21.5	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	22/04/14	20	0.0	0.0	21.2	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	22/04/14	30	0.0	0.0	21.0	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	22/04/14	60	0.0	0.0	21.0	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSB	22/04/14	120	0.0	0.0	21.0	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	22/04/14	10	0.0	0.0	21.0	0.0	0.10	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	22/04/14	20	0.0	0.0	20.9	0.0	0.10	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	22/04/14	30	0.0	0.0	20.8	0.0	0.10	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	22/04/14	60	0.0	0.0	20.8	0.0	0.10	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSC	22/04/14	120	0.0	0.0	20.8	0.0	0.10	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	22/04/14	10	0.0	0.0	21.4	0.0	0.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	22/04/14	20	0.0	1.0	19.5	0.0	0.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	22/04/14	30	0.0	1.0	19.0	0.0	0.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	22/04/14	60	0.0	1.0	18.8	0.0	0.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
WSD	22/04/14	120	0.0	1.1	18.7	0.0	0.40	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	22/04/14	10	0.0	0.0	21.2	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	22/04/14	20	0.0	0.0	21.1	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	22/04/14	30	0.0	0.2	21.1	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	22/04/14	60	0.0	0.1	20.9	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH103	22/04/14	120	0.0	0.1	20.8	0.0	0.00	1004	DRY	0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
Max values			0.1	2.3	21.9	0.2	3.50	1026.0		0.000	0.003	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
Min Values			0.0	0.0	16.5	-0.5	0.00	995.0		0.000	0.000	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN
BH Flow LoD check			0.1	2.3	21.9	0.1	3.50	1026.0		0.000	0.002	CS1	CS1	NO	NO	NO	GREEN	GREEN	GREEN	GREEN



APPENDIX G

Imported Soil Specification

IMPORTED SOIL SPECIFICATION

For

HAVANT RETAIL PARK, PO9 3NA

CONTENTS

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1.0 Introduction

This documents sets out the requirements for cover systems and imported materials for any project undergoing redevelopment or other works where capping work is required.

Within the specification reference has been made to topsoil and subsoil. Topsoil relates to the top layer of natural soil that can support healthy vegetation growth. Subsoil relates to the layer of soil immediately below the topsoil to the depth of the underlying broken rock or geological parent material.

The specification considers the chemical, nutritional and physical properties of soils that are to be imported onto site, in order to ensure materials used are suitable for their intended use and do not introduce any new hazard or pollutant linkage on to the site.

2.0 Chemical Composition

The chemical criteria listed below are based on published CLEA Soil Guideline Values (SGVs), generic assessment criteria calculated using UK policy compliant software or by reference to current guidance and best practice. From time to time these values may change in line with regulatory or UK policy changes. Such changes will require revision and re-issue of this document.

At the time of preparation, where SGVs have not been published, generic assessment criteria (GAC) published in 2009 by the Chartered Institute of Environmental Health and Land Quality Management have been used. Where SGVs or GAC are published for a range of Soil Organic Matter (SOM) values, these ranges and their respective SOM values have been presented and would be considered when assessing compliance with this Specification.

2.1 Method of Analysis

Samples should be analysed using UKAS or MCERTS accredited laboratories. For TPH analysis sample preparation must not include air drying.

2.1.1 Poly Aromatic Hydrocarbon (PAH)

The PAH analysis must include the EPA priority 16.

2.1.2 Total Petroleum Hydrocarbons (TPH)

The analysis for TPH should be undertaken on the 'as received' sample and not be subject to any pre-treatment and include aliphatic and aromatic carbon banding split.

2.2 Topsoil (0-300mm depth)

Table 1 provides a list of the maximum acceptable concentrations for imported topsoil.



Parameter	Maximum concentration (mg/kg)
Inorganic	
Arsenic (total)	<32
Boron (water soluble)	<291
Cadmium (total)	10 (SOM=6%)
Chromium (total)	<130
Copper (total)	<2330
Cyanide (total)	<250
Lead (total)	<450
Mercury (total inorganic)	<8
Nickel (total)	<130 (SOM=6%)
pH	5.5 – 7.8
Selenium (total)	<350 (SOM=6%)
Sulphate (total)	<2000
Zinc (total)	<3750
Organic	
Soil Organic Matter (SOM)	
Phenols (total)	<420 (SOM=6%)
Poly Aromatic Hydrocarbon (speciated)	See Table 1a
Total Petroleum Hydrocarbon (speciated)	See Table 1b

Table 1: Chemical Specification for Topsoil

	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Acenaphthene	210	480	1000
Acenaphthylene	170	400	850
Anthracene	2300	4900	9200
Benz(a)anthracene	3.1	4.7	5.9
Benzo(a)pyrene	0.83	0.94	1.0
Benzo(b)fluoranthene	5.6	6.5	7.0
Benzo(ghi)perylene	44	46	47
Benzo(k)fluoranthene	8.5	9.6	10
Chrysene	6.0	8.0	9.3
Dibenz(ah)anthracene	0.76	0.86	0.9
Fluoranthene	260	460	670
Fluorene	160	380	780
Indeno(1,2,3CD)pyrene	3.2	3.9	4.2
Naphthalene	1.5	3.7	8.7
Phenanthrene	92	200	380
Pyrene	560	1000	1600

Table 1a: Topsoil Specification for Speciated PAH



	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	30	55	110
EC >6-8	73	160	370
EC >8-10	19	46	110
EC >10-12	93	230	540
EC >12-16	740	1700	3000
EC >16-35	45000	64000	76000
EC >35-44	45000	64000	76000
Aromatic			
EC 5-7 (benzene)	65	130	280
EC >7-8 (toluene)	120	270	611
EC >8-10	27	65	151
EC >10-12	69	160	346
EC >12-16	140	310	593
EC >16-21	250	480	770
EC >21-35	890	1100	1230
EC >35-44	890	1100	1230
Aliphatic and Aromatic			
EC >44-70	1200	1300	1300

Table 1b: Topsoil Specification for Speciated TPH**2.3 Subsoil (300-1000mm depth)**

Table 2 provides a list of the maximum acceptable concentrations for imported subsoil.

Parameter	Maximum concentration (mg/kg)
Inorganic	
Arsenic (total)	<32
Boron (water soluble)	<291
Cadmium (total)	10 (SOM=6%)
Chromium (total)	<130
Copper (total)	<2330
Cyanide (total)	<250
Lead (total)	<450
Mercury (total inorganic)	<8
Nickel (total)	<130 (SOM=6%)
pH	5.5 – 7.8
Selenium (total)	<350 (SOM=6%)
Sulphate (total)	<2000
Zinc (total)	<3750
Organic	
Soil Organic Matter (SOM)	
Phenols (total)	<420 (SOM=6%)
Poly Aromatic Hydrocarbon (speciated)	See Table 1a
Total Petroleum Hydrocarbon (speciated)	See Table 1b

Table 2: Chemical Specification for Subsoil



	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Acenaphthene	210	480	1000
Acenaphthylene	170	400	850
Anthracene	2300	4900	9200
Benz(a)anthracene	3.1	4.7	5.9
Benzo(a)pyrene	0.83	0.94	1.0
Benzo(b)fluoranthene	5.6	6.5	7.0
Benzo(ghi)perylene	44	46	47
Benzo(k)fluoranthene	8.5	9.6	10
Chrysene	6.0	8.0	9.3
Dibenz(ah)anthracene	0.76	0.86	0.9
Fluoranthene	260	460	670
Fluorene	160	380	780
Indeno(1,2,3CD)pyrene	3.2	3.9	4.2
Naphthalene	1.5	3.7	8.7
Phenanthrene	92	200	380
Pyrene	560	1000	1600

Table 2a: Subsoil Specification for Speciated PAH

	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	30	55	110
EC >6-8	73	160	370
EC >8-10	19	46	110
EC >10-12	93	230	540
EC >12-16	740	1700	3000
EC >16-35	45000	64000	76000
EC >35-44	45000	64000	76000
Aromatic			
EC 5-7 (benzene)	65	130	280
EC >7-8 (toluene)	120	270	611
EC >8-10	27	65	151
EC >10-12	69	160	346
EC >12-16	140	310	593
EC >16-21	250	480	770
EC >21-35	890	1100	1230
EC >35-44	890	1100	1230
Aliphatic and Aromatic			
EC >44-70	1200	1300	1300

Table 2b: Subsoil Specification for Speciated TPH

3.0 Nutritional Composition

The nutritional criteria listed below are based on BS 3882:2007 Specification for Topsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.

3.1 Topsoil & Subsoil

Table 3 details the minimum acceptable concentrations for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Min Concentration
Topsoil	Phosphorous	16 mg/l
	Potassium	120 mg/l
	Magnesium	51 mg/l
	Nitrogen	0.15 %
Subsoil	Phosphorous	16 mg/l
	Potassium	120 mg/l
	Magnesium	51 mg/l
	Nitrogen	0.15 %

Table 3: Nutritional Specification for Topsoil and Subsoil

4.0 Physical Composition

The physical criteria listed below are based on BS 3882:1994 Specification for Topsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.

4.1 Topsoil

Table 4 details requirements for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Specification requirements
Topsoil	Textural Classification	Sandy clay loam, sandy loam, loamy sand, sandy silt loam (as defined in BS 3882, Figure 1)
	Loss on Ignition	5-50%
	Maximum Stone content:	>2mm = 30% >20mm= 10% >50mm= 0%
Subsoil	Textural Classification	N/A
	Loss on Ignition	2-50%
	Maximum Stone content:	>2mm = 65% >20mm= 60% >50mm= 40%

NOTE: Topsoil and Subsoil must be free from glass, brick fragments etc and suitable as a growing medium for plants.

Table 4: Physical Specification for Topsoil & Subsoil

5.0 Source Requirements

5.1 Topsoil and Subsoil

The following will be provided with all soils imported to site:

- Location of site which is clean and has no history of potentially contaminative uses.
- A site plan detailing the location and address of the source site.

5.2 Manufactured soils

Where natural soils are unavailable manufactured soils may be utilised the following should be provided:

- Details of the soil manufacturing process, including criteria for received soils, quality control procedure and validation protocol.
- Soils should be tested at a minimum ratio of one sample per 50m³.

6.0 Testing Rates and Compliance

6.1 Topsoil

Where natural sourcing is proposed, the provenance of the material shall be determined by confirmation of the source site's history to confirm no previous potentially contaminative use, coupled with analysis of soils at a minimum rate of 3No. samples per source site (up to 250m³) and 1 sample per 250m³ thereafter.

Where Topsoil is derived from a manufactured source, testing would be undertaken at a rate of 1 sample per 50m³.

With regards to physical and nutritional composition and minimum testing regime of 1 sample per 250m³ is recommended for either source.

6.2 Subsoil

Where the source of the material is known and a due diligence review has established no previous contaminative use associated with the proposed subsoil, validation sampling should be undertaken at a minimum rate of 3 sample per source (up to 250m³) and 1 sample per 250m³ thereafter.

Where the source of the material is not known the validation sampling should be undertaken at a minimum of 1 sample per 50m³.

6.3 Manufactured soils

Soils should be tested at a minimum ratio of one sample per 50m³.

6.4 Sample failure

In the event that a sample fails to meet the specified criteria for any parameter the Environmental Consultant should be contacted for advice on the suitability of the materials.

Further testing may be required to provide reassurance that the exceedances are not representative of the soil.

6.5 Timing

Sampling and analysis undertaken by a manufactured topsoil supplier shall be no earlier than two weeks from the date of import, any results which are older than two weeks will be deemed not to be representative of the soils to be imported and rejected.

Imported Soil Suppliers and Groundworks Contractors are required to take reasonably practicable measures to ensure that compliance with this Specification does not hinder formal completion of individual plots or developments.



6.6 General Compliance

All analytical suites shall correspond with the chemical and nutritional compliance criteria (as set out in Tables 1 to 3). The soil supplier shall ensure that the analytical limits of detection are equal or lower than the compliance values presented within this Specification. Where either testing suites or limits of detection do not comply with this Specification, the entire set of results shall be rejected.