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A different perspective

Phase II Geo-Environmental Assessment
Lundwood, Barnsley

For
Cornell Group

Delta-Simons Project No. 12-0776.01

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EXECUTIVE SUMMARY STATEMENT

PHASE II GEO-ENVIRONMENTAL ASSESSMENT

LUNDWOOD, BARNSLEY

DELTA-SIMONS PROJECT NO. 12-0776.01

Authorisation	Delta-Simons Environmental Consultants Limited (Delta-Simons) was instructed by Bright Young Consulting Ltd on behalf of Cornell Group (the 'Client') to undertake a Phase II Geo-Environmental Assessment of land off Lund Lane, Lundwood, Barnsley, South Yorkshire, (hereafter referred to as the 'Site').
Context and Purpose	The Assessment is required to inform the Client with regard to the potential environmental and geotechnical liabilities that may exist at the Site and is intended to support the Client in a future planning application in accordance with the National Planning Policy Framework (NPPF)
Current Site Status	The Site comprises a parcel of open land approximately 0.50 Ha., located in the Lundwood area of Barnsley. The Site is currently undeveloped with two small former access roads located in the north-east and central areas of the Site. The Site is located in a predominantly residential area, with properties located on all sides of the Site. Trees are noted to be present along the western boundary of the Site.
Summary of Environmental Setting	The Site is underlain by Mid Pleistocene Till, overlying the Pennines Middle Coal Measures. The Mid Pleistocene Till is classified as Unproductive Strata, with the Pennines Middle Coal Measures classified as a Secondary A Aquifer. The closest surface water feature is the River Dearne, located approximately 71 m to the north-east of the Site. Reference to the Phase I Desk Study indicates that the Site is located within an area which experienced flooding in June 2007, although the Site is not indicated by the Environment Agency to be in an area at risk of fluvial or tidal flooding. Delta-Simons has obtained radon reports from UKRadon for properties adjacent to the north and south of the Site. These reports indicate that properties to the south of the Site are not in a radon effected area, whilst properties to the north are in area with a probability of the property being above the Action Level for radon of 1-3%.
Site Investigation Works	The scope of works included the following: Δ A review of the published geological records, previous third party reports, and data provided by the Client; Δ An intrusive investigation including excavation of six trial pits to a maximum depth of 3.50 m bgl, seven. dynamic sampler boreholes to a maximum depth of 3.00 m bgl, including Dynamic Penetration Tests (DPTs) extending to 5.40 m bgl; Δ Installation of three dynamic sampler boreholes as monitoring wells; Δ Completion of three soakway tests to obtain indicative infiltration values; Δ Collection and analysis of a total of 14 soil samples for a range of chemical and geotechnical determinands from the exploratory locations; Δ Monitoring of depth to groundwater and ground gas concentrations on three separate occasions; and Δ 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 generally comprise a layer of Made Ground extending to a maximum recorded depth of 0.70 m bgl, overlying gravelly, occasionally silty, Clay (Mid Pleistocene Till), to a maximum depth of 3.00 m bgl, underlain by weak thinly laminated weathered mottled light grey siltstone. Shallow groundwater beneath the Site is considered to be perched and has been identified at depth of between 0.800 to 1.570 m bgl.
Environmental Conclusions	The key environmental findings at the Site are summarised as: Δ The site investigation has been carried out in order to assess the ground

	conditions in the context of a proposed residential with assumed plant uptake end-use of the Site; and Δ Limited hydrocarbon and PAH contamination above relevant guidance values has been identified within shallow Made Ground beneath the Site. In addition, the presence of ACMs has been identified within one sample of shallow Made Ground, however, based upon the results obtained, the proposed development area can be considered to be suitable for its intended use on the basis of the environmental recommendations.
Geotechnical Conclusions	The key geotechnical findings at the Site are summarised as: Δ Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction; Δ It is recommended that where variable ground in identified in the formation strata, foundations are reinforced against differential settlement. Precautions should be taken where trees are present, proposed, or removed in line with NHBC guidelines; Δ The clays have been found to have a low shrinkability, with a classification of low plasticity predominating and, therefore, allowances should be made for this in foundation design; Δ The Site is not suitable for the use of soakaway drainage at shallow depth due to the predominantly cohesive and low permeability ground conditions; Δ The Design Sulfate Class for the Site is DS-1, and the ACEC Class is AC-1; and Δ A design California Bearing Ratio (CBR) value for the shallow depth clay soils of 2% may be adopted.
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: Δ Any groundworkers who are required to perform sub-surface work at the Site should be made aware of the presence of low concentrations of hydrocarbons and the potential for ACMs and the possibility of encountering unforeseen contamination. Therefore, good standards of personal hygiene should be observed with appropriate levels of PPE/RPE provided and utilised, and toolbox talks should be given to contractors prior to the commencement of works. Dust suppression via the damping down of Made Ground soils should also be employed; Δ A hotspot protocol should be put in place to deal with any previously unidentified hotspots of contamination, including the potential for ACMs to be present; Δ A clean cover layer (such as topsoil) will be required in areas of privare gardens and soft landscaping. The required thickness of topsoil in these areas should be agreed with the NHBC and Local Authority; Δ A detailed radon gas report should be obtained for the Site to further assess the risked posed and to establish if protective measures are required; and Δ The developer and their contractors should remain vigilant for any previously unidentified contamination, including asbestos fragments.
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: Δ Alternative drainage solutions to soakaway drainage will need to be sought; and Δ The developer and their contractors should remain vigilant for any unexpected or unusual ground conditions.
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 and should be read in conjunction with the main Report text.	

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PHASE II GEO-ENVIRONMENTAL ASSESSMENT

LUNDWOOD, BARNSLEY

FOR

CORNELL GROUP

DELTA-SIMONS PROJECT NO. 12-0776.01

1.0 INTRODUCTION

1.1 Authorisation

Delta-Simons Environmental Consultants Limited (Delta-Simons) was instructed by Bright Young Consulting Ltd on behalf of Cornell Group (the 'Client') to undertake a Phase II Geo-Environmental Assessment of land off Lund Lane, Lundwood, Barnsley, South Yorkshire, (hereafter referred to as the 'Site').

1.2 Context and Purpose

The Assessment is required to inform the Client with regard to the potential environmental and geotechnical liabilities that may exist at the Site. At this stage, it is understood that the Site is to be redeveloped as a residential development with private gardens, public open space and associated roads and infrastructure.

This Report comprises data obtained from both a desk study and an intrusive Site investigation, and is intended to support the Client in a future planning application in accordance with the National Planning Policy Framework (NPPF). 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 and data provided by the Client;
- A review of the previous third party investigation of the Site;
- Excavation of six trial pits (TP101 – TP106) across the Site to a maximum depth of 3.50 m bgl (metres below ground level);
- Completion of seven dynamic sampler boreholes (DS101 – DS107), across the Site, to a maximum depth of 3.00 m bgl, including Dynamic Penetration Tests (DPTs) extending to 5.40 m bgl;

- Installation of three dynamic sampler boreholes (DS101, DS104, and DS106) with 50 mm internal diameter monitoring wells to a maximum depth of 3.00 m bgl, to facilitate ground gas and groundwater monitoring;
- Completion of three soakway tests (SA101 – SA103) within trial pits to obtain indicative infiltration values;
- Supervision of works by Delta-Simons geo-environmental engineer to oversee the works, take samples and log arisings in general accordance with BS5930;
- Collection of a total of five soil samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of organic and inorganic determinands;
- Collection of nine soils samples from the exploratory holes for analysis at an appropriately accredited laboratory for a range of geotechnical parameters;
- Monitoring of depth to groundwater and ground gas concentrations on three separate occasions; and
- 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:

- Chemtech Ltd;
- Professional Soils Laboratory Ltd; and
- The Client, including a Phase I Desk Study undertaken for the Site.

1.5 Limitations to Site Investigation

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 Desk Top Review

Data obtained for a desk based assessment, including a Phase I Desk Study undertaken by Bright Young Consulting Ltd, is summarised in the table below.

Current Site Status and Surrounding Area	The Site comprises a parcel of open land approximately 0.50 Ha., located in the Lundwood area of Barnsley. The Site is currently undeveloped with two small former access roads located in the north-east and central areas of the Site. The Site is located in a predominantly residential area, with properties located on all sides of the Site. Trees are noted to be present along the western boundary of the Site. A Site Location Map and Site Layout Plan are provided as Figures 1 and 2 respectively.
Geology **Hydrogeology**	From the British Geological Survey (BGS) Geology of Britain viewer, provided on their website[1], the Site is underlain by Mid Pleistocene Till – Diamicton, overlying the carboniferous Pennine Middle Coal Measures Formation which consists of mudstone, siltstone and sandstone. The presence of some Made Ground is considered likely associated with previous development. From the Environment Agency (EA) Aquifer Designation Map, the superficial geology (Glacial Till) underlying the Site is classified as Unproductive Strata with the solid geology (Pennine Middle Coal Measures) as a Secondary A Aquifer.
Hydrology **Other Environmental / Land Features**	The Site is not located within a groundwater Source Protection Zone. The nearest surface water feature is the River Dearne, approximately 71 m north-east of the Site. 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 of flooding from rivers or seas. However, reference to the Phase I Desk Study indicates that the Site is located within an area which experienced flooding in June 2007, with flood waters extending to Lund Lane, located to the south of the Site. Delta-Simons has obtained radon reports from UKRadon for properties adjacent to the north and south of the Site. These reports indicate that properties to the south of the Site are not in a radon effected area, whilst properties to the north are in an area with a probability of the property being above the Action Level for radon of 1-3%.
Coal Mining	From a review of the Interactive Map Viewer on the Coal Authority Website the Site is not shown to be within a development high risk area and therefore the risk of mining legacy issues is considered to be low. The Site is not located within a Referral area and, therefore, does not require a detailed Coal Mining Risk Assessment. In addition, it is understood that the Client has obtained a Coal Authority Report and further assessment of coal mining risks are not considered to be required within this Report.

[1] http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html

Previous Report Review	Delta Simons has been provided with a previous Phase I Desk Study report undertaken by Bright Young Consulting Ltd, following instructions from NJT Design Ltd on behalf of RMG Developments Ltd. As part of the Phase I Desk Study a review of historical maps was undertaken which indicated that the Site was occupied by agricultural land from 1854-1907. By the 1931 map edition, the Site is occupied by residential developments, which remain until at least the 2008 edition. These residential properties are understood to have been cleared between 2008 and the present day. The proposed redevelopment plan contained within this report indicates that the Site will be redeveloped with 24 residential properties with associated gardens, public space and access roads. A copy of this proposed redevelopment plan is included as Appendix I. The Coal Authority Report contained within this desk study indicated that the property is not within the zone of likely physical influence of present underground workings. However from past underground coal mining, the previous report indicates that the property is in the likely zone of influence from 8 seams of coal at 180m to 560m depth, and last worked in 1991.

2.2 Initial Conceptual Site Model

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

Table 1 – Initial Conceptual Site Model

Source	Pathway	Receptor	Matrix Assessment	Justification
Any Made Ground present associated with the former residential properties at the Site. Contamination from previously unidentified sources.	Direct contact/ ingestion and inhalation of dust and vapours.	Groundworkers during the development or during any sub-surface maintenance works and future Site users.	**Low to Medium**	An intrusive investigation is required to determine if any risks are posed to groundworkers and future Site users from likely underlying Made Ground at the Site.
	Vertical and lateral migration through any permeable deposits below the Site.	Secondary A Aquifer below the Site.	**Low**	No significant potential sources of contamination have been identified at the Site. An intrusive location will further assess if underlying Made Ground poses any risks to protected water bodies. However, the underlying aquifer is likely to be afforded some protection from vertical migration of any contaminants by the underlying Glacial Till deposits. An intrusive investigation will determine groundwater levels and whether a groundwater body is present beneath the Site at shallow depth.
	Service conduits.	Direct infiltration in water supply pipes.	**Low to Medium**	An intrusive investigation is required to determine if underlying Made Ground at the Site poses any risk to newly installed water supply pipes. New water supply pipes may need to be upgraded.
	Vertical and lateral migration through any permeable deposits below the Site.	Adjacent residential properties and nearby River Dearne.	**Low**	No significant potential sources of contamination have been identified and shallow drift deposits are likely to be of low permeability. An intrusive investigation will further assess any risks associated with any underlying Made Ground and off-Site receptors.
Ground Gas from underlying Made Ground and natural deposits.	Vertical & lateral migration	Human Health and buildings	**Low to Medium**	Potential sources of hazardous ground gas may be present beneath the Site, associated with Made Ground and natural deposits. Radon may pose a risk to properties at the Site.

Risk Definitions are included within Appendix II.

3.0 SITE INVESTIGATION

3.1 Intrusive Locations and Soil Sampling

In order to obtain information on the ground conditions across the Site, seven dynamic sampler boreholes (DS101 to DS107) were advanced on the 4th February 2013, to a maximum depth of 3.00 m bgl, including Dynamic Penetration Tests (DPTs) extending to 5.40 m bgl. Boreholes were advanced to assess the shallow geology beneath the Site and to allow for ground gas and groundwater monitoring wells to be installed. Remaining boreholes were backfilled with arisings upon completion.

In addition, six machine-excavated trial pits (TP101 to TP106) were advanced on the 4th February 2013 to a maximum depth of 3.50 m bgl to allow for assessment of shallow geology beneath the Site and to allow for soakway tests to be carried out. All trial pits were backfilled upon completion.

Intrusive location logs are included in Appendix III and intrusive locations are shown on Figure 3.

Geotechnical tests and chemical analysis was performed on a total of 14 No. soil samples collected from the Site (nine geotechnical and five 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 tests were selected on the basis of the encountered ground conditions and in the context of the likely proposed development. The location, depth and suite of analyses selected for each soil sample is presented in Table 2.

Table 2 – Soil Sample Analyses

		Chemical Determinands								Geotechnical Determinands	
Intrusive Location	Depth (m bgl)	Heavy Metals	TPH	sTPH	sPAH	Water Soluble Sulphate	pH	Asbestos Screen	Calorific Value	Plastic and Liquid Limits	California Bearing Ratio
DS101	0.20	✓	✓		✓			✓	✓		
DS102	0.50					✓	✓				
DS102	1.80	✓			✓		✓				
DS104	1.50					✓	✓				
DS106	0.90					✓	✓				
DS107	0.30	✓	✓		✓	✓	✓	✓			
DS107	1.50									✓	
TP101	1.00									✓	
TP102	0.50	✓		✓	✓		✓		✓		
TP102	1.50									✓	
TP103	0.80					✓	✓				✓
TP103	1.40									✓	
TP104	0.50	✓	✓		✓		✓		✓		
TP104	1.00										✓
TP104	3.40									✓	
TP105	0.80										✓
TP106	2.00									✓	
TOTAL		**5**	**3**	**1**	**5**	**5**	**8**	**2**	**3**	**6**	**3**

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

3.2 Ground Gas and Groundwater Monitoring

Measurements of the depth to groundwater and measurements of methane, carbon dioxide and oxygen concentrations, atmospheric pressure and borehole flow rates were made in each of the monitoring wells on the 15th and 20th February 2013 and 4th March 2013. Depths to groundwater were recorded using an electronic dip meter and soil gas concentrations and gas flows were recorded using an infrared gas analyser.

No groundwater samples were collected as part of this investigation.

4.0 RESULTS & ASSESSMENT

4.1 Ground Conditions

A summary of the observed ground conditions at the Site is provided in Table 3 below.

Table 3 – Summary of Observed Ground Conditions

Stratum	Typical Description	Depth
Site Surface	The majority of the Site surface is covered in grass and rough vegetation, with tarmac roads present in the centre and north-eastern sections of the Site	NA
Made Ground	Dark brown, grey gravelly clayey silt, silty clay. Gravel includes brick, sandstone, and flints. Occasional pottery, coal and clinker materials present. Dark brown gravelly sand present in TP103, TP104, TP105. Gravel include concrete, brick, slate, asphalt, plastics, and wood. Concrete cobbles present.	GL to 0.70 m bgl
Mid Pleistocene Till	Yellow brown mottled grey, occasional dark brown patches gravelly, silty in places clay. Gravel is sandstone, with cobbles and boulders of sandstone and siltstone.	From base of Made Ground To maximum identified depths between 0.90 to >3.00 m bgl
Suspected Pennine Middle Coal Measures	Yellow brown, very weak thinly laminated weathered mottled light grey siltstone, recovered as gravelly clayey silt, with gravels of siltstone. This strata is considered to be the weathered top of the bed rock underlying the Site. However, this could only be proven conclusively through rotary drilling.	From the base of the Glacial Till to an unproven depth.

Groundwater

Groundwater strikes were not identified during the advancement of intrusive locations and therefore significant groundwater flow within shallow superficial deposits is considered unlikely.

A summary of the levels of groundwater identified within installed boreholes over the monitoring period is provided in Table 4 below:

Table 4 - Depth to Groundwater

Intrusive Location	Minimum Depth to Groundwater (m bgl)	Maximum Depth to Groundwater (m bgl)	Depth to Base (m bgl)
DS101	1.490	1.570	2.000
DS104	0.890	0.910	2.340
DS106	0.800	1.010	3.000

Groundwater beneath the Site is considered to be shallow and perched, associated with the Glacial Till beneath the Site.

4.2 Visual and Olfactory Evidence of Contamination

Limited amounts of coal materials and clinker were noted within Made Ground beneath the Site. No olfactory evidence of hydrocarbons was noted within any of intrusive locations. No visible evidence of asbestos materials was noted.

5.0 ENVIRONMENTAL ANALYTICAL RESULTS

5.1 Guidance for Analytical Results: Assessment Criteria

Information on the relevant guidance values which have been used for this Environmental Assessment is presented in the following section.

5.1.1 Human Health Soil Screening Values

In the absence of a regulatory set of screening values derived using the new Contaminated Land Exposure Assessment (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.

5.2 Soil Analysis Results

A summary of the soil analysis results is provided below and copies of the laboratory certificates are presented in Appendix V. The results have been assessed with reference to generic assessment criteria considered protective of Human Health for a residential with assumed plant uptake end-use.

- Three concentrations of benzo(a)pyrene have been identified in exceedance of the published GAC values of 1.00 mg/kg within samples of Made Ground, identified to a maximum concentration of 12.1 mg/kg within a sample collected from DS101 at a depth of 0.20 m bgl;
- Further concentrations of individual PAH compounds including benzo(a)anthracene, chrysene, benzo(b)fluoranthene, ideno(1,2,3-cd)pyrene, and dibenzo(ah)anthracene have been identified above published GAC

values within a sample of Made Ground collected from DS101 at a depth of 0.20 m bgl;

- Concentrations of individual sTPH carbons bands (aliphatic C_8-C_{10}, C_{10}-C_{12}, C_{12}-C_{16}, C_{16}-C_{35}, and aromatic C_{16}-C_{21} and C_{21}-C_{35}) have been identified above laboratory detection limits within samples of Made Ground, identified to a combined maximum total concentration of 1,021 mg/kg within a sample collected from TP102 at a depth of 0.80 m bgl. Concentrations of TPH have been identified above laboratory detection limits within samples of Made Ground to a maximum concentration of 988 mg/kg, within a sample collected from DS101 at a depth of 0.20 m bgl. All recorded concentrations of sTPH are below individual guidance values in relation to human health;
- Asbestos containing materials (ACMs), identified as chrysotile, have been identified within one sample of Made Ground collected from DS101 at a depth of 0.20 m bgl; and
- All other concentrations were below guidance values or laboratory detection limits.

5.3 Hazardous Gases

5.3.1 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 Gas Screening Value (GSV) for methane and carbon dioxide.

The GSV is calculated by multiplying the borehole flow rate (l/hr) by the gas concentration (%), 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. The calculated GSV has also been used in conjunction with Table 8.7 (NHBC Traffic Light (TL)) in CIRIA C665, in order to provide typical scopes of protection measures for the proposed development.

5.3.2 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 three separate occasions on the 15th and 20th February 2013 and 4th March 2013. A summary of the ground gas monitoring results is provided in Table 5. A copy of the monitoring sheets are included in Appendix VI.

Table 5 - Summary of Ground Gas Monitoring Results

Date	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Flow Rate l/hr	GSV/CS/TL			
					Methane		Carbon Dioxide	
	Max	Max	Min	Max	GSV	CS/TL	GSV	CS/TL
15/02/13	<0.1	0.5	21.3	<0.1	0.0001	1/green	0.0005	1/green
20/02/13	<0.1	0.9	19.6	<0.1	0.0001	1/green	0.0009	1/green
04/03/13	<0.1	0.5	21.0	<0.1	0.0001	1/green	0.0005	1/green

Date	Conditions During Monitoring Round	
	Atmospheric Pressure (mb)	Weather Conditions
15/02/13	1011	Sunny and dry
20/02/13	1021	Sunny and dry
04/03/13	1017	Overcast

Note: GSV = Gas Screening Value
CS = Characteristic Situation (Range: 1 = Very low risk to 6 = Very high risk)

Following a review of the available ground gas monitoring results that have been undertaken as part of this investigation, it is considered that the ground gas regime at the Site falls under Characteristic Situation 1 equivalent to NHBC traffic Light Green which represents the lowest risk characterisation and no gas protection measures are required.

6.0 CONTAMINATED LAND RISK ASSESSMENT

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 of the Environmental Protection Act 1990 (Part 2A) (when assessing current Site status or when considering the acquisition of an existing development), or as part of the planning process (for the redevelopment of an existing Site, or when considering the acquisition of a Site for redevelopment purposes). In either context the 'suitable for use' approach is adopted in assessing the risks. As such, the source-pathway-receptor assessment defines a conceptual model for the Site under consideration.

For the purposes of this Assessment, the risk assessment has been undertaken based upon the suitable for use approach in the context of the proposed residential with plant uptake end-use. The following revised Conceptual Site Model (CSM) has been formulated, taking into account all of the available data for the Site.

Table 6 – Identified Pollutant Linkages

Source	Pathway	Receptor	Matrix Assessment	Assessment of the Significance of the Linkage
Identified concentrations of PAH compounds and TPH within underlying Made Ground within DS101, DS107, TP102, and TP104. ACMs identified within shallow Made Ground within DS101 Previously unidentified hotspots of contamination.	Direct contact/ ingestion and inhalation of dust	Future Site users (occupiers and visitors) Off-Site residents	**Low to Medium**	A clean cover system should be employed within areas of gardens and regions of soft landscaping to remove the direct contact / ingestion pathway. The Local Planning Authority should be consulted to ascertain the required thickness of any clean cover as this may vary between private gardens and public open space. In addition, it should be ensured that Made Ground is not left exposed on the Site surface. DS101 is located beneath a proposed access road, which will remove the direct pathway between any ACM fibres and future Site users but the isolated presence of asbestos fibres elsewhere cannot be ruled out. A hotspot protocol should be put in place to deal with any previously unidentified hotspots of contamination. Best working practices, including dust suppression should be employed during any construction activities at the Site.
	Inhalation of volatile vapours		**Low**	Absence of source – concentrations of hydrocarbon contaminants that were either below the detection thresholds, or below the relevant UK guidance thresholds.
	Direct contact/ ingestion and inhalation of dust (including ACMs) and vapours	Groundworkers during any future sub-surface works	**Low to Medium**	Any groundworkers who are required to perform work at the Site should be made aware of the potential for hydrocarbons and ACM materials, plus previously unrecorded contamination to be present beneath the Site. Therefore, good standards of personal hygiene should be observed with appropriate levels of PPE / RPE provided and utilised, and toolbox talks should be given to contractors prior to the commencement of works. Precautionary working practices, including damping down of soils in the area of DS101 should be undertaken.
	Vertical and lateral migration through any permeable deposits below the Site.	Secondary A Aquifer below the Site.	**Low**	Slightly elevated concentrations of PAH compounds and TPH are likely to be associated with identified immobile coal and clinker materials. In addition, the underlying Coal Measures are afforded some protection from the Made Ground by the presence of the underlying low permeability Glacial Till, therefore, the risks to groundwater are considered to be low. In addition, no sensitive abstractions or surface water bodies have been identified in the immediate vicinity.
	Direct infiltration in water supply pipes.	Service conduits.	**Low to Medium**	It should be noted that due to the slightly elevated concentrations of hydrocarbons identified within Made Ground beneath the Site, local water authority may require upgraded water supply pipes.

	Vertical and lateral migration through any permeable deposits below the Site.	Adjacent residential properties and River Dearne	**Low**	Groundwater beneath the site is considered to be perched. In addition, elevated concentrations of PAH compounds and TPH are likely to be associated with identified coal and clinker materials and, thus are not mobile contaminants. In addition, the underlying Coal Measures are afforded some protection from the Made Ground by the presence of the underlying low permeability Glacial Till.
	Root zone uptake	Plants in any landscaped areas	**Low**	It should be ensured that a suitable covering of clean topsoil is positioned over regions of Made Ground.
Ground Gas	Vertical & lateral migration	Human Health and buildings	**Low to Medium**	Elevated concentrations of hazardous ground gases have not been identified beneath the Site, therefore, ground gas protective measures are not considered necessary within future development of the Site. Radon gas may potential effect all or part of the development. A further, detailed radon gas assessment should be obtained for the Site to further assess the risks and need for radon gas protective measures.

7.0 GEOTECHNICAL RESULTS

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

7.1 Geotechnical Appraisal

The Site comprises an open parcel of land as described in Section 2.1 of this Report.

7.1.1 Structural Foundations and Floor Slabs

The ground conditions beneath the Site have been shown to generally comprise a layer of Made Ground extending to a maximum recorded depth of 0.70 m bgl, overlying gravelly occasionally silty Clay, described in the field as being soft to firm, identified to a maximum depth of 3.00 m bgl. This clay was further underlain by weak thinly laminated weathered yellow mottled light grey siltstone, recovered as gravelly clayey silt, with gravels of siltstone identified from the base of the Glacial Till, as described in Section 4.0 of this Report.

DPTs indicate that blow counts show an increase from approximately 1.30 m bgl, indicating medium to high strength clay.

Shallow groundwater beneath the Site is considered to be perched and has been identified at depth of between 0.80 to 1.57 m bgl.

Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction. Initial allowable bearing capacity of 100kN/m^2 would be suitable located at a minimum depth of approximately 1.30 m bgl, within clay, beneath any Made Ground or other unsuitable soil. It is recommended that where the formation strata is variable foundations are reinforced against small degrees of differential settlement.

The clays have been found to have a low shrinkability, with a classification of low plasticity predominating, therefore, appropriate precautions in line with NHBC guidance, especially where trees currently exist or are proposed, should be adhered to. This could entail taking foundations deeper and the use of void formers or other methods for heave protection where trees are proposed, remain, or have been present.

7.1.2 Groundworks

Shallow excavations are likely to remain stable, except for extended periods, where support may be required during construction. Shallow excavations may require close boarded support 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.

Excavations within the Made Ground and clay strata should be possible without the use of hydraulic breaker. Excavations into the underlying suspected bed rock may require the use of a breaker.

7.1.3 External Works

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

A design California Bearing Ratio (CBR) value for the shallow depth soft to firm clay soils of 2% may be adopted, and the clays are generally considered to be sufficiently competent to support the construction of new roads and pavements without the need for any abnormal preparatory work. However, it should be noted that the presence of locally soft clays maybe present at the Site which require removal and replacement with a suitable aggregate and geotextile in line with the Specification for Highways Work Series 600.

7.1.4 Drainage and Soakaway Testing

Soakaway tests were undertaken by Delta-Simons within three trial pits (SA101 – SA103), with each trial pit filled to the top of the natural deposits. Soil infiltration rates could not be calculated as 25% effective depth was not obtained. Water levels did not reduce within trail pits over the observation period (minimum of 4 hours), therefore, soak-away drainage is not considered to be a suitable Site-wide drainage option at the Site.

7.1.5 Sulphate Attack on Buried Concrete

Soluble sulphate concentrations were recorded at a maximum of 149 mg/l while pH values ranged between neutral to slightly alkaline. Further limited investigation could be undertaken to determine if pyrite is present.

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.

8.0 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 significant liabilities and/or costs exist.

8.1 Regulatory Body Enforcement

8.1.1 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.

8.1.2 Planning and Development Control

This Report is considered likely to be sufficient for supporting the discharge contaminated land planning conditions associated with the proposed residential development at the Site.

8.1.3 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.

8.2 Risks to the Proposed Development

Based on the available information, Delta-Simons considers that the ground conditions are suitable for the proposed development, subject to recommendations and mitigation methods where required.

9.0 CONCLUSIONS & RECOMMENDATIONS

9.1 Environmental Conclusions

The Site comprises an open parcel of land as described in Section 2.1 of this Report.

- Δ Potential sources of contamination were identified at the Site during the initial Site inspection, in the form of the presence of Made Ground associated with former development at the Site. No significant historical sources of potential contamination were identified;
- Δ The site investigation has been carried out in order to assess the ground conditions in the context of a proposed residential, with assumed plant uptake, end-use of the Site; and
- Δ Limited hydrocarbon and PAH contamination has been identified within shallow Made Ground beneath the Site. In addition, the presence of ACMs has also been identified within one sample of shallow Made Ground, however, based upon the results obtained, the proposed development area can be considered to be suitable for its intended use on the basis of the recommendations set out in Section 8.3.

9.2 Geotechnical Conclusions

The ground conditions beneath the Site have been shown to generally comprise a layer of Made Ground extending to a maximum recorded depth of 0.70 m bgl, overlying Glacial Till clay, identified to a maximum depth of 3.00 m bgl, further underlain by weathered mottled light grey siltstone.

Shallow groundwater beneath the Site is considered to be perched and has been identified at depth of between 0.80 to 1.57 m bgl.

Ground conditions are considered to be potentially suitable for traditional strip or pad foundations for the proposed construction.

It is recommended that where variable ground is identified in the formation strata, foundations are reinforced against differential settlement. Precautions should be taken where trees are present, proposed, or removed in line with NHBC guidelines.

The clays have been found to have a low shrinkability, with a classification of low plasticity predominating and, therefore, allowances should be made for this in foundation design.

The Site is not suitable for the use of soakaway drainage at shallow depth due to the predominantly cohesive and low permeability ground conditions.

The Design Sulfate Class for the Site is DS-1, and the ACEC Class is AC-1.

A design California Bearing Ratio (CBR) value for the shallow depth clay soils of 2% may be adopted.

9.3 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 presence of low concentrations of hydrocarbons and the potential for ACMs and the possibility of encountering unforeseen contamination. Therefore, good standards of personal hygiene should be observed with appropriate levels of PPE/RPE provided and utilised, and toolbox talks should be given to contractors prior to the commencement of works. Dust suppression via the damping down of Made Ground soils should also be employed;
- A hotspot protocol should be put in place to deal with any previously unidentified hotspots of contamination, including the potential for ACMs to be present;
- A clean cover layer (such as topsoil) will be required in areas of privare gardens and soft landscaping. The required thickness of topsoil in these areas should be agreed with the NHBC and Local Authority;
- A detailed radon gas report should be obtained for the Site to further assess the risked posed and to establish if protective measures are required; and
- The developer and their contractors should remain vigilant for any previously unidentified contamination, including asbestos fragments.

It should be noted that any Made Ground material be removed from Site may attract elevated disposal costs and a possible requirement for waste classification and WAC analysis.

9.4 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:

- Alternative drainage solutions to soakaway drainage will need to be sought; and
- The developer and their contractors should remain vigilant for any unexpected or unusual ground conditions.

9.5 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 7 – 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**.
Planning and Development Control	This Report is considered to be sufficient for supporting the discharge contaminated land planning conditions associated with the proposed residential development at the Site.
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.

10.0 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:

pp' K Bradley

Adam Worley

Senior Environmental Scientist

6th March 2013

Date

This Report was reviewed by:

Paul Bennett

Unit Manager – Regions

6-03-2013

Date

This Report was authorised by:

Roger Griffiths

Technical Director

6th March 2013

Date

Figures



LEGEND

Site Boundary

-N-

Scale: 1 / 10,000 @ A4

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delta-simons environmental consultants	TITLE: Site Location Map Lundwood Barnsley	DWN: DE CHK: KB DATE: 01 February 2013	SCA: To Scale@A4 REV: 1	PROJECT NO.: 12-0776.01 FIGURE NO.: 1



Not to Scale

Ordnance Survey, (c) Crown Copyright 2011. All rights reserved.

delta-simons
environmental consultants

TITLE:
Site Layout Plan
Lundwood
Barnsley

DRAWN BY: DE	DESIGNED BY: -	PROJECT NO.: 12-0776.01	
CHECKED BY: KB	APPROVED BY: -	FIGURE: 2	
DATE: 01 February 2013	REVISION NO: 1		



Not to Scale

Ordnance Survey, (c) Crown Copyright 2011. All rights reserved.

delta-simons environmental consultants

TITLE:
Approximate Intrusive Location Plan
Lundwood
Barnsley

DRAWN BY: DE	DESIGNED BY: -	PROJECT NO.: 12-0776.01	
CHECKED BY: AW	APPROVED BY: -	FIGURE: 3	
DATE: 21 February 2013	REVISION NO: 1		

Appendix I



NOT DESIGNATED BOUNDARY

KEY

HOUSE TYPE 1

HOUSE TYPE 2

HOUSE TYPE 3

DENOTES AREA OF PUBLIC OPEN SPACE

DENOTES MASONRY GARDEN WALL

N

A SLIPS OF Drawing updated to suit comments from highways. Turning heads extended and visibility splays added. Garden walls added as per suggestions of residents security request. Rights reserved from advertisement and speech. Please refer to planning statement for full list.

CLIENT

RMG DEVELOPMENTS

DEVELOPMENT OF LAND AT THE CLOSE LUNDWOOD - BARNSLEY

PROPOSED SITE PLAN

PLANNING APPROVAL

DRAWN NJT CHECKED NJT

SCALE 1:500 @ A3

DATE JUNE 2008

NJT DESIGN LIMITED

JOB NO. 08.007 DRAWING NUMBER A(00)-02 REV. A

Appendix II

APPENDIX II : 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 III

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delta-simons environmental consultants

Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS101**
DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown clayey very gravelly silt. Gravel is fine to medium angular to sub-angular brick, sandstone and flint.				(0.30) 0.30	ES ES	1 2	0.12 0.20		
Soft yellow brown mottled light grey silty CLAY. Gravel is sub rounded fine to coarse sandstone and siltstone.				(0.60) 0.90					
Very weak yellow brown completley weathered mottled light grey SILTSTONE. (Recovered as gravelly clayey silt with dark patches of clay. Gravel is sub rounded siltstone)				(0.80) 1.70					
Borehole terminated at 1.70 m bgl due to refusal on assumed cobbles or gravels.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Installed with a 63mm HDPE standpipe to 1.70 m bgl.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available		Page 1 of 1
Plant Used: Competitor Rig	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS102**

DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown clayey very gravelly silt. Gravel is fine to medium angular to sub-angular brick, sandstone and flint.				(0.30) 0.30	ES	1	0.20		
Soft yellow brown mottled grey, with occasional dark brown patches, gravelly CLAY. Gravel is sub-rounded fine to coarse sandstone and siltstone.				(0.50) 0.80	D	2	0.50		
Firm yellow brown mottled light grey silty CLAY with dark brown patches of clay. Gravel is sub-rounded fine to coarse sandstone and siltstone.				(1.40) 2.20	ES	3	1.50		
Firm grey silty CLAY. Occasional weak tabular subangular fine to coarse siltstone gravel.				(0.70) 2.90					
Borehole terminated at 2.90 m bgl due to refusal on suspected solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Backfilled with arisings.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available	Page 1 of 1

Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
Competitor Rig		AW	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS103**
DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown clayey very gravelly silt. Gravel is fine to medium angular to sub-angular brick, pottery, sandstone and flint.				(0.50) 0.50	ES	1	0.40		
Soft yellow brown mottled grey, with occasional dark brown patches, gravelly CLAY. Gravel is sub rounded fine to coarse sandstone and siltstone.				(0.50) 1.00					
Firm yellow brown mottled light grey silty CLAY with dark brown patches of clay. Gravel is angular to sub angular fine to coarse sandstone and siltstone.				(1.20) 2.20					
Very weak thinly laminated distinctly weathered grey brown mottled SILTSTONE. (Recovered as clayey silt)				(0.60) 2.80	D	2	2.40		
Borehole terminated at 2.80 m bgl due to refusal on suspected solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Backfilled with arisings.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available		Page 1 of 1
Plant Used: Competitor Rig	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS104**
DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown very gravelly sandy silt. Gravel is fine to coarse angular to sub angular fine to medium brick and possible coal material.				(0.70) 0.70	ES	1	0.40		
Soft to firm yellow brown mottled grey, with occasional dark brown patches, gravelly CLAY. Gravel is sub rounded fine to coarse sandstone and siltstone.				(1.30) 2.00	D	2	1.50		
Firm yellow brown mottled light grey silty CLAY with dark brown patches of clay.				(1.00) 3.00					
Borehole terminated at 3.00 m bgl due to refusal on suspected solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Installed with a 63mm HDPE standpipe to 3.00 m bgl.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available		Page 1 of 1
Plant Used: Competitor Rig	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS105**

DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown clayey very gravelly silt. Gravel is fine to coarse angular to sub angular fine to medium brick, sandstone and flint.				(0.70) 0.70	ES	1	0.50		
Soft to firm yellow brown mottled light grey silty CLAY, with dark brown patches of clay. Gravel is angular to sub angular fine to coarse sandstone and siltstone.				(1.30) 2.00	ES	2	0.90		
Very weak thinly laminated distinctly weathered grey brown mottled SILTSTONE. (Recovered as clayey silt)				(0.60) 2.60	D	3	2.50		
Borehole terminated at 2.60 m bgl due to refusal on suspected solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Backfilled with arisings.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available	Page 1 of 1

Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
Competitor Rig		AW	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS106**
DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown clayey very gravelly silt. Gravel is fine to coarse angular to sub angular fine to medium brick, sandstone and flint.				(0.30) 0.30	ES	1	0.20		
Soft yellow brown mottled light grey silty CLAY. Gravel is sub rounded fine to coarse sandstone and siltstone.				(0.70) 1.00	D	2	0.90		
Firm yellow brown mottled light grey silty CLAY, with dark brown patches of clay. Gravel is angular to sub angular fine to coarse sandstone and siltstone.				(1.20) 2.20					
Very weak thinly laminated distinctly weathered grey brown mottled SILTSTONE. (Recovered as clayey silt)				(0.40) 2.60					
Borehole terminated at 2.60 m bgl due to refusal on solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Installed with a 63mm HDPE standpipe to 2.60 m bgl.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken		Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:				NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available		Page 1 of 1
Plant Used: Competitor Rig	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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delta-simons environmental consultants

Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DS107**

DYNAMIC SAMPLER LOG	Date: 04/02/2013	Client: **Cornell Group**

DESCRIPTION OF STRATA	LEGEND	WATER	CASING DEPTH / (Diam. mm)	DEPTH (Thickness)	Sample Details TYPE	Sample Details REF	Sample Details Depth	Test Results SPT N Value/Drive mm	Backfill Details
MADE GROUND: Dark brown sandy very gravelly silt. Gravel is fine to coarse angular to sub angular fine to medium brick and possible coal material.				(0.50) 0.50	ES	1	0.40		
Soft yellow brown mottled grey with occasional dark brown patches gravelly CLAY. Gravel is sub rounded fine to coarse sandstone and siltstone.				(0.40) 0.90					
Firm yellow brown mottled light grey silty CLAY, with dark brown patches of clay. Gravel is angular to sub angular fine to coarse sandstone and siltstone.				(1.00) 1.90	D	2	1.50		
Very weak thinly laminated distinctly weathered grey brown mottled SILTSTONE. (Recovered as clayey silt)				(1.10) 3.00					
Borehole terminated at 3.00 m bgl due to refusal on suspected solid geology.									

REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Borehole remained dry on completion.
4. Backfilled with arisings.

CHISELLING			WATER LEVEL OBSERVATIONS				
Depth From	Depth To	Time Taken	Date	Time	Water Strike	Standing Level	Casing Depth
NO CHISELLING UNDERTAKEN:			NO WATER ENCOUNTERED:				

BOREHOLE DIAMETER	CASING DIAMETER	DEPTH SEALED

All measurements in metres unless otherwise stated	5m/page Scale: 1:31.25	No Coordinate Data Available No Datum Information Available	Page 1 of 1

Plant Used:	Coordinates / Level (mAOD):	Logged By:	Checked By:	Approved By:
Competitor Rig		AW	AW	CR

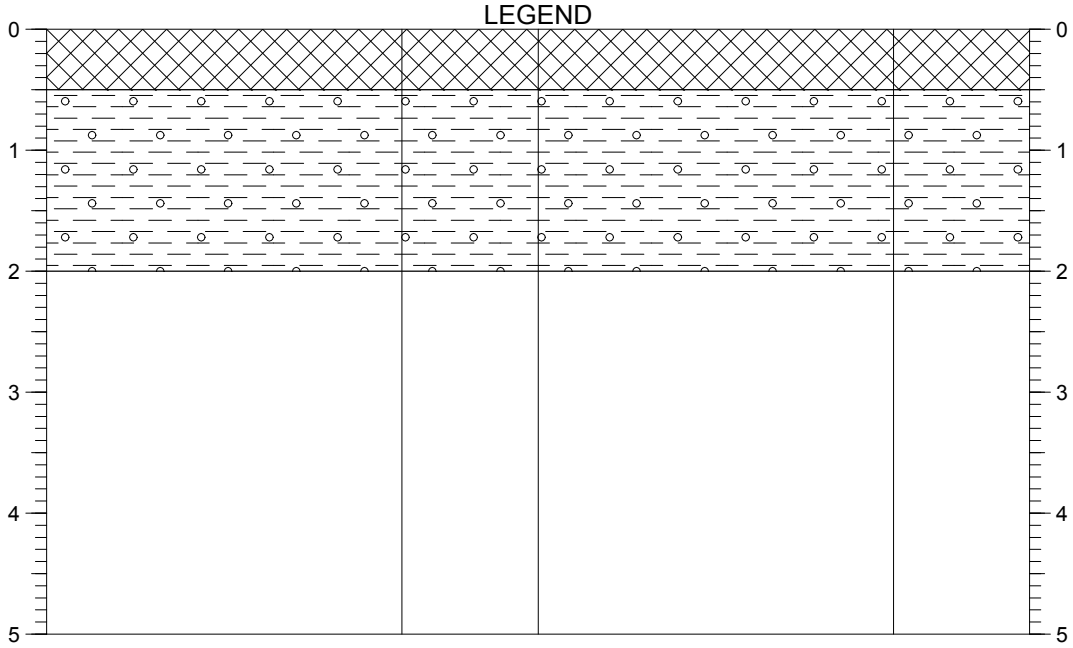
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP101**

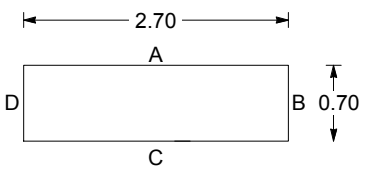
TRIAL PIT LOG	Date:	Client:
	04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
(0.50) 0.50		MADE GROUND: Dark brown silty clay. Rootlets and occasional sub-angular brick cobble. Rare fine to coarse angular to sub angular gravels of mixed lithologies.	0.30 0.40	B1 ES2		
(1.50) 2.00		Soft to firm yellow brown mottled grey with occasional dark brown patches gravelly CLAY. Gravel is subrounded fine to coarse sandstone and siltstone. Micaeous in places. Cobble and boulders of sandstone.. Trail pit complete at 2.00 m bgl.	1.00 1.10	B3 ES4		

Shoring/Support: Good
Stability:



Bearing: °



REMARKS :
1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

All measurements in metres unless otherwise stated	5m/page Scale: 1:62.5	No Coordinate Data Available No Datum Information Available		
Plant Used: JCB 3CX	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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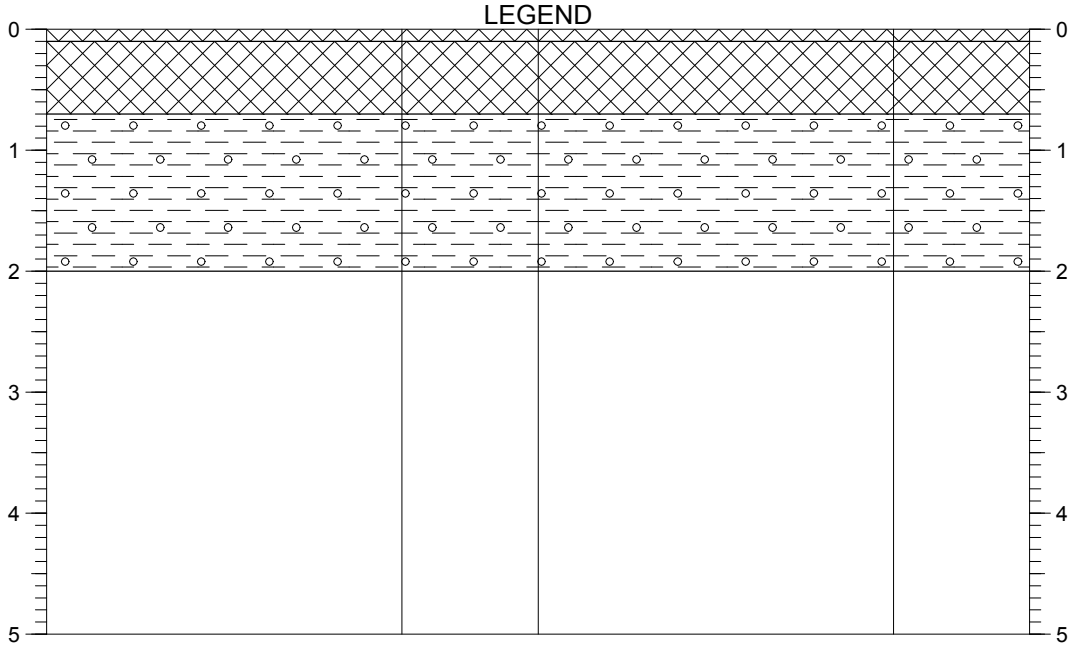
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP102**

TRIAL PIT LOG

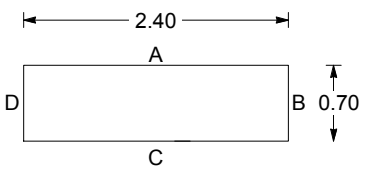
Date:	Client:
04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.10		MADE GROUND: Dark brown silty clay. Rootlets and occasional sub angular brick cobble. Rare fine to coarse angular to sub angular gravels of mixed lithologies.				
(0.60)						
0.70		MADE GROUND: Grey slightly sandy clayey silt. Occasional gravel of angular to sub-angular brick, coal material and clinker materials present.	0.50	B1		
			0.50	ES2		
		Soft to firm yellow brown mottled grey with occasional dark brown patches gravelly soft to firm CLAY. Gravel is fine to coarse sub rounded sandstone and siltstone. Micaeous in places. Cobbles of sandstone. Clay pipe drain noted in corner of trial pit at 0.70 m bgl.	0.80	ES3		
(1.30)						
			1.50	B4		
2.00		Trail pit complete at 2.00 m bgl.				

Shoring/Support: Good
Stability:



Bearing: °
N

REMARKS :
1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

All measurements in metres unless otherwise stated	5m/page	Scale: 1:62.5	No Coordinate Data Available No Datum Information Available		
Plant Used: JCB 3CX	Coordinates / Level (mAOD):		Logged By: AW	Checked By: AW	Approved By: CR

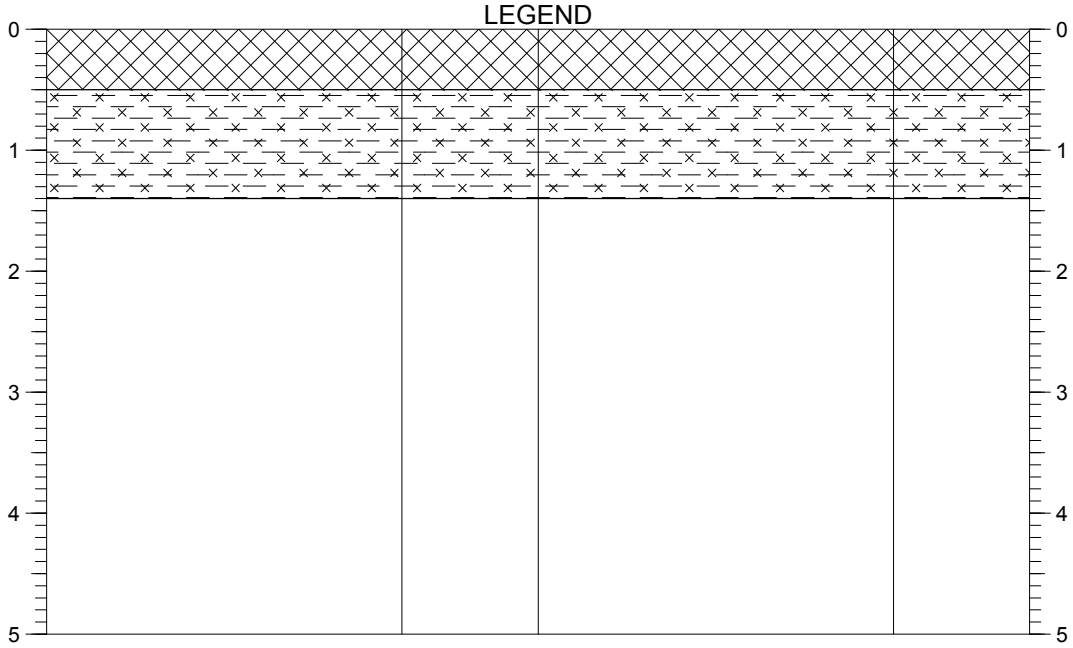
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP103**

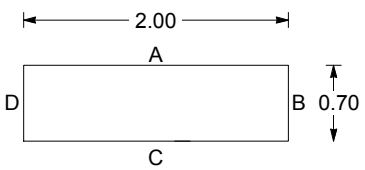
TRIAL PIT LOG	Date:	Client:
	04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
(0.50) 0.50		MADE GROUND: Dark brown clayey gravelly sand. Gravel is fine to coarse angular to sub angular brick, sandstone, flint, slate and asphalt. Occasional sub angular concrete cobble.	0.30 0.40	B1 ES2		
(0.90) 1.40		Soft to firm yellow brown mottled light grey silty CLAY. Gravel is sub rounded sandstone. Sub rounded siltstone and sandstone cobbles noted. Dark brown patches of clay from 1.00 m bgl.	0.80 0.80	B3 ES4		
		Trail pit complete at 1.40 m bgl.	1.40	D5		

Shoring/Support: Good
Stability:



Bearing: °



REMARKS :
1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

All measurements in metres unless otherwise stated	5m/page Scale: 1:62.5	No Coordinate Data Available No Datum Information Available		
Plant Used: JCB 3CX	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

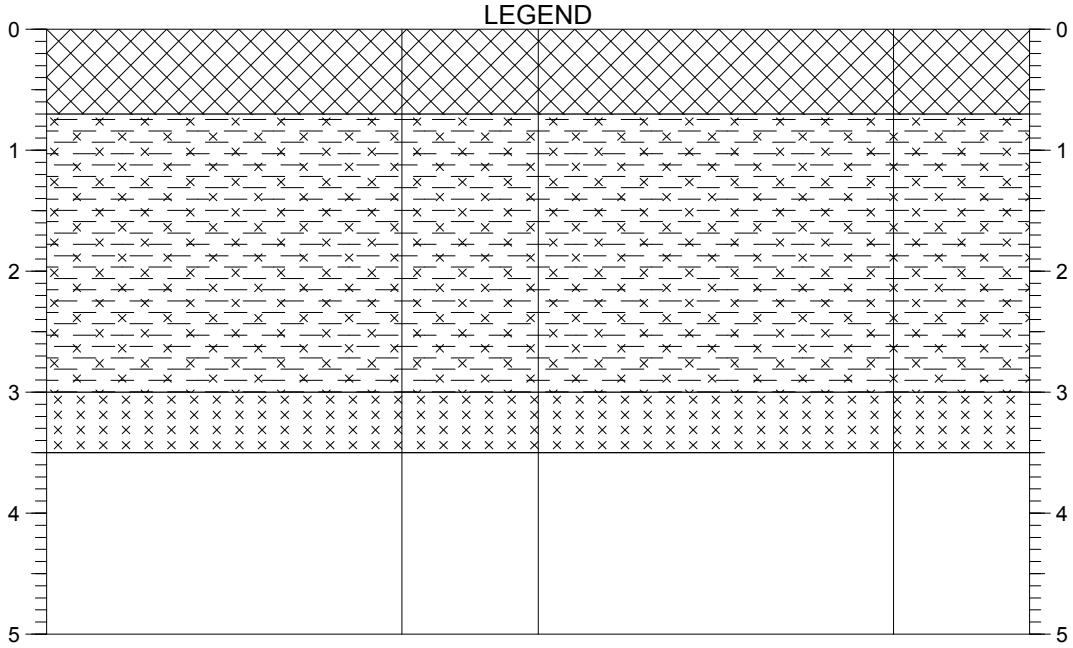
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP104**

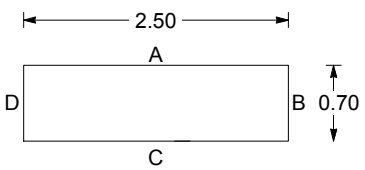
TRIAL PIT LOG	Date:	Client:
	04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
(0.70) 0.70		MADE GROUND: Dark brown slightly clayey gravelly sand. Gravel is fine to coarse angular to sub angular brick, concrete, slate, with rare coal material and plastics. Occasional sub angular concrete cobble.	0.50	ES1		
(2.30) 3.00		Firm yellow brown mottled light grey silty firm CLAY. Gravel is sub rounded fine to coarse sandstone. Sub rounded siltstone and sandstone cobbles noted . Dark brown patches of clay from 1.00 m bgl.	1.00 1.50	B2 D3		
(0.50) 3.50		Very weak thinly laminated completley weathered grey brown mottled SILTSTONE. (Recovered as gravelly clayey silt)	3.40	B4		
		Trail pit complete at 3.50 m bgl.				

Shoring/Support: Good
Stability:



Bearing: °



REMARKS :
1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

All measurements in metres unless otherwise stated	5m/page Scale: 1:62.5	No Coordinate Data Available No Datum Information Available		
Plant Used: JCB 3CX	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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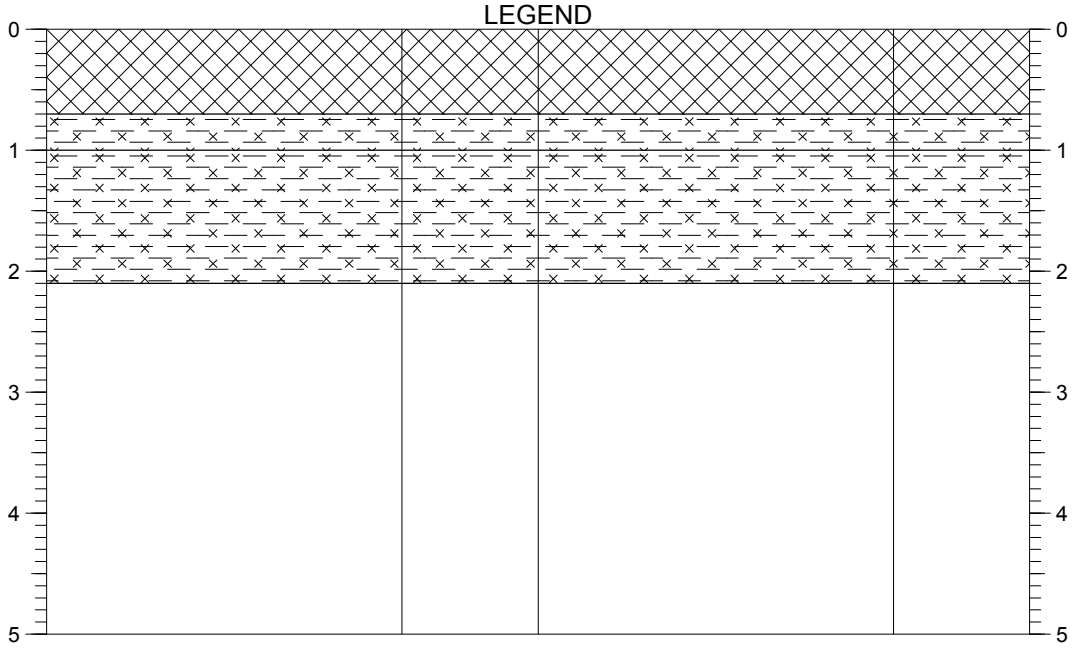
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP105**

TRIAL PIT LOG

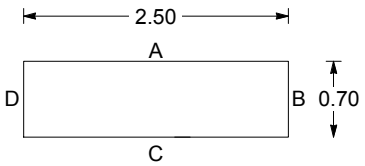
Date:	Client:
04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
(0.70) 0.70		MADE GROUND: Dark brown slightly clayey gravelly sand. Gravel is angular to sub angular brick, concrete, slate, wood, with rare coal material and plastics. Occasional sub angular concrete cobble.	0.20 0.40	D1 ES2		
1.00		Soft yellow brown mottled light grey silty CLAY. Gravel is sub rounded fine to coarse sandstone. Sub rounded siltstone and sandstone cobbles noted.	0.80	B3		
(1.10) 2.10		Firm yellow brown mottled grey silty firm CLAY with dark brown patches of clay. Gravel is sub rounded fine to coarse sandstone. Sub rounded siltstone and sandstone cobbles noted.	1.50	B4		
		Trail pit complete at 2.10 m bgl.				

Shoring/Support: Good
Stability:



Bearing: °



REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

All measurements in metres unless otherwise stated	5m/page Scale: 1:62.5	No Coordinate Data Available No Datum Information Available		
Plant Used: JCB 3CX	Coordinates / Level (mAOD):	Logged By: AW	Checked By: AW	Approved By: CR

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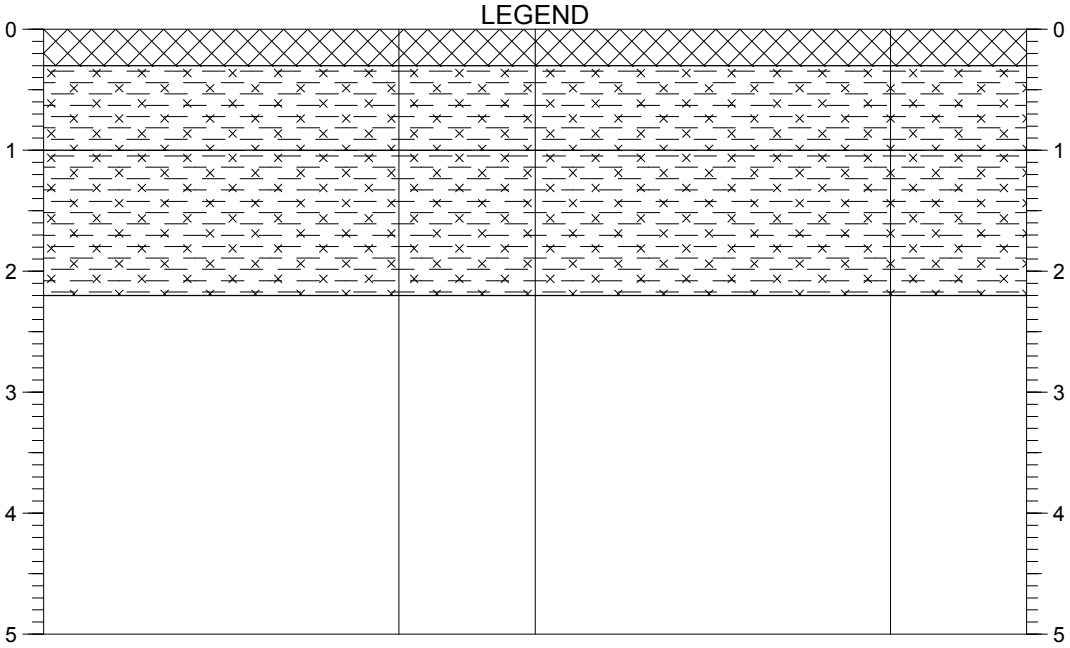
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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**TP106**

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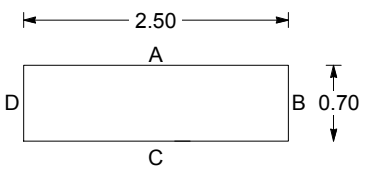
Date:	Client:
04/02/2013	**Cornell Group**

LEGEND



STRATA			SAMPLES		TESTS	
Depth	No	DESCRIPTION	Depth	No	Depth	Results
0.30		MADE GROUND: Dark brown silty clay. Rootlets and occasional sub angular brick cobble. Rare angular to sub angular gravels of mixed lithologies, including possible clinker and pottery.	0.20	ES1		
(0.70)		Soft yellow brown mottled light grey silty CLAY. Gravel is sub rounded fine to coarse sandstone. Sub rounded siltstone and sandstone cobbles noted.	0.50	D2		
1.00		Firm yellow brown mottled grey silty CLAY with dark brown patches of clay. Gravel is sub roundedfine to coarse sandstone. Sub rounded siltstone and sandstone cobbles noted.				
(1.20)						
2.20		Trail pit complete at 2.20 m bgl.	2.00	B3		

Shoring/Support: Good
Stability:



Bearing: °



REMARKS :

1. Engineer verified logged in general accordance to BS 5930.
2. Area CAT scanned prior to excavation.
3. Trial pit remained dry on completion.
4. Backfilled with arisings.

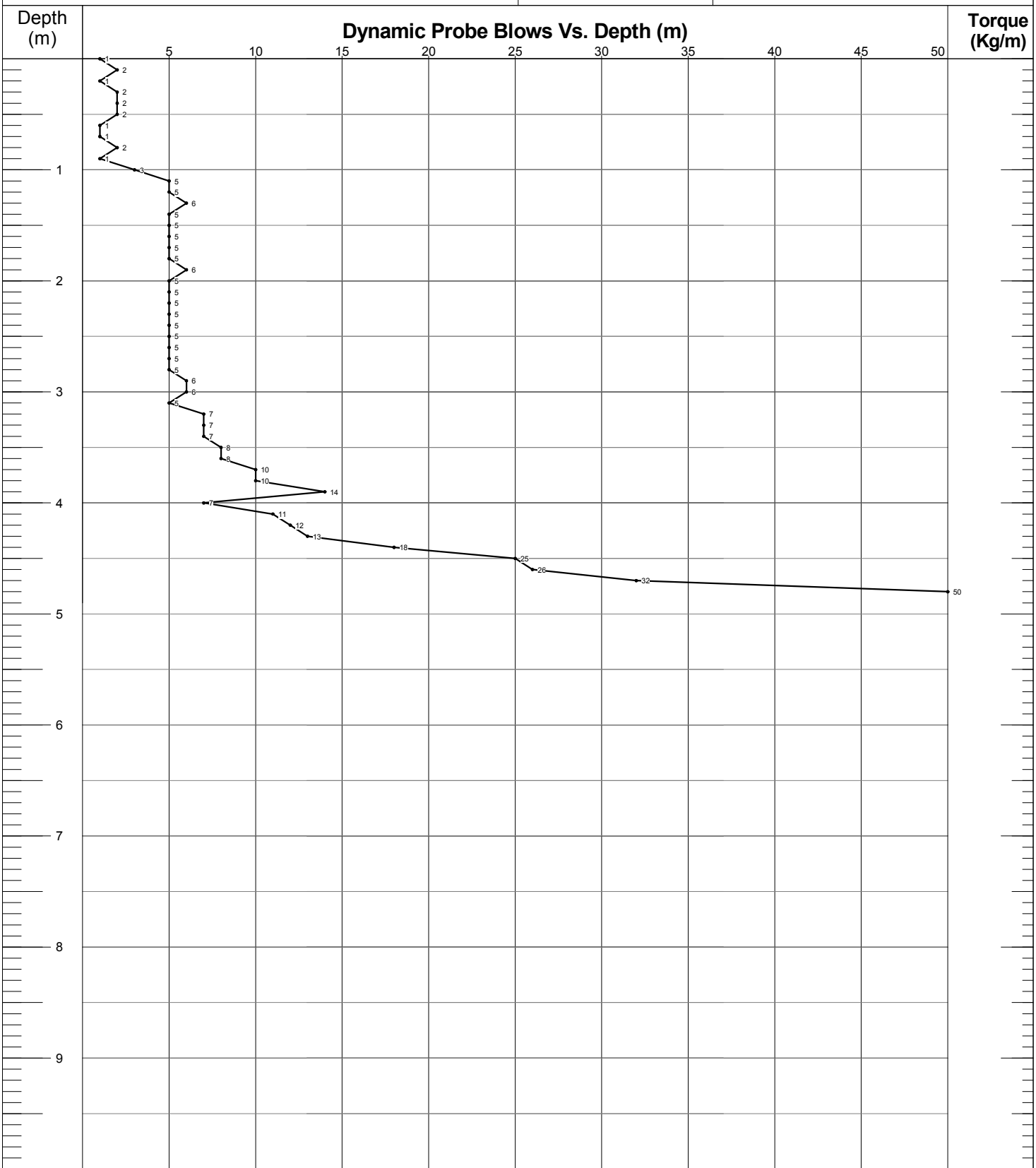
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Plant Used: JCB 3CX	Coordinates / Level (mAOD):		Logged By: AW	Checked By: AW	Approved By: CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT101**

DYNAMIC PROBE LOG	Date:	Client:
	04/02/2013	**Cornell Group**



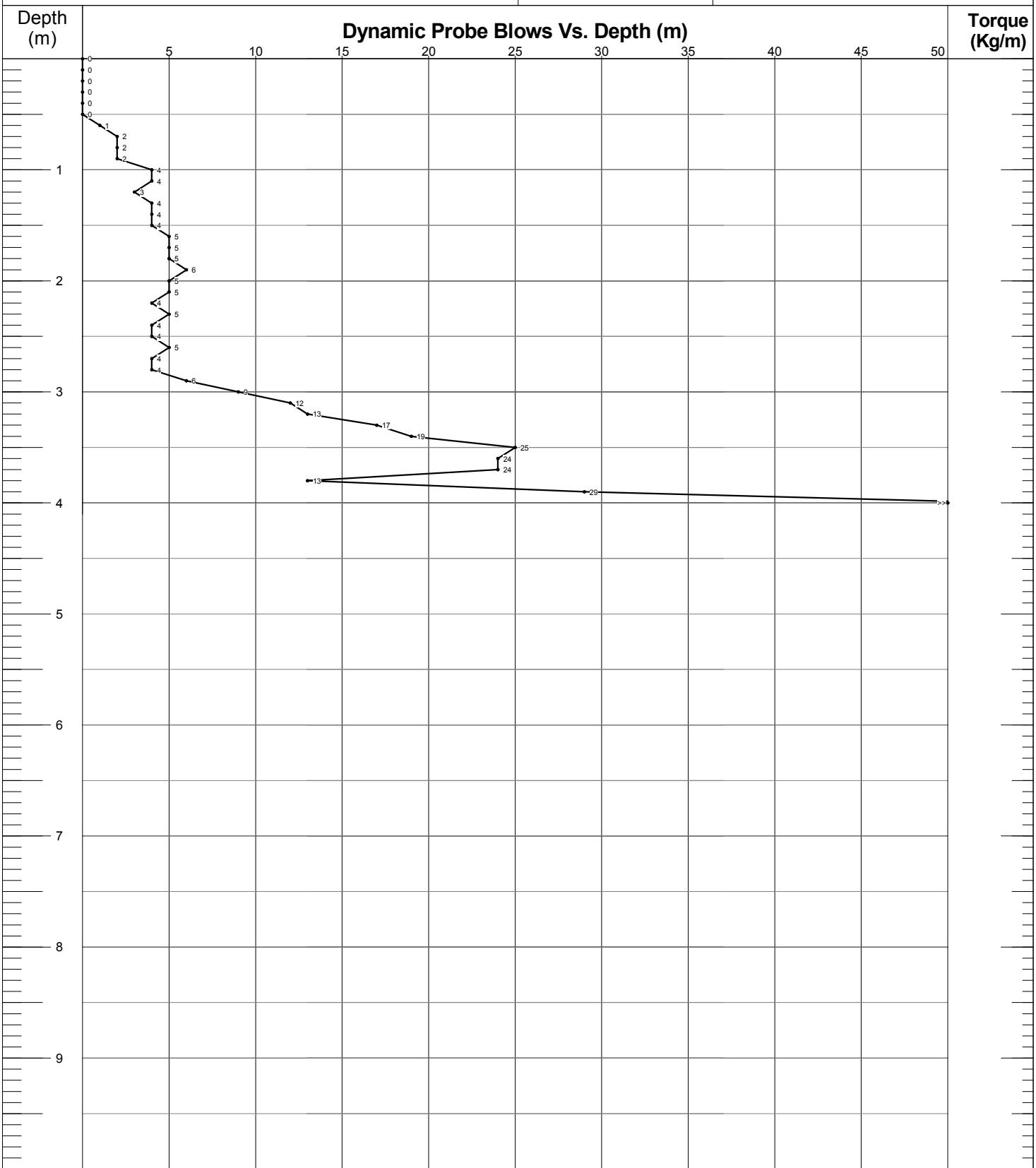
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Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT102**
DYNAMIC PROBE LOG	Date: 04/02/2013	Client: **Cornell Group**



BS EN ISO 22476-2:2005	63.5kg Hammer Mass	750mm Standard Drop	50mm Cone Base Diameter	35mm Rod Diameter

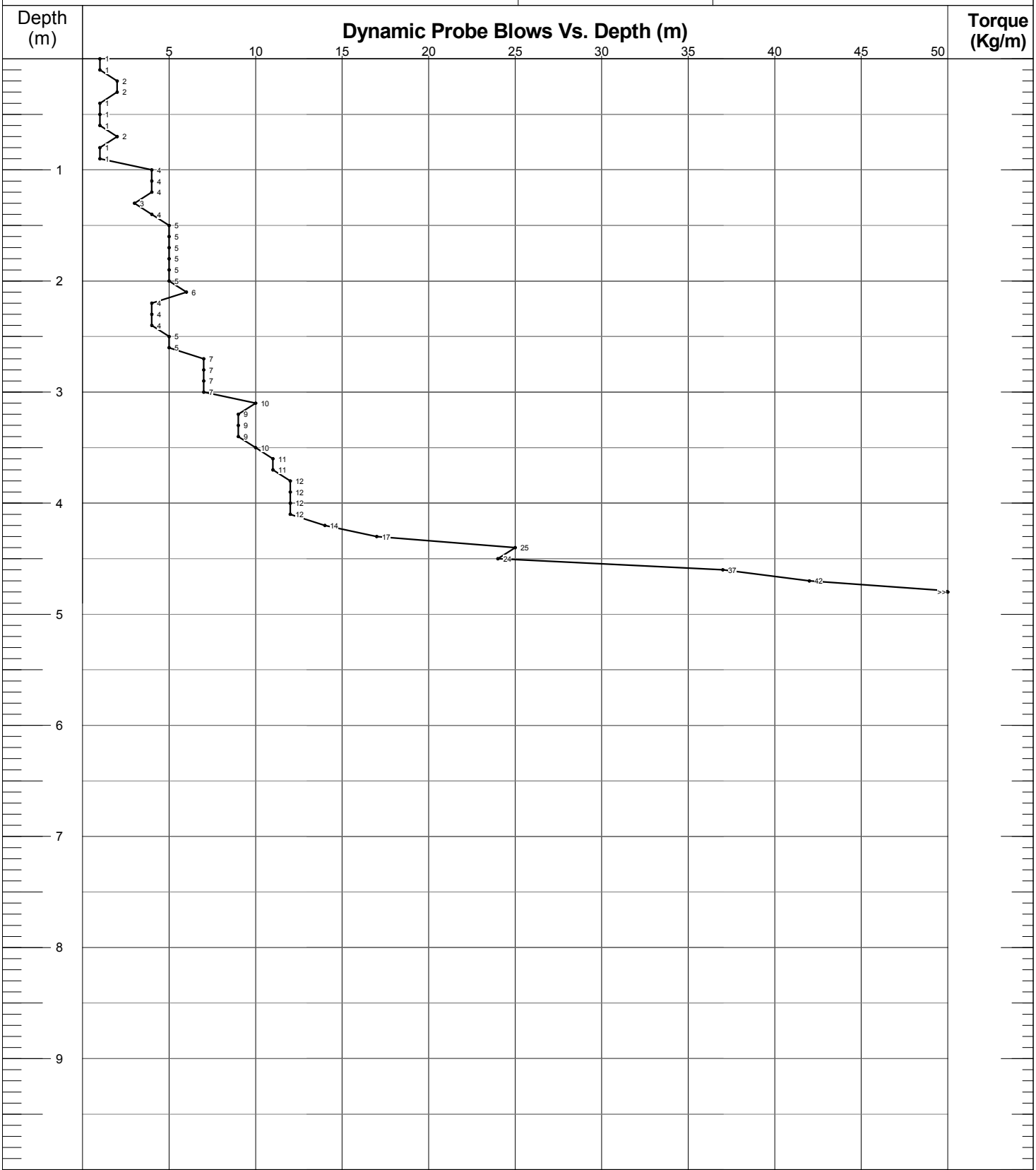
Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT103**

DYNAMIC PROBE LOG	Date:	Client:
	04/02/2013	**Cornell Group**



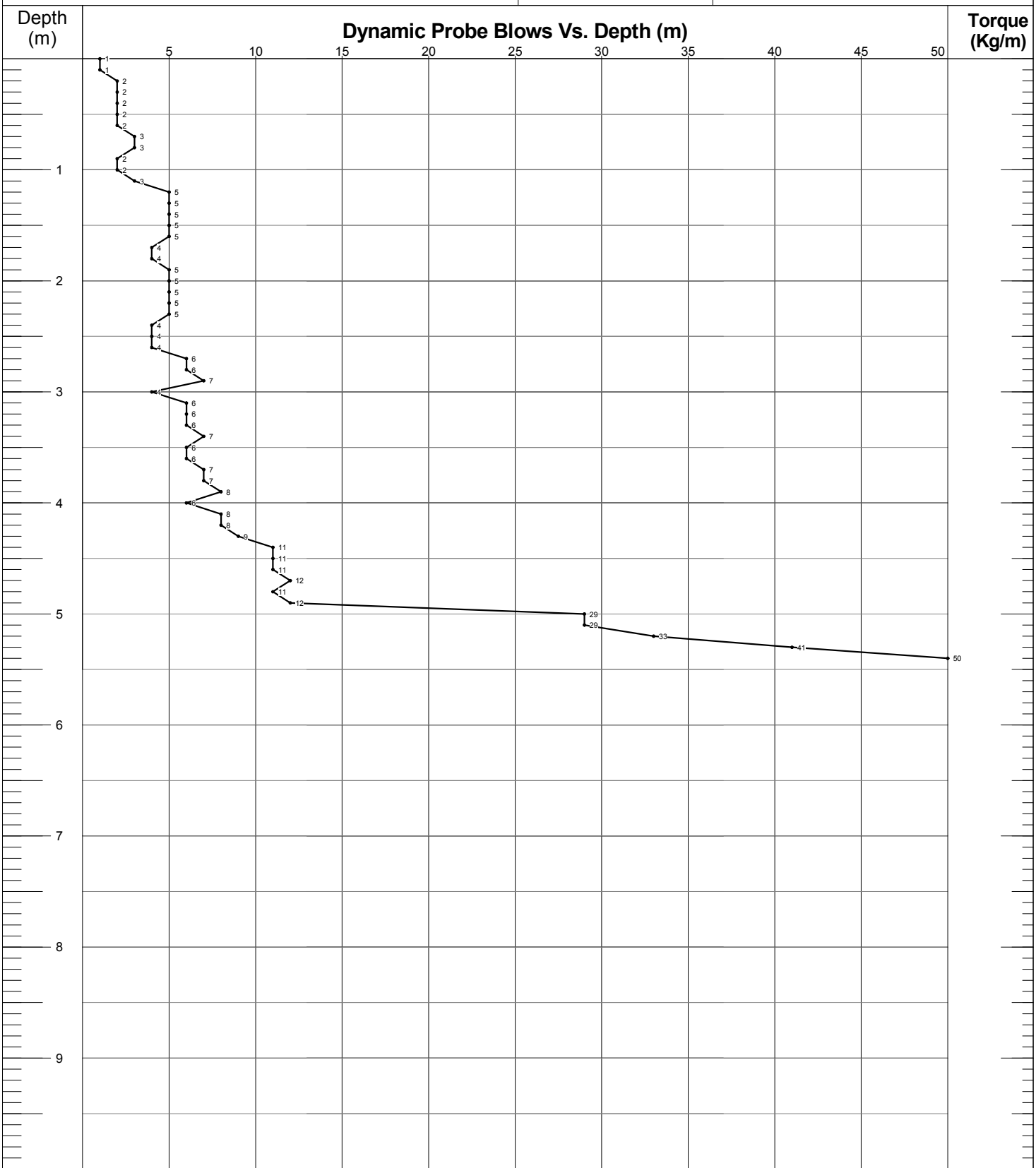
BS EN ISO 22476-2:2005	63.5kg Hammer Mass	750mm Standard Drop	50mm Cone Base Diameter	35mm Rod Diameter

Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT104**
DYNAMIC PROBE LOG	Date: 04/02/2013	Client: **Cornell Group**



BS EN ISO 22476-2:2005	63.5kg Hammer Mass	750mm Standard Drop	50mm Cone Base Diameter	35mm Rod Diameter

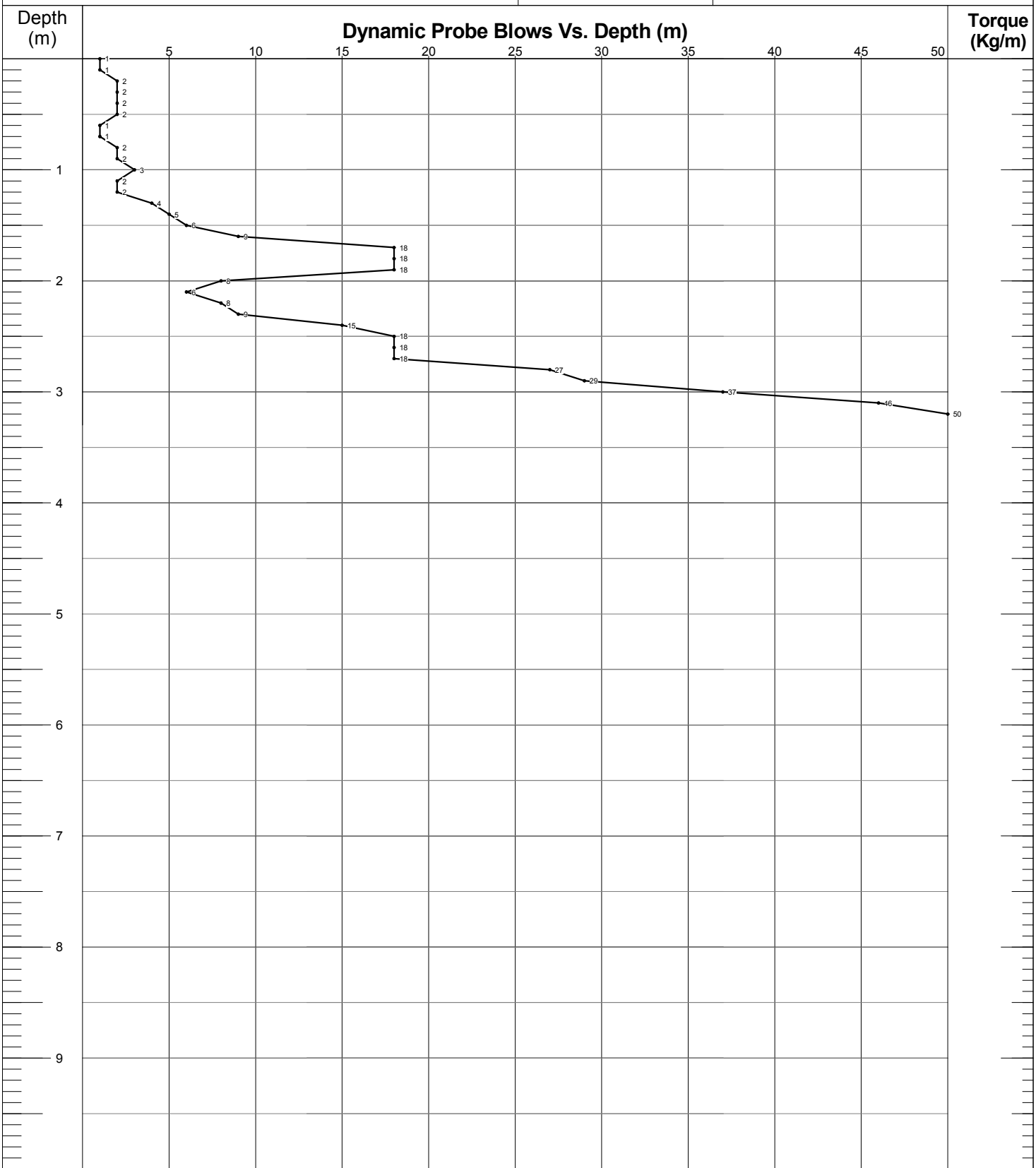
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Competitor Rig		JB	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT105**

DYNAMIC PROBE LOG	Date:	Client:
	04/02/2013	**Cornell Group**



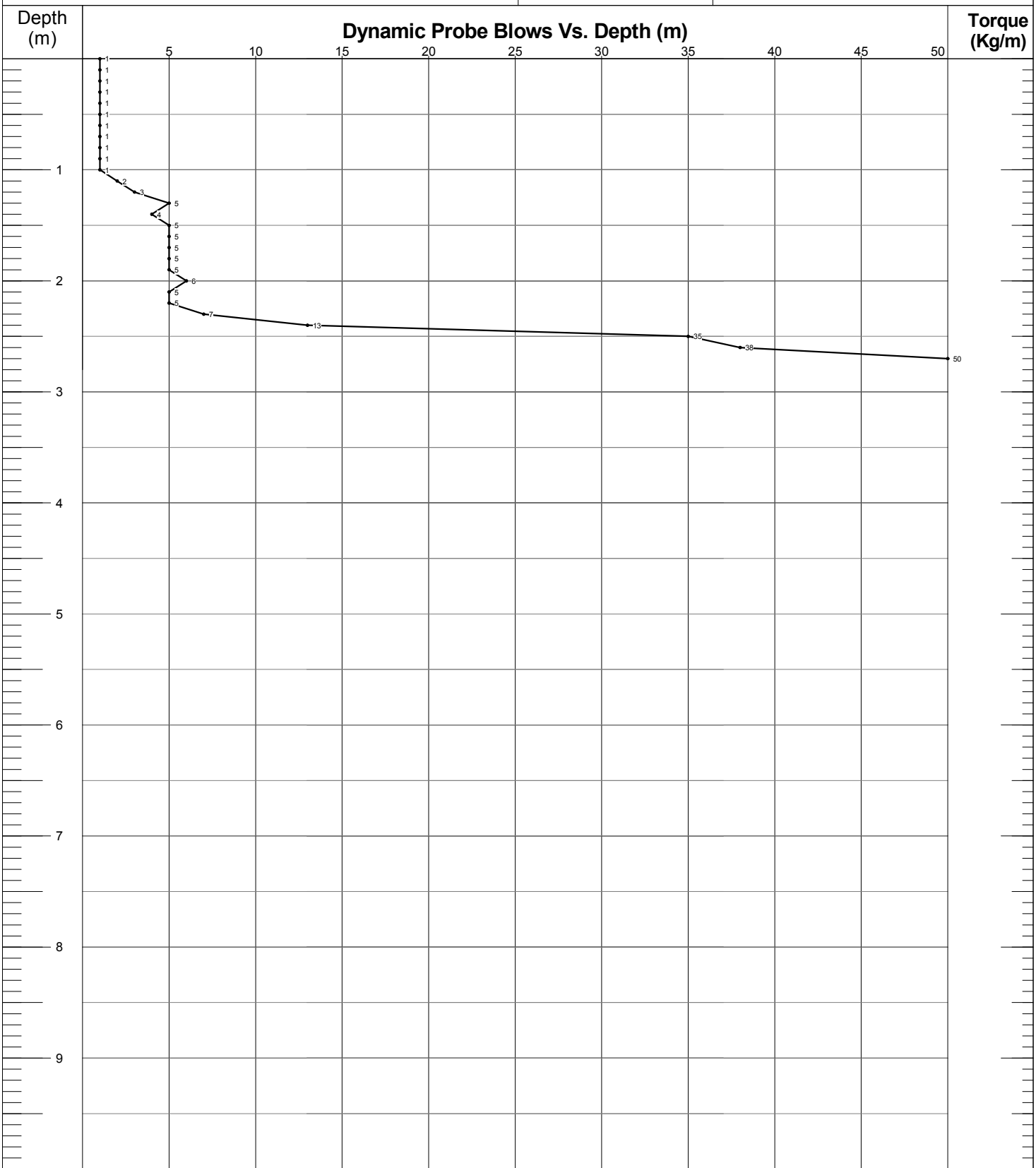
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Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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environmental consultants

Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT106**
DYNAMIC PROBE LOG	Date: 04/02/2013	Client: **Cornell Group**



BS EN ISO 22476-2:2005	63.5kg Hammer Mass	750mm Standard Drop	50mm Cone Base Diameter	35mm Rod Diameter

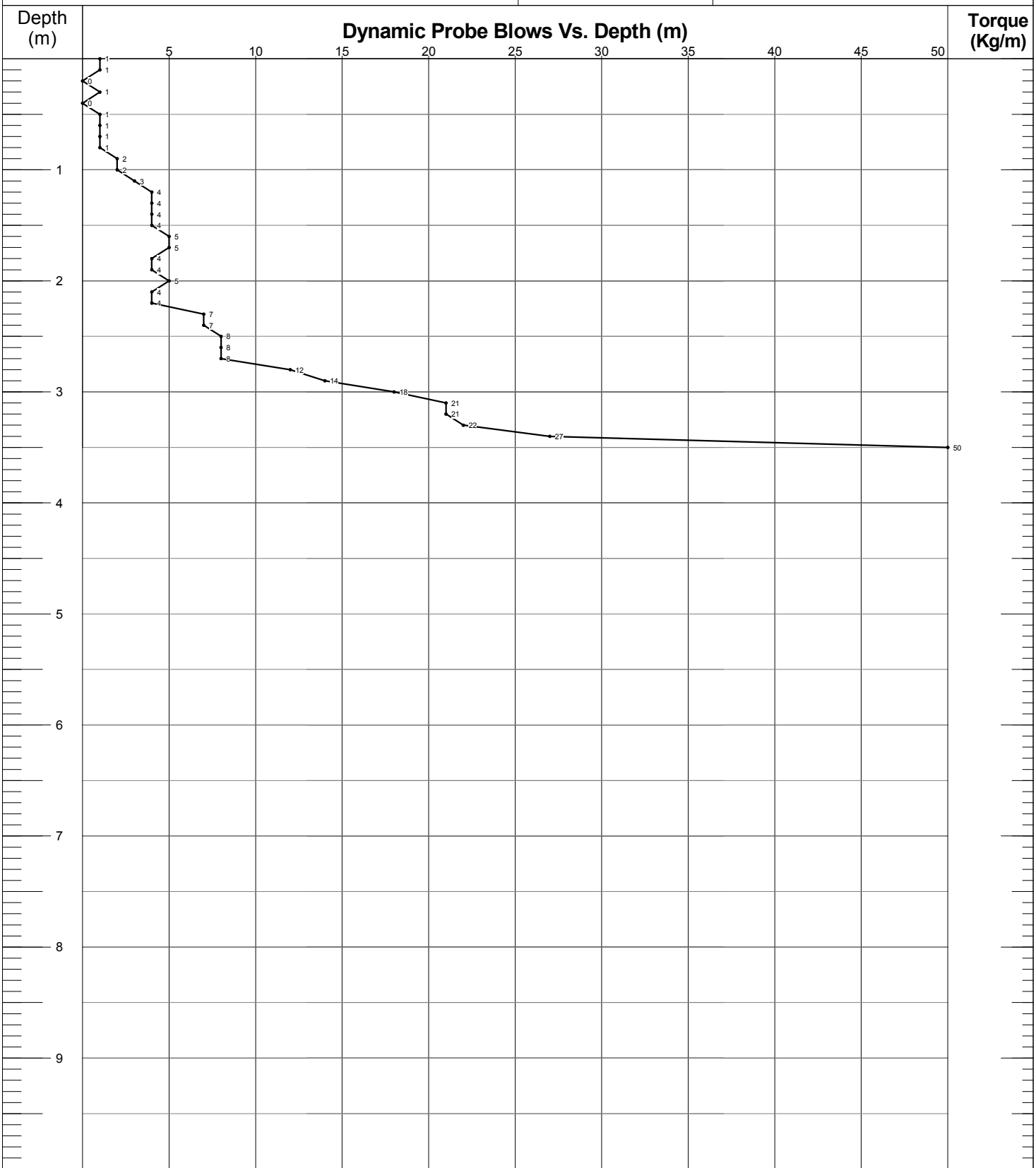
Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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Project:	Project No:	Hole ID:
Lundwood, Barnsley	**12-0776.01**	**DPT107**

	Date:	Client:
DYNAMIC PROBE LOG	04/02/2013	**Cornell Group**



BS EN ISO 22476-2:2005	63.5kg Hammer Mass	750mm Standard Drop	50mm Cone Base Diameter	35mm Rod Diameter

Plant Used:	Coordinates / Level (mAOD):	Drilled By:	Checked By:	Approved By:
Competitor Rig		JB	AW	CR

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

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Inogen® Environmental Alliance

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	**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	**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	**EIC GAC 6% SOM**	**EIC GAC 1% SOM**	**EIC GAC 2.5% SOM**
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-*n*-butyl phthalate	15,000 (27.3) *	15,000 (4.65) *	15,000 (11.4) *
Di-*n*-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 *tert*-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) *
Trans 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	**EIC GAC 6% SOM**	**EIC GAC 1% SOM**	**EIC GAC 2.5% SOM**
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-*n*-butyl phthalate	450 (27.3) *	450 (4.65) *	450 (11.4) *
Di-*n*-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 *tert*-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
Trans 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	**EIC GAC 6% SOM**	**EIC GAC 1% SOM**	**EIC GAC 2.5% SOM**
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-*n*-butyl phthalate	67 (27.3) *	13 (4.65) *	31 (11.4) *
Di-*n*-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 *tert*-butyl ether	160	49	84

Propylbenzene	190	34	82
Styrene	43	8.1	19
Total Cresols (2-, 3- and 4-methylphenol)	400	80	180
Trans 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
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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Appendix V

2531

ANALYTICAL TEST REPORT

Contract no: 47242(1)

Contract name: Barnsley

Client reference: 12-0776.01

Clients name: Delta Simons

Clients address: The Lawn
Union Road
Lincoln
LN1 3BL

Samples received: 05 February 2013

Analysis started: 11 February 2013

Analysis completed 05 March 2013

Report issued: 05 March 2013

This is a supplementary report to report number 47242 issued 18 February 2013.

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, withour 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
NAD No Asbestos Detected

Approved by:

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 (%)
47242-1	DS 101	0.20	Loamy Clay	Gravel	28.2	14.9
47242-2	DS 102	1.80	Clay	Gravel	4.4	14.5
47242-3	DS 107	0.30	Loamy Clay	Stones & Gravel	30.5	15.9
47242-4	TP 102	0.80	Loamy Clay	Gravel	9.0	18.4
47242-5	TP 104	0.50	Loamy Clay	Gravel	18.9	16.5

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SOILS

Lab number			47242-1	47242-2	47242-3	47242-4	47242-5
Sample id			DS 101	DS 102	DS 107	TP 102	TP 104
Depth (m)			0.20	1.80	0.30	0.80	0.50
Date sampled			04/02/2013	04/02/2013	04/02/2013	04/02/2013	04/02/2013
Test	**Method**	**Units**					
Arsenic (total)	CE054 M	mg/kg As	21	4.9	30	22	19
Boron (water soluble)	CE063 M	mg/kg B	0.8	<0.3	4.0	0.8	0.7
Cadmium (total)	CE054 M	mg/kg Cd	<0.2	<0.2	1.0	<0.2	0.3
Chromium (total)	CE054 M	mg/kg Cr	36	34	33	38	33
Copper (total)	CE054 M	mg/kg Cu	36	28	60	44	42
Lead (total)	CE054 M	mg/kg Pb	71	16	141	138	107
Mercury (total)	CE054	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE054 M	mg/kg Ni	21	39	28	22	23
Selenium (total)	CE054 M	mg/kg Se	1.3	1.1	1.9	1.9	1.0
Zinc (total)	CE054 M	mg/kg Zn	96	81	224	146	124
pH	CE004 M	units	-	7.4	8.1	7.7	7.9
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	-	-	32	-	-
Calorific value	CE069	kJ/kg	1282	-	-	1784	2321
PAH							
Naphthalene	CE087	mg/kg	0.2	<0.1	0.1	<0.1	0.1
Acenaphthylene	CE087	mg/kg	0.1	<0.1	0.2	<0.1	<0.1
Acenaphthene	CE087	mg/kg	0.6	<0.1	<0.1	<0.1	<0.1
Fluorene	CE087	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE087	mg/kg	10.3	<0.1	1.4	0.7	1.1
Anthracene	CE087	mg/kg	3.4	<0.1	0.4	0.2	0.3
Fluoranthene	CE087	mg/kg	26.7	<0.1	3.4	0.9	2.5
Pyrene	CE087	mg/kg	24.3	<0.1	3.2	0.8	2.2
Benzo(a)anthracene	CE087	mg/kg	15.9	<0.1	1.9	0.4	1.2
Chrysene	CE087	mg/kg	15.1	<0.1	1.9	0.4	1.2
Benzo(b)fluoranthene	CE087	mg/kg	14.5	<0.1	2.2	0.5	1.4
Benzo(k)fluoranthene	CE087	mg/kg	6.2	<0.1	0.8	0.2	0.6
Benzo(a)pyrene	CE087	mg/kg	12.1	<0.1	1.7	0.4	1.1
Indeno(123cd)pyrene	CE087	mg/kg	5.5	<0.1	0.9	0.2	0.6
Dibenz(ah)anthracene	CE087	mg/kg	1.4	<0.1	0.3	<0.1	0.1
Benzo(ghi)perylene	CE087	mg/kg	5.9	<0.1	1.1	0.3	0.7
PAH (total)	CE087	mg/kg	143	<5	20	5.0	13
TPH							
TPH (C10-C40)	CE033 U	mg/kg	988	-	242	-	141
TPH Aromatic EC5-EC7	CE068	mg/kg	-	-	-	<0.01	-
TPH Aromatic EC7-EC8	CE068	mg/kg	-	-	-	<0.01	-
TPH Aromatic EC8-EC10	CE068	mg/kg	-	-	-	<0.01	-
TPH Aromatic EC10-EC12	CE068	mg/kg	-	-	-	<1	-
TPH Aromatic EC12-EC16	CE068	mg/kg	-	-	-	<1	-
TPH Aromatic EC16-EC21	CE068	mg/kg	-	-	-	3	-
TPH Aromatic EC21-EC35	CE068	mg/kg	-	-	-	2	-
TPH Aromatic EC35-EC44	CE068	mg/kg	-	-	-	<1	-

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SOILS

Lab number			47242-1	47242-2	47242-3	47242-4	47242-5
Sample id			DS 101	DS 102	DS 107	TP 102	TP 104
Depth (m)			0.20	1.80	0.30	0.80	0.50
Date sampled			04/02/2013	04/02/2013	04/02/2013	04/02/2013	04/02/2013
Test	**Method**	**Units**					
TPH Aliphatic EC5-EC6	CE068	mg/kg	-	-	-	<0.1	-
TPH Aliphatic EC6-EC8	CE068	mg/kg	-	-	-	<0.1	-
TPH Aliphatic EC8-EC10	CE068	mg/kg	-	-	-	0.2	-
TPH Aliphatic EC10-EC12	CE068	mg/kg	-	-	-	2	-
TPH Aliphatic EC12-EC16	CE068	mg/kg	-	-	-	10	-
TPH Aliphatic EC16-EC35	CE068	mg/kg	-	-	-	936	-
TPH Aliphatic EC35-EC44	CE068	mg/kg	-	-	-	68	-
Subcontracted analysis							
Asbestos	$	-	Chrysotile	-	NAD	-	-

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg As
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.3	mg/kg B
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	Dry	M	0.2	mg/kg Cd
CE054	Chromium (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cr
CE054	Copper (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cu
CE054	Lead (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Pb
CE054	Mercury (total)	Aqua regia digest, ICP-OES	Dry		0.5	mg/kg Hg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Ni
CE054	Selenium (total)	Aqua regia digest, ICP-OES	Dry	M	0.3	mg/kg Se
CE054	Zinc (total)	Aqua regia digest, ICP-OES	Dry	M	3	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4
CE069	Calorific value	Combustion, Carbon analyser	Dry		100	kJ/kg
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.1	mg/kg
CE087	PAH (total)	Solvent extraction, GC-MS	Wet		5	mg/kg
CE033	TPH (C10-C40)	Solvent extraction, GC-FID	Wet	U	10	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C5-C10)	Headspace GC-FID	Wet		0.01-0.1	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C10-C44)	Solvent extraction, GC-FID	Wet		1	mg/kg
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

2531

ANALYTICAL TEST REPORT

Contract no: 47487

Contract name: Barnsley

Client reference: 12-0776.01

Clients name: Delta Simons

Clients address: The Lawn
Union Road
Lincoln
LN1 3BL

Samples received: 05 February 2013

Analysis started: 04 March 2013

Analysis completed 05 March 2013

Report issued: 05 March 2013

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, withour 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

K Campbell

Karan Campbell — Director
John Campbell — Director

Approved by:

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 (%)
47487-1	DS 102	0.50	Sandy Clay	N/A	<1	20.1
47487-2	DS 104	1.50	Clay	Gravel	15.2	14.8
47487-3	DS 106	0.90	Sandy Clay	N/A	<1	18.1
47487-4	TP 103	0.80	Clay	N/A	<1	18.7

Chemtech Environmental Limited

SOILS

Lab number			47487-1	47487-2	47487-3	47487-4
Sample id			DS 102	DS 104	DS 106	TP 103
Depth (m)			0.50	1.50	0.90	0.80
Date sampled			04/02/2013	04/02/2013	04/02/2013	04/02/2013
Test	**Method**	**Units**				
pH	CE004 M	units	7.6	6.9	7.5	7.5
Sulphate (2:1 water soluble)	CE061 M	mg/l SO_4	17	90	35	149

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO_4

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/0463

Client's Reference: Report Date: 22 February 2013

Client Name: Delta Simons
The Lawn
Union Road
Lincoln

LN1 3BL

For the attention of: Adam Worley

Contract Title: Barnsley

Date Received: 13/2/2013
Date Commenced: 13/2/2013
Date Completed: 22/2/2013

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)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
TP101	3	B	1.00	Brown gravelly slightly sandy silty CLAY.
TP102	4	B	1.50	Brown gravelly sandy silty CLAY.
TP103	3	B	0.80	Brown slightly sandy silty CLAY.
TP103	5	D	1.40	Brown mottled grey slightly gravelly sandy silty CLAY.
TP104	2	B	1.00	Grey mottled brown slightly gravelly slightly sandy silty CLAY.
TP104	4	B	3.40	Brown highly weathered MUDSTONE.
TP105	3	B	0.80	Brown slightly gravelly slightly sandy silty CLAY.
TP106	3	B	2.00	Brown highlly weathered MUDSTONE.
DS107	2	D	1.50	Brown mottled grey slightly gravelly sandy silty CLAY.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	22/02/13		22/02/13		22/02/13
BARNSLEY.				Contract No:	PSL13/0463
				Client Ref:	

SUMMARY OF SOIL CLASSIFICATION TESTS

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

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 6.	% Passing .425mm	Remarks
TP101	3	B	1.00	25				49	24	25	80	Intermediate plasticity CI.
TP102	4	B	1.50	22				45	21	24	82	Intermediate plasticity CI.
TP103	5	D	1.40	20				44	22	22	95	Intermediate plasticity CI.
TP104	4	B	3.40	15				39	20	19	71	Intermediate plasticity CI.
TP106	3	B	2.00	18				45	25	20	79	Intermediate plasticity CI.
DS107	2	D	1.50	22				42	21	21	94	Intermediate plasticity CI.

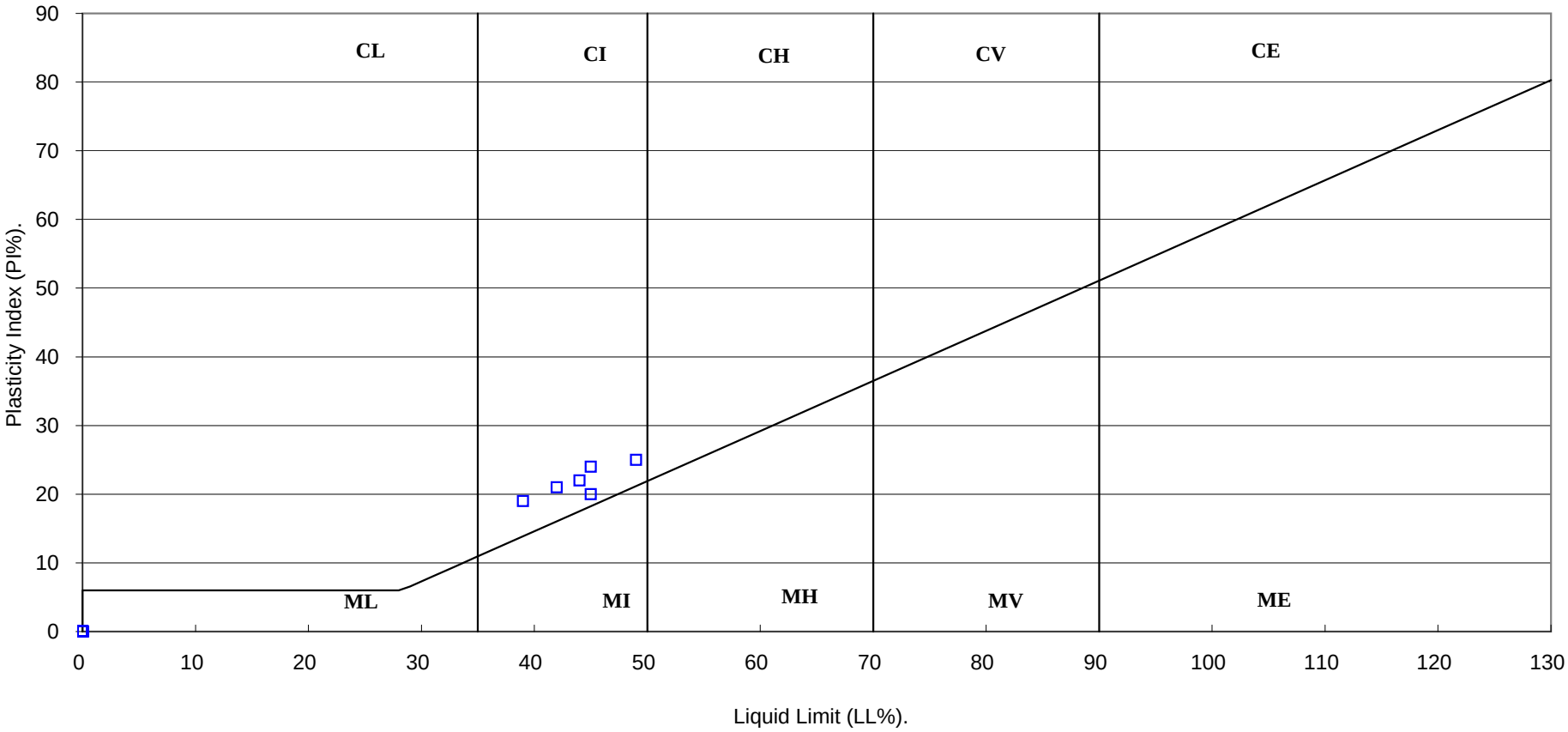
SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

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Compiled by	Date	Checked by	Date	Approved by	Date
	22/02/13		22/02/13		22/02/13
BARNSLEY.				Contract No:	PSL13/0463
				Client Ref:	

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



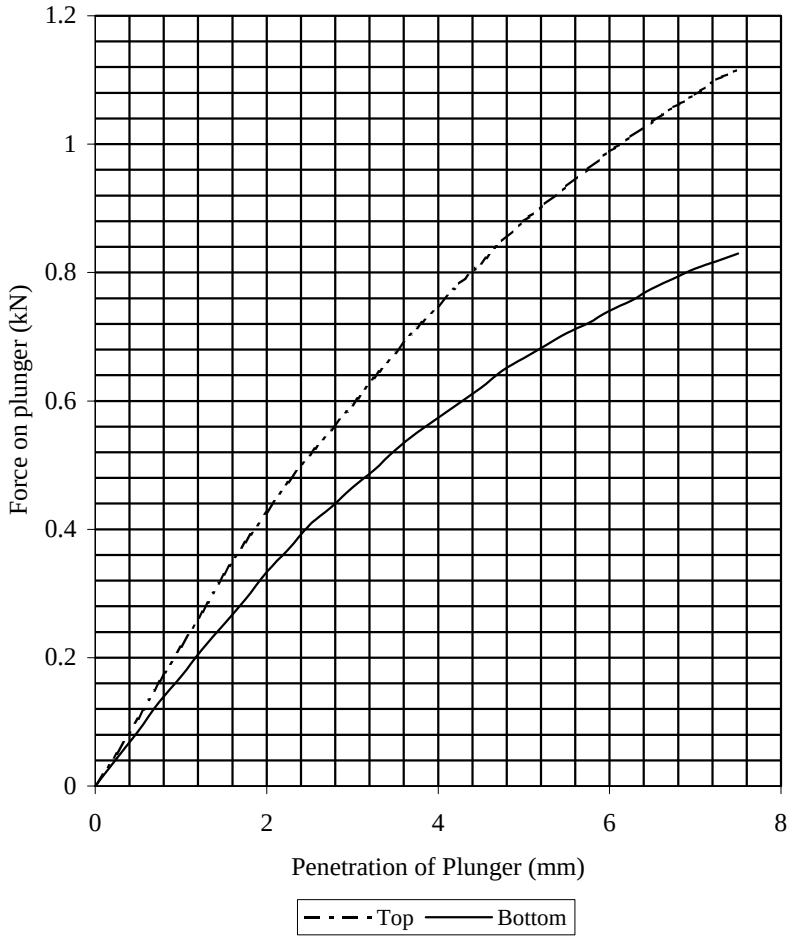
PSL Professional Soils Laboratory	**Compiled by**	**Date**	**Checked by**	**Date**	**Approved by**	**Date**
		22/02/13		22/02/13		22/02/13
	BARNSLEY.				**Contract No:**	**PSL13/0463**
					Client Ref:	

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: **TP103** **Depth (m):** **0.80**

Sample Number: **3** **Sample Type:** **B**



Initial Sample Conditions		Test Conditions		Method of compaction	2.5Kg Rammer		
Moisture Content:	25	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	2.00	Soaking Time hrs	0	Sample Top	25	Sample Top	4.4
Dry Density Mg/m3:	1.60	Swelling mm:	0	Sample Bottom	25	Sample Bottom	3.3
Percentage retained on 20mm BS test sieve:	0	Remarks:	See Summary of Soil Description.				

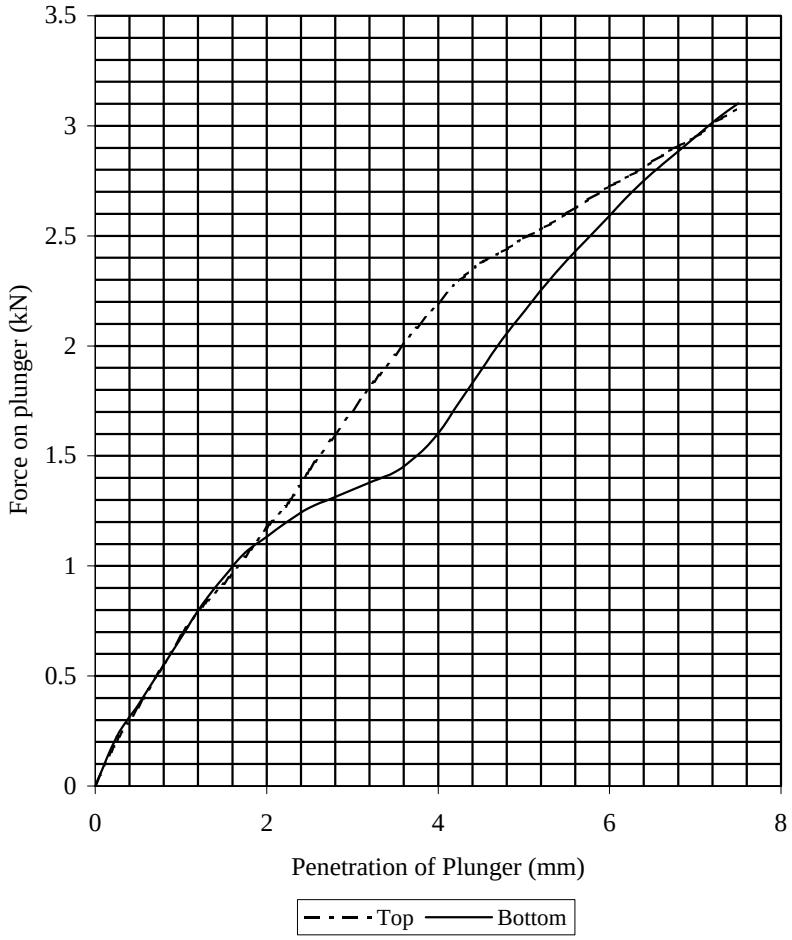
Checked by	Date	Approved By	Date
	22/02/13		22/02/13

PSL Professional Soils Laboratory	**BARNSLEY.**	**Contract No. PSL13/0463**

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number:	**TP104**	**Depth (m):**	**1.00**
Sample Number:	**2**	**Sample Type:**	**B**



Initial Sample Conditions		Test Conditions		Method of compaction	2.5Kg Rammer		
Moisture Content:	16	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	2.12	Soaking Time hrs	0	Sample Top	16	Sample Top	12.4
Dry Density Mg/m3:	1.83	Swelling mm:	0	Sample Bottom	16	Sample Bottom	10.8
Percentage retained on 20mm BS test sieve:	0	Remarks:	See Summary of Soil Description.				

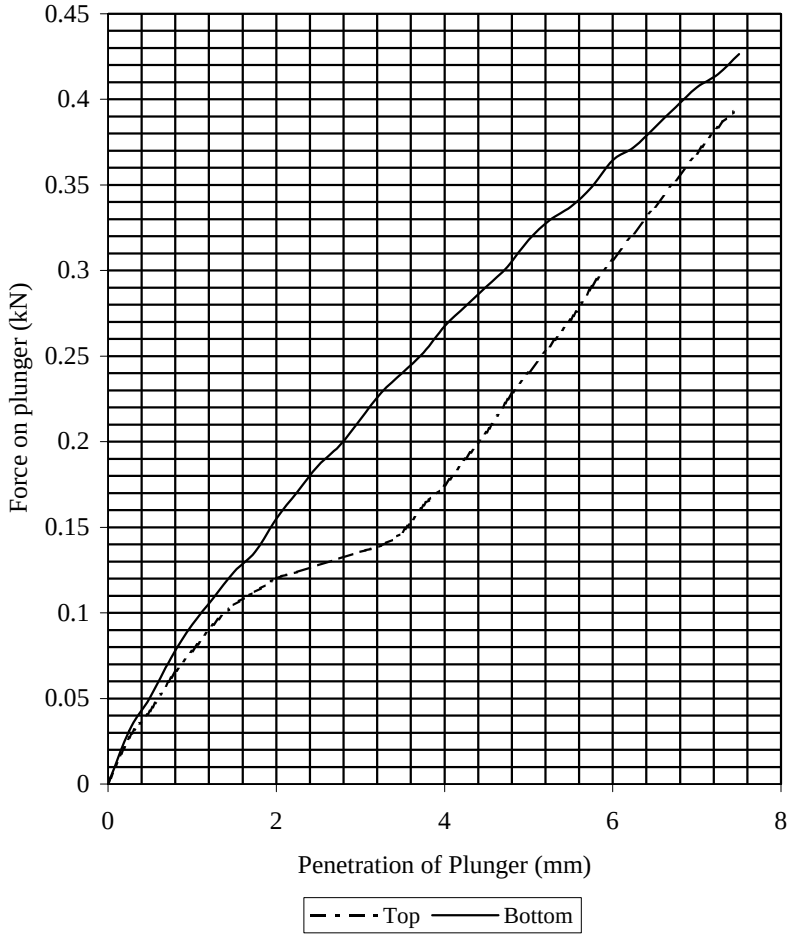
Checked by	Date	Approved By	Date
	22/02/13		22/02/13

PSL Professional Soils Laboratory	**BARNSLEY.**	**Contract No. PSL13/0463**

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number:	**TP105**	**Depth (m):**	**0.80**
Sample Number:	**3**	**Sample Type:**	**B**



Initial Sample Conditions		Test Conditions		Method of compaction	2.5Kg Rammer		
Moisture Content:	25	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	1.98	Soaking Time hrs	0	Sample Top	25	Sample Top	1.2
Dry Density Mg/m3:	1.58	Swelling mm:	0	Sample Bottom	25	Sample Bottom	1.6
Percentage retained on 20mm BS test sieve:	0	Remarks:	See Summary of Soil Description.				

Checked by	Date	Approved By	Date
	22/02/13		22/02/13

PSL Professional Soils Laboratory	**BARNSLEY.**	**Contract No. PSL13/0463**

Appendix **VI**

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GROUNDWATER AND GROUND GAS MONITORING RECORD SHEET

Sheet: 1 of 1

Project Name:	Barnsley	Weather Conditions:	Dry, Sunny
Project Number:	12-0776.01	Gas Kit Model:	GFM435
Personnel:	Redmond Parker-Dunn	Gas Kit Serial No:	

Date: 15/02/2013

LOCATION	Flow Peak (L/hr)	Flow Steady (L/hr)	CH_4 Peak (%v/v)	CH_4 Steady (%v/v)	CO_2 Peak (%v/v)	CO_2 Steady (%v/v)	O_2 Min. (%v/v)	O_2 Steady (%v/v)	Atmospheric Pressure (mb)	PID (ppm)	Well I.D. (mm)	Depth to Product (DTP) (m)	Product Thickness (m)	Depth to Water (DTW) (m)	Depth to Base (DTB) (m)	Height of Water Column (m)	NOTES
DS101	0.0	0.0	<0.1	<0.1	0.5	0.5	21.3	21.3	1011		50			1.570	2.000	0.430	
DS104	0.0	0.0	<0.1	<0.1	<0.1	<0.1	21.3	21.3	1011		50			0.890	2.340	1.450	
DS106	0.0	0.0	<0.1	<0.1	<0.1	<0.1	21.3	21.3	1011		50			0.800	3.000	2.200	

GUIDE TO PURGING VOLUMES

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.

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

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GROUNDWATER AND GROUND GAS MONITORING RECORD SHEET

Sheet: 1 of 1

Project Name:	Barnsley	Weather Conditions:	Dry, Sunny
Project Number:	12-0776.01	Gas Kit Model:	GFM435
Personnel:	Paul Huteson	Gas Kit Serial No:	

Date: 20/02/2013

LOCATION	Flow Peak (L/hr)	Flow Steady (L/hr)	CH_4 Peak (%v/v)	CH_4 Steady (%v/v)	CO_2 Peak (%v/v)	CO_2 Steady (%v/v)	O_2 Min. (%v/v)	O_2 Steady (%v/v)	Atmospheric Pressure (mb)	PID (ppm)	Well I.D. (mm)	Depth to Product (DTP) (m)	Product Thickness (m)	Depth to Water (DTW) (m)	Depth to Base (DTB) (m)	Height of Water Column (m)	NOTES
DS101	0.0	0.0	<0.1	<0.1	0.2	0.2	20.2	20.2	1021		50			1.490	1.990	0.500	
DS104	0.0	0.0	<0.1	<0.1	0.2	0.2	20.0	20.0	1021		50			0.910	2.350	1.440	
DS106	0.0	0.0	<0.1	<0.1	0.9	0.9	19.6	19.6	1021		50			1.010	2.990	1.980	

GUIDE TO PURGING VOLUMES

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.

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

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GROUNDWATER AND GROUND GAS MONITORING RECORD SHEET

Sheet: 1 of 1

Project Name:	Barnsley	Weather Conditions:	overcast
Project Number:	12-0776.01	Gas Kit Model:	GFM435
Personnel:	Paul Huteson	Gas Kit Serial No:	

Date: 04/03/2013

LOCATION	Flow Peak (L/hr)	Flow Steady (L/hr)	CH_4 Peak (%v/v)	CH_4 Steady (%v/v)	CO_2 Peak (%v/v)	CO_2 Steady (%v/v)	O_2 Min. (%v/v)	O_2 Steady (%v/v)	Atmospheric Pressure (mb)	PID (ppm)	Well I.D. (mm)	Depth to Product (DTP) (m)	Product Thickness (m)	Depth to Water (DTW) (m)	Depth to Base (DTB) (m)	Height of Water Column (m)	NOTES
DS101	0.0	0.0	<0.1	<0.1	0.1	0.1	21.0	21.0	1017		50			1.490	1.990	0.500	
DS104	0.0	0.0	<0.1	<0.1	0.1	0.1	21.0	21.0	1017		50			0.900	2.350	1.450	
DS106	0.0	0.0	<0.1	<0.1	0.5	0.5	21.0	21.0	1017		50			0.990	2.990	2.000	

GUIDE TO PURGING VOLUMES

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.

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

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Soakaway Test Results

Engineer : AW
Site Name : The Close
Site Address : Barnsley
Job Number : 12-0776.01

Version 2 / July 2007
Author: KDM

Test Location : TP 101
Test Number : SW1
Date of Test :

Test Results

Time (min)	*DTW mm)*
0	600.000
1	600.000
2	600.000
3	600.000
4	600.000
5	600.000
6	600.000
7	600.000
8	600.000
9	600.000
10	600.000
15	600.000
20	600.000
25	600.000
40	600.000
55	600.000
70	600.000
130	600.000
190	600.000
250	600.000

Trial Pit Parameters

Test Pit Length	2700	*mm*
Test Pit Width	700	*mm*
Test Pit Depth	2000	*mm*

Effective Depth Parameters

Water Start Depth	600	*mm*
75% Effective Depth	950	*mm*
25% Effective Depth	1650	*mm*
75% Effective Time	21	*mins*
25% Effective Time	122	*mins*

75% Effective Depth Line

Time	75%
0	950
250	950

Time	25%
0	1650
250	1650

25% Effective Depth Line

Comments:
Test did not achieve 25 % effective depth, therefore, a rate of infiltration could not be calculated.

Notes:
This results sheet is based upon guidance given in "Building Research Establishment Digest 365: Soakaway design" 2003 edition.
Input values only in **blue**.
Suggested time intervals are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 minutes then every 10 minutes thereafter.
DTW = Depth to Water
Refer to BRE Digest 365 for information on conducting the soakaway test.
Should a full depth soakage test not be achieved, the 75% and 25% Effective Depths are based on the actual maximum water depth achieved. In this instance take the final depth achieved as the test pit depth for the purposes of this results sheet.

Soakaway Test Results

Engineer : AW
Site Name : The Close
Site Address : Barnsley
Job Number : 12-0776.01

Version 2 / July 2007
Author: KDM

Test Location : TP 102
Test Number : SW1
Date of Test :

Test Results

Time (min)	*DTW mm)*
0	1200.000
1	1200.000
2	1200.000
3	1200.000
4	1200.000
5	1200.000
6	1200.000
7	1200.000
8	1200.000
9	1200.000
10	1200.000
15	1200.000
20	1200.000
25	1200.000
40	1200.000
55	1200.000
70	1200.000
130	1200.000
190	1200.000
250	1200.000

Trial Pit Parameters

Test Pit Length	2400	*mm*
Test Pit Width	700	*mm*
Test Pit Depth	2000	*mm*

Effective Depth Parameters

Water Start Depth	1200	*mm*
75% Effective Depth	1400	*mm*
25% Effective Depth	1800	*mm*
75% Effective Time	21	*mins*
25% Effective Time	122	*mins*

75% Effective Depth Line

Time	75%
0	1400
250	1400

Time	25%
0	1800
250	1800

25% Effective Depth Line

Comments:
Test did not achieve 25 % effective depth, therefore, a rate of infiltration could not be calculated.

Notes:
This results sheet is based upon guidance given in "Building Research Establishment Digest 365: Soakaway design" 2003 edition.
Input values only in **blue**.
Suggested time intervals are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 minutes then every 10 minutes thereafter.
DTW = Depth to Water
Refer to BRE Digest 365 for information on conducting the soakaway test.
Should a full depth soakage test not be achieved, the 75% and 25% Effective Depths are based on the actual maximum water depth achieved. In this instance take the final depth achieved as the test pit depth for the purposes of this results sheet.

Soakaway Test Results

Engineer : AW
Site Name : The Close
Site Address : Barnsley
Job Number : 12-0776.01

Version 2 / July 2007
Author: KDM

Test Location : TP 103
Test Number : SW1
Date of Test :

Test Results

Time (min)	*DTW mm)*
0	560.000
1	560.000
2	560.000
3	560.000
4	560.000
5	560.000
6	560.000
7	560.000
8	560.000
9	560.000
10	560.000
15	560.000
20	560.000
25	560.000
40	560.000
55	560.000
70	560.000
130	560.000
190	560.000
250	560.000

Trial Pit Parameters

Test Pit Length	2000	*mm*
Test Pit Width	700	*mm*
Test Pit Depth	1400	*mm*

Effective Depth Parameters

Water Start Depth	560	*mm*
75% Effective Depth	770	*mm*
25% Effective Depth	1190	*mm*
75% Effective Time	21	*mins*
25% Effective Time	122	*mins*

75% Effective Depth Line

Time	75%
0	770
250	770

Time	25%
0	1190
250	1190

25% Effective Depth Line

Comments:
Test did not achieve 25 % effective depth, therefore, a rate of infiltration could not be calculated.

Notes:
This results sheet is based upon guidance given in "Building Research Establishment Digest 365: Soakaway design" 2003 edition.
Input values only in **blue**.
Suggested time intervals are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 minutes then every 10 minutes thereafter.
DTW = Depth to Water
Refer to BRE Digest 365 for information on conducting the soakaway test.
Should a full depth soakage test not be achieved, the 75% and 25% Effective Depths are based on the actual maximum water depth achieved. In this instance take the final depth achieved as the test pit depth for the purposes of this results sheet.