



A different perspective

**Combined Phase I & II Geo-Environmental
Assessment
Fields End, Hemel Hempstead**

**For
Taylor Wimpey UK Limited**

Delta-Simons Project No. 11-0150.01

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EXECUTIVE SUMMARY STATEMENT
COMBINED PHASE I & II GEO-ENVIRONMENTAL ASSESSMENT
FIELDS END, HEMEL HEMPSTEAD
DELTA-SIMONS PROJECT NO. 11-0150.01

Delta-Simons Environmental Consultants Limited (Delta-Simons) was instructed by Vincent & Gorbng Ltd (the 'Planning Consultant') on behalf of Taylor Wimpey UK Ltd (the 'Client') to undertake a Combined Phase I & II Geo-Environmental Assessment of land at Fields End, Hemel Hempstead, (hereafter referred to as the 'Site').

The purpose of this Report is to summarise Delta-Simons' findings in order to gain a better understanding of the geotechnical and contamination status of the Site to identify any potential risks or liabilities associated with contaminated land or geotechnical constraints.

Current Site Status	The Site comprises an approximate rectangular parcel of land south of Fields End Farm, extending to an area of approximately 22 Hectares, located on the eastern urban/rural fringe of Hemel Hempstead in Hertfordshire.
Context/Purpose	It is understood that the Site is to be developed under a Local Development Framework with an anticipated mix of residential properties together with retail, educational and health facilities.
Environmental Setting	The 1:50,000 British Geological Survey map for the area indicate that the Site geology is likely to comprise clays of the Clay with Flints Formation overlying Chalk.
Historical Land Uses	Historical mapping shows that the Site has remained undeveloped from the earliest mapping available as part of this investigation, with the primary historic use being arable farmland.
Site Investigation Works	<p>Scope of works included the following:</p> <ul style="list-style-type: none"> △ A review of the published geological records, Sitecheck data, and data provided by the Planning Consultant; △ A Site walkover to identify any potential on-Site and off-Site sources of contamination and to agree intrusive locations at the Site; △ Completion of 18 window sample boreholes including Dynamic Penetration Tests across the Site, to a maximum depth of 6.00 metres below ground level (m bgl); △ Completion of 26 trial pits across the Site to a maximum depth of 4.00 m bgl; △ Collection of a total of eight soil samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of organic and inorganic determinands; △ Collection of six soils samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of geotechnical parameters; △ Four rounds of groundwater and ground gas monitoring; and △ Completion of a Phase II Geo-Environmental Assessment Report summarising the findings of the investigation.
Ground Conditions	The ground conditions beneath the Site have been shown to comprise a layer of topsoil extending to a maximum recorded depth of 0.35 m bgl, overlying generally firm to stiff clays rested upon weak and very weak chalk.
Environmental Findings	<p>The environmental findings at the Site are summarised as:</p> <ul style="list-style-type: none"> △ There were no potential sources of contamination identified at the Site during the initial Site inspection; △ The ground gas regime has been categorised as CS-1;

	<ul style="list-style-type: none"> △ A Site investigation has been carried out in order to assess the ground conditions in the context of a proposed residential end-use of the Site; and △ No visual or olfactory evidence of contamination was identified at the Site during the investigation, and, therefore, the Site can be considered as being uncontaminated.
Geotechnical Findings	<p>The geotechnical findings at the Site are summarised as:</p> <ul style="list-style-type: none"> △ Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction. Initial assessments indicate that an allowable bearing capacity of 125kN/m² would be suitable located at a minimum within the firm to stiff clays beneath any topsoil or other unsuitable soil, however, due to the risk of laterally variable granular fractions and soil strengths it is recommended that allowable bearing capacities are limited to 100kN/m²; △ It is recommended that foundations are reinforced against differential settlement; △ The clays are found to be of high or very high shrinkability and, therefore, allowances should be made for this in foundation design; △ There were no conclusive indications of the presence of dissolution features; △ The Site is not suitable for the use of soakaway drainage at shallow depth due to the predominantly cohesive ground conditions, however, soakaways may be feasible at an increased depth within the chalk stratum subject to the appropriate confirmatory testing; △ The Design Sulfate Class for the Site is DS-1, and the ACEC Class is AC-1; and △ A design California Bearing Ratio (CBR) value for the shallow depth clay soils of 5% may be adopted and, therefore, the natural clays are considered suitable for re-use beneath roadways and pavements without the need for any abnormal preparatory work.
Environmental Recommendations	<p>On the basis of the information obtained and reviewed as part of this Assessment and the conclusions drawn above, Delta-Simons recommends the following:</p> <ul style="list-style-type: none"> △ Any groundworkers who are required to perform sub-surface work at the Site should be made aware of the possibility of encountering unforeseen contamination. Therefore, good standards of personal hygiene should be observed with appropriate levels of personal protective equipment (PPE) provided and utilised, and toolbox talks should be given to contractors prior to the commencement of works; △ The developer and their contractors should remain vigilant for any previously unidentified contamination; and △ It is recommended that this Report is submitted in support of any future planning application.
Geotechnical Recommendations	<p>Based on the completion of this Assessment, the following recommendations are considered appropriate:</p> <ul style="list-style-type: none"> △ Any groundworkers who are required to perform sub-surface work at the Site should be made aware of the possibility of encountering unforeseen chalk dissolution features during excavations for foundations or other structures. The foundation formation level should be inspected for dissolution features and fractures, with any significant 'puttied' or highly weathered material removed prior to construction. Should any unusual ground conditions be encountered, the advice of a geotechnical engineer should be sought prior to placement of concrete. If unusual features are encountered, localised deepening of the formation would be required, or the foundation designed to span the affected area. Once deemed suitable, the formation should be protected upon exposure to prevent spoiling through moisture content variation; and △ If soakaway drainage is required, permeability testing should be undertaken within the chalk stratum to assess its suitability for this purpose.
Statement of Risk	<p>On the basis of available information, Delta-Simons considers that with regard to potential soil and groundwater contamination issues and associated environmental and geotechnical liabilities, the Site represents a Low overall risk status.</p>
<p>This Executive Summary is intended as a summary of the Assessment of the Site based on information received by Delta-Simons at the time of production.</p>	

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FOR
TAYLOR WIMPEY UK LIMITED
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1.0 INTRODUCTION

1.1 Authorisation

Delta-Simons Environmental Consultants Limited (Delta-Simons) was instructed by Vincent & Goring Ltd (the 'Planning Consultant') on behalf of Taylor Wimpey UK Ltd (the 'Client') to undertake a Combined Phase I & II Geo-Environmental Assessment of land at Fields End, Hemel Hempstead, (hereafter referred to as the 'Site').

1.2 Context and Purpose

It is understood that the Client already owns the Site, and proposes to develop it under a Local Development Framework (LDF), and is completing due diligence to support their intended development of the Site. As part of the due diligence process the Client requires a desk-top study and intrusive investigation in order to gain a better understanding of the contamination and geotechnical status of the Site and any associated potential risks or liabilities. The exact development layout is not yet known, however, it is understood that it is likely to comprise residential housing with landscaping, gardens and infrastructure, alongside supporting facilities which may include retail, health and educational facilities. A proposed 'skeleton' development layout is given in Figure 2.

This Report includes data obtained from the previous third party desk studies and an intrusive Site investigation. This data is interpreted to form a Conceptual Site Model (CSM) and risk assessment, based on the Source-Pathway-Receptor principle.

1.3 Scope of Works

The scope of works undertaken by Delta-Simons comprised:

- △ A review of the published geological records, Sitecheck data, and data provided by the Planning Consultant;
- △ A Site walkover to identify any potential on-Site and off-Site sources of contamination and to agree intrusive locations at the Site;

- Δ Completion of 18 window sample boreholes including Dynamic Penetration Tests across the Site, to a maximum depth of 6.00 metres below ground level (m bgl);
- Δ Completion of 26 trial pits across the Site to a maximum depth of 4.00 metres below ground level (m bgl);
- Δ Collection of a total of eight soil samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of organic and inorganic determinands;
- Δ Collection of six soils samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of geotechnical parameters;
- Δ Four rounds of groundwater and ground gas monitoring; and
- Δ Completion of a Phase II Geo-Environmental Assessment Report summarising the findings of the investigation.

1.4 Data Sources and Third Party Information

In completing this assessment, Delta-Simons has utilised information from the following:

- Δ Chemtech Ltd;
- Δ Professional Soils Laboratory Ltd; and
- Δ The Client.

1.5 Limitations to Site Investigation

The locations of the window sample boreholes and trial pits were selected in order to give the widest possible coverage, with respect being given to the Site's current agricultural use. It should be noted that the area in the south-eastern corner of the Site identified as a 'settling pond' was not subject to intrusive investigation due to health and safety concerns.

Any other issues not listed in the scope of works, but subsequently identified during the completion of the Site investigation and reported herein (such as the potential presence of Japanese knotweed, flood assessment studies or ecological surveys) are provided for information only and fall outside the scope of this Assessment. The Report does not constitute an archaeological or ecological assessment, nor does it constitute an asbestos inspection or flood assessment.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client, Professional Soils Laboratory, Chemtech Ltd and others. Delta-Simons' conclusions, opinions and recommendations are based upon this information and the information obtained during the Site investigation. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions that Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

2.0 ENVIRONMENTAL SETTING

2.1 Information from the Planning Consultant

Delta-Simons has been provided, for information purposes, with a copy of the Local Development Framework document pertaining to this Site, which includes a summary of the likely end-uses and 'skeleton' proposed Site layouts.

2.2 Desk Top Review

Data obtained from the Planning Consultant and other sources has been summarised in the table below.

Current Site Status and Surrounding Area	<p>The Site comprises an approximate rectangular parcel of land south of Fields End Farm, extending to an area of approximately 22 Hectares, located on the eastern urban/rural fringe of Hemel Hempstead in Hertfordshire.</p> <p>The Site currently comprises arable farmland, and is divided into four areas as follows:</p> <ul style="list-style-type: none"> Δ The western half of the Site comprises a single field (roughly 50 % of the total Site area) with the division between the western and eastern areas being formed by deciduous tree line and dry ditch; and Δ The eastern half of the Site is further sub-divided into three areas, comprising two fields and a settling pond, with the settling pond comprising approximately 5 % of the total Site area. <p>The Site boundaries are formed by structural tree planting of deciduous species to all aspects, with Pouchen End Lane running in a generally north to south direction along the Site's western boundary.</p> <p>Beyond the Site boundaries the land comprises arable farmland to the north, south and west, with residential housing to the east.</p> <p>A Site location map and Site layout plan are given in Figures 1 and 2 respectively.</p>
Geology	<p>The 1:50,000 British Geological Survey map for the area indicate that the Site geology is likely to comprise clays of the Clay with Flints Formation overlying Chalk.</p>
Hydrogeology	<p>From the EA Aquifer Designation Map, the solid (Chalk) geology underlying the Site is classified as a Major Aquifer and the Site is within a Source Protection Zone (Zone III).</p> <p>There are two licensed abstractions from groundwater recorded within 250 m, located north of the Site.</p>
Hydrology	<p>The nearest surface water feature is a settling pond located in the Site's south-eastern corner. Beyond this, no surface water features are noted within 250m of the Site.</p>
Other Environmental / Land Features	<p>Reference to the online EA Flood Risk maps indicates that the Site is not located in an area that is considered to be at risk from fluvial flooding.</p>

Historical Land Features of the Site and Surrounding Area	<p>The current Site layout and field boundaries reflect those shown in the earliest historical mapping obtained as part of this investigation.</p> <p>The land surrounding the Site remains unchanged from the earliest obtained mapping, up until to the most recent mapping which shows the encroachment of residential properties in the east.</p>
Coal Mining	<p>The Site is not considered to be at risk from any coal mining activities.</p>
Hazardous Ground Gas	<p>No potential sources of hazardous ground gas have been identified.</p> <p>The BRE Radon Gas Map for the Site indicates that the Site is located in an area where radon gas protective measures are not required.</p>

2.3 Initial Conceptual Site Model

Based on the findings of the desktop review, an Initial CSM has been developed and is presented overleaf.

Table 1 – Potential Pollutant Linkages

Source	Pathway	Receptor	Matrix Assessment	Justification
No Sources Identified	Vertical migration through permeable deposits below the Site	Major Aquifer	Low Risk	Absence of source
	Direct contact/ingestion and inhalation of dust and vapours	Human Health	Low Risk	Absence of source
	Direct contact and leaching	Buildings and services (including water supply pipes)	Low Risk	Absence of source
Ground Gas	Vertical & lateral migration	Human Health and buildings	Low Risk	Absence of source

Risk Definitions are included within Appendix I.

3.0 SITE INVESTIGATION

3.1 Intrusive Locations and Soil Sampling

In order to obtain information on the ground conditions across the Site, 18 window sample boreholes with Dynamic Penetration Tests (DPTs) referenced WS 101 to WS 118) were advanced at the Site between the 5th and the 10th of May 2011 using a tracked window sample rig. Window sample boreholes and DPTs were advanced to a maximum depth of 6.00 m.

The locations of the window sample boreholes are shown on Figure 3 and the borehole logs are included as Appendix II. Soil samples were collected from the arisings for environmental analysis. Window sample boreholes WS 101, WS 104, WS 106, WS 107, WS 110 and WS 115 were installed with 50 mm internal diameter monitoring wells to facilitate ground gas and groundwater monitoring. The construction of the monitoring wells is detailed on the individual window sample borehole logs. The remainder of the window sample boreholes were backfilled with arisings.

In order that greater coverage could be achieved and further detail obtained, a total of 26 trial-pits and four hand-auger holes were excavated to a maximum depth of 4.00m bgl. The locations of the trial pits are shown on Figure 3 and the logs are included as Appendix II.

Geotechnical and Chemical analysis was performed on 14 soil samples collected from the Site (six geotechnical and eight chemical). Chemical analyses were selected on the basis of the potential pollutant linkages identified in the CSM and field observations and to obtain representative data on ground conditions at the Site. Geotechnical analyses were selected on the basis of the encountered ground conditions and in the context of the proposed development. The location, depth and suite of analyses selected for each soil sample is presented in Table 2.

Table 2 – Soil Sample Analyses

Intrusive Location	Depth (m bgl)	Chemical Determinands				Geotechnical Determinands			
		Heavy Metals	TPH	STPH	sPAH	pH	Plastic and Liquid Limits	Moisture Content	CBR
WS 101	0.20	X	X	X	X	X			
WS 101	0.30						X	X	X
WS 104	0.30	X	X	X	X	X			
WS 104	1.00	X	X	X	X	X			
WS 107	0.40						X	X	X
WS 108	1.50						X	X	
WS 109	1.00						X	X	
WS 110	0.20	X	X	X	X	X			
WS 110	0.50	X	X	X	X	X			
WS 111	1.00						X	X	
WS 113	0.10	X	X	X	X	X			
WS 114	0.10	X	X	X	X	X			
WS 114	1.50						X	X	
WS 118	0.30	X	X	X	X	X			
TOTAL		8	8	8	8	8	6	6	3

Note: Heavy metals = Arsenic, boron, cadmium, chromium, copper, zinc, lead, mercury, nickel, selenium
 TPH = Total petroleum hydrocarbons
 sTPH = Speciated total petroleum hydrocarbons
 sPAH = Speciated polycyclic aromatic hydrocarbons
 pH = Acidity/Alkalinity

3.2 Groundwater Sampling

Groundwater was not recorded during the intrusive investigation works or during the subsequent visits for monitoring, therefore, no sampling was undertaken.

3.3 Ground Gas Monitoring

Measurements of methane, carbon dioxide and oxygen concentrations, atmospheric pressure and borehole flows were made in each of the monitoring wells on the 10th 16th, 25th and the 31st May 2011. The soil gas concentrations were recorded using an infrared gas analyser (Gas Data, GFM Series). Gas flow readings were measured using a Geotechnical Instruments Flow Pod. The monitoring sheets are included as Appendix III.

4.0 RESULTS & ASSESSMENT

4.1 Ground Conditions

Made Ground was not recorded at the Site. Generally the geological sequence comprised topsoil extending to depths of approximately 0.35 m bgl, overlying gravelly clays rested upon chalk.

Topsoil

The topsoil at the Site generally comprised a dark brown gravelly clayey organic reworked soil with frequent roots. Topsoil thicknesses were recorded between 0.15 m and 0.35 m.

Clay

Generally firm and stiff brown and light brown sandy gravelly clay was encountered at the Site beneath the topsoil. The clays were variable in their granular composition, with very gravelly clays recorded in the southern areas of the Site, and only slightly gravelly clays encountered in the central areas of the Site. Where granular fractions were highest within the clay matrix, coarse gravel and cobbles were also recorded as being present. The full extent of the clay was not proven in all of the exploratory holes.

Chalk

Very weak white chalk was encountered beneath the clays, most frequently in the far northern and south-eastern areas of the Site. The chalk was varied between weak white chalk and cream structureless 'putty' chalk. The full depth of this stratum was not proven as part of this investigation.

Dissolution Features

Although not fully substantiated, there remains a risk that chalk dissolution may have occurred at this Site given the variability in chalk condition and it's only sporadic presence at shallow depth.

Groundwater

No groundwater was encountered during either drilling or the excavation of the trial pits, and all exploratory holes were noted as being stable during advancement. It

should be noted, however, that prevailing conditions were noted as being exceptionally dry at the time of the investigation.

4.2 Visual and Olfactory Evidence of Contamination

No olfactory or visual evidence of contamination was identified within either the window sample boreholes or the trial pits during the Site investigation.

4.3 Analytical Results: Soils

4.3.1 Soils: Available Guidance

In the absence of a complete published set of screening values derived by the Regulators using the new CLEA Framework, Delta-Simons will refer to the following:

- △ The new Soil Guidance Values (SGVs) published by the EA;
- △ Former SGVs for which no updated SGV has been published;
- △ The 2009 Chartered Institute of Environmental Health (CIEH)/Land Quality Management (LQM) Generic Assessment Criteria (GAC);
- △ The guidance values produced by the Environmental Industries Commission (EIC), the Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Application in Real Environments (CL:AIRE) in December 2009; and
- △ In house Generic Screening Values (HH-GSVs) derived by Delta-Simons and other non UK values where considered relevant.

These guidance values are presented in Appendix IV.

For the purpose of this Assessment, the analytical results have been assessed against guidance values for a residential end-use with gardens.

4.3.2 Summary of Analytical Results: Soil Analysis

A total of eight soil samples were submitted for a range of chemical analyses. A complete set of analytical results for soils is provided within Appendix V. A summary of the pertinent findings is presented below:

- △ The samples of topsoil and natural clay can be generally considered to be uncontaminated, with concentrations of hydrocarbons and heavy metals contaminants that were either below the detection thresholds, or below the relevant UK guidance thresholds, and as such, based upon the results

obtained, the proposed development area can be considered to be uncontaminated.

4.4 Analytical Results: Groundwater

4.4.1 Groundwater: Available Guidance

The Freshwater Environmental Quality Standards (FEQS), the UK Drinking Water Quality Standards (DWQS) or World Health Organisation Drinking Water Guidelines (WHO DWG) have been used as initial conservative screening values to assess whether groundwater contamination requires further assessment or discussion in terms of both the risks to controlled waters and Human Health. The chosen guidance values relate to the sensitivity of the Site setting.

In terms of risk to Human Health, where groundwater contaminant concentrations (for volatile organic compounds and lighter fraction hydrocarbon bandings) exceed the above stringent water quality standards, the concentrations can be compared to HH-GSVs that have been derived by Delta-Simons for groundwater using the Risk Based Corrective Action (RBCA) Toolkit for Chemical Releases (adapted where necessary to be in line with the CLEA methodology). The HH-GSVs are based upon the indoor inhalation pathway as it is considered unlikely that there will be direct contact with or direct consumption of groundwater at the Site. The HH-GSVs are presented in Appendix IV.

In terms of the risks to controlled waters, groundwater contaminant concentrations that exceed the above stringent water quality standards need to be considered in the context of the Site's environmental setting as to whether further qualitative or quantitative assessment is required.

4.4.2 Summary of Analytical Results: Groundwater Analysis

Groundwater was not encountered during the Site investigation or subsequent monitoring in significant volumes. As such it was not possible to undertake groundwater analysis as part of this Assessment.

4.5 Hazardous Gases

4.5.1 Available Guidance

Upon completion of the ground gas monitoring, the results of the gas monitoring can be used to assess the level of risk associated with the presence of gas at the Site. From available guidance (CIRIA, C665), a classification system has been developed using both the gas concentrations and the borehole flow rates to define a Characteristic Situation for the Site based on the GSV for methane and carbon dioxide.

The GSV is calculated by multiplying the borehole flow rate (l/hr) by the gas concentration (% v/v), using the maximum recordable concentrations of methane and carbon dioxide and the maximum recordable positive gas flow rate. Once calculated, the GSV can be further assessed using Table 8.5 and Table 8.6 in CIRIA, C665, in order to provide typical scopes of protection measures for the proposed development.

4.5.2 Ground Gas Monitoring Results

Measurements of methane, carbon dioxide and oxygen concentrations, atmospheric pressure and borehole flows were made in each of the monitoring wells on the 10th, 16th, 25th and the 31st May 2011. Barometric pressure ranged between 998 mb and 1008 mb during the monitoring events.

Table 3 – Summary of Ground Gas Monitoring Results.

Maximum Methane (% v/v)	Maximum Carbon Dioxide (% v/v)	Minimum Oxygen (% v/v)	Maximum flow rate (l/hr)	GSV (l/hr) (CIRIA 665)	Characteristic Situation
<0.1	2.2	17.2	<0.1	0.0022	1

Following a review of the available ground gas monitoring results that have been undertaken as part of this investigation, and consideration of the prevailing geology (generally comprising low permeability clays overlying chalk), it is considered that the ground gas regime at the Site falls under Characteristic Situation 1, which represents the lowest risk characterisation, under which ground gas protection measures are not required.

5.0 CONTAMINATED LAND RISK ASSESSMENT

The regulatory framework for contaminated land risk assessment is discussed in Sections 5.1 and 5.2 below. The qualitative risk assessment for this Site is provided in Section 5.3.

5.1 Environmental Protection Act 1990

The clean-up of historical contamination is controlled under a specific statutory scheme found in Part 2A of the Environmental Protection Act 1990 (Part 2A), as inserted by the Environment Act 1995, and other 'rules' found in regulations and statutory guidance. The Act came into force in England in April 2000.

The LA has the primary role in inspecting land within its area and identifying land, which is deemed to be contaminated for the purposes of Part 2A. Once contaminated land has been identified, responsibility is divided with the EA taking control over sites where risks from contamination are perceived to be high (special sites). The definition of contaminated land is, therefore, central to the operation of Part 2A. Section 78A (2), EPA 1990 provides that for the purposes of Part 2A contaminated land is defined as:

Any land which appears to the LA in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled water is being, or likely to be, caused.

Harm is defined as meaning:

Harm to the health of living organisms or other interference with the ecological systems of which they form part and in the case of man includes harm to his property.

Section 86 of the Water Act 2003, which will be implemented in stages, will amend the definition of contaminated land so that Part 2A only applies where 'significant' pollution of controlled waters is being caused or there is a 'significant' possibility of such pollution being caused. Statutory Guidance for the determination of what is "significant" pollution has yet to be issued, as this requires careful and key

consideration in conjunction with the implementation of the new EC Water Framework Directive.

The statutory definitions are meaningless without the backing of statutory guidance and the enforcing authorities are required to act in accordance with the guidance on the definition of contaminated land.

5.2 Significant Harm

The guidance introduces the concept of the 'pollutant linkage'. A pollutant linkage is formed when there is a linkage between a contaminant source and a receptor or target by means of a pathway. If any one aspect is missing no linkage is formed. Where such a linkage is present it must be 'significant' forming what is known as a 'significant pollutant linkage' (SPL) for the land to come within the definition of 'contaminated land' under Part 2A. Significance is assessed in relation to the types of targets, which are being harmed, the degree or nature of the harm and the possibility of harm being caused. The focus of a risk assessment in relation to Part 2A is, therefore, the identification of sources, pathways, receptors and significant pollutant linkages.

The guidance also defines the types of receptors, which can form part of the SPL and comprises human beings, nature conservation sites (those protected under nature conservation laws), buildings and other property (covers crops and animals which are subject to property rights such as livestock). Any targets outside these categories do not fall under Part 2A.

In terms of harm, for humans this includes serious injury, birth defects and impairment of reproductive functions. In relation to nature conservation sites it includes harm, which results in irreversible, or substantial adverse changes to the functioning of the ecosystem. In relation to property it includes substantial loss in crop value or substantial damage to buildings.

5.3 Revised Conceptual Site Model

The risk assessment procedure which identifies sources, pathways, receptors and pollutant linkages is recognised as an appropriate approach to determining the extent and significance of contamination either within the context of Part 2A, or as part of the planning process.

This risk assessment has been undertaken for the Site based upon the suitable for use approach in the context of the Site being redeveloped with a residential with gardens end-use. This revised CSM provides an update to the initial CSM discussed in Section 2.2 of this Report, based upon the findings of the intrusive investigation. The revised CSM is presented overleaf.

Table 4 – Identified Pollutant Linkages

Source	Receptor	Pathway	Matrix Assessment	Assessment of the Significance of the Linkage
None Identified	Future Site users (residents and visitors)	Direct contact/ ingestion and inhalation of dust	Low Risk	Absence of source
		Inhalation of volatile vapours	Low Risk	Absence of source
	Groundworkers during any future landscaping works	Direct contact/ ingestion and inhalation of dust and vapours	Low Risk	Absence of source
	Off-Site receptors including passers-by	Dust inhalation	Low Risk	Absence of source
	Controlled waters (surface water courses and groundwater Aquifer)	Horizontal and vertical leaching of contamination	Low Risk	Absence of source
	Water supply pipes	Direct infiltration	Low Risk	Absence of source
	Plants in landscaped areas	Root zone uptake	Low Risk	Absence of source
Ground Gas	Future Site users and buildings	Lateral and vertical migration	Low Risk	Absence of source

Risk Definitions are included within Appendix I.

6.0 GEOTECHNICAL RESULTS

The results of the geotechnical tests carried out on soil samples are included in Appendix VI.

6.1 Geotechnical Appraisal

The Site comprises arable farmland as described in Section 2.1 of this Report.

6.1.1 Structural Foundations and Floor Slabs

The ground conditions beneath the Site have been shown to comprise a layer of topsoil extending to a maximum recorded depth of 0.35 m bgl, overlying generally firm to stiff clays rested upon weak and very weak chalk as described in Section 4.1 of this Report.

Groundwater has not been encountered at shallow depth beneath the Site, though this should be treated with caution due to the exceptionally dry conditions experienced at the time of the investigation.

Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction. Initial assessments indicate that an allowable bearing capacity of 125kN/m² would be suitable located at a minimum within the firm to stiff clays beneath any topsoil or other unsuitable soil, however, due to the risk of laterally variable granular fractions and soil strengths it is recommended that allowable bearing capacities are limited to 100kN/m². It is recommended that foundations are reinforced against differential settlement.

Geotechnical analysis has found the clay soils to be of high to very high shrinkability, therefore, appropriate precautions in line with NHBC guidance, especially where trees currently exist, should be adhered to. This may include the extending, or reinforcing of foundations where appropriate, and the use of void formers near to where trees are existing, are to be removed, or are proposed. As a result, suitable foundation formation depths are likely to vary across the Site, and allowances should be made for this.

There were no conclusive indications of dissolution features recorded in the investigation. The foundation formation level should be inspected for dissolution

features and fractures, with any significant 'puttied' or highly weathered material removed prior to construction. Should any unusual ground conditions be encountered, the advice of a geotechnical engineer should be sought prior to placement of concrete. If unusual features are encountered, localised deepening of the formation would be required, or the foundation designed to span the affected area. Once deemed suitable, the formation should be protected upon exposure to prevent spoiling through moisture content variation.

6.1.2 Groundworks

Shallow excavations are likely to remain stable, except for extended periods, where support may be required during construction. Once below about 1.00 m depth, close boarded support is recommended.

During all excavation work, particular care will be needed to maintain footways and services. If excavations exceed approximately 1.00 m in depth, the need for ground support to be provided before workers enter them must be considered, in compliance with Health and Safety legislation. Loadings from neighbouring structures and traffic must be considered in the design of ground support systems. Heavy plant and stockpiles of materials must not be placed close to the edges of open excavations.

6.1.3 External Works

The formation for new paved areas and access roads is likely to comprise the natural gravelly clays.

A design California Bearing Ratio (CBR) value for the shallow depth stiff clay soils of 5 % may be adopted, and the clays are considered to be sufficiently competent to support the construction of new roads and pavements without the need for any abnormal preparatory work.

6.1.4 Drainage

The shallow-depth ground conditions where the clays are present at the Site are not suitable for soakaway drainage due to the cohesive ground conditions. The chalk present at increased depth may be suitable for soakaway drainage subject to the appropriate field testing being undertaken.

6.1.5 Sulphate Attack on Buried Concrete

Soluble sulphate concentrations were generally recorded below the laboratory detection limits and pH values ranged between neutral and slightly alkaline, with the risk of Oxidisable Sulphides assessed as being low.

The Design Sulphate Class for the Site is DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1, from Table C2 of BRE Special Digest 1, Concrete in aggressive ground, 2005.

7.0 ASSESSMENT OF RISKS AND LIABILITIES

This Assessment considers both perceived and actual risks using the Source, Pathway, Receptor concept, with the principal measure of risk being whether significant harm to people, animals, property, (including buildings, cattle or ecosystems etc) or pollution of controlled waters (surface water bodies, aquifers, coastal waters, or territorial waters) is being caused, or whether there is a significant possibility of such harm being caused.

The overall risk classification, based on the source-pathway-receptor principle, adopted for this preliminary assessment, is defined as follows:

- △ Low risk – issue unlikely to present a liability or cost;
- △ Moderate risk – issue may present a liability or cost, but these may be limited;
and
- △ High risk – likely that liabilities and/or costs exist.

7.1 Regulatory Body Enforcement

7.1.1 Part 2A of the Environmental Protection Act 1990

Based on the available information, Delta-Simons considers that the risk of remediation being enforced on the Site under the terms of Part 2A is low.

7.1.2 Planning and Development Control

Prior to any future major application for redevelopment on the Site it is likely that further assessment of the environmental condition of the land may be required by the Local Planning Authority as a condition of planning.

7.1.3 Water Resources Act (WRA)

Based on the available information, Delta-Simons considers there to be a low risk that the Site is likely to present a risk of pollution to controlled waters and invoke prosecution under the WRA.

7.2 Third Party Liability

Delta-Simons considers that the risk of legal action from a third party with regard to contamination migration from the Site is low.

7.3 Investment/Asset Impact

Delta-Simons considers there to be a low risk of significant adverse impacts on the commercial value of the Site, in relation to contamination issues.

8.0 CONCLUSIONS & RECOMMENDATIONS

8.1 Environmental Conclusions

The Site comprises an approximate rectangular parcel of land south of Fields End Farm, extending to an area of approximately 22 Hectares, located on the eastern urban/rural fringe of Hemel Hempstead in Hertfordshire as described in Section 2.2 of this report.

- △ There were no potential sources of contamination identified at the Site during the initial Site inspection;
- △ The ground gas regime has been categorised as CS-1;
- △ A Site investigation has been carried out in order to assess the ground conditions in the context of a proposed residential end-use of the Site; and
- △ No visual or olfactory evidence of contamination was identified at the Site during the investigation, and, therefore, the Site can be considered as being uncontaminated.

8.2 Geotechnical Conclusions

The ground conditions beneath the Site have been shown to comprise a layer of topsoil extending to a maximum recorded depth of 0.35 m bgl, overlying generally firm to stiff clays rested upon weak and very weak chalk as described in Section 4.1 of this report.

- △ Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction. Initial assessments indicate that an allowable bearing capacity of 125kN/m² would be suitable located at a minimum within the firm to stiff clays beneath any topsoil or other unsuitable soil, however, due to the risk of laterally variable granular fractions and soil strengths it is recommended that allowable bearing capacities are limited to 100kN/m²;
- △ It is recommended that foundations are reinforced against differential settlement;
- △ The clays are found to be of high or very high shrinkability and, therefore, allowances should be made for this in foundation design;
- △ There were no conclusive indications of the presence of dissolution features;

- △ The Site is not suitable for the use of soakaway drainage at shallow depth due to the predominantly cohesive ground conditions, however, soakways may be feasible at an increased depth within the chalk stratum subject to the appropriate confirmatory testing;
- △ The Design Sulfate Class for the Site is DS-1, and the ACEC Class is AC-1; and
- △ A design California Bearing Ratio (CBR) value for the shallow depth clay soils of 5% may be adopted, and, therefore the natural clays are considered suitable for re-use beneath roadways and pavements without the need for any abnormal preparatory work.

8.3 Environmental Recommendations

On the basis of the information obtained and reviewed as part of this assessment and the conclusions drawn above, Delta-Simons recommends the following:

- △ Any groundworkers who are required to perform sub-surface work at the Site should be made aware of the possibility of encountering unforeseen contamination. Therefore, good standards of personal hygiene should be observed with appropriate levels of PPE provided and utilised, and toolbox talks should be given to contractors prior to the commencement of works;
- △ The developer and their contractors should remain vigilant for any previously unidentified contamination; and
- △ It is recommended that this Report is submitted in support of any future planning application.

8.4 Geotechnical Recommendations

On the basis of the information obtained and reviewed as part of this assessment and the conclusions drawn above, Delta-Simons recommends the following:

- △ Any groundworkers who are required to perform sub-surface work at the Site should be made aware of the possibility of encountering unforeseen chalk dissolution features during excavations for foundations or other structures. The foundation formation level should be inspected for dissolution features and fractures, with any significant 'puttied' or highly weathered material removed prior to construction. Should any unusual ground conditions be encountered, the advice of a geotechnical engineer should be sought prior to placement of concrete. If unusual features are encountered, localised deepening of the formation would be required, or the foundation designed to span the affected

area. Once deemed suitable, the formation should be protected upon exposure to prevent spoiling through moisture content variation; and

- Δ If soakaway drainage is required, permeability testing should be undertaken within the chalk stratum to assess its suitability for this purpose.

8.5 Statement of Risk

On the basis of the CSM identified in Section 5, Delta-Simons considers that in the Site's current use, the following risk and liability statements can be made.

Table 5 – Liability Assessment

Regulatory Body Enforcement under Part 2A or WRA	There is a Low risk of enforcement action in the future.
Third Party Liability	Potential for legal action by surrounding landowners based on the potential for contamination to migrate off-Site is considered to be Low .
Investment Impact	Delta-Simons considers there to be a Low risk of impact on the value of the Site from significant contamination issues, in the context of the Site remaining in a commercial use.
Overall Statement of Risk	On the basis of available information, Delta-Simons considers that with regard to potential soil and groundwater contamination issues and associated environmental liabilities, in its current use, the Site represents an investment opportunity with a Low overall risk status.

Should the Site be redeveloped in the future for a residential end-use, the Site would still be considered to represent a low overall risk with regard to potential soil and groundwater contamination issues and associated environmental liabilities.

9.0 LIMITATIONS TO GEO-ENVIRONMENTAL ASSESSMENTS

The recommendations contained in this Report represent Delta-Simons' professional opinions, based upon the information referred to in Section 1.0 of this Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client, Landmark Information Group and others. Delta-Simons' conclusions, opinions and recommendations have been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed as defined in Section 1.1 of this Report. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

This Report was prepared by:



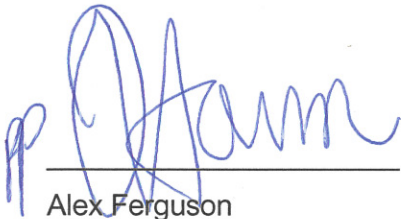
Kevin McGee

Geo-Environmental Consultant

14/06/11

Date

This Report was reviewed and authorised by



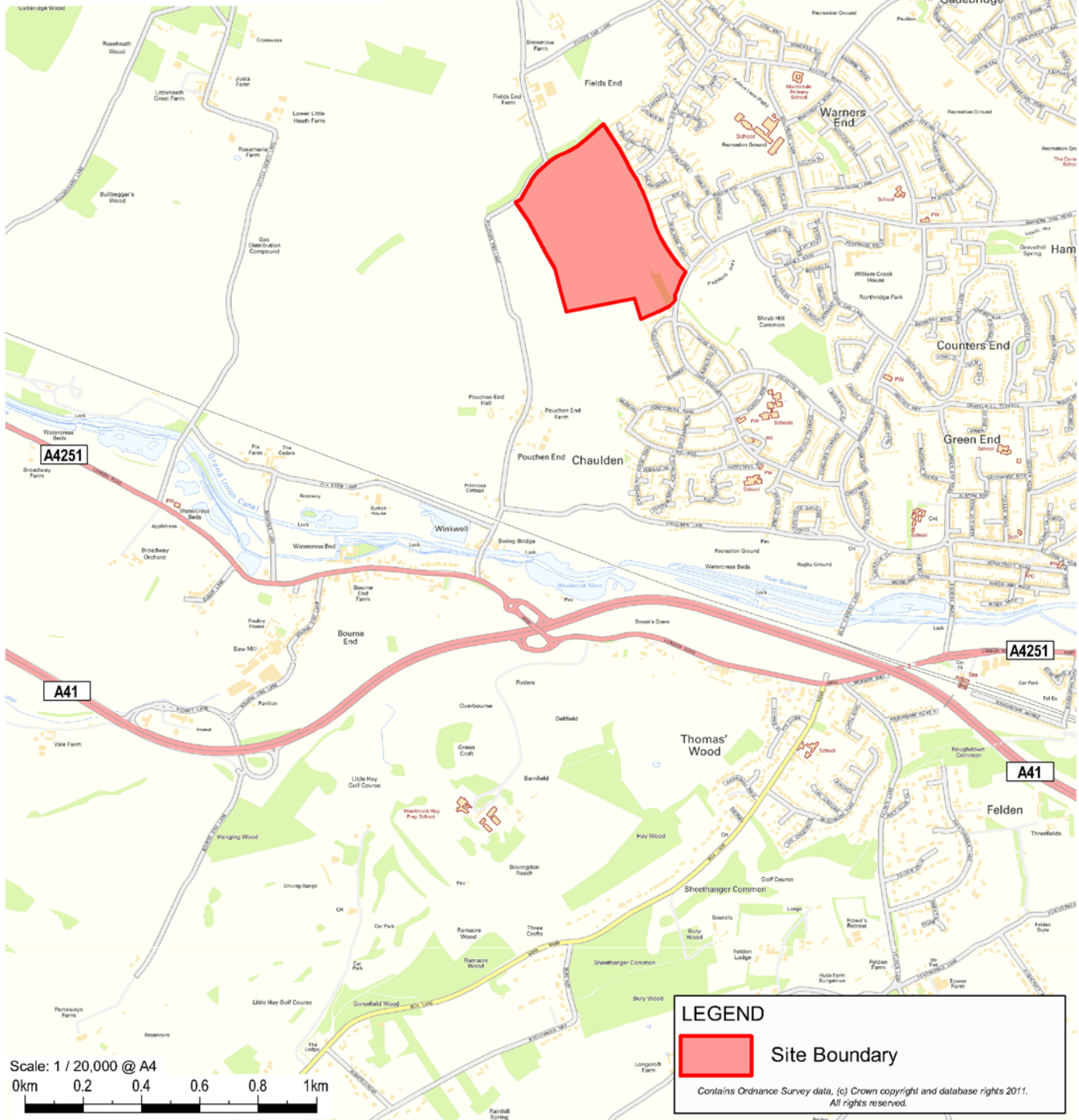
Alex Ferguson

Projects Director

14th June 2011

Date

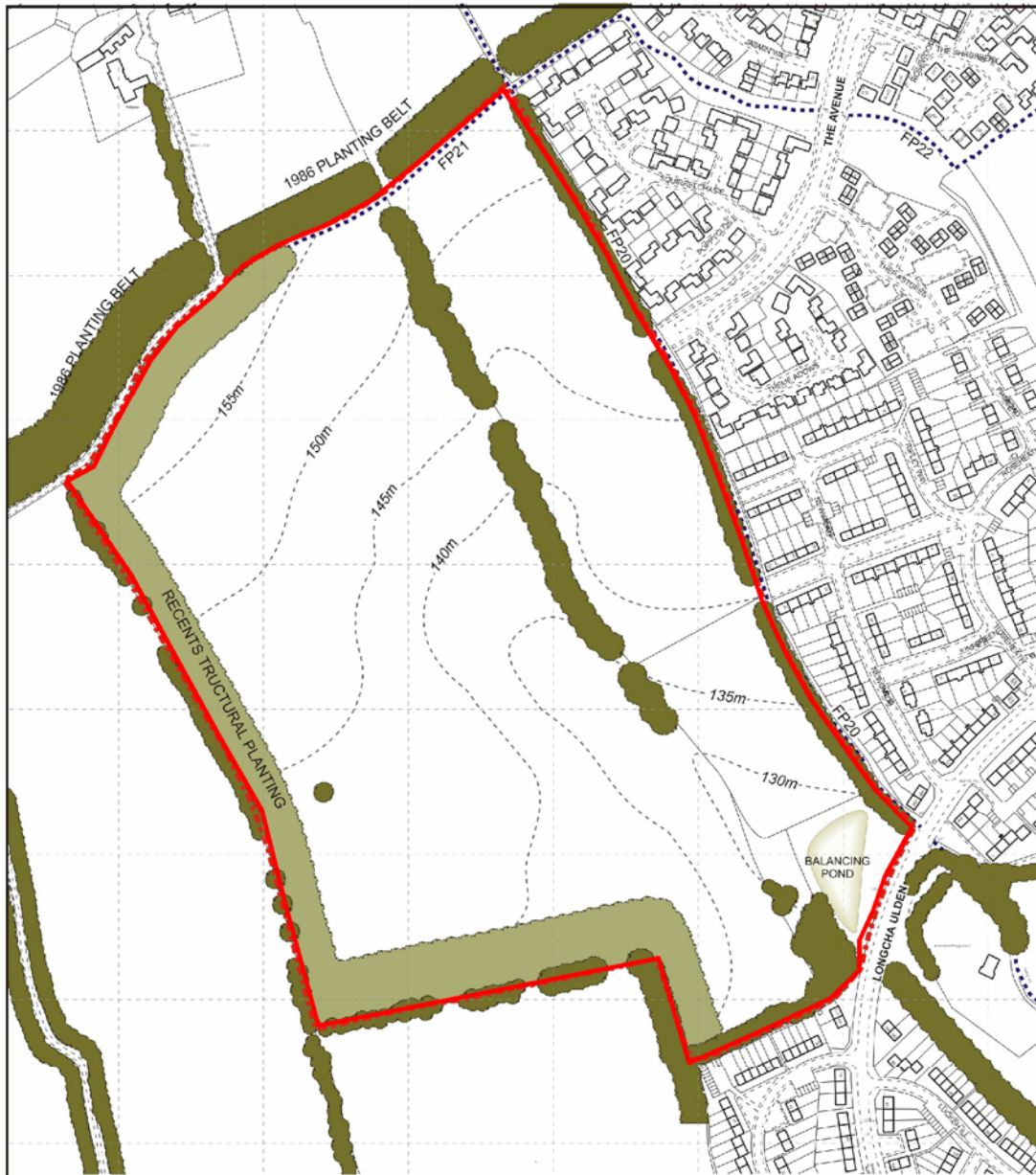
Figures



LEGEND

Site Boundary

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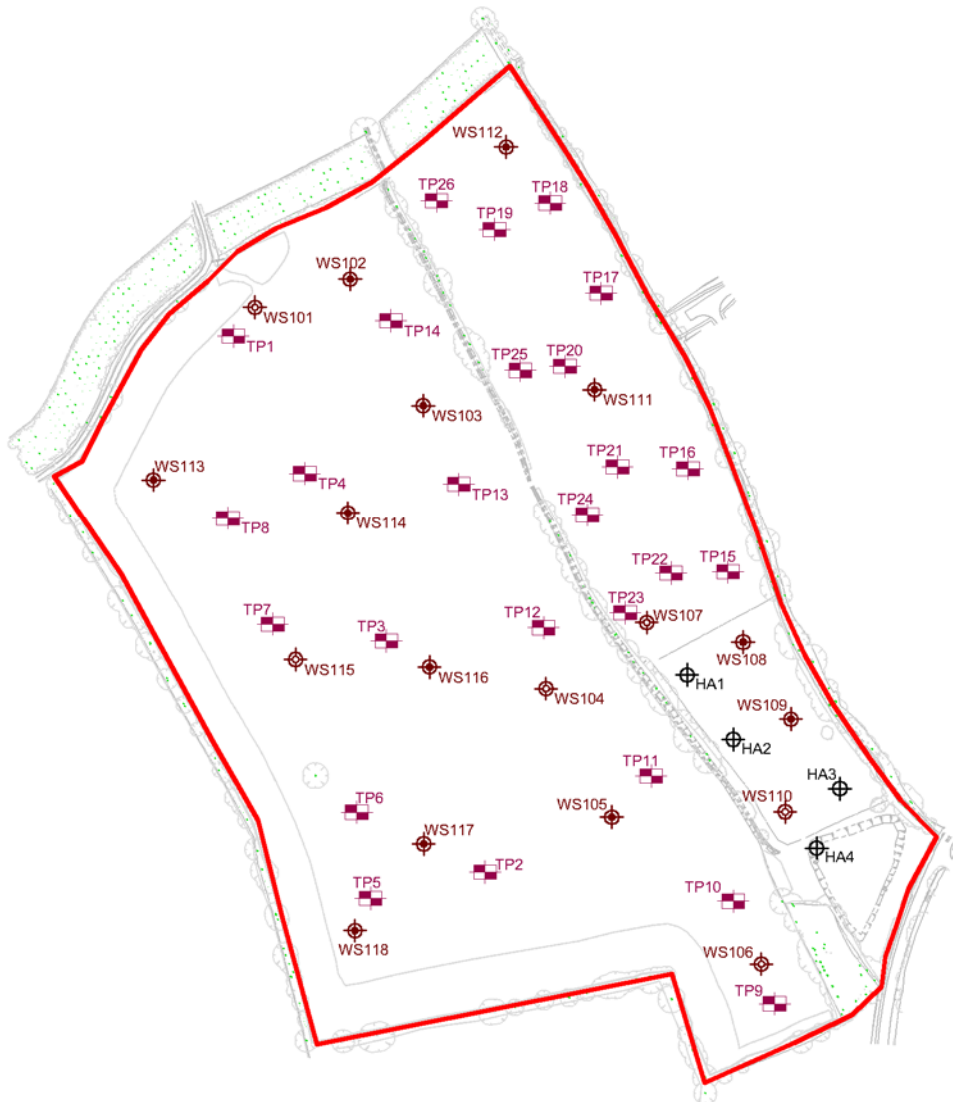
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LEGEND

 Site Boundary

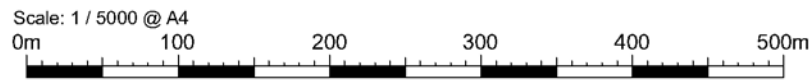
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LEGEND

- Site Boundary
- Window Sample (Installed) Advanced by Delta-Simons, May 2011
- Window Sample (Backfilled) Advanced by Delta-Simons, May 2011
- Hand Auger Advanced by Delta-Simons, May 2011
- Trial Pit Advanced by Delta-Simons, May 2011

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TITLE: Approximate Intrusive Location Plan
Hemel Hempstead

DWN: AL	DES: -	PROJECT NO.: 11-0150.01
CHK: KDM	APP: -	FIGURE NO.: 3
DATE: 12 May 2011	REV: 1	

Appendix I



A different perspective



APPENDIX I : RISK DEFINITIONS

Consequence to Receptor Definition Matrix

	Human Health	Controlled Waters	Buildings/Services
Severe Consequence	Acute or chronic permanent impact on human health.	Sensitive controlled water pollution ongoing, or just about to occur.	Catastrophic collapse
Moderate Consequence	Chronic permanent impact on human health	Gradual pollution of sensitive controlled water	Degradation of materials
Mild Consequence	Chronic temporary impact on human health	Gradual pollution of non-sensitive controlled water	Noticeable change, non-structural

Standard Risk Matrix

	Severe Consequence	Moderate Consequence	Mild Consequence
Higher Probability	Very High Risk	High Risk	Medium Risk
Median Probability	High Risk	Medium Risk	Low Risk
Lower Probability	Medium Risk	Low Risk	Very Low Risk

Probability Definitions

Probability	Definition in Context
Higher	Positive evidence of hazard, pathway and receptor
Median	Suspect hazard, pathway, and receptor
Lower	No evidence of hazard, pathway, and receptor

Risk Rank Definitions

Rank	Definition in Context
Very High Risk	Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended.
High Risk	Likely contaminated land situation, risk assessment and action recommended.
Medium Risk	Plausible contaminated land situation, risk assessment and possible action recommended.
Low Risk	Unlikely contaminated land situation, possible risk assessment and possible action.
Very Low Risk	Negligible risk, no action recommended except vigilance for changes in conditions.

Appendix II

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Project:	Fields End Farm	Project No: 11-0150.01	WS101
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1 B D2	0.20 0.30		
Very stiff light orange/brown slightly silty gravelly sandy CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			(0.70) 1.00				
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			(0.80) 1.80	D3	1.50		
White weathered CHALK with occasional medium size chalk gravel.			(2.20) 4.00	D4	2.50		
White structureless CHALK (putty like characteristics).			(1.00) 5.00	D5	4.80		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 5.0m.
4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy Clay. Sand is fine. Gravel is fine to coarse angular and includes flint.			(0.25) 0.25	D1	0.20		
Very stiff light orange/brown slightly silty sandy, gravelly, CLAY. Sand is fine, Gravel is fine to coarse, angular and includes flint.			(0.55) 0.80	D2	0.50		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(3.20) 4.00	D3 D4	1.50 3.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 4.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS103
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to coarse angular and includes flint.			0.20	D1	0.15		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			(0.80)				
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint and fine chalk gravels.			1.00	D2	1.00		
Very stiff dark orange/ black/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to medium angular to rounded and includes flint.			(0.50)				
			1.50				
			(3.50)	D3	2.50		
			5.00	D4	5.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 5.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS104
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20		
Very stiff light orange/brown slightly silty gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to coarse angular and includes flint.			(0.70) 1.00	D2	1.00		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			(2.00) 3.00	D3	2.50		

REMARKS :
 1. Engineer verified logged in general accordance to BS 5930.
 2. Groundwater not encountered.
 3. Window sample terminated at 3.0m.
 4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.40) 0.40	D1 B D2	0.30 0.40		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			(1.80) 2.20	D3	2.00		
White structureless CHALK.			(0.80) 3.00	D4	2.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS106
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1	
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.20	D1	0.15		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.80)	D2	1.50		
Very stiff dark orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.00)	D3	2.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS107
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.30) 1.60	B D2	0.40	CBR	
White/cream/ brown weathered chalk includes flint and fine chalk gravel.			(1.20) 2.80	D3	2.50		
White/brown/cream structureless CHALK. Fine to medium chalk gravel.			3.00				

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project: Fields End Farm	Project No: 11-0150.01	WS108
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.15	D1	0.10		
Stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.65)				
White/cream/brown weathered CHALK. Includes fine chalk gravel.			1.80	D2	1.50		
White/brown/cream structureless CHALK. Includes fine to medium chalk gravel.			(0.70)				
Firm light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			2.50	D3	2.50		
			(0.30)				
			2.80				
			3.00	D4	3.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20		
Stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.70) 1.00	D2	1.00		
Stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to medium angular to rounded and includes flint and fine chalk gravel.			(0.50) 1.50	D3	1.50		
White/cream/brown weathered CHALK. Includes fine to medium chalk gravel.			(1.50) 3.00	D4	2.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS110
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy Clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20		
Stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(2.40)	B D2 D3	0.40 0.50		
Stiff light orange/brown slightly silty sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular and includes flint.			2.70 2.80	D4	2.00		
White structureless CHALK (putty like Characteristics).			3.00	D5	3.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS111
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1	
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.20	D1	0.10		
Very stiff light orange/brown slightly silty slightly sandy very gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.90)				
			1.10	D2	1.00		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.90)				
			3.00	D3	2.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project: Fields End Farm	Project No: 11-0150.01	WS112
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BOREHOLE LOG	Date Started: 09-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.20	D1	0.10		
Very stiff light orange/brown slightly silty slightly sandy very gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(2.00)	D2	1.50		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			2.20 (1.30)	D3	2.50		
Brown/cream weathered CHALK with fine to medium chalk gravel.			3.50 (0.50)	D4	4.00		
			4.00				

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 4.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS113
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BOREHOLE LOG	Date Started: 10-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.20	D1	0.10		
Very stiff dark orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.60)				
Very stiff light orange/brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium angular to rounded and includes flint.			0.80				
			(1.70)	D2	1.50		
			2.50				
Cream/brown weathered CHALK with occasional medium flint gravels.			(0.50)				
			3.00	D3	3.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS114
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BOREHOLE LOG	Date Started: 10-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Dark orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.15	D1	0.10		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.95)	D2	0.50		
Very stiff light orange/brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium angular to rounded and includes flint.			(1.90)	D3	2.00		
			3.00				

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS115
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BOREHOLE LOG	Date Started: 06-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20		
Very stiff light orange/brown slightly silty gravelly sandy CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.60) 0.90	D2	0.50		
Very stiff light orange/red/grey/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(2.10) 3.00	D3 D4	2.00 3.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Installed as 50mm monitoring well.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS116
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BOREHOLE LOG	Date Started: 06-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.20	CBR	
Very stiff light orange/brown slightly silty gravelly sandy CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.50) 0.80	B D2	0.40		
Very stiff light orange/red/grey/brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(2.20) 3.00	D3 D4	1.00 2.50		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS117
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BOREHOLE LOG	Date Started: 06-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			0.20	D1	0.15		
Very stiff light orange/brown slightly silty gravelly sandy CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.80)				
			1.00				
Very stiff light orange/brown slightly silty slightly sandy very gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(2.00)	D2	1.50		
			3.00	D3	3.00		
Very stiff light orange/brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(1.20)				
			4.20				
Cream and brown structureless CHALK (putty like Characteristics).			(0.80)	D4	4.50		
			5.00				

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 5.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	WS118
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BOREHOLE LOG	Date Started: 05-05-2011	Page 1 of 1
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DESCRIPTION OF STRATA	LEGEND	WATER	DEPTH (Thickness)	SAMPLES & TESTS			BACKFILL DETAILS
				TYPE	DEPTH	RESULT	
TOPSOIL: Light orange/brown slightly silty gravelly sandy clay. Sand is fine. Gravel is fine to medium angular and includes flint.			(0.30) 0.30	D1	0.30		
Very stiff light orange/brown slightly silty slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse angular to rounded and includes flint.			(0.70) 1.00	D2	0.80		
Very stiff dark orange/brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium angular to rounded and includes flint.			(2.00) 3.00	D3	2.00		

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Groundwater not encountered.
3. Window sample terminated at 3.0m.
4. Pit backfilled with compacted arisings on completion.

(ALL DIMENSIONS IN METRES)

Plant Used: Terrier	Coordinates / Level (AOD):	Logged By: GB	Checked By: KM	Approved By:
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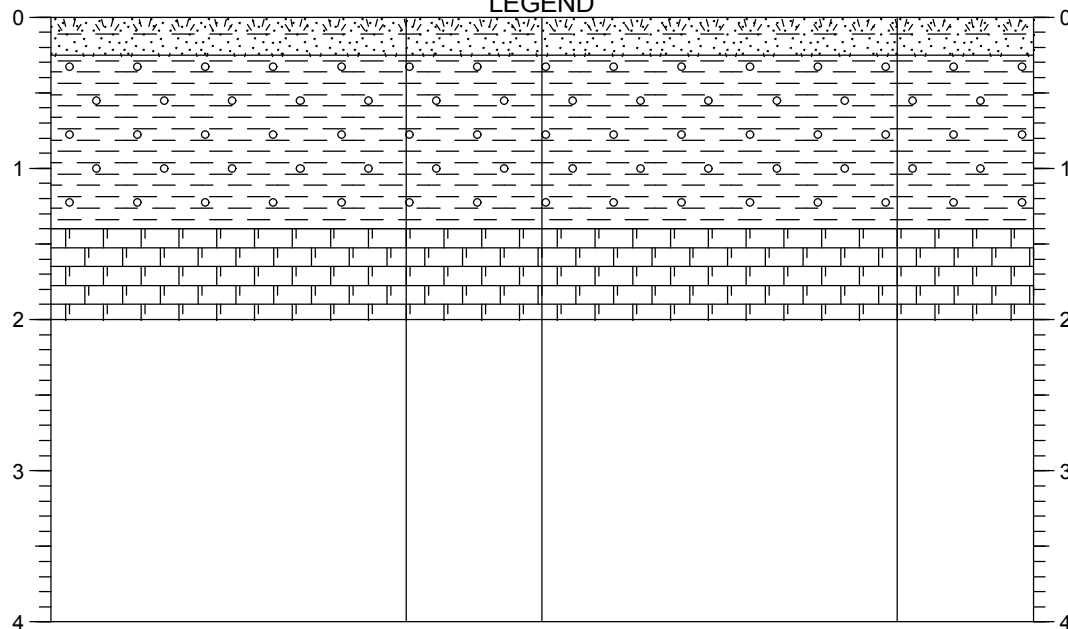
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Project:	Fields End Farm	Project No: 11-0150.01	TP1
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

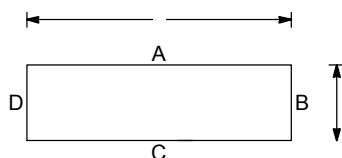


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown sandy gravelly TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.25		Firm light brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint.					
1.40		Very weak white weathered CHALK.					
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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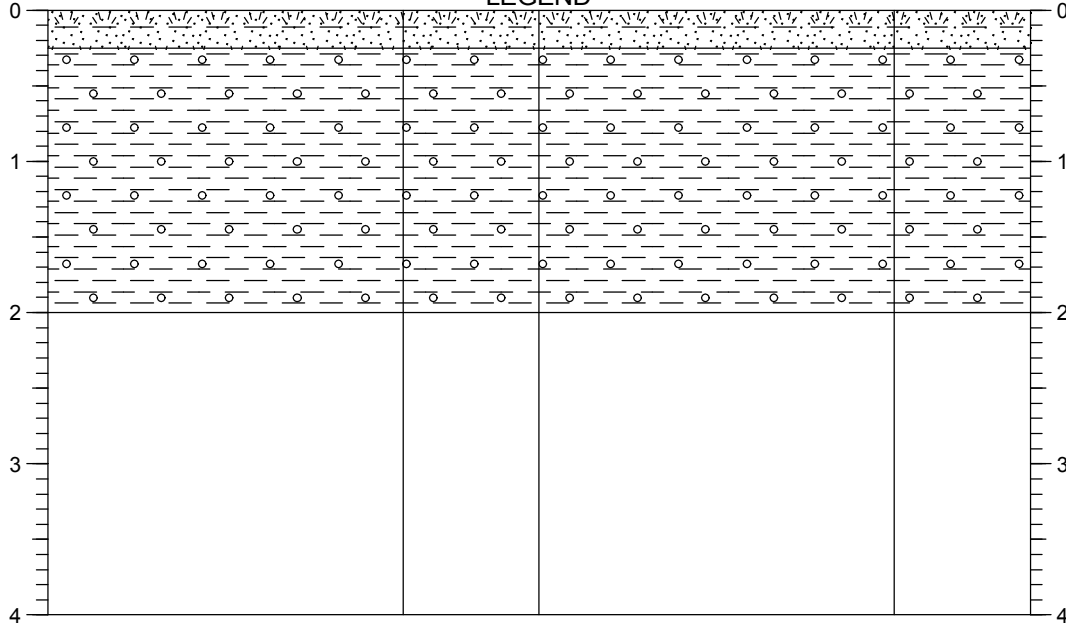
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Project: Fields End Farm	Project No: 11-0150.01	TP2
TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

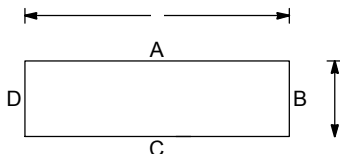


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown sandy gravelly TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. stiff brown slightly sandy very gravelly CLAY with occasional grey mottles. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint. Below 1.50m: becoming locally grey. Difficult excavation noted.					
0.25							
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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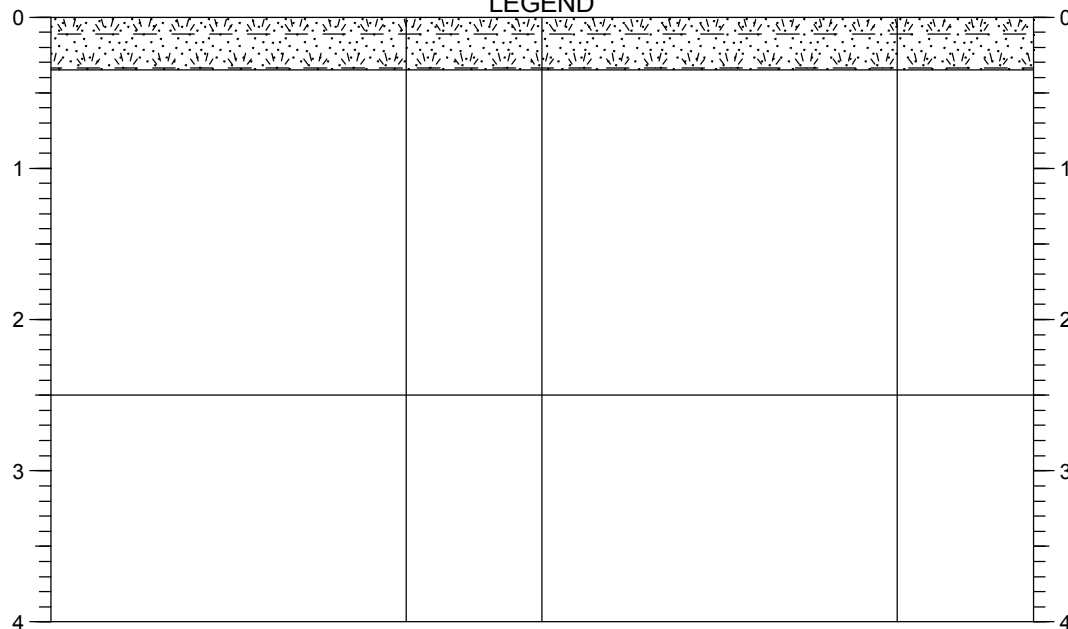
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Project:	Fields End Farm	Project No: 11-0150.01	TP3
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

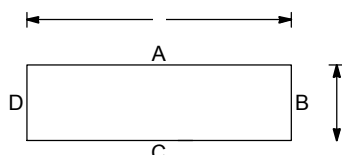


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown sandy gravelly TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.35		firm to stiff light brown and locally orange brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint. Below 1.00m: becoming locally mottled grey and slightly gravelly.					
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

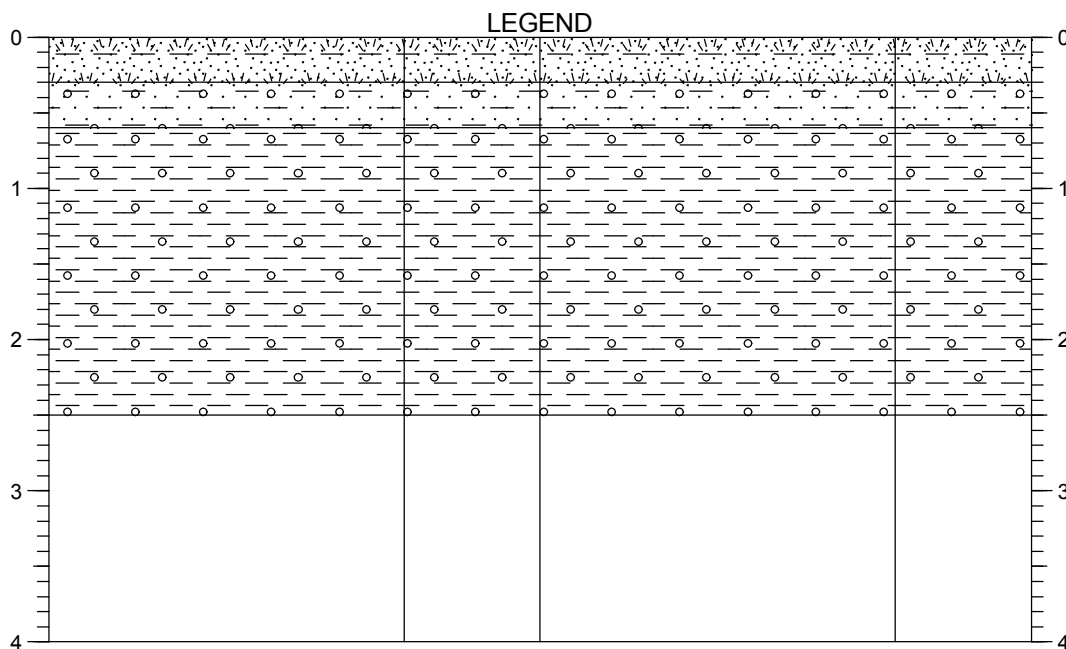
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP4
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

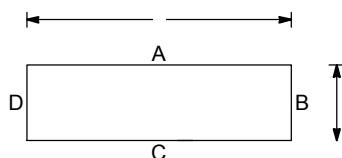


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown sandy gravelly TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30		light brown gravelly clayey fine to medium SAND. Gravel is subrounded to angular fine to coarse flint.					
0.60		stiff grey and brown slightly sandy very gravelly CLAY with occasional grey mottles. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint. Below 1.50m: becoming light brown with occasional flint cobbles.					
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
 Stability:

**REMARKS:**

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

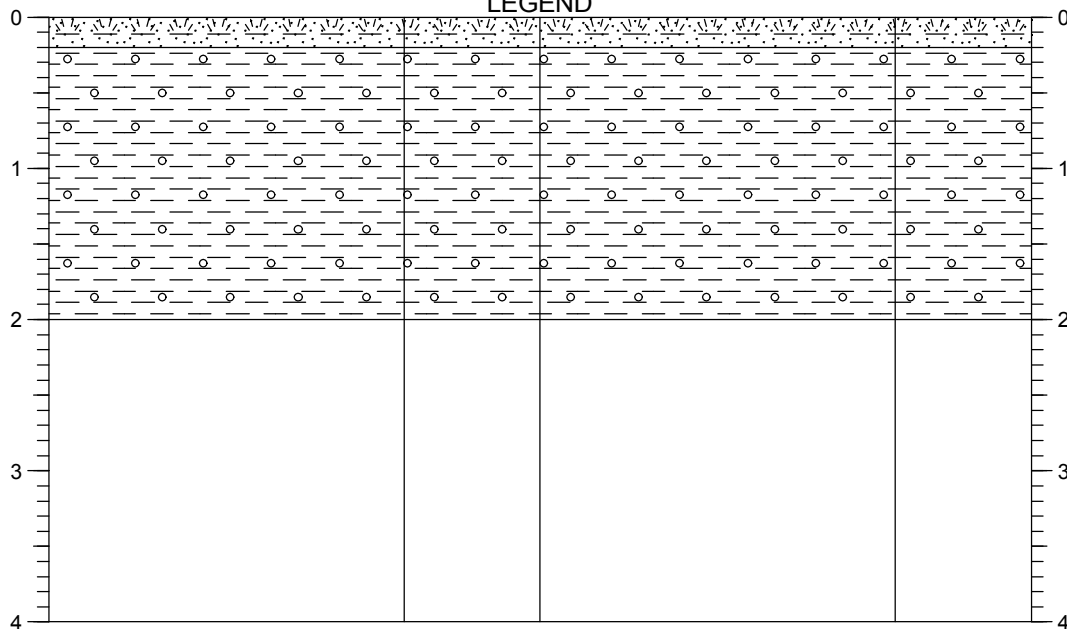
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP5
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

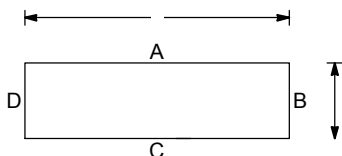


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown sandy very gravelly TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. stiff light brown slightly sandy very gravelly CLAY with occasional grey mottles. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint. Difficult excavation noted.					
0.20							
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
Stability:



REMARKS:

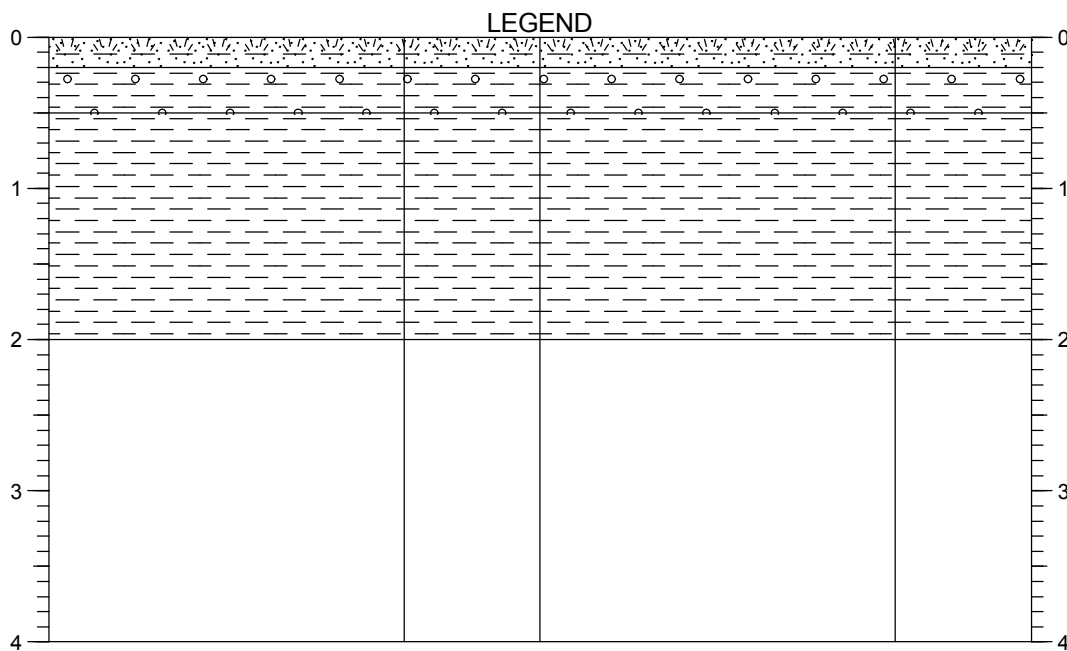
1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP6
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1



STRATA			SAMPLES & TESTS				
Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.20		Stiff brown gravelly CLAY. Gravel is subrounded to angular fine to coarse flint.					
0.50		Firm to stiff light brown, mottled grey, slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subrounded to angular fine to coarse flint and chalk.					
2.00		Trial pit complete at 2.00 m					

Shoring/Support:
Stability:

REMARKS:
 1. Logged in general accordance to BS 5930.
 2. Remained dry and stable during excavation.

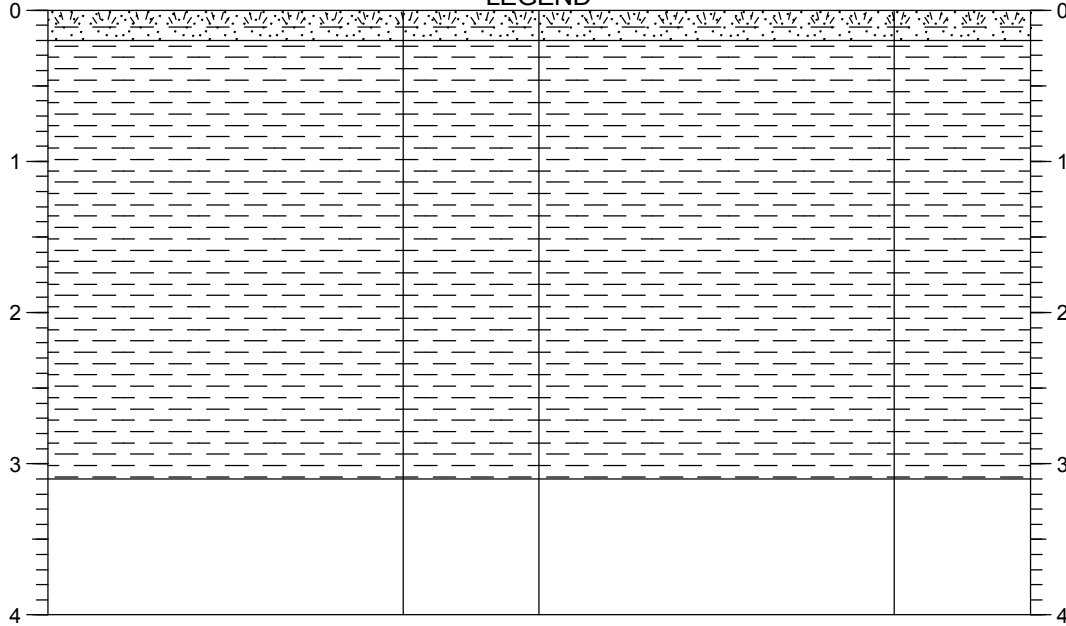
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP7
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

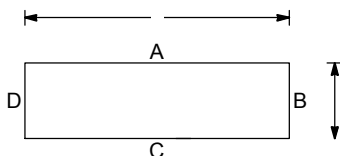


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00 0.20		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
		Firm to stiff brown slightly sandy slightly gravelly mottled grey CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse flint. 2.80m: becoming grey/brown.					
3.10		Trial pit complete at 3.10 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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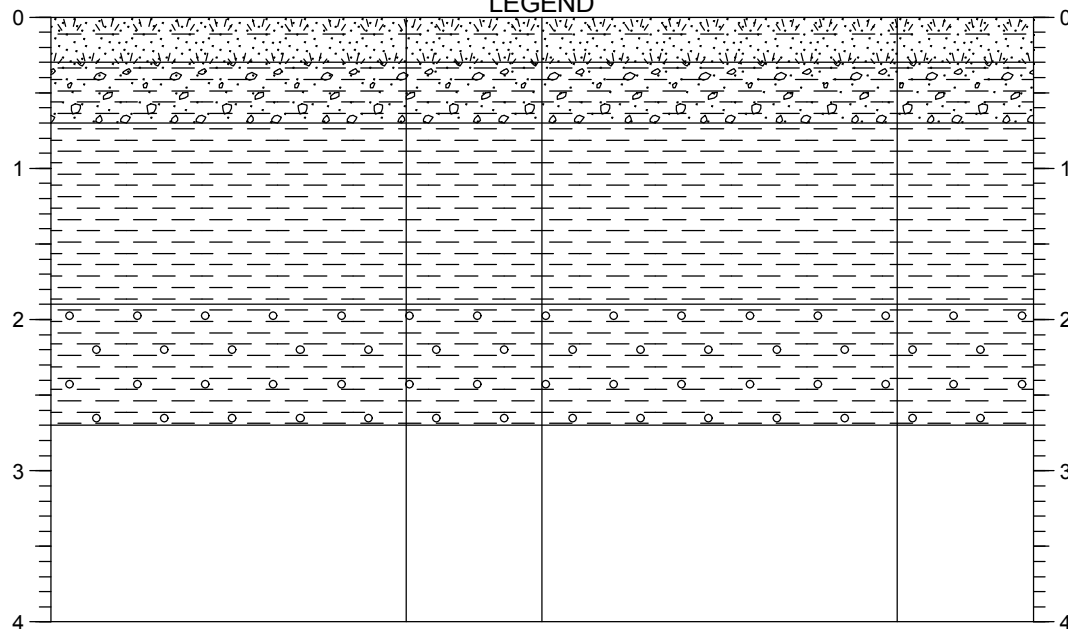
Delta Simons Environmental Consultants Ltd
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Project:	Fields End Farm	Project No: 11-0150.01	TP8
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

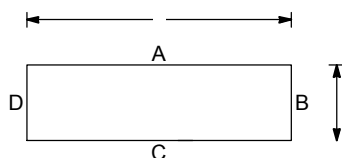


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30		Firm grey/brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint.					
0.70		Firm to stiff light brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to subangular fine to medium flint. 2.80m: becoming grey/brown.					
1.90		Stiff grey locally brown gravelly CLAY. Gravel is subrounded to angular fine to coarse flint.					
2.70		Trial pit complete at 2.70 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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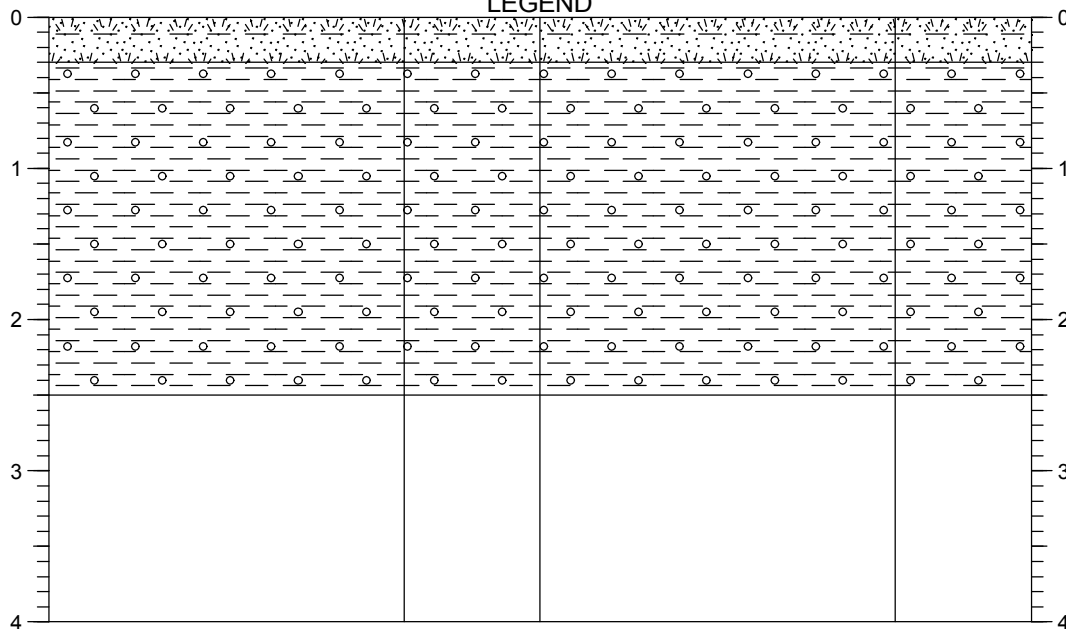
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Project:	Fields End Farm	Project No: 11-0150.01	TP9
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

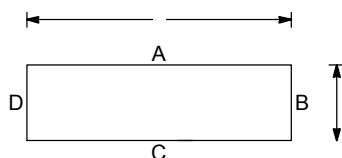


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30							
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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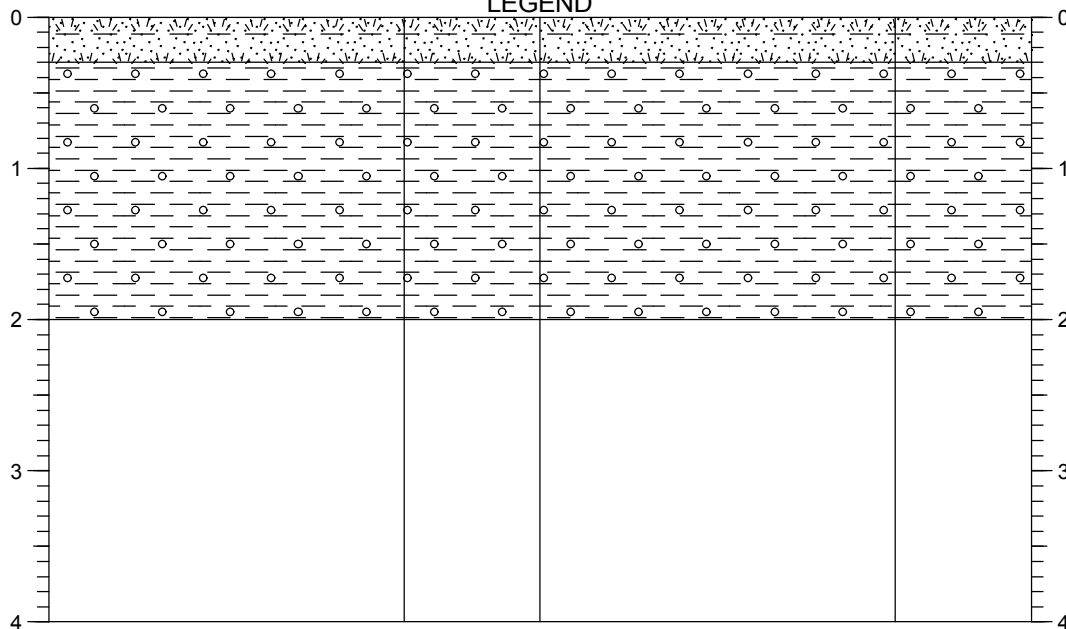
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Project:	Fields End Farm	Project No: 11-0150.01	TP10
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

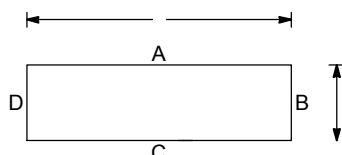


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30							
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

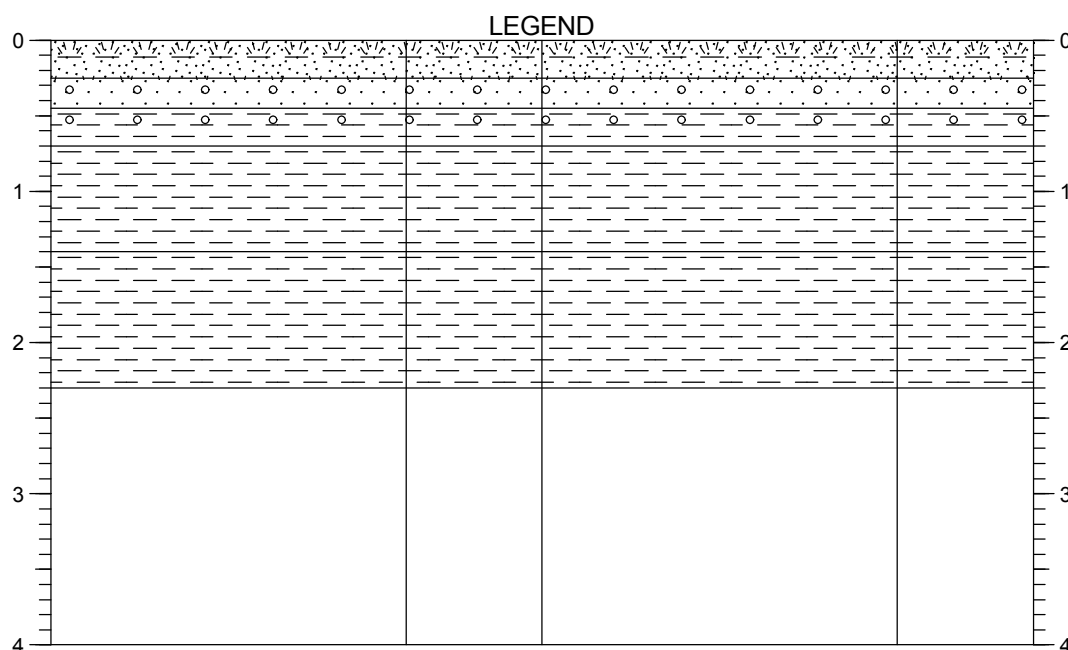
Plant Used: JCB 3X Excavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP11
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

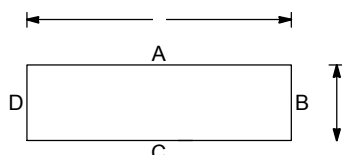


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.25		Orange/brown gravelly fine to medium SAND with occasional pockets of firm brown clay. Gravel is subangular to rounded fine to coarse flint.					
0.45							
0.70		Firm to stiff brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to rounded fine to coarse flint.					
		Firm to stiff light grey/brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to angular fine to coarse flint and chalk.					
1.40		Firm grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium flint and chalk.					
2.30		Trial pit complete at 2.30 m.					

Shoring/Support:
 Stability:

**REMARKS:**

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

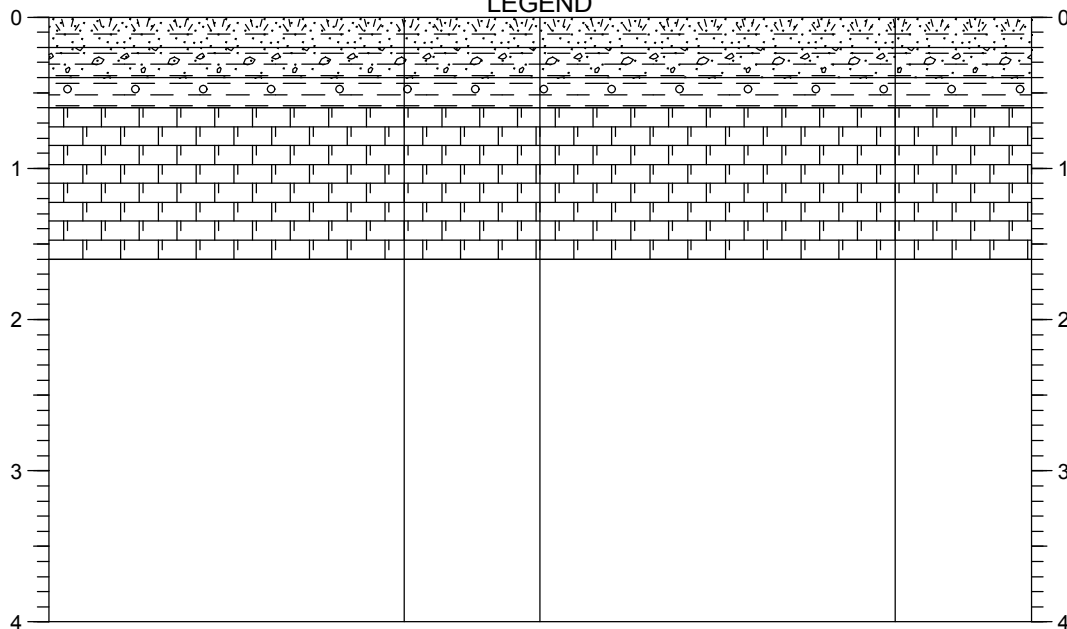
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP12
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

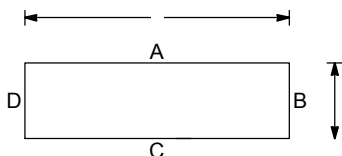


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Brown sandy very gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse flint. Fine to medium light brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. Very weak white structureless CHALK with occasional gravel. Gravel is subangular to subrounded fine to coarse flint. Light brown mottling.					
0.20							
0.40							
0.60							
1.60		Trial pit complete at 1.60 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

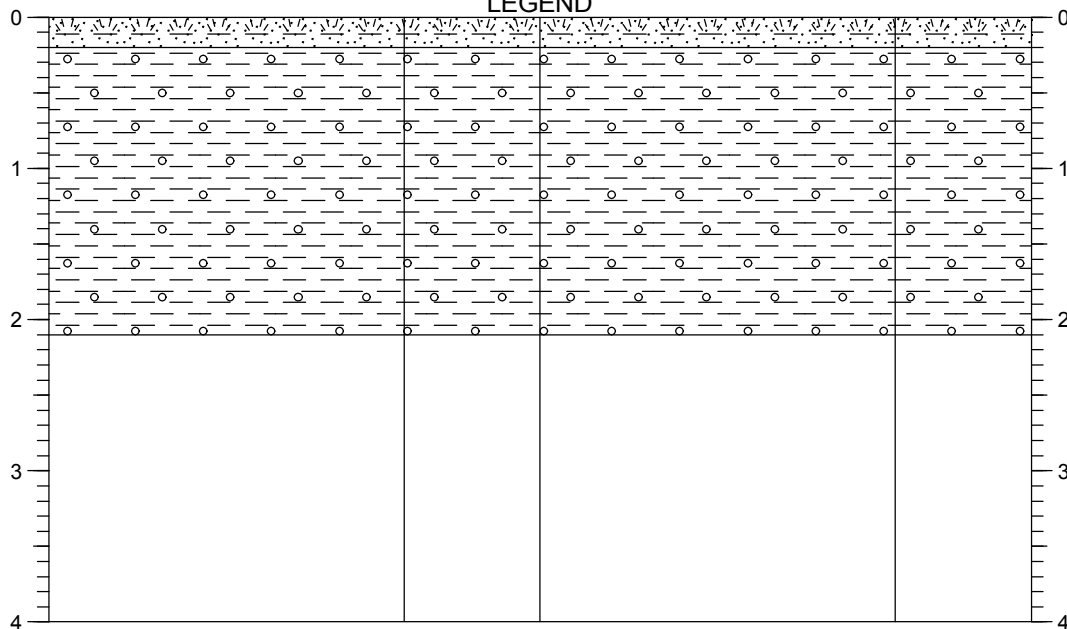
Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP13
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

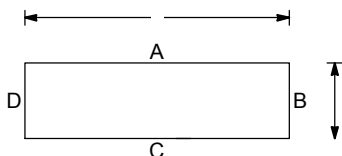


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm brown gravelly CLAY. Gravel is fine to coarse subrounded to angular flint. Below 1.50 m becoming firm to stiff.					
0.20							
2.10		Trial pit complete at 2.10 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

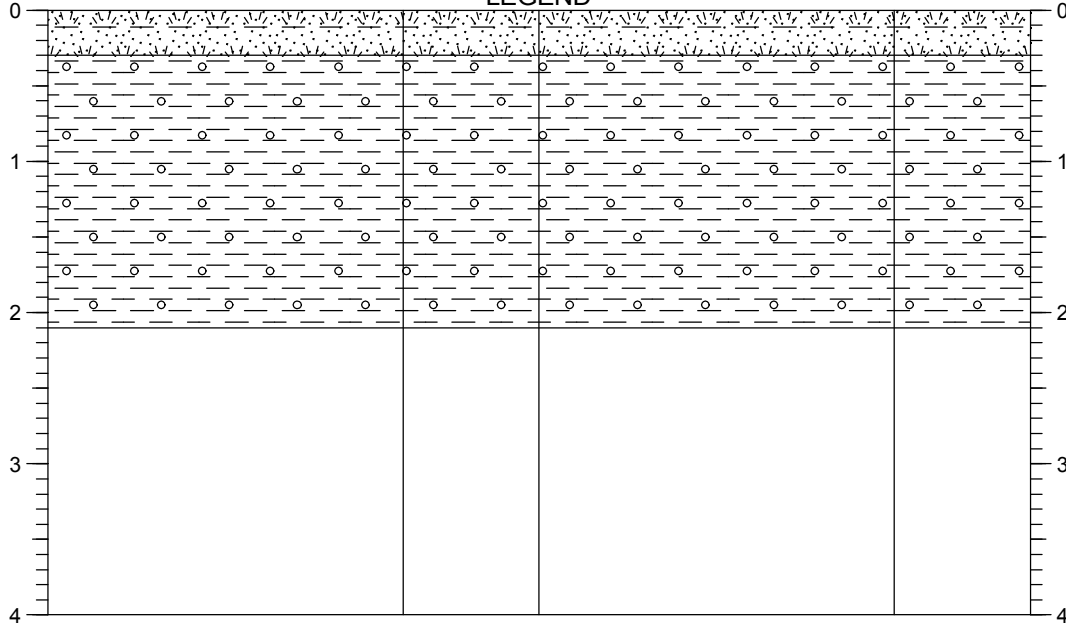
Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP14
	TRIAL PIT LOG	Date Started: 09-05-2011	Page 1 of 1

LEGEND

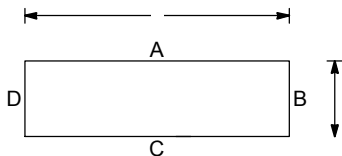


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30							
2.10		Trial pit complete at 2.10 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

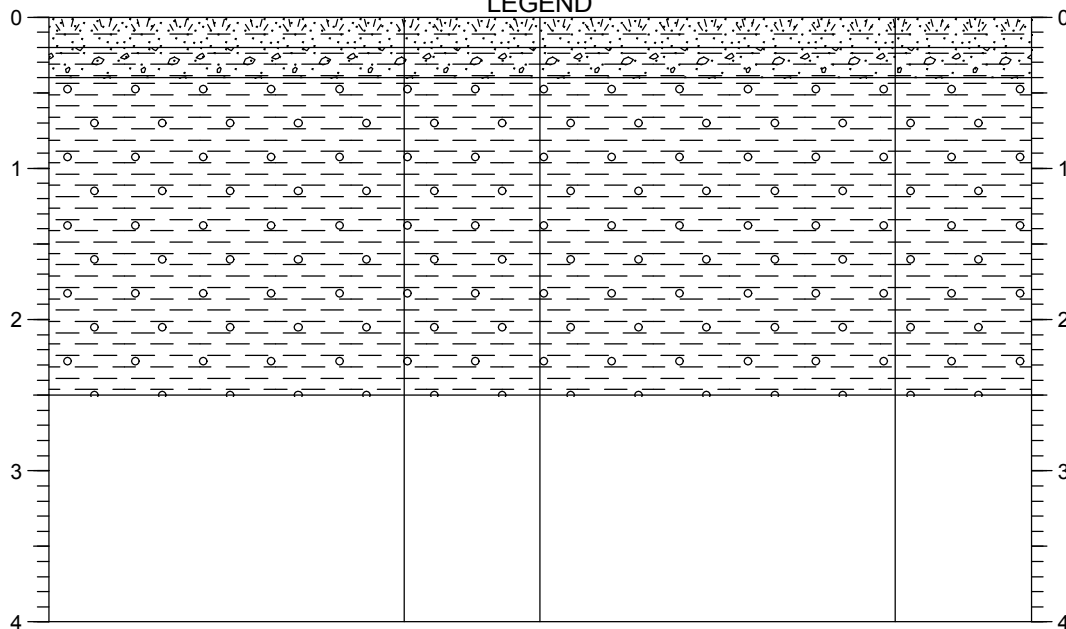
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP15
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

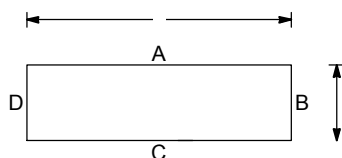


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm dark brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm to stiff light brown gravelly CLAY. Gravel is subrounded to angular fine to coarse flint and chalk. Below 1.00 m Occasional flint cobbles.					
0.20							
0.40							
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

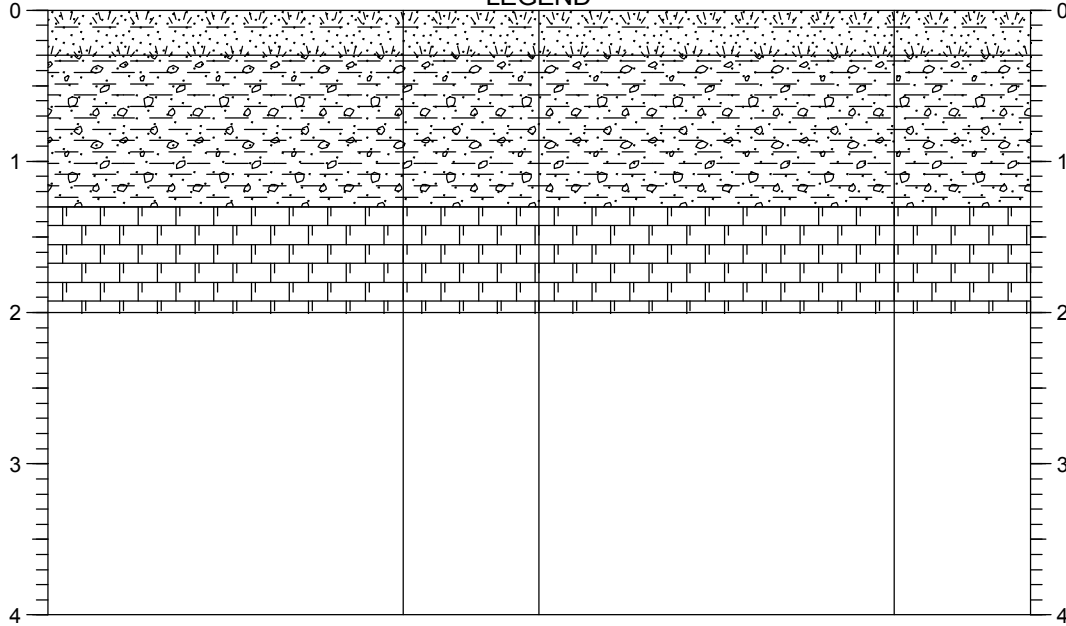
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP16
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

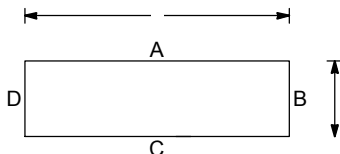


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30		Firm dark brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
1.30		Very weak white CHALK.					
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

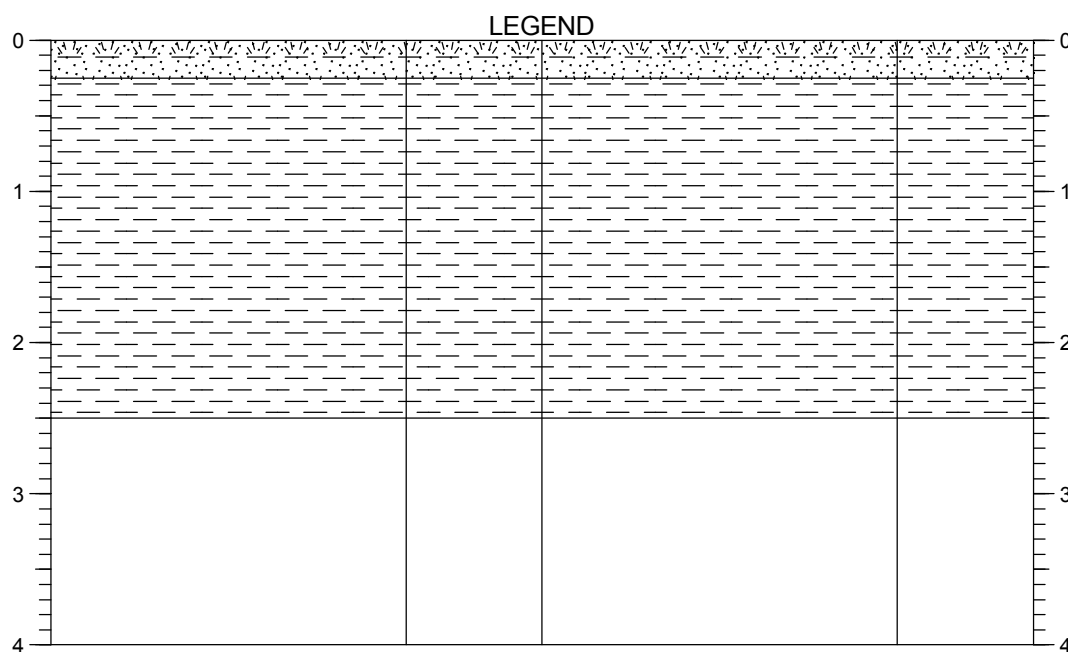
Plant Used: JCB 3X Excavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP17
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

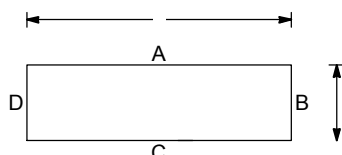


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm orange/brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint.					
0.25							
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
 Stability:

**REMARKS:**

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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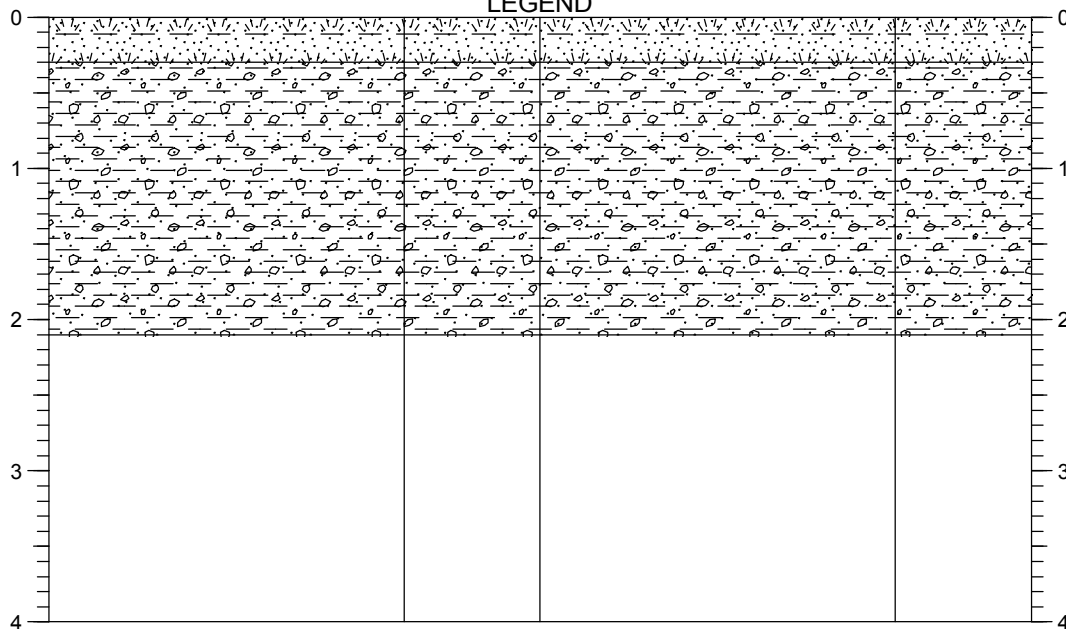
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Project:	Fields End Farm	Project No: 11-0150.01	TP18
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

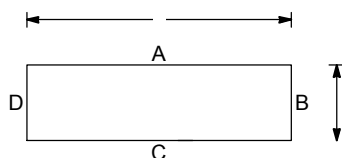


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30		Firm, becoming stiff with depth orange/brown mottled grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to angular fine to coarse flint. Occasional subrounded flint cobbles below 1.00 m.					
2.10		Trial pit complete at 2.10 m.					

Shoring/Support:
 Stability:



REMARKS:

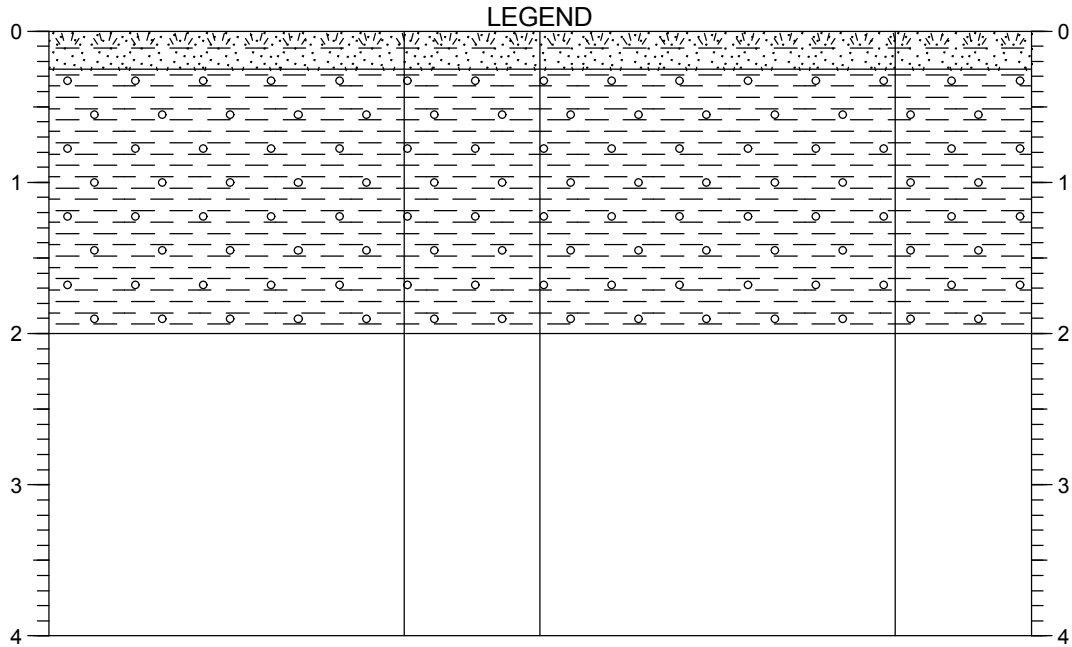
1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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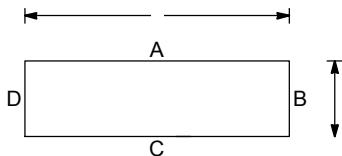


Project:	Fields End Farm	Project No: 11-0150.01	TP19
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1



STRATA			SAMPLES & TESTS				
Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.25							
		Firm brown gravelly CLAY with occasional cobbles. Gravel is subrounded to angular fine to coarse flint. Cobbles are subangular to rounded flint.					
2.00		Trial pit complete at 2.00 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

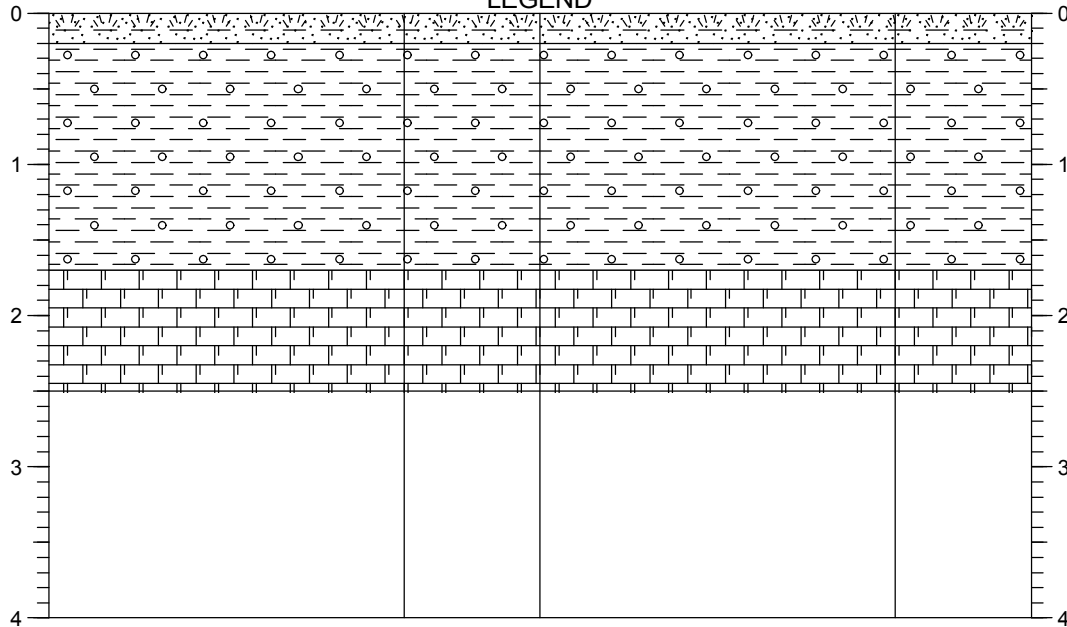
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP20
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

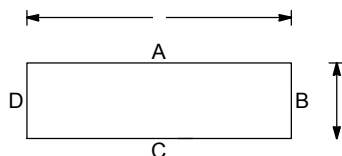


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00 0.20		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm to stiff brown locally grey gravelly CLAY. Gravel is subrounded to angular fine to coarse flint.					
1.70		Very weak white CHALK.					
2.50		Trial pit complete at 2.50 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

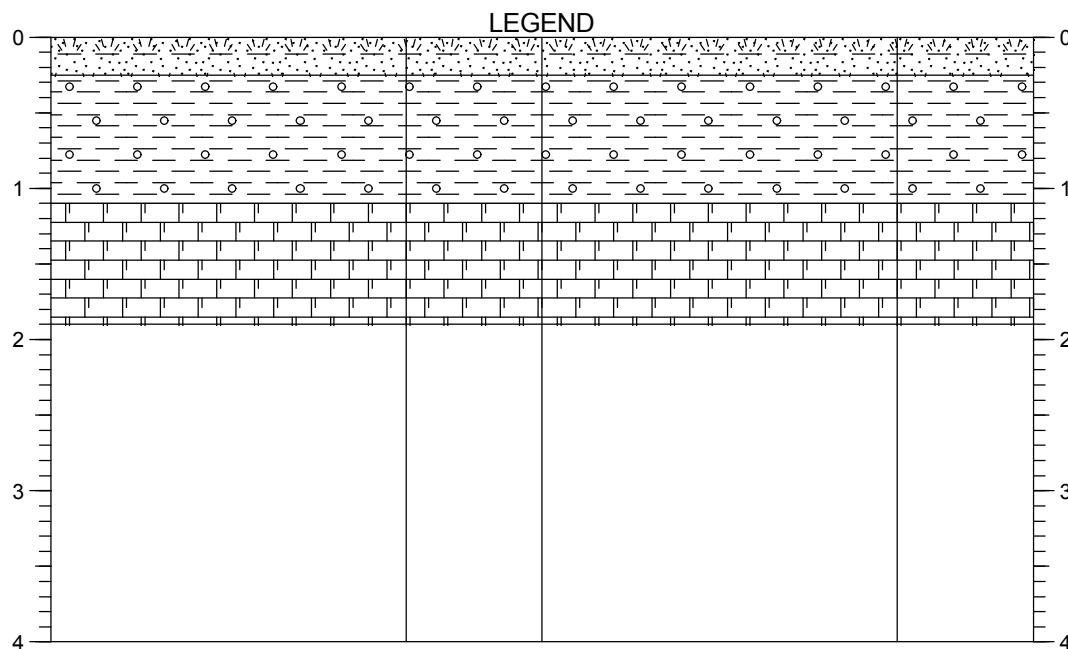
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP21
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

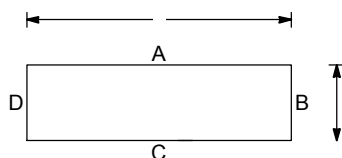


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.25		Firm to stiff brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint and chalk.					
1.10		Very weak white CHALK.					
1.90		Trial pit complete at 1.90 m.					

Shoring/Support:
 Stability:

**REMARKS:**

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

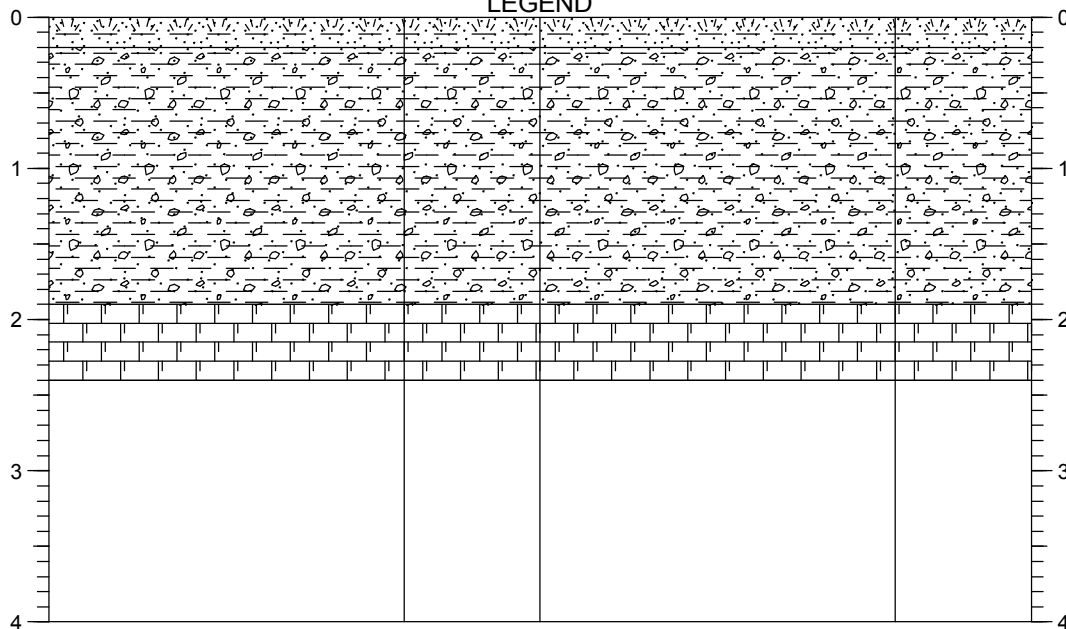
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Project:	Fields End Farm	Project No: 11-0150.01	TP22
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

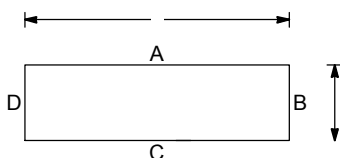


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00 0.20		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm becoming stiff with depth brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint. Below 1.00 m becoming slightly gravelly.					
1.90		Very weak white CHALK.					
2.40		Trial pit complete at 2.40 m.					

Shoring/Support:
Stability:



REMARKS:

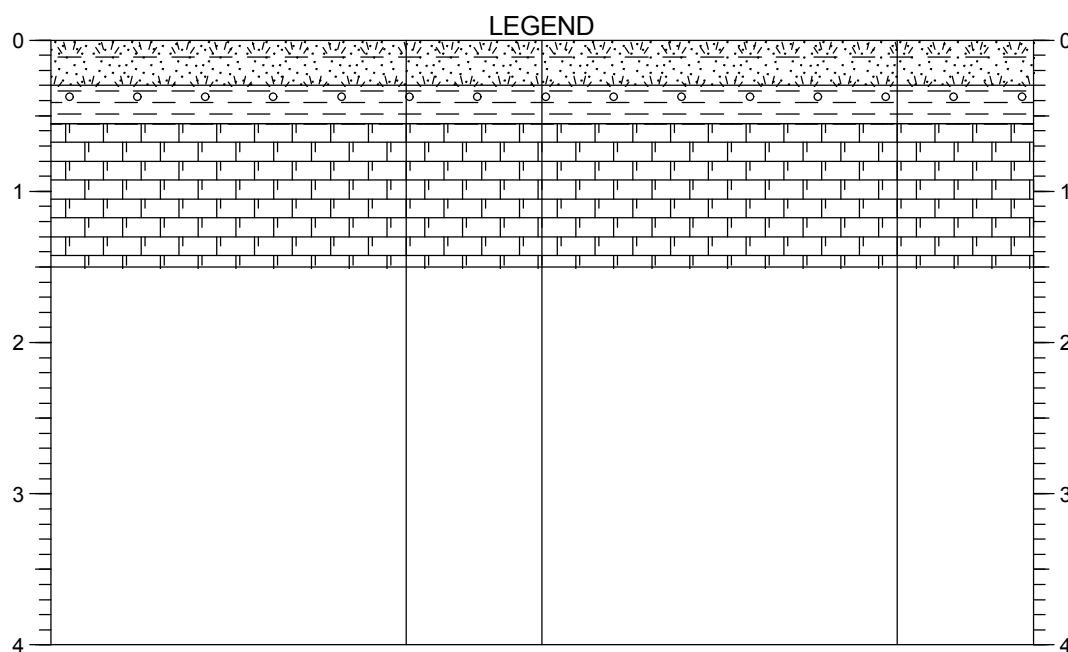
1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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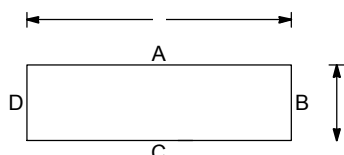


Project:	Fields End Farm	Project No: 11-0150.01	TP23
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

**STRATA****SAMPLES & TESTS**

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy clayey TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.30		Stiff brown gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and chalk.					
0.55		Very weak white structureless CHALK.					
1.50		Trial pit complete at 1.50 m.					

Shoring/Support:
Stability:

**REMARKS:**

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

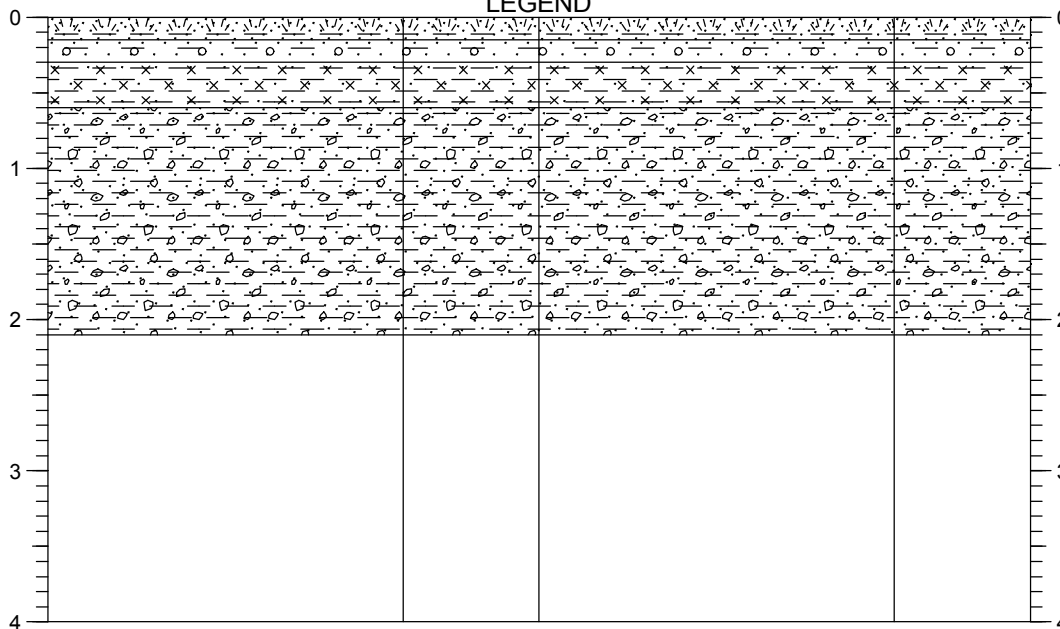
Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Delta Simons Environmental Consultants Ltd
 The Lawn, Union Road,
 Lincoln LN1 3BL
 Tel: 08700 400 012
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 Email: info@deltasimons.com



Project:	Fields End Farm	Project No:	11-0150.01	TP24
	TRIAL PIT LOG	Date Started:	10-05-2011	Page 1 of 1

LEGEND

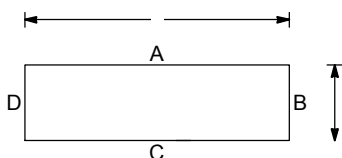


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Light brown gravelly clayey fine to medium SAND. Gravel is subrounded to angular fine to medium flint and chalk. Brown clayey gravelly silty fine SAND. Gravel is subangular to subrounded fine to medium flint. Firm to stiff brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint and chalk.					
0.15							
0.30							
0.60							
2.10		Trial pit complete at 2.10 m.					

Shoring/Support:
 Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

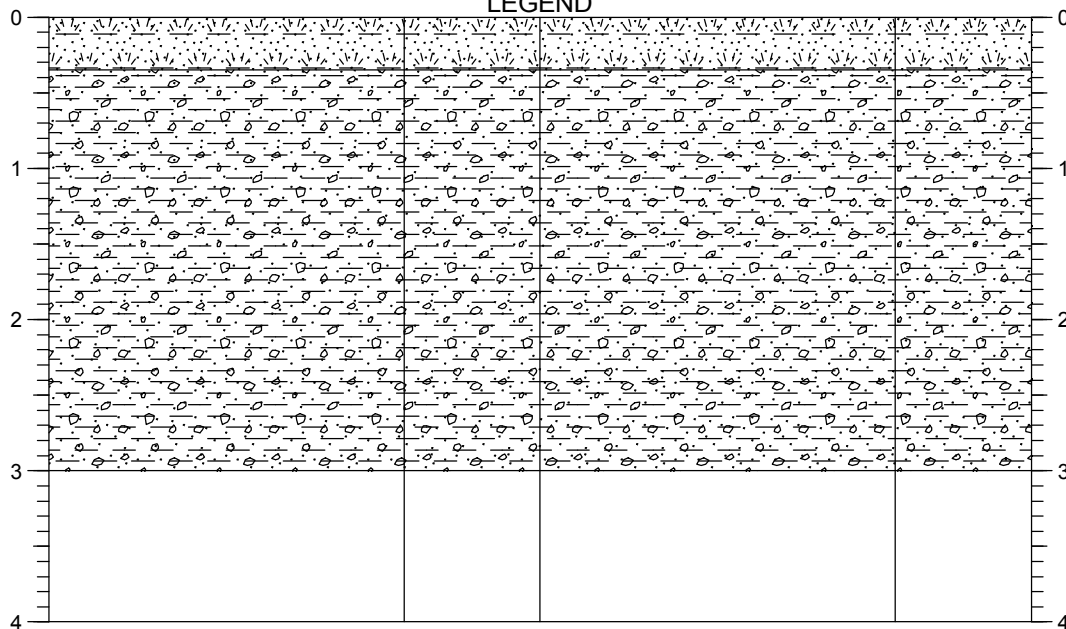
Plant Used:	Coordinates / Level (AOD):	Logged By:	Checked By:	Approved By:
JCB 3X Ecavator		KM		

Delta Simons Environmental Consultants Ltd
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Project:	Fields End Farm	Project No: 11-0150.01	TP25
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

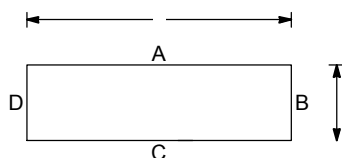


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint.					
0.35		Firm becoming stiff with depth brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint. Becoming orange/brown from 1.90 m.					
3.00		Trial pit complete at 3.00 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

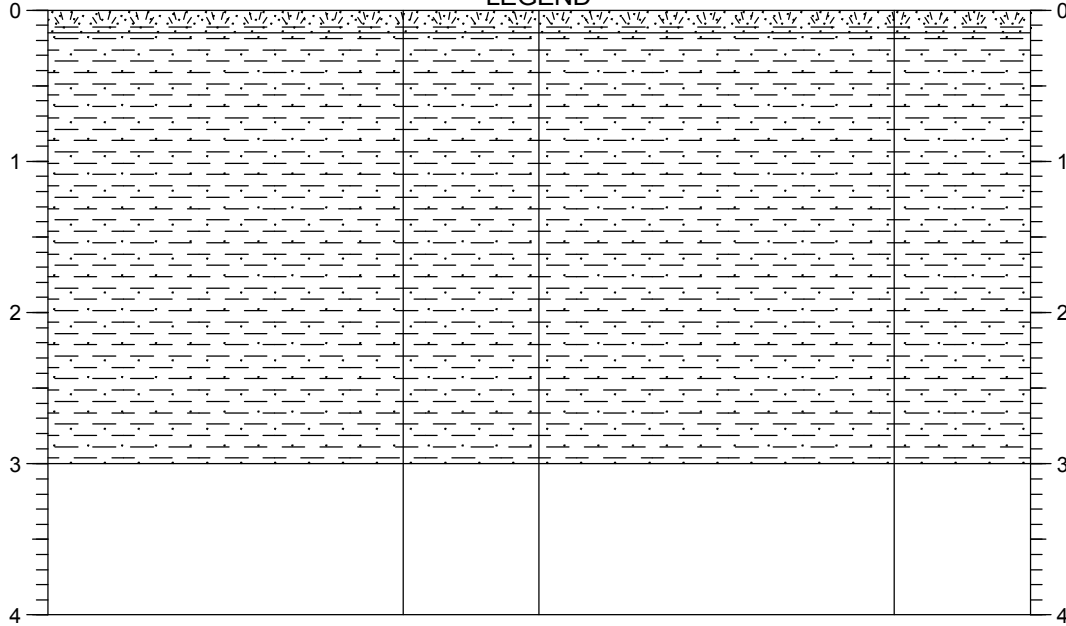
Plant Used: JCB 3X Ecavator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Delta Simons Environmental Consultants Ltd
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Project:	Fields End Farm	Project No: 11-0150.01	TP26
	TRIAL PIT LOG	Date Started: 10-05-2011	Page 1 of 1

LEGEND

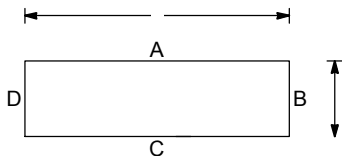


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	PID	HSV	PP
0.00 0.15		Brown gravelly very sandy TOPSOIL with frequent roots. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Firm to stiff light brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded to angular fine to coarse flint and chalk.					
3.00		Trial pit complete at 3.00 m.					

Shoring/Support:
Stability:



REMARKS:

1. Logged in general accordance to BS 5930.
2. Remained dry and stable during excavation.

Plant Used: JCB 3X Ecvator	Coordinates / Level (AOD):	Logged By: KM	Checked By:	Approved By:
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Appendix III


Proforma: B03	Monitoring Record Sheet
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Job Name:	Hemel Hemstead, Fields End
Job Number:	11-0150.01
Date:	10.05.11
Site Personnel:	Hazel Salkeld
Site Contact:	
Weather Conditions:	Sunny

Monitoring Location		WS101	WS115	WS104	WS107	WS110	WS106	
GROUNDWATER	Pressure	1006	1006	1008	1008	1009	1008	
	Flow	Peak Flow	0	0	0	0	0	0
		Steady Flow	0	0	0	0	0	0
	CH₄ (% v/v)	Highest Value	0	0	0	0	0	0
		Steady	0	0	0	0	0	0
	CO₂ (% v/v)	Highest Value	1.9	1.9	2.2	1.9	1.6	2.4
		Steady	1.9	1.9	2.2	1.9	1.6	2.4
	O₂ (% v/v)	Lowest Value	16.4	18.9	18.7	17.3	19	17.7
		Steady	16.4	18.9	18.7	17.3	19	17.7
	Mb							
	PID (ppm)	Highest Value						
		Steady						
	Time							
	Notes							
	Internal Well Diameter (mm)							
Depth To Product (m)								
Product Thickness (mm)								
Depth To Water (m)		Dry	Dry	Dry	Dry	Dry	Dry	
Depth To Base (m)								
Height of Water Column (m)								
Volume to Purge (L)								
Water Colour								
Odour/Sheen								
Notes								

Diameter of Casing (mm)	19	35	50	50	75	100
Diameter of Bailer (mm)	18	19	19	38	38	38
No. bails per m	4	12	22	6	13	23

To calculate the number of litres to be purged from a well with a different diameter, use the formula $3\pi r^2 h$ (where r = radius of the well and h = height of the water column). Use the formula $\pi r^2 h$ to calculate the volume of a bailer. Please note that the standard bailers Delta-Simons use are typically 0.95 m in length.

Author: C Ramsbottom	Proforma: B03	Issue Date: June 2006	
Version: 1.0	Page: 1 of 1	Authorised by: G Pickles	


Proforma: B03	Monitoring Record Sheet
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Job Name:	Fields End Farm, Hemel Hempstead
Job Number:	11-0150.01
Date:	16/05/2011
Site Personnel:	Keith Roper
Site Contact:	Kevin McGee
Weather Conditions:	Sunny Intervals, Warm, Breezy 18°C

Monitoring Location		WS101	WS115	WS104	WS107	WS110	WS106	
GROUNDWATER	Pressure							
	Flow	Peak Flow						
		Steady Flow	0	0	0	0	0	0
	CH₄ (% v/v)	Highest Value						
		Steady	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	CO₂ (% v/v)	Highest Value	2.7	1.8	2.2	1.8	2.0	2.6
		Steady	2.7	1.8	2.2	1.8	2.0	2.6
	O₂ (% v/v)	Lowest Value	15.0	18.0	17.5	16.7	17.2	17.3
		Steady	15.0	18.0	17.6	16.7	17.2	17.3
	Mb		1000	1000	1000	1000	1002	1000
	PID (ppm)	Highest Value						
		Steady						
	Time							
	Notes							
Internal Well Diameter (mm)		50	50	50	50	50	50	
Depth To Product (m)								
Product Thickness (mm)								
Depth To Water (m)		-	-	-	-	-	-	
Depth To Base (m)		4.92	2.91	2.91	2.91	2.91	2.91	
Height of Water Column (m)		-	-	-	-	-	-	
Volume to Purge (L)								
Water Colour								
Odour/Sheen								
Notes		Wet at base	Dry at base	Dry at base	Dry at base	Dry at base	Dry at base	

Diameter of Casing (mm)	19	35	50	50	75	100
Diameter of Bailer (mm)	18	19	19	38	38	38
No. bails per m	4	12	22	6	13	23

To calculate the number of litres to be purged from a well with a different diameter, use the formula $3\pi r^2 h$ (where r = radius of the well and h = height of the water column). Use the formula $\pi r^2 h$ to calculate the volume of a bailer. Please note that the standard bailers Delta-Simons use are typically 0.95 m in length.

Author: C Ramsbottom	Proforma: B03	Issue Date: June 2006	
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Proforma: B03	Monitoring Record Sheet
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Job Name:	Fields End Farm, Hemel Hempstead
Job Number:	11-0150.01
Date:	25/05/2011
Site Personnel:	Keith Roper
Site Contact:	Kevin McGee
Weather Conditions:	Sunny, windy, very dry, warm 20° C

Monitoring Location		WS101	WS115	WS104	WS107	WS110	WS106	
GROUNDWATER	Pressure							
	Flow	Peak Flow						
		Steady Flow	0	0	0	0	0	0
	CH₄ (% v/v)	Highest Value	0.1					
		Steady	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	CO₂ (% v/v)	Highest Value	1.9	1.5	2.0	1.7	1.8	2.3
		Steady	1.9	1.5	2.0	1.7	1.8	2.3
	O₂ (% v/v)	Lowest Value	15.3	18.4	17.7	17.4	17.4	17.8
		Steady	15.3	18.4	17.7	17.4	17.4	17.8
	Mb		998	998	998	998	998	998
	PID (ppm)	Highest Value						
		Steady						
	Time							
	Notes							
Internal Well Diameter (mm)		50	50	50	50	50	50	
Depth To Product (m)								
Product Thickness (mm)								
Depth To Water (m)		-	-			-	-	
Depth To Base (m)		4.91	2.91			2.90	2.91	
Height of Water Column (m)		-	-			-	-	
Volume to Purge (L)								
Water Colour								
Odour/Sheen								
Notes		Wet at base	Dry at base	Not dipped	Not dipped	Dry at base	Dry at base	

Diameter of Casing (mm)	19	35	50	50	75	100
Diameter of Bailer (mm)	18	19	19	38	38	38
No. bails per m	4	12	22	6	13	23

To calculate the number of litres to be purged from a well with a different diameter, use the formula $3\pi r^2 h$ (where r = radius of the well and h = height of the water column). Use the formula $\pi r^2 h$ to calculate the volume of a bailer. Please note that the standard bailers Delta-Simons use are typically 0.95 m in length.

Author: C Ramsbottom	Proforma: B03	Issue Date: June 2006	
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Proforma: B03	Monitoring Record Sheet
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Job Name:	Fields End Farm, Hemel Hempstead
Job Number:	11-0150.01
Date:	31/05/2011
Site Personnel:	Keith Roper
Site Contact:	Kevin McGee
Weather Conditions:	Overcast, showers 12°C

Monitoring Location		WS101	WS115	WS104	WS107	WS110	WS106	
GROUNDWATER	Pressure							
	Flow	Peak Flow						
		Steady Flow	0	0	0	0	0	0
	CH₄ (% v/v)	Highest Value						
		Steady	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	CO₂ (% v/v)	Highest Value	0.8	1.6	2.0	1.6	1.9	2.3
		Steady	0.8	1.6	2.0	1.6	1.9	2.3
	O₂ (% v/v)	Lowest Value	18.1	18.2	17.9	18.3	17.2	17.6
		Steady	18.1	18.3	17.9	18.3	17.2	17.6
	Mb		998	998	998	998	998	998
	PID (ppm)	Highest Value						
		Steady						
	Time							
	Notes							
Internal Well Diameter (mm)		50	50	50	50	50	50	
Depth To Product (m)								
Product Thickness (mm)								
Depth To Water (m)		4.91	-	-	-	-	-	
Depth To Base (m)		4.92	2.91	2.90	2.91	2.91	2.91	
Height of Water Column (m)		0.01	-	-	-	-	-	
Volume to Purge (L)								
Water Colour								
Odour/Sheen								
Notes			Dry at base	Dry at base	Dry at base	Dry at base	Dry at base	

Diameter of Casing (mm)	19	35	50	50	75	100
Diameter of Bailer (mm)	18	19	19	38	38	38
No. bails per m	4	12	22	6	13	23

To calculate the number of litres to be purged from a well with a different diameter, use the formula $3\pi r^2 h$ (where r = radius of the well and h = height of the water column). Use the formula $\pi r^2 h$ to calculate the volume of a bailer. Please note that the standard bailers Delta-Simons use are typically 0.95 m in length.

Author: C Ramsbottom	Proforma: B03	Issue Date: June 2006	
Version: 1.0	Page: 1 of 1	Authorised by: G Pickles	

Appendix IV



Collation of Human Health SGVs and Soil Screening Values

Version 2.2- January 2010

Environment Agency (EA) Soil Guideline Values (SGVs) and Delta-Simons Human Health Generic Screening Values (HH-GSVs) calculated within CLEA V.1.04

Environment Agency (EA) Soil Guideline Values (SGVs) for dioxins, furans and dioxin-like PCBs calculated within CLEA V.1.05

LQM/CIEH Generic Assessment Criteria (GAC) 2nd Edition and Delta-Simons GAC derived using CLEA V.1.04

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment derived using CLEA V.1.06

Withdrawn SGVs derived using CLEA UK Beta Version 1.0

Dutch Intervention Values

USEPA PRGs

References – CLEA UK Beta Modelling and Old Guidance

References – CLEA V.1.04 Modelling

Environment Agency (EA) Soil Guideline Values (SGVs) and Delta-Simons Human Health Generic Screening Values (HH-GSVs) calculated within CLEA V.1.04 – Commercial (mg/kg) dry weight soil

Compound	Published EA SGV 6% SOM	DS HH-GSV 1% SOM	DS HH-GSV 3% SOM
Organic compounds			
Benzene	95	28	57
Toluene	4,400 *	870 *	2,300 *
Ethylbenzene	2,800 *	520 *	1,500 *
Xylene – m	3,500 *	630 *	1,800 *
Xylene – o	2,600 *	480 *	1,300 *
Xylene – p	3,200 *	580 *	1,600 *
Phenol	3,200 (38,000)	3,200 (31,000)	3,200 (36,000)
Metals			
Elemental mercury Hg	26 *	4.3 *	13 *
Inorganic mercury Hg ²⁺	3,600	3,600	3,600
Methyl mercury Hg ⁴⁺	410	73 *	400
Selenium	13,000	13,000	13,000
Inorganic Arsenic	640	640	640
Nickel	1,800	1,800	1,800
Cadmium	230	230	230

Notes:

* Soil or vapour Saturation limit

3200 (38,000) – Based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only).

Environment Agency (EA) Soil Guideline Values (SGVs) and Delta-Simons Human Health Generic Screening Values (HH-GSVs) calculated within CLEA V.1.04 – Residential (Assumes Plant Uptake) (mg/kg) dry weight soil

Compound	Published EA SGV 6% SOM	DS HH-GSV 1% SOM	DS HH-GSV 3% SOM
Organic compounds			
Benzene	0.33	0.18	0.27
Toluene	610	120	320
Ethylbenzene	350	65	180
Xylene – m	240	44	120
Xylene – o	250	45	130
Xylene – p	230	42	120
Phenol	420	180	320
Metals			
Elemental mercury Hg	1.0	0.17	0.5
Inorganic mercury Hg ²⁺	170	170	170
Methyl mercury Hg ⁴⁺	11	7.4	10
Selenium	350	350	350
Inorganic Arsenic	32	32	32
Nickel	130	130	130
Cadmium	10	10	10

Environment Agency (EA) Soil Guideline Values (SGVs) and Delta-Simons Human Health Generic Screening Values (HH-GSVs) calculated within CLEA V.1.04 – Residential without Plant Uptake (mg/kg) dry weight soil

Compound	DS HH-GSV 6% SOM	DS HH-GSV 1% SOM	DS HH-GSV 3% SOM
Organic compounds			
Benzene	1.0	0.27	0.56
Toluene	2,700	610	1,500
Ethylbenzene	840	170	450
Xylene – m	300	55	160
Xylene – o	320	60	170
Xylene – p	290	53	150
Phenol	520	310	440
Metals			
Elemental mercury Hg	1.0	0.17	0.51
Inorganic mercury Hg ²⁺	240	240	240
Methyl mercury Hg ⁴⁺	14	8.4	12
Selenium	600	600	600
Inorganic Arsenic	35	35	35
Nickel	130	130	130
Cadmium	84	84	84

Environment Agency (EA) Soil Guideline Values (SGVs) calculated within CLEA V.1.05 for Sum of PCDDs, PCDFs and dioxin-like PCBs (µg/kg) dry weight soil

Land Use	Residential	Allotment	Commercial
Sum of PCDDs, PCDFs and dioxin-like PCBs	8	8	240

Notes:
Based on a sandy loam soil and 6 per cent SOM.

**LQM/CIEH Generic Assessment Criteria (GAC) and Delta-Simons Generic Assessment
Criteria (DS GAC)–
Commercial (mg/kg) dry weight soil**

Compound	Published GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Metals			
Beryllium	420	420	420
Boron	192,000	192,000	192,000
Chromium (III)	30,400	30,400	30,400
Chromium (VI)	35	35	35
Copper	71,700	71,700	71,700
Vanadium	3,160	3,160	3,160
Zinc	665,000	665,000	665,000
Petroleum Hydrocarbons			
Petroleum Hydrocarbons	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Aliphatic EC5-EC6	13,000 (1,150) *	3,400 (304) *	6,200 (558) *
Aliphatic >EC6-EC8	42,000 (736) *	8,300 (144) *	18,000 (322) *
Aliphatic >EC8-EC10	12,000 (451) *	2,100 (78) *	5,100 (190) *
Aliphatic >EC10-EC12	49,000 (283) *	10,000 (48) *	24,000 (118) *
Aliphatic >EC12-EC16	91,000 (142) *	6,100 (24) *	83,000 (59) *
Aliphatic >EC16-EC35	1,800,000	1,600,000	1,800,000
Aliphatic >EC35-EC44	1,800,000	1,600,000	1,800,000
Aromatic >EC5-EC7	90,000 (4,710) *	28,000 (1,220) *	49,000 (2,260) *
Aromatic >EC7-EC8	190,000 (4,360) *	59,000 (869) *	110,000 (1,920) *
Aromatic >EC8-EC10	18,000 (3,580) *	3,700 (613) *	8,600 (1,500) *
Aromatic >EC10-EC12	34,500 (2,150) *	17,000 (364) *	29,000 (899) *
Aromatic >EC12-EC16	37,800	36,000 (169) *	37,000
Aromatic >EC16-EC21	28,000	28,000	28,000
Aromatic >EC21-EC35	28,000	28,000	28,000
Aromatic >EC35-EC44	28,000	28,000	28,000
Aromatic and Aliphatic >EC44-EC70	28,000	28,000	28,000
PAHs			
PAHs	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Acenaphthene	100,000	85,000 (57) *	141
Acenaphthylene	100,000	84,000 (86) *	212
Anthracene	540,000	530,000	540,000

Benz[a]anthracene	97	90	95
Benzo[a]pyrene	14	14	14
Benzo[b]fluoranthene	100	100	100
Benzo[ghi]perylene	660	650	660
Benzo[k]fluoranthene	140	140	140
Chrysene	140	140	140
Dibenz[ah]anthracene	13	13	13
Fluoranthene	23,000	23,000	23,000
Fluorene	71,000	64,000 (31) *	69,000
Indeno[123-cd]pyrene	62	60	61
Naphthalene	1,100 (432) *	200 (76) *	480 (183) *
Phenanthrene	23,000	22,000	22,000
Pyrene	54,000	54,000	54,000
Chloroalkanes and alkenes	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Vinyl Chloride (Chloroethene)	0.12	0.063	0.081
Trichloromethane	370	110	190
1,2-Dichloroethane	1.8	0.71	1.0
Trichloroethene	55	12	25
1,1,1-Trichloroethane	3,100	700	1,400
Tetrachloroethene	660	130	290
1,1,1,2-Tetrachloroethane	590	120	260
1,1,2,2-Tetrachloroethane	1,200	290	580
Tetrachloromethane	15	3.0	6.6
Explosives	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
TNT	1,100	1,000	1,000
RDX	6,400	6,400	6,400
HMX	110,000	110,000	110,000
Pesticides	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Aldrin	54	54	54
Dieldrin	92	90	91
Atrazine	880	880	870
Dichlorvos	893	842	872
Endosulfan (alpha)	3,390	2,310 (0.003) *	2,990 (0.007) *

Endosulfan (beta)	3,480	2,580 (0.00007) *	3,160 (0.0002) *
Hexachlorocyclohexane (alpha)	14,900	14,000	14,600
Hexachlorocyclohexane (beta)	1,130	1,120	1,130
Hexachlorocyclohexane (gamma)	552	532	546
Chlorobenzenes	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Chlorobenzene	310	59	130
1,2-Dichlorobenzene	12,000 (3,240) *	2,100 (571) *	5,100 (1,370) *
1,3-Dichlorobenzene	180	32	77
1,4-Dichlorobenzene	22,000 (1,280) *	4,500 (224) *	10,000 (540) *
1,2,3-Trichlorobenzene	620	110	270
1,2,4-Trichlorobenzene	1,300	230	560
1,3,5-Trichlorobenzene	140	24	57.8
1,2,3,4-Tetrachlorobenzene	4,500 (728) *	1,800 (122) *	3,200 (304) *
1,2,3,5-Tetrachlorobenzene	250 (235) *	52 (39.4) *	120 (98.1) *
1,2,4,5-Tetrachlorobenzene	97	44 (19.7) *	73 (49.1) *
Pentachlorobenzene	830	650 (43.0) *	770 (107) *
Hexachlorobenzene	55	48 (0.20) *	53
Chlorophenols	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Chlorophenols (except Pentachlorophenol)	4,200	3,500	4,000
Pentachlorophenol	1,400	1,200	1,300
Other	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Carbon Disulphide	50	12	23
Hexachlorobutadiene	120	32	69

Notes:

* Soil or vapour Saturation limit, presented in brackets

LQM/CIEH Generic Assessment Criteria (GAC) and Delta-Simons Generic Assessment

Criteria (DS GAC) –

Residential (Assumes Plant Uptake) (mg/kg) dry weight soil

Compound	Published GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Metals			
Beryllium	51	51	51
Boron	291	290	290
Chromium (III)	3,000	3,000	3,000
Chromium (VI)	4.3	4.3	4.3
Copper	2,330	2,330	2,330
Vanadium	75	74	74
Zinc	3,750	3,750	3,750
Petroleum Hydrocarbons			
	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Aliphatic EC5-EC6	110	30	55
Aliphatic >EC6-EC8	370	73	160
Aliphatic >EC8-EC10	110	19	46
Aliphatic >EC10-EC12	540 (283) *	93 (48) *	230 (118) *
Aliphatic >EC12-EC16	3,000 (142) *	740 (24) *	1,700 (59) *
Aliphatic >EC16-EC35	76,000	45,000 (8.48) *	64,000 (21) *
Aliphatic >EC35-EC44	76,000	45,000 (8.48) *	64,000 (21) *
Aromatic >EC5-EC7	280	65	130
Aromatic >EC7-EC8	611	120	270
Aromatic >EC8-EC10	151	27	65
Aromatic >EC10-EC12	346	69	160
Aromatic >EC12-EC16	593	140	310
Aromatic >EC16-EC21	770	250	480
Aromatic >EC21-EC35	1,230	890	1,100
Aromatic >EC35-EC44	1,230	890	1,100
Aromatic and Aliphatic >EC44-EC70	1,300	1,200	1,300
PAHs			
	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Acenaphthene	1,000	210	480
Acenaphthylene	850	170	400
Anthracene	9,200	2,300	4,900

Benz[a]anthracene	5.9	3.1	4.7
Benzo[a]pyrene	1.0	0.83	0.94
Benzo[b]fluoranthene	7.0	5.6	6.5
Benzo[ghi]perylene	47	44	46
Benzo[k]fluoranthene	10	8.5	9.6
Chrysene	9.3	6.0	8.0
Dibenz[ah]anthracene	0.90	0.76	0.86
Fluoranthene	670	260	460
Fluorene	780	160	380
Indeno[123-cd]pyrene	4.2	3.2	3.9
Naphthalene	8.7	1.5	3.7
Phenanthrene	380	92	200
Pyrene	1,600	560	1,000
Chloroalkanes and alkenes	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Vinyl Chloride (Chloroethene)	0.00099	0.00047	0.00064
Trichloromethane	2.7	0.75	1.3
1,2-Dichloroethane	0.014	0.0054	0.0080
Trichloroethene	0.49	0.11	0.22
1,1,1-Trichloroethane	28	6.2	13
Tetrachloroethene	4.8	0.94	2.1
1,1,1,2-Tetrachloroethane	4.8	0.90	2.1
1,1,2,2-Tetrachloroethane	6.3	1.4	2.9
Tetrachloromethane	0.089	0.018	0.039
Explosives	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
TNT	8.0	1.6	3.7
RDX	16	3.5	7.4
HMX	26	5.7	13
Pesticides	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Aldrin	2.1	1.7	2.0
Dieldrin	2.2	0.69	1.4
Atrazine	1.3	0.24	0.56
Dichlorvos	1.3	0.29	0.6
Endosulfan (alpha)	16	2.9	7.0

Endosulfan (beta)	15	2.8	6.6
Hexachlorocyclohexane (alpha)	100	19	46
Hexachlorocyclohexane (beta)	8.5	1.7	3.9
Hexachlorocyclohexane (gamma)	3.0	0.58	1.4
Chlorobenzenes	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Chlorobenzene	1.7	0.33	0.73
1,2-Dichlorobenzene	91	16	39
1,3-Dichlorobenzene	1.7	0.29	0.7
1,4-Dichlorobenzene	167	30	72
1,2,3-Trichlorobenzene	6.1	1.0	2.6
1,2,4-Trichlorobenzene	11	1.8	4.5
1,3,5-Trichlorobenzene	1.3	0.23	0.57
1,2,3,4-Tetrachlorobenzene	62	12	29
1,2,3,5-Tetrachlorobenzene	2.8	0.49	1.2
1,2,4,5-Tetrachlorobenzene	1.4	0.3	0.68
Pentachlorobenzene	17	5.2	10
Hexachlorobenzene	1.4	0.59 (0.20) *	1.0 (0.50) *
Chlorophenols	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Chlorophenols (except Pentachlorophenol)	4.4	0.87	2.0
Pentachlorophenol	2.96	0.55	1.3
Other	Published GAC 6% SOM	Published GAC 1% SOM	Published GAC 2.5% SOM
Carbon Disulphide	0.44	0.10	0.20
Hexachlorobutadiene	1.2	0.21	0.51

Notes:

* Soil or vapour Saturation limit presented in brackets

Delta-Simons Generic Assessment Criteria (DS GAC) – Residential without Plant

Uptake (mg/kg) dry weight soil

Compound	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Metals			
Beryllium	51	51	51
Boron	10,000	10,000	10,000
Chromium (III)	3,010	3,010	3,010
Chromium (VI)	4.3	4.3	4.3
Copper	6,200	6,200	6,200
Vanadium	190	190	190
Zinc	40,400	40,400	40,400
Petroleum Hydrocarbons			
	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Aliphatic EC5-EC6	110	30	55
Aliphatic >EC6-EC8	370	73	160
Aliphatic >EC8-EC10	110	19	46
Aliphatic >EC10-EC12	540 (283) *	93 (48) *	230 (118) *
Aliphatic >EC12-EC16	3,000 (142) *	750 (24) *	1,700 (59) *
Aliphatic >EC16-EC35	77,000	45,000 (8.5) *	64,000 (21) *
Aliphatic >EC35-EC44	77,000	45,000 (8.5) *	64,000 (21) *
Aromatic >EC5-EC7	980	260	480
Aromatic >EC7-EC8	2,700	610	1,300
Aromatic >EC8-EC10	190	33	81
Aromatic >EC10-EC12	870	180	420
Aromatic >EC12-EC16	1,710	1,300 (169) *	1,600 (419) *
Aromatic >EC16-EC21	1,300	1,300	1,300
Aromatic >EC21-EC35	1,300	1,300	1,300
Aromatic >EC35-EC44	1,300	1,300	1,300
Aromatic and Aliphatic >EC44-EC70	1,300	1,300	1,300
PAHs			
	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Acenaphthene	3,900 (336) *	2,000 (57) *	3,100 (140) *
Acenaphthylene	3,900 (506) *	1,950 (86) *	3,000 (212) *
Anthracene	23,000	20,000 (1.2) *	22,000
Benz[a]anthracene	6.2	3.7	5.2

Benzo[a]pyrene	1.0	1.0	1.0
Benzo[b]fluoranthene	7.4	7.0	7.3
Benzo[ghi]perylene	48	47	47
Benzo[k]fluoranthene	10	10	10
Chrysene	10	8.8	9.7
Dibenz[ah]anthracene	0.93	0.87	0.9
Fluoranthene	1,000	970	990
Fluorene	2,900 (183) *	1,850 (31) *	2,500 (77) *
Indeno[123-cd]pyrene	4.4	4.2	4.4
Naphthalene	9.2	1.6	3.9
Phenanthrene	970	840 (36) *	930
Pyrene	2,400	2,400	2,400
Chloroalkanes and alkenes	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Vinyl Chloride (Chloroethene)	0.0011	0.00054	0.0007
Trichloromethane	3.22	0.92	1.6
1,2-Dichloroethane	0.016	0.0065	0.0093
Trichloroethene	0.51	0.11	0.23
1,1,1-Trichloroethane	28	6.3	13
Tetrachloroethene	5.3	1.0	2.3
1,1,1,2-Tetrachloroethane	5.7	1.1	2.4
1,1,2,2-Tetrachloroethane	12	2.7	5.5
Tetrachloromethane	0.090	0.018	0.040
Explosives	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
TNT	58	57	57
RDX	370	370	370
HMX	6,500	6,500	6,500
Pesticides	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Aldrin	2.2	2.1	2.1
Dieldrin	3.9	3.5	3.8
Atrazine	32	31	32
Dichlorvos	37	25	32
Endosulfan (alpha)	110 (0.016) *	44 (0.0029) *	78 (0.00069) *
Endosulfan (beta)	120 (0.00038) *	53 (0.000067) *	89 (0.00016) *

Hexachlorocyclohexane (alpha)	650	17	42
Hexachlorocyclohexane (beta)	52	50	52
Hexachlorocyclohexane (gamma)	23	19	22
Chlorobenzenes	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Chlorobenzene	1.7	0.33	0.74
1,2-Dichlorobenzene	94	17	40
1,3-Dichlorobenzene	1.7	0.31	0.74
1,4-Dichlorobenzene	230	42	100
1,2,3-Trichlorobenzene	6.2	1.1	2.6
1,2,4-Trichlorobenzene	11	1.8	4.5
1,3,5-Trichlorobenzene	1.4	0.23	0.57
1,2,3,4-Tetrachlorobenzene	84	17	39
1,2,3,5-Tetrachlorobenzene	3.0	0.53	1.3
1,2,4,5-Tetrachlorobenzene	2.6	0.52	1.2
Pentachlorobenzene	27	14	21
Hexachlorobenzene	1.7	1.2 (0.2) *	1.5 (0.5) *
Chlorophenols	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Chlorophenols (except Pentachlorophenol)	110	58	85
Pentachlorophenol	35	22	31
Other	DS GAC 6% SOM	DS GAC 1% SOM	DS GAC 2.5% SOM
Carbon Disulphide	0.44	0.10	0.20
Hexachlorobutadiene	1.3	0.22	0.55

Notes:

* Soil or vapour Saturation limit presented in brackets

EIC/AGS/CL:AIRE Generic Assessment Criteria – Commercial

Compound	EIC GAC 6% SOM	EIC GAC 1% SOM	EIC GAC 2.5% SOM
Metals			
Antimony	7,500	7,500	7,500
Barium	22,000	22,000	22,000
Molybdenum	17,000	17,000	17,000
Organics			
1,1,2 Trichloroethane	400	94	190
1,1-Dichloroethane	850	280	450
1,1-Dichloroethene	92	26	46
1,2,4-Trimethylbenzene	220	42	99
1,2-Dichloropropane	12	3.3	5.9
2,4-Dimethylphenol	30,000 (7,240) *	16,000 (1,380) *	24,000 (3,140) *
2,4-Dinitrotoluene	3,800 (669) *	3,700 (141) *	3,700 (299) *
2,6-Dinitrotoluene	1,900 (1,400) *	1,900 (287) *	1,900 (622) *
2-Chloronaphthalene	2,200 (669) *	390 (114) *	960 (280) *
Biphenyl	48,000 (201) *	18,000 (34.4) *	33,000 (84.3) *
Bis (2-ethylhexyl)phthalate	86,000 (51.7) *	85,000 (8.68) *	86,000 (21.6) *
Bromobenzene	520	97	220
Bromodichloromethane	7.6	2.1	3.7
Bromoform	3,100	760	1500
Butyl benzyl phthalate	950,000 (154) *	940,000 (26.3) *	940,000 (64.7) *
Chloroethane	2,100	960	1,300
Chloromethane	1.6	1	1.2
Cis 1,2-Dichloroethene	47	14	24
Dichloromethane	560	270	360
Diethyl phthalate	290,000 (65) *	150,000 (13.7) *	220,000 (29.1) *
Di- <i>n</i> -butyl phthalate	15,000 (27.3) *	15,000 (4.65) *	15,000 (11.4) *
Di- <i>n</i> -octyl phthalate	89,000 (196) *	89,000 (32.6) *	89,000 (81.5) *
Hexachloroethane	120 (48.1) *	22 (8.17) *	53 (20.1) *
Iso-propylbenzene	7,700 (2,250) *	1,400 (390) *	3,300 (950) *
Methyl <i>tert</i> -butyl ether	24,000	7,900	13,000
Propylbenzene	21,000 (2,330) *	4,100 (402) *	9,700 (981) *

Styrene	11,000 (3,350) *	3,300 (626) *	6,500 (1,440) *
Total Cresols (2-, 3- and 4-methylphenol)	180,000 (73,300) *	160,000 (15,000) *	180,000 (32,500) *
<i>Trans</i> 1,2-dichloroethene	81	22	40
Tributyl tin oxide	200 (241) *	130 (41.3) *	180 (101) *

Notes:

* GAC exceed soil saturation concentration (given in brackets). Soil concentrations above the soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

**EIC/AGS/CL:AIRE Generic Assessment Criteria –Residential without consumption of
 homegrown produce**

Compound	EIC GAC 6% SOM	EIC GAC 1% SOM	EIC GAC 2.5% SOM
Metals			
Antimony	550	550	550
Barium	1,300	1,300	1,300
Molybdenum	670	670	670
Organics			
1,1,2 Trichloroethane	3.9	0.88	1.8
1,1-Dichloroethane	7.7	2.5	4.1
1,1-Dichloroethene	0.82	0.23	0.41
1,2,4-Trimethylbenzene	2.3	0.41	0.99
1,2-Dichloropropane	0.085	0.024	0.042
2,4-Dimethylphenol	730	210	410
2,4-Dinitrotoluene	170	170 (141) *	170
2,6-Dinitrotoluene	87	78	84
2-Chloronaphthalene	22	3.8	9.3
Biphenyl	980 (201) *	220 (34.4) *	500 (84.3) *
Bis (2-ethylhexyl)phthalate	2,800 (51.7) *	2,700 (8.68) *	2,800 (21.6) *
Bromobenzene	4.9	0.91	2.1
Bromodichloromethane	23	5.2	11
Bromoform	0.070	0.019	0.034
Butyl benzyl phthalate	44,000 (154) *	42,000 (26.3) *	44,000 (64.7) *
Chloroethane	18	8.4	11
Chloromethane	0.013	0.0085	0.0099
Cis 1,2-Dichloroethene	0.39	0.12	0.2
Dichloromethane	4.5	2.1	2.8
Diethyl phthalate	6,300 (65) *	1,800 (13.7) *	3,500 (29.1) *
Di- <i>n</i> -butyl phthalate	450 (27.3) *	450 (4.65) *	450 (11.4) *
Di- <i>n</i> -octyl phthalate	3,400 (196) *	3,400 (32.6) *	3,400 (81.5) *
Hexachloroethane	1.3	0.22	0.54
Iso-propylbenzene	67	12	28
Methyl <i>tert</i> -butyl ether	220	73	120

Propylbenzene	230	40	97
Styrene	170	35	78
Total Cresols (2-, 3- and 4-methylphenol)	6,900	3,700	5,400
<i>Trans</i> 1,2-dichloroethene	0.71	0.19	0.35
Tributyl tin oxide	5.7	1.4	3.1

Notes:

* GAC exceed soil saturation concentration (given in brackets). Soil concentrations above the soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

**EIC/AGS/CL:AIRE Generic Assessment Criteria –Residential with consumption of
 homegrown produce**

Compound	EIC GAC 6% SOM	EIC GAC 1% SOM	EIC GAC 2.5% SOM
Metals			
Antimony	ND	ND	ND
Barium	ND	ND	ND
Molybdenum	ND	ND	ND
Organics			
1,1,2 Trichloroethane	2.7	0.6	1.2
1,1-Dichloroethane	7.4	2.4	3.9
1,1-Dichloroethene	0.82	0.23	0.40
1,2,4-Trimethylbenzene	2.0	0.35	0.85
1,2-Dichloropropane	0.084	0.024	0.042
2,4-Dimethylphenol	97	19	43
2,4-Dinitrotoluene	7.2	1.5	3.2
2,6-Dinitrotoluene	3.9	0.78	1.7
2-Chloronaphthalene	22	3.7	9.2
Biphenyl	360	66 (34.4) *	160
Bis (2-ethylhexyl)phthalate	1,100 (51.7) *	280 (8.68) *	610 (21.6) *
Bromobenzene	4.7	0.87	2
Bromodichloromethane	0.061	0.016	0.030
Bromoform	13	2.8	5.9
Butyl benzyl phthalate	7,200 (154) *	1,400 (26.3) *	3,300 (64.7) *
Chloroethane	18	8.3	11
Chloromethane	0.013	0.0083	0.0098
Cis 1,2-Dichloroethene	0.37	0.11	0.19
Dichloromethane	1.7	0.58	0.98
Diethyl phthalate	570 (65) *	120 (13.7) *	260 (29.1) *
Di- <i>n</i> -butyl phthalate	67 (27.3) *	13 (4.65) *	31 (11.4) *
Di- <i>n</i> -octyl phthalate	3,100 (196) *	2,300 (32.6) *	2,800 (81.5) *
Hexachloroethane	1.1	0.2	0.48
Iso-propylbenzene	64	11	27
Methyl <i>tert</i> -butyl ether	160	49	84

Propylbenzene	190	34	82
Styrene	43	8.1	19
Total Cresols (2-, 3- and 4-methylphenol)	400	80	180
<i>Trans</i> 1,2-dichloroethene	0.7	0.19	0.34
Tributyl tin oxide	1.3	0.25	0.59

Notes:

* GAC exceed soil saturation concentration (given in brackets). Soil concentrations above the soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

ND – Not derived. It was considered beyond the scope of the project to collate and review plant concentration factors for the metals and therefore GAC have only been produced for land-uses that do not involve plant uptake.

Withdrawn CLEA Soil Guideline Values (SGVs) derived using CLEA UK Beta

Compound	Residential with plant uptake (mg/kg) dry weight soil			Residential without plant uptake (mg/kg) dry weight soil	Allotments (mg/kg) dry weight soil			Commercial/ Industrial (mg/kg) dry weight soil
	(pH6) 1	(pH7) 2	(pH8) 8		(pH6) 1	(pH7) 2	(pH8) 8	
Inorganic compounds								
Arsenic	20			20	20			500
Cadmium	(pH6) 1	(pH7) 2	(pH8) 8	30	(pH6) 1	(pH7) 2	(pH8) 8	1,400
Chromium	130			200	130			5,000
Lead	450			450	450			750
Mercury	8			15	8			480
Nickel	50			75	50			5,000
Selenium	35			35	35			8,000
Organic compounds								
Ethylbenzene	9 [#]			16 [#]	18 [#]			48,000 [#]
Toluene	3 [#]			3 [#]	31 [#]			150 [#]
Phenol	78 [#]			21,900 [#]	80 [#]			21,900 [#]

Notes:

Based on 1 % soil organic matter, which is the most conservative scenario of those presented within the appropriate SGV document.

Ethylbenzene Residential without Plant Uptake SGV updated April 2005.

ICRCL Values for Copper and Zinc (use LQM/CIEH GACs for Human Health)

Compound	ICRCL (mg/kg)
Copper	130
Zinc	300

Notes:

It is noted that at elevated copper and zinc concentrations, phytotoxicity might start to limit vegetable growth and may become a major cause of concern. In these circumstances the ICRCL limit of 130 mg/kg for copper, and the ICRCL Tentative 'Trigger concentration' of 300 mg/kg for zinc might need to be considered as suitable generic assessment criterias in order to be protective of plant growth.

Dutch Intervention Values

Compound	Dutch Intervention Value (mg/kg) dry matter
Cobalt	240
Free cyanide	20
Complex cyanide	(pH <5) 650 (pH >5) 50

Notes:

The soil remediation Intervention Values indicate when the functional properties of the soil for humans, plant and animal life, is seriously impaired or threatened. They are representative of the level of contamination above which there is a serious case of soil contamination (Dutch Circular). Values for soil/sediment have been expressed as the concentration in a standard soil assumed to be 10% organic matter and 25 % clay.

USEPA PRGs 2004

Compound	Residential Soil (mg/kg)	Industrial Soil (mg/kg)
Manganese and compounds	1,800	19,000
Ammonium sulphate	12,000	100,000

Notes:

The USEPA Preliminary Remediation Goals are guideline values to be used for Site screening. Ammonium sulphamate has been used by Delta-Simons as a proxy for Ammonium.

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Human Health Generic Screening Values (HH-GSVs) for Groundwater derived using RBCA.

**Version 4.0
April 2007**

Table 1a. Human Health Generic Screening values (HH-GSVs) for Groundwater derived using RBCA

Compound	Carcinogenic Compound (Y or N)	Applicable Residential HH-GSV (mg/l)	Applicable Commercial/Industrial HH-GSV (mg/l)
BTEX			
Benzene	Y	0.27	2.3
Ethylbenzene	N	45	>170
Toluene	N	20	170
Xylene (-m)	N	18	150
Xylene (-o)	N	24	>180
Xylene (mixed isomer)	N	25	>200
sTPH			
Aliphatics >C5-C6	N	4.4	>36
Aliphatics >C6-C8	N	2.9	>5.4
Aliphatics >C8-C10	N	0.098	>0.43
Aliphatics >C10-C12	N	>0.034	>0.034
Aliphatics >C12-C16	N	>7.6x10 ⁻⁴	>7.6x10 ⁻⁴
Aliphatics >C16 – C21	N	NC	NC
Aliphatics >C21 – C35	N	NC	NC
Aromatics >C5-C7 (as benzene)	Y	0.26	2.3
Aromatics >C7-C8 (as toluene)	N	19	160
Aromatics >C8-C10	N	3.2	27
Aromatics >C10-C12	N	11	>25
Aromatics >C12 – C16	N	>5.8	>5.8
Aromatics >C16 – C21	N	NC	NC
Aromatics >C21 – C35	N	NC	NC

Table 1a. Human Health Generic Screening Values (HH-GSVs) for Groundwater derived using RBCA, cont'd

Compound	Carcinogenic Compound (Y or N)	Applicable Residential HH-GSV (mg/l)	Applicable Commercial/Industrial HH-GSV (mg/l)
PAH			
Naphthalene	N	4.2	>31
Acenaphthylene	N	NC	NC
Acenaphthene	N	NC	NC
Fluorene	N	NC	NC
Phenanthrene	N	NC	NC
Anthracene	N	NC	NC
Fluoranthene	N	NC	NC
Pyrene	N	NC	NC
Benzo[a]anthracene	Y	$>5.7 \times 10^{-3}$	$>5.7 \times 10^{-3}$
Chrysene	Y	$>1.8 \times 10^{-3}$	$>1.8 \times 10^{-3}$
Benzo[b]fluoranthene	Y	>0.015	>0.015
Benzo[k]fluoranthene	Y	$>4.3 \times 10^{-3}$	$>4.3 \times 10^{-3}$
Benzo[a]pyrene	Y	$>1.6 \times 10^{-3}$	$>1.6 \times 10^{-3}$
Indeno[1,2,3-cd]pyrene	N	>0.062	>0.062
Dibenzo[a,h]anthracene	Y	$>5.0 \times 10^{-4}$	$>5.0 \times 10^{-4}$
Benzo[g,h,i]perylene	N	NC	NC
PCBs and Dioxins			
PCBs	Y	NC	NC
Dioxin (2,3,7,8-tcdd)	Y	NC	NC

Table 1a. Human Health Generic Screening Values (HH-GSVs) for Groundwater derived using RBCA, cont'd

Compound	Carcinogenic Compound (Y or N)	Applicable Residential HH-GSV (mg/l)	Applicable Commercial/Industrial HH-GSV (mg/l)
VOCs			
Isopropyl benzene (cumene)	N	5.8	48
Methyl- <i>t</i> -butyl ether	N	1,500	13,000
Methylethylketone MEK	N	1,300	11,000
Chlorinated Compounds			
Vinyl Chloride	Y	0.013	0.11
Trichloroethene (TCE)	Y	0.83	7.1
1,1,2,2-Tetrachloroethane	Y	32	280
Tetrachloroethene (PCE)	Y	7.5	63
1,1,1-Trichloroethane	N	59	500
cis-1,2-dichloroethene	N	NC	NC
trans-1,2-dichloroethene	N	NC	NC
1,1 - Dichloroethane	N	0.33	2.8
1,2 – Dichloroethane	Y	0.19	1.7
1,2,4-Trichlorobenzene	N	>30	>30
1,1,2-Trichloroethane	Y	91	780
1,2-Dichlorobenzene	N	8.5	72
1,3-Dichlorobenzene	N	1.1	9.3
1,4-Dichlorobenzene	Y	>150	>150
Chloroform	Y	0.028	0.071
Carbon tetrachloride (tetrachloromethane)	Y	0.14	1.2

">" indicates that the HH-GSV exceeds the constituent solubility value (groundwater). The predicted volatilisation within RBCA model is carried out using the Johnson and Ettinger equation, which is only valid for dissolved phase concentrations of contaminants. Where the HH-GSV is indicated to exceed the constituent solubility value, this means that even if free product were encountered it would not cause adverse effects via that particular exposure pathway, (this is confirmed by the Fact Sheet for the RBCA Tool Kit for Chemical Releases by the Environment Agency, FS-02, February 2003).

NC - HH-GSVs for the heavy end aliphatic and aromatic hydrocarbons in the range >C16-C35, for some of the Pah's, PCBs and dioxins are not calculated by the RBCA method. Given the low volatility, there is also no inhalation reference concentration within the RBCA Toolkit for these compounds and they are not considered to be of concern via the inhalation exposure pathway. HH-GSVs for the dichloroethenes are not calculated as no inhalation reference dose has been sourced to date.

Carcinogenicity data from RBCA, DEFRA, USEPA and IARC.

The HH-GSVs are based upon the indoor inhalation pathway in order to maintain a conservative approach.

Constituents of Concern Input Parameters

The Constituents of Concern input parameters have been updated from the default values within RBCA, in order to reflect the CLEA methodology. Where possible, toxicological information was taken from the DEFRA TOX reports.

For carcinogenic compounds, the Oral Index dose (ID oral) from the DEFRA TOX reports was input into the model as the Oral Reference Dose (RfD oral). The inhalation Index Dose (ID inhal) was also input into the model, as the Inhalation Reference Concentration (RfC inhal). In order to convert the ID inhal to the correct units, it was necessary to perform the following calculation;

$$\text{Inhalation Index Dose (mg/kg/day)} \times \text{Average Weight (kg)} / \text{Average Inhaled Concentration per day (m}^3\text{/day)} = \text{Value input (mg/m}^3\text{)}$$

i.e. Value input = ID inhal x (70/20)

The Average Weight of 70 kg was taken from CLR 9 Para. 3.19.

The Average inhaled concentration of 20 m³/day was taken from CLR 9 Table 3.1.

For non-Carcinogenic compounds for which there is a DEFRA TOX report, the Oral Tolerable Daily Soil Intake (TDSI) and Inhalation TDSI could be input into the model in place of the RfD oral and the RfC inhal, respectively.

For non-carcinogenic compounds for which there is no DEFRA TOX report, the Oral and Inhalation TDSIs were calculated from the RBCA RfD oral (TDI equivalent) and RfC inhal (TDI equivalent), with consideration of the Mean Daily Intake (MDI), as detailed in CLR 9 Para. 3.26.

In summary:

Where the MDI < 80% TDI, then the TDSI = TDI - MDI

Where the MDI ≥ 80% TDI or if the MDI was unknown, then the TDSI = 0.2 x TDI

The Henry's Law Concentration was corrected for an average annual temperature of 10 °C, on the basis that the ambient soil temperature at UK sites is 283 K from CLEA Briefing Note 2 Version 1.1, Table 3. The correction was performed using the USEPA on-line Tools for Site Assessment Calculations <http://www.epa.gov/athens/learn2model/part-two/onsite/esthenry.htm>. The calculation was performed for benzene, toluene, ethylbenzene, xylenes (as o-xylene), naphthalene, vinyl chloride, 1,1,1-trichloroethane, 1,2-Dichloroethane, aromatic C5-C7 (as benzene), aromatics >C7-C8 (as toluene), chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(a)pyrene, trichloroethene, fluorine, fluoranthene, acenaphthene, anthracene, pyrene, indeno(1,2,3,c,d)pyrene, Methyl t-butyl ether, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1,2-trichloroethane, 1,2,4-trichlorobenzene, 1,1-dichloroethane, 1,2-trans-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, 1,1,2,2-tetrachloroethane and carbon tetrachloride.

Exposure Parameters

EA CLR9 Parameters used within the RBCA Toolkit

Parameter	Residential			Commercial / Industrial	Source
	Female Adult Age 16-70	Female Child Age 0-6	Female Child Age 0-16	Female Adult age 16-59	
Human receptor					
Exposure duration (years)	54	6	16	43	CLR 10, Table 3.2.
Exposure frequency (days/yr)	365	365	365	230	CLR 10 Table 4.8, Table 4.9 and Table 4.13
Body weight (kg)	46.4	14.8	39.0	46.4	CLR 10 Table 5.6
Skin surface area, soil contact (cm ²).	274	-	253	274	CLR 10, Table 5.8

Soil Parameters

Parameter	Soil Parameters used within the RBCA Toolkit		Source
	Residential	Commercial / Industrial	
Depth to Water- bearing Unit	1 m	1 m	Assumed
Total porosity	0.46	0.46	CLEA Briefing Note 2 : Version 1.1 Table 3 Sandy Soil
Volumetric water content	0.15	0.15	CLEA Briefing Note 2 : Version 1.1 Table 3 Sandy Soil
Volumetric air content	0.31	0.31	CLEA Briefing Note 2 : Version 1.1 Table 3 Sandy Soil
Dry Bulk Density	1.6 g/cm ³	1.6 g/cm ³	CLEA Briefing Note 2 : Version 1.1 Table 3 Sandy Soil
Vertical Hydraulic conductivity	860 cm/d	860 cm/d	RBCA Default for sand
Vapour permeability	1.0 x 10 ⁻¹² m ²	1.0 x 10 ⁻¹² m ²	RBCA Default for sand
Capillary zone thickness	0.05 m	0.05 m	RBCA Default for sand
Fraction of organic carbon	0.01	0.01	Assumed
Soil/water pH	6.8	6.8	RBCA default for sand

Groundwater Parameters

Groundwater Parameters used within the RBCA Toolkit

Parameter	Residential	Commercial / Industrial	Source
Groundwater plume width at source	10 m	10 m	Assumed

Outdoor Air Parameters

Outdoor Air Parameters used within the RBCA Toolkit

Parameter	Residential	Commercial / Industrial	Source
Air mixing zone height	1.623 m	1.623 m	Adult body height CLR 10 Table 5.7
Ambient air velocity in mixing zone	3 m/s	3 m/s	Conservative assumption based on met office data

Indoor Air Parameters

Indoor Air Parameters used within the RBCA Toolkit

Parameter	Residential	Commercial / Industrial	Source
Building Volume/area ratio	2.4 m	9.6 m	CLEA Briefing Note 3: Version 1.0 (March 2004)
Foundation area	70 m ²	600 m ²	CLEA Briefing Note 3: Version 1.0 (March 2004)
Foundation perimeter	33.6 m	98 m	Calculated from CLEA Briefing Note 3: Version 1.0 (March 2004)

Building air exchange rate	1.4 x 10 ⁻⁴ /s	2.8 x 10 ⁻⁴ /s	Calculated from CLEA Briefing Note 3: Version 1.0 (March 2004)
Depth to bottom of foundation slab	0.15 m	0.15 m	CLEA Briefing Note 3: Version 1.0 (March 2004)
Foundation thickness	0.15 m	0.15 m	CLEA Briefing Note 3: Version 1.0 (March 2004)
Foundation crack fraction	0.001	0.001	CLEA Briefing Note 3: Version 1.0 (March 2004)
Volumetric water content of cracks	0.12	0.12	RBCA Default
Volumetric air content of cracks	0.26	0.26	RBCA Default
Indoor/outdoor differential pressure	2.5 Pa	4.5 Pa	CLEA Briefing Note 3: Version 1.0 (March 2004) Table 5.

The Building parameters were taken for a commercial office building and for a residential bungalow.

References

CLEA Briefing Note 2: Update on Estimating Vapour Intrusion Into Buildings. Version 1.1 (July 2004)

CLEA Briefing Note 3: Update of Supporting Values and Assumptions Describing UK Building Stock Version 1.0 (March 2004)

CLR 9 - Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Department for Environment, Food and Rural Affairs and The Environment Agency, Various contaminants covered in DEFRA TOX reports (March 2002)

CLR10 The Contaminated Land Exposure Assessment (CLEA) Model: Technical Basis and Algorithms. Department for Environment, Food and Rural Affairs and The Environment Agency, R&D Publication CLR1 (Jan 2002)

Appendix V



ANALYTICAL TEST REPORT

Contract no: PSL/42570
Contract name: Fields End
Client reference: PSL11/1163
Clients name: Professional Soils Laboratory
Clients address: 5-7 Hexthorpe Road
Doncaster
DN4 0AG

Samples received: 26 May 2011

Analysis started: 26 May 2011

Analysis completed: 02 June 2011

Report issued: 03 June 2011

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAF Non-Asbestos Fibre

Approved by: *K Campbell*

Karan Campbell
Director

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are exclusive of stones.

Lab ref	Sample id	Depth (m)	Soil description passing 2mm sieve	Description of material retained on 2mm sieve	% Retained on 2mm sieve	Moisture (%)
42570-1	WS 101	0.20	Clay Loam	Stones & Gravel	44.8	10.0
42570-2	WS 104	0.30	Loamy Clay	Stones & Gravel	41.7	9.6
42570-3	WS 104	1.00	Sandy Clay	Stones & Gravel	21.5	13.7
42570-4	WS 110	0.20	Loam	Gravel & Roots	5.6	19.4
42570-5	WS 110	0.50	Loamy Clay	Gravel	23.3	13.4
42570-6	WS 113	0.10	Clay Loam	Stones & Gravel	46.7	12.6
42570-7	WS 114	0.10	Sandy Clay	Stones & Gravel	48.9	11.9
42570-8	WS 118	0.30	Clay Loam	Stones & Gravel	68.6	4.7

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SOILS

Lab number			42570-1	42570-2	42570-3	42570-4	42570-5	42570-6
Sample id			WS 101	WS 104	WS 104	WS 110	WS 110	WS 113
Depth (m)			0.20	0.30	1.00	0.20	0.50	0.10
Test	Method	Units						
Arsenic (total)	CE054 ^M	mg/kg	17	20	11	11	11	12
Boron (water soluble)	CE063 ^M	mg/kg	1.0	1.0	0.6	0.8	0.8	0.5
Cadmium (total)	CE054 ^M	mg/kg	<0.2	0.4	<0.2	0.3	<0.2	0.3
Chromium (total)	CE054 ^M	mg/kg	46	69	41	37	38	36
Copper (total)	CE054 ^M	mg/kg	34	46	20	28	25	42
Lead (total)	CE054 ^M	mg/kg	57	75	7.1	35	25	110
Mercury (total)	CE054	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE054 ^M	mg/kg	36	61	62	41	42	28
Selenium (total)	CE054 ^M	mg/kg	0.3	0.6	<0.3	0.4	<0.3	0.7
Zinc (total)	CE054 ^M	mg/kg	84	119	86	78	66	88
pH	CE004 ^M	units	7.3	7.7	7.7	6.7	7.7	6.9
Sulphate (2:1 water soluble)	CE049 ^U	mg/l	15	<10	<10	11	<10	<10
PAH								
Naphthalene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE087	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total)	CE087	mg/kg	<5	<5	<5	<5	<5	<5
TPH								
TPH (C6-C10)	CE067	mg/kg	<10	<10	<10	<10	<10	<10
TPH (C10-C28)	CE033	mg/kg	<10	<10	<10	<10	<10	<10
TPH (C28-C40)	CE033	mg/kg	51	26	12	137	19	83

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SOILS

Lab number			42570-7	42570-8
Sample id			WS 114	WS 118
Depth (m)			0.10	0.30
Test	Method	Units		
Arsenic (total)	CE054 ^M	mg/kg	15	9.9
Boron (water soluble)	CE063 ^M	mg/kg	1.3	0.5
Cadmium (total)	CE054 ^M	mg/kg	<0.2	0.3
Chromium (total)	CE054 ^M	mg/kg	48	30
Copper (total)	CE054 ^M	mg/kg	32	27
Lead (total)	CE054 ^M	mg/kg	47	59
Mercury (total)	CE054	mg/kg	<0.5	<0.5
Nickel (total)	CE054 ^M	mg/kg	30	17
Selenium (total)	CE054 ^M	mg/kg	<0.3	0.9
Zinc (total)	CE054 ^M	mg/kg	68	61
pH	CE004 ^M	units	7.7	7.7
Sulphate (2:1 water soluble)	CE049 ^U	mg/l	<10	<10
PAH				
Naphthalene	CE087	mg/kg	<0.1	<0.1
Acenaphthylene	CE087	mg/kg	<0.1	<0.1
Acenaphthene	CE087	mg/kg	<0.1	<0.1
Fluorene	CE087	mg/kg	<0.1	<0.1
Phenanthrene	CE087	mg/kg	<0.1	0.1
Anthracene	CE087	mg/kg	<0.1	<0.1
Fluoranthene	CE087	mg/kg	<0.1	<0.1
Pyrene	CE087	mg/kg	<0.1	<0.1
Benzo(a)anthracene	CE087	mg/kg	<0.1	<0.1
Chrysene	CE087	mg/kg	<0.1	<0.1
Benzo(b)fluoranthene	CE087	mg/kg	<0.1	<0.1
Benzo(k)fluoranthene	CE087	mg/kg	<0.1	<0.1
Benzo(a)pyrene	CE087	mg/kg	<0.1	<0.1
Indeno(123cd)pyrene	CE087	mg/kg	<0.1	<0.1
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	<0.1
Benzo(ghi)perylene	CE087	mg/kg	<0.1	<0.1
PAH (total)	CE087	mg/kg	<5	<5
TPH				
TPH (C6-C10)	CE067	mg/kg	<10	<10
TPH (C10-C28)	CE033	mg/kg	<10	<10
TPH (C28-C40)	CE033	mg/kg	43	31

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	STATUS	LOD	UNITS
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE063	Boron (water soluble)	Hot water extract, ICP-OES	M	0.3	mg/kg
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	M	0.2	mg/kg
CE054	Chromium (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Copper (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Lead (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Mercury (total)	Aqua regia digest, ICP-OES		0.5	mg/kg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Selenium (total)	Aqua regia digest, ICP-OES	M	0.3	mg/kg
CE054	Zinc (total)	Aqua regia digest, ICP-OES	M	3	mg/kg
CE004	pH	Based on BS 1377, pH Meter	M	0.1	units
CE049	Sulphate (2:1 water soluble)	Aqueous extraction, IC-COND	U	10	mg/l
CE087	PAH (speciated)	Solvent extraction, GC-MS		0.1	mg/kg
CE087	PAH (total)	Solvent extraction, GC-MS		5	mg/kg
CE033	TPH (C6-C40) speciation	Solvent extraction, GC-FID		1	mg/kg

Appendix VI



LABORATORY REPORT



4043

Contract Number: PSL11/1163

Client's Reference:

Report Date: 26 May 2011

Client Name: Delta-Simons Environmental Consultants
The Lawn
Union Road
Lincoln

LN1 3BL

For the attention of: Kevin McGee

Contract Title: Fields End

Date Received: 19-May-11
Date Commenced: 19-May-11
Date Completed: 26-May-11

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS101			0.30	Brown gravelly CLAY.
WS107			0.40	Brown very gravelly CLAY.
WS108			1.50	Brown CLAY.
WS109			1.00	Brown slightly gravelly CLAY.
WS111				Brown very gravelly CLAY.
WS114				Brown very gravelly CLAY.



Compiled by	Date	Checked by	Date	Approved by	Date
<i>Mat</i>	26/05/11	<i>Re</i>	26/05/11	<i>Re</i>	26/05/11
FIELDS END.				Contract No:	PSL11/1163
				Client Ref:	


SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % <small>Clause 3.2</small>	Bulk Density Mg/m ³ <small>Clause 7.2</small>	Dry Density Mg/m ³ <small>Clause 7.2</small>	Particle Density Mg/m ³ <small>Clause 8.</small>	Liquid Limit % <small>Clause 4.3/4.4</small>	Plastic Limit % <small>Clause 5.</small>	Plasticity Index % <small>Clause 6.</small>	% Passing .425mm	Remarks
WS101			0.30	31				77	22	55	79	Very high plasticity CV.
WS107			0.40	19				78	23	55	59	Very high plasticity CV.
WS108			1.50	33				82	23	59	100	Very high plasticity CV.
WS109			1.00	30				82	24	58	92	Very high plasticity CV.
WS111				12				78	20	58	66	Very high plasticity CV.
WS114				13				79	23	56	67	Very high plasticity CV.

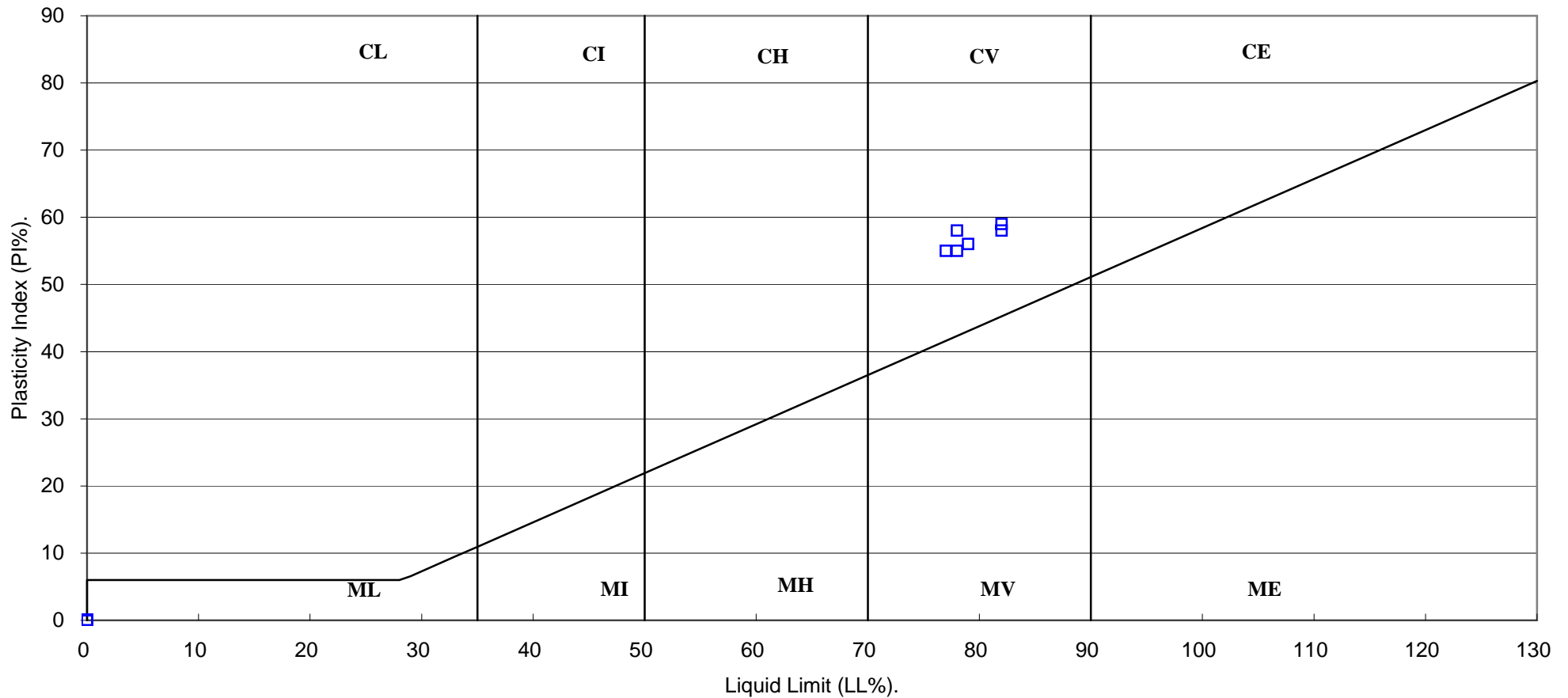
SYMBOLS : NP : Non Plastic


* : Liquid Limit and Plastic Limit Wet Sieved.

	Compiled by	Date	Checked by	Date	Approved by	Date
	<i>Mar</i>	26/05/11	<i>R</i>	26/05/11	<i>R</i>	26/05/11
	FIELDS END.					

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



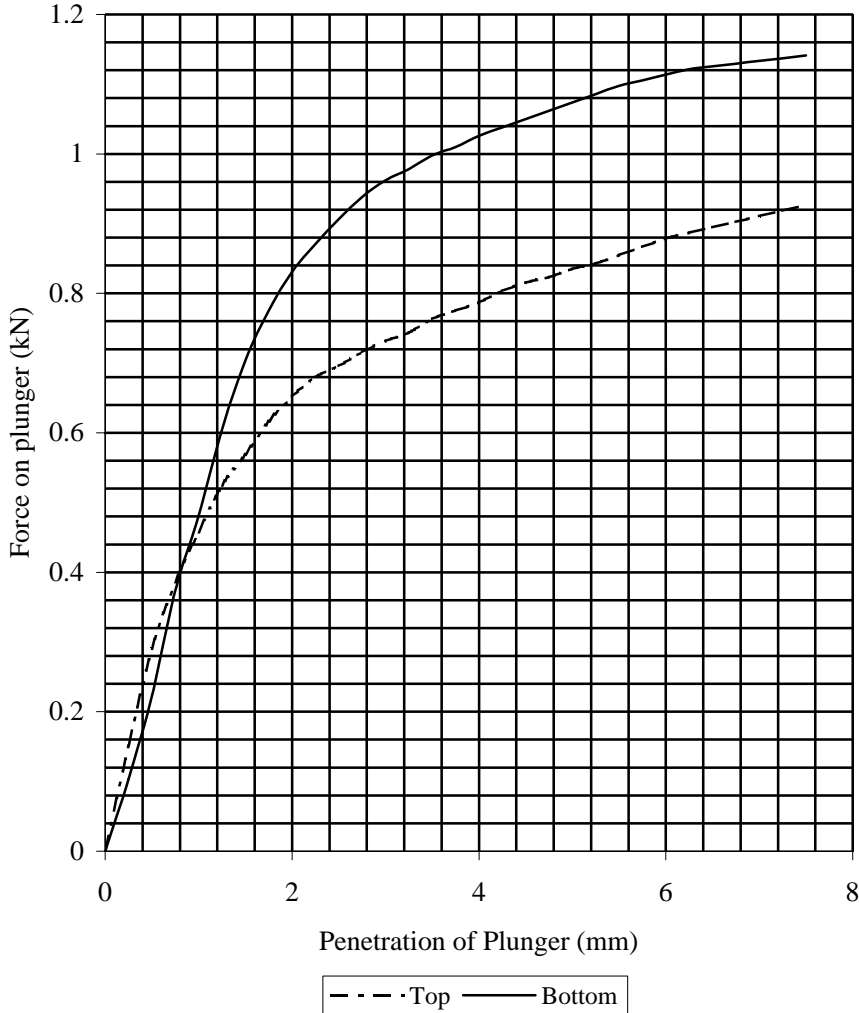
	Compiled by	Date	Checked by	Date	Approved by	Date	
	<i>Mat</i>	26/05/11	<i>[Signature]</i>	26/05/11	<i>[Signature]</i>	26/05/11	
	FIELDS END.					Contract No:	PSL11/1163
						Client Ref:	

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: **WS101** **Depth (m):** **0.30**

Sample Number: **Sample Type:**



Initial Sample Conditions		Test Conditions		Method of compaction		2.5Kg Rammer	
Moisture Content:	31.6	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	1.81	Soaking Time hrs	0	Sample Top	31.5	Sample Top	5.3
Dry Density Mg/m3:	1.38	Swelling mm:	0	Sample Bottom	31.7	Sample Bottom	6.9
Percentage retained on 20mm BS test sieve:	6	Remarks: See Summary of Soil Description.					

Checked by	Date	Approved By	Date
<i>Re</i>	26/05/11	<i>Re</i>	26/05/11

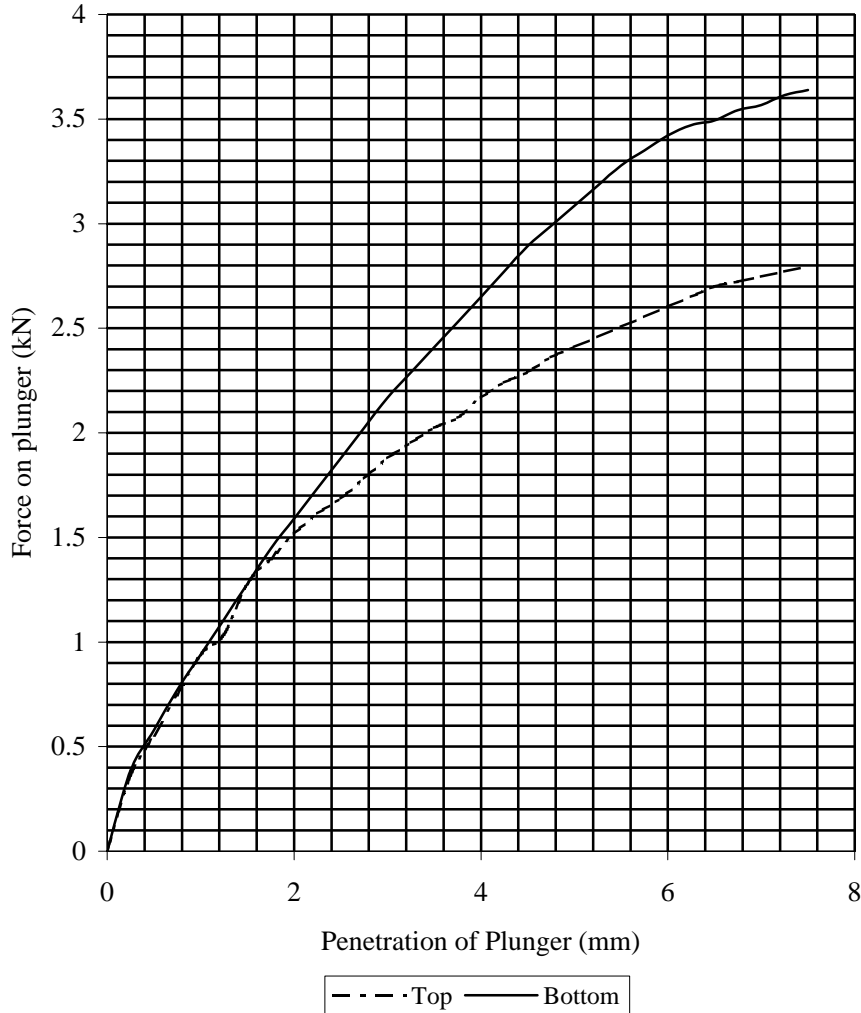
 Professional Soils Laboratory	FIELDS END.	Contract No. PSL11/1163
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California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: **WS107** **Depth (m):** **0.40**

Sample Number: **Sample Type:**



Initial Sample Conditions		Test Conditions		Method of compaction		2.5Kg Rammer	
Moisture Content:	18.9	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	1.76	Soaking Time hrs	0	Sample Top	19.2	Sample Top	12.8
Dry Density Mg/m3:	1.48	Swelling mm:	0	Sample Bottom	18.6	Sample Bottom	15.4
Percentage retained on 20mm BS test sieve:	17	Remarks: See Summary of Soil Description.					

Checked by	Date	Approved By	Date
<i>Re</i>	26/05/11	<i>Re</i>	26/05/11

	<p>FIELDS END.</p>	<p>Contract No. PSL11/1163</p>
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