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PROPOSED WASTE TRANSFER STATION OFF LOWER ECCLESHILL ROAD, DARWEN, LANCASHIRE
PHASE 2 SITE INVESTIGATION REPORT

Planning Consultant:

HY Consulting Limited

Carried out for:

SITA UK

PROPOSED WASTE TRANSFER STATION OFF LOWER ECCLESHILL ROAD, DARWEN, LANCASHIRE

PHASE 2 SITE INVESTIGATION REPORT

Date: 16/06/2014

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EXECUTIVE SUMMARY

Item	Description
Client	SITA UK Limited
Site Location and Name:	The site is located within Sita Recovery facility off Lower Eccleshill Road, Darwen, Lancashire, BB3 0EH.
Objective	The main objective of the Phase 2 investigation was to meet the requirements of the Phase 1 desk study and to provide information for planning purposes and for design of the development. The objective is to identify the ground conditions at the site and undertake a Tier 2 Geoenvironmental Risk Assessment in order to determine geoenvironmental, geotechnical or ground gas related issues as part of the planning process prior to the development of the waste transfer station.
Purpose of this report	This report presents the findings of the ground investigation, the environmental risk assessment and any recommendations relating to the proposed development.
Land Use History	The site has previously been used for in a variety of industrial uses dating back from the mid 1890's.including railway siding, iron works, bronze works and ink works. There is evidence of mining, underground flues and water storage tanks from these former industrial uses. To the west of the site is railway land and to the south is a former quarry which has been landfilled from circa 1955. Worked ground and a reservoir were also historically present to the north of the development area.
Geoenvironmental Setting	**Topography:** The ground level in the main area of the WTS development area is relatively level at approximately 150.8 mOD. The level rises to the south along the main access road to approximately 157 mOD. The area of proposed welfare and offices in the south west has a ground level at approximately 151.2 mOD. **Geology:** The site is underlain by Made Ground over Glacial Deposits with the Pennine Lower Coal Measures Formation bedrock at relatively shallow depth dipping NNW. The bedrock consisted of a very weak grey friable mudstone. **Hydrogeology:** The Glacial Deposits are unproductive strata, the sand lenses will have higher permeability however they are thought to be discontinuous. The Coal Measures are Secondary A Aquifer. The closest groundwater abstraction is 277 m south west of the site and the site is not within a source protection zone. **Hydrology:** The nearest surface water feature is a pond 70 m east of the site (however within the large site owned by SITA UK). **Mining & Quarrying:** Coal mining is known to be on site and within the surrounding area. The Coal Authority report stated that the site is not within the likely zone of influence from past underground workings. It was also noted that there is a mining shaft in the south of the site however it is unknown as to whether it has been sealed.
Hazard Identification	Based on the former land uses at the site the potential for contamination to be present at the site is considered to be relatively high. However, based upon the results of the current ground investigations significant contamination has not been identified.
Hazard Assessment	Plausible contaminant linkages have been identified. The receptors of concern are human health, ecology, controlled waters and structures.

Item	Description
Ground Profile Encountered	There was Made Ground to depths of between 0.30 m and 3.45 m. Apart from the concrete or tarmac hard standing there were three discrete types of Made Ground identified the first being a sub-base, the second a heterogeneous material and the third as slag. Buried structures including voids and a suspected water tank were also encountered at the site. Slag was encountered but testing has shown that this is not expansive. Below the Made Ground there was a variable sequence of Glacial Deposits including Glacial Till which was mainly a stiff clay with beds of sand up to 1.40 m thick. The total thickness of Glacial Deposits varied considerably from absent to 10.30 m but was typically about 4 to5 m thick. The bedrock was very weak grey friable the depth to bedrock varied between 0.45 and 13.80 m.
Conclusions – Geoenvironmental	The ground investigation data did not show any elevated concentrations of any potential contaminants present within the soils in relation to the risk to human health. The results of the groundwater assessment indicated that there was a slightly elevated concentration of zinc, fluoride and sulphate however these are not of significant risk to the controlled waters. There were significant exceedances of the threshold criteria for unionised ammonia across the site. It is assessed that the most likely source of ammonia is from the adjacent landfill. The conceptual site model and contaminant linkage assessment indicates that the groundwater within the Made Ground has a low mobility and the slow migration off site will enable natural attenuation to occur and the concentrations to reduce to below the screening thresholds before the groundwater reaches any controlled waters receptors and therefore there is not a significant concern. The concentrations of the phytotoxic metals copper, chromium, nickel and zinc have the potential to be harmful to plants. Due the various exceedances in these metals the material is not suitable to be reused within the areas of proposed soft landscaping and imported clean inert materials will be required.
Conclusions – Geotechnical	The proposed project can be developed using a number of different options: • Remove all existing Made Ground including voids, then re-compact to provide a homogeneous engineered platform and use spread footings; • Piled foundations • Re-use existing slab The final foundation option will be decided by the client/clients structural engineer. If the existing slab is to be re-used then further geophysical investigation to confirm the location of voids will be required and the voids should be backfilled with grout or concrete. All below ground concrete should be designed to meet the requirements of DS-2 ACEC Class AC-2.
Conclusions – Ground Gas	No specific precautions are required with respect to landfill type ground gases (Characteristic Situation 1 gas conditions occur) and hydrocarbons for the development. No protection measures will be required due to the potential risk from radon.
This summary forms part of a Tier 2 Risk Assessment (Ground Condition) report prepared by TerraConsult and contains an overview of the key findings and conclusions. The summary should not be treated as an independent document.	

PROPOSED WASTE TRANSFER STATION, SITA UK, OFF LOWER ECCLESHILL ROAD, DARWEN, LANCSHIRE

PHASE 2 INVESTIGATION REPORT

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PROPOSED WASTE TRANSFER STATION, SITA UK LIMITED, OFF LOWER ECCLESHILL ROAD, DARWEN, LANCSHIRE

PHASE 2 SITE INVESTIGATION REPORT

1. INTRODUCTION

1.1 Background Information

1.1.1 TerraConsult Limited was commissioned by SITA UK Limited to carry out a site investigation for an area of land off Lower Eccleshill Road, Darwen, Lancashire, within for a new Waste Transfer station with associated buildings. Following from a preliminary Phase 1 investigation (desk study) undertaken by Entec UK Limited in September 2010. TerraConsult have carried out the Phase 2 main intrusive investigation and the findings and assessment of this information is presented in this report. Subsequent to issuing the first issue of the Phase 2 Site Investigation Report (1970R1-1) on 28 April 2014, a 'Phase 1 Environmental Desk Top Study' (date unknown) by HY Consulting was received. The findings of the HY Consulting report have been incorporated into the current issue for the report.

1.1.2 This report should be read in conjunction with Entec UK Limited Phase 1 report (Report No 10387il September 2010) and the HY Consulting 'Phase 1 Environmental Desk Top Study' report.

1.1.3 This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990;
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012);
- National Planning Policy Framework (HCA, March 2012);
- BS5930:1999 +A2:2010: "Code of practice for site investigations";
- BS10175: 2011+A1:2013 "Investigation of Potentially Contaminated Sites - Code of Practice";
- DEFRA/Environment Agency (2004) Report CLR11 "Model Procedures for the Management of Land Contamination";
- Environment Agency (2011) Report GPLC1 "Guiding Principles for Land Contamination";
- Environment Agency (2012) Report GP3 "Groundwater protection: Principles and Practice".

1.1.4 TerraConsult's service constraints and report limitations are presented in Appendix A and a description of environmental risk assessment methodology and terminology is presented in Appendix B.

1.2 Development Proposals

1.2.1 The immediate boundaries of the site are part of a wider SITA facility that has already been subject to partial development as part of a change of use consent ref: 10/11/0930. The northern boundary of the site is defined by a 2 storey brick engineering and storage block associated with the former works still remains and is currently used for the storage of salt/grit, beyond which is a 2 storey building that has been refurbished for staff offices. A new Materials Recovery Facility (MRF) has been constructed, together with external storage bays to the northeast of the Site. There is a further 2 storey brick building located between the MRF and engineering/storage building associated with the former works that is now used as a storage facility for the MRF. The area to the west of the Site includes landscaping and a pond. The proposed site plan is presented in Figure 1 below.

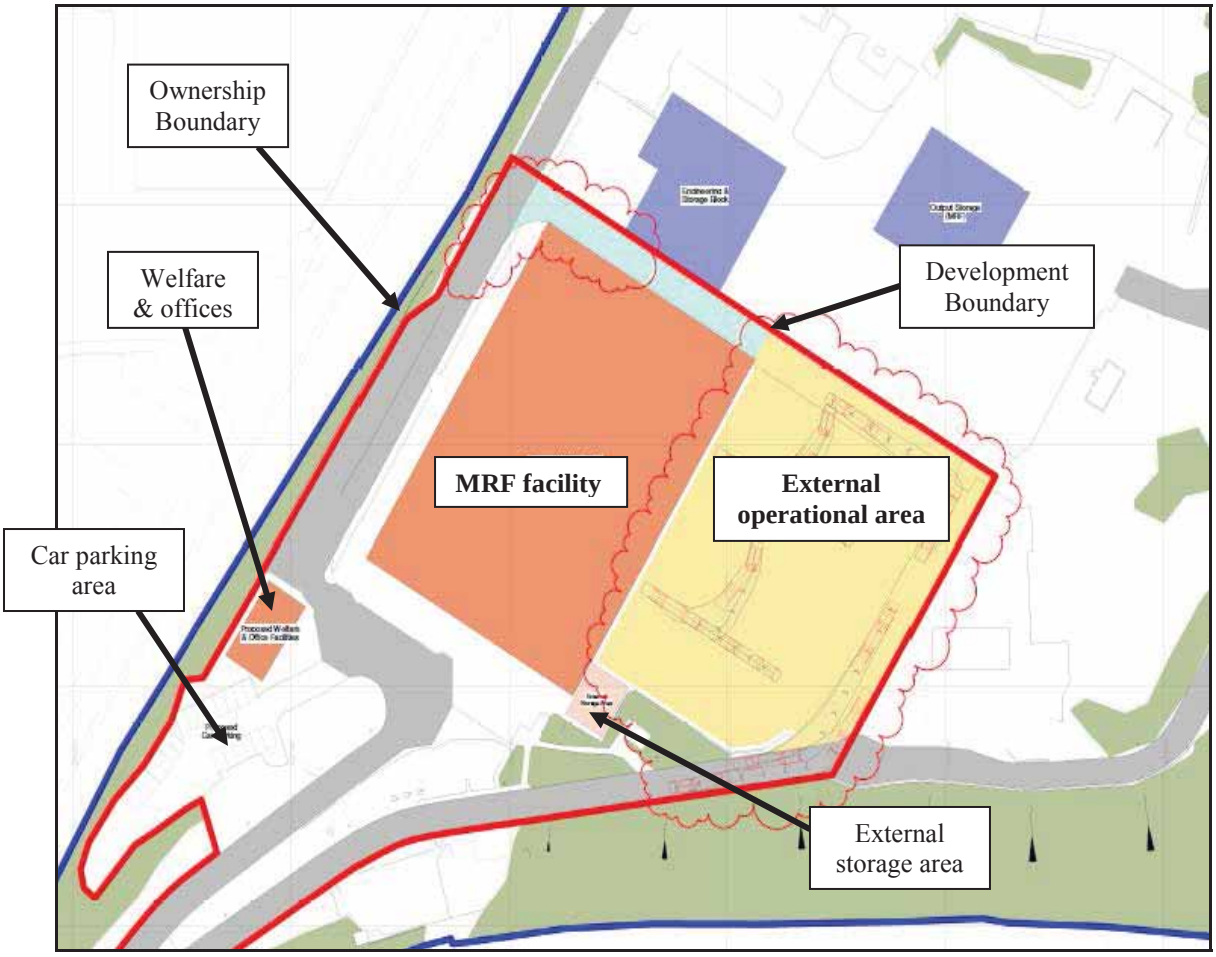


Figure 1: Proposed Site Plan (from M+W Group, Drawing 2001 Revision E)

1.2.2 We understand that from previous reports and contact with SITA UK Limited, that there is the potential for disused services (ventilation flues, drains etc) and storage tanks existing below the current ground level from previous industrial uses. Their locations and as to whether they have been backfilled are both unknown.

1.2.3 The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed commercial/industrial end use. If there is a subsequent change in the proposed type of land development the risk assessments and

conclusions should be reviewed to determine whether they are still applicable for the new end use.

1.3 Objectives of the Investigation

1.3.1 The objectives and scope of the investigation was specified by HY Consulting. The main objectives of the overall Phase 2 investigation were to meet the requirements to provide information for planning purposes and for design of the development. The specific activities to be carried out as part of the Phase 2 investigation are as follows:

- Provide sufficient information to satisfy the requirements of Condition 3 (ii) for Planning Application 10/12/0558;
- To obtain sufficient information regarding the subsoil and groundwater regime to enable adequate and economic designs to be prepared for the building foundations, internal ground floor slabs, external pavements and below-ground drainage;
- Assess the general nature and extent of contamination at the site (including soil, groundwater and permanent ground gases) and carry out a contamination risk assessment to determine if the site poses a risk to potential receptors (including property, humans occupying the site and controlled waters);
- To recommend appropriate (and economic) foundation solutions for the proposed buildings.
- To determine the nature and dimensioned detail of existing foundations local to each proposed area of extension, to facilitate detailing of the new foundations at their interface with the existing.
- To determine the feasibility of the use of ground-bearing construction for the new areas of internal ground floor slab, and to provide detailed recommendations for ground preparation and sub-base for same.
- To determine the aggressiveness of the chemical environment with regard to buried concrete and to define the ACEC classification.
- To identify the presence and nature of potentially harmful ground gases and to define any specific ground gas protection measures that may be required for the new buildings
- To establish former site uses and any significant geo-environmental features or risks.
- To assess the suitability of excavated material for re-use as backfill.
- To determine the contamination status of surplus excavated material for disposal;
- Please note that there is no longer a statutory requirement to produce site waste management plans for building projects so we have not allowed for this.
- To identify the presence and extent of contaminated material above acceptable limits for the intended site use, including general landscaping.

- To identify the presence of any material, that may be harmful to the construction workers involved in the construction and future building users.
- To support a full Planning Application for the proposed development and to satisfy Blackburn with Darwen Borough Council's requirements relating to site contamination.

1.4 Previous Investigations

1.4.1 A number of previous reports for the development site and surrounding area have been provided by the client and are listed below:

- Entec Report R10387il, September 2010: Phase 1 Desk Study GeoEnvironmental Report (includes EnviroCheck and Coal Authority Report);
- CC Geotechnical Report C-11-6459 January 2012: Darwen Ink Works Ground Investigation Factual Report;
- W A Fairhurst report D/I/D/92064/04 January 2012: Darwen Ink Works Redevelopment, Geo-Environmental Ground Investigation Report;
- TerraConsult Report 1639LR001 July 2012: Coal Mining Risk Assessment, Lower Eccleshill Road, Darwen; and
- HY Consulting: Phase 1 Geo-Environmental Desk Top Study, Lower Eccleshill Road, Darwen.

1.4.2 It is recommended that these previous reports are read in conjunctions with this report in particular the Entec and HY Consulting Phase 1 reports as the Phase 2 site investigation is based around the findings and conclusions of these reports, as well as the historical ground investigations.

1.4.3 The Entec Phase 1 report was undertaken as part of a wider pre-acquisition audit and the investigation was undertaken for a larger area than the current area of investigation. The current site and ground investigation is located in the southwest of site considered within the Entec Phase 1 report.

1.4.4 The two ground investigation reports by CC Geotechnical and W A Fairhurst are for areas of land to the north and northeast of the proposed MRF. This land is a former landfill site. These investigations were undertaken in relation to a historical planning application for a waste treatment facilities. Whilst this area of land is within SITA UK Limited's Recovery Facility area, it is not part of the current area of investigation.

1.4.5 In the previous investigations a list of potential contaminant sources were provided with the preliminary risk rankings from 'Low' to 'High'. The following potential sources were rated as either 'Moderate' or 'High':

- Contaminants within the Made Ground from onsite previous land use;
- Groundwater and surface water by leaching through soils;

- Offsite sources such as the former quarry/landfill to the south and former reservoir and worked areas to the north of the development area (potential gas and leachate source); and
- Any coal within the natural strata (potential gas source).

1.4.6 Note that since the Entec Phase 1 report was written, demolition of the structures within the development area have been removed from site. In brief, the Entec Phase 1 report recommended a site investigation to confirm chemical and geotechnical conditions and determine whether there are any geo-environmental risks associated with the site.

1.4.7 The more recent HY Consulting Phase 1 report for this development area indicated that the overall risk classifications for the development site is:

- Human Health low to moderate
- Buildings Services moderate risk
- Controlled waters low to moderate

1.4.8 HY Consulting recommended that "*an intrusive site investigation would need to be undertaken prior to the redevelopment of the site. This should include the following*:

- *Evaluation of possible air shaft located in southwest corner of the site, initially through excavation of a slit trench and then, if deemed necessary investigation using rotary open hole drilling. This approach has been discussed and agreed in principal with the Coal Authority and the need for the rotary drilling will be subject to discussions with the Coal Authority.*
- *Trial pits – to evaluate shallow ground conditions below the slab and to allow appropriate soil sampling for geotechnical and contamination testing*
- *Cable percussive boreholes – these should be spread across the footprint of the proposed buildings. Boreholes should also be positioned as follows*
- *Gas and groundwater monitoring installations in all bore and window sample holes*
- *Soil and leachate analysis from the made ground - testing to include full standard suite of contaminants (including heavy metals/sulphides/pH/phenols), with a representative sample of testing from natural ground;*
- *Selective soil testing – for TPH (including speciated TPH as appropriate), BTEX, PAH and Volatile Organic Compounds where visual and olfactory evidence of contamination is recorded in the field;*
- *A minimum of 6 gas and groundwater monitoring visits to be undertaken under differing atmospheric pressure regimes. This will include monitoring of existing boreholes. Further monitoring may be undertaken depending on the findings of the initial work*
- *Groundwater monitoring and sampling of existing and proposed BH on site;*

- *Factual and interpretive reporting including consideration of the findings of the Fairhurst report and including recommendations for further SI work as necessary."*

1.5 Coal Mining Risk Assessment

1.5.1 In addition to the above reports TerraConsult have previously produced the following report in relation to the development: Coal Mining Risk Assessment for Redevelopment of Site at Darwen, Blackburn (Report No 1639/LR001-1/CSE of 9th July 2012). The Coal Mining Risk Assessment report was produced to aid discharge of planning condition 12. The site is in a Coal Mining Development Referral Area and a Coal Authority Report for the site indicated a shaft to be present in the south west of the proposed development are but not below any proposed buildings. TerraConsult contacted the Coal Authority to acquire the full shaft details but these are not available. The Coal Authority records relating to the shaft comprise only the location and that it is a shaft abandoned pre-1872.

1.5.2 The conclusion of this report is presented below:

Based on the available information there is a possibility that the shaft indicated to be present by the Coal Authority is not present at the site, however, whether it is present or not cannot be proven based on the available information. If the shaft is present it is likely to be within a 10 m radius of the location shown by the Coal Authority. All of this area lies outside the footprint of the new buildings. This area of possible influence around the shaft is located below an area of access road and adjacent soft landscaping. Therefore if the shaft collapses it could cause unacceptable movements and deformation leading to cracking and un-serviceability of the access road. Whilst this would cause operation constraints to the site, it would not cause site closure as the site will have both access and egress roads and two-way traffic could be operated with temporary traffic lights on the surviving road.

In order to mitigate the potential effects of the shaft (even though this may not even be present) it is recommended that the road sub-base in a 20 m diameter area centred on the anticipated shaft location, is thickened to about 0.75 m thickness and two layers of high strength biaxial geogrid is installed in the sub-base. This will limit any deformation and settlement of the ground due to shaft collapse or void migration and would prevent any migrating void reaching the ground surface.

Whilst the Coal Authority Report for the site indicates that there is potential for unrecorded shallow coal mine workings at the site their report does not indicate whether this comment refers to all or part of the site. Their statement regarding the possible presence of shallow workings is included in their reports if any part of a site can be considered to have the risk of unrecorded shallow workings. Based on the geological map of the area the only area where coal will be present at shallow depth is to the south east of the sub-crop of the Dib Hole Coal Seam. This area is the area of proposed soft landscaping to the south of the access/egress road along the south western perimeter of the site. If there is any movement due to collapse of coal mining in this area there is a very low risk of any significant damage to the site as it will only affect soft landscaping. Overall

the risk from shallow mining below the site in relation to the proposed development is negligible and no mitigation measures are required.

2. SITE LOCATION AND DESCRIPTION

2.1 Site Location

2.1.1 The site is indicated in Figure 2 below and the site location is summarised in Table 1:

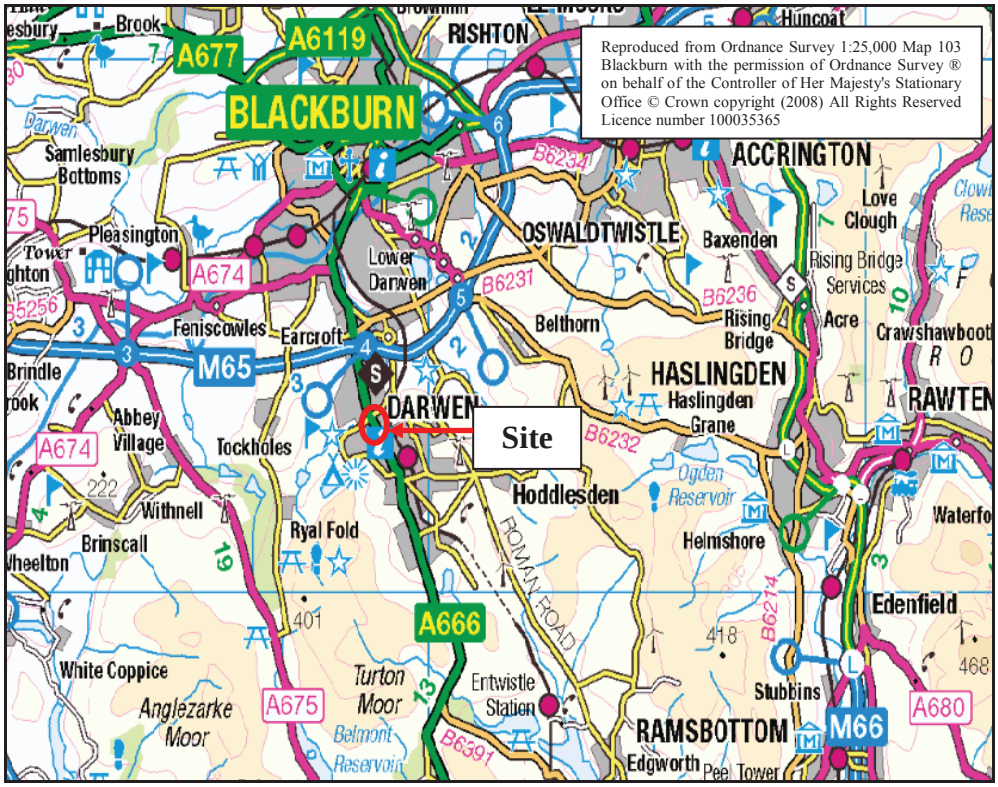


Figure 2: Site Location

Table 1: Summary of Description of the Site and its Environs	
Location	Approximately 4 miles south of Blackburn town centre The proposed new development area is situated within the southern area of Sita's Recovery Facility off Lower Eccleshill Road, Darwen, Lancashire.
Grid Reference	369300, 423920 (approx. centre of development area)
Post Code	BB3 0EH
Site Area	Area of new development is approximately 1.9 ha
Site Shape	The main area of development is roughly rectangular in shape and the boundary narrows to the south along the access road.
Topography	The ground level in the main area of the WTS development area is relatively level at approximately 150.8 mOD. The level rises to the south along the main access road to approximately 157 mOD. The area of proposed welfare and offices in the south west has a ground level at approximately 151.2 mOD.

2.2 Environmental Setting

2.2.1 A summary of the environmental background information (geology, hydrology, hydrogeology, database information etc.) is provided in the Entec Phase 1 desk study report (see Appendix D) and is not repeated in full here.

- ***Superficial Geology*** – The site is underlain by Glacial Till deposited in the Quaternary Period under ice age conditions. The unit is classified as unproductive.
- ***Solid Geology*** – The superficial deposits overlie the Pennine Lower Coal Measures Formation formed during the Carboniferous Period. It comprises coal, mudstone, siltstone and sandstones. The formation is classified as a secondary (A) Aquifer.
- ***Mining and Quarrying*** – Coal mining is known to be on site and within the surrounding area. The coal authority report stated that the site is not within the likely zone of influence from past underground workings. It was also noted that there is a mining shaft in the south of the site however it is unknown as to whether it has been sealed.
- ***Ground Stability***

Table 2: Summary of Geotechnical Hazards	
Geohazards:	
Highly Compressible Ground	Moderate risk
Running Sand	Very low to low
Landslip	Very low to moderate risk

- ***Landfill –*** Two historic and an active landfill are within 250 m of the site. The closest landfill is Goosehouse Quarry bordering the southern boundary of the site, recorded as operational. The landfill was licenced from 1977 to receive household, commercial and industrial waste. Wolstenholm Brown Powers within the ownership boundary of the site and north of the investigation area historically received inert, industrial and commercial waste.

- ***Hydrology –*** The closest surface water body is Davyfield Brook located adjacent to the northern site boundary. The closest ground water abstraction is for industrial processing, located 277 m south west of the site.

3. SCOPE OF PHASE 2 INVESTIGATION

3.1 Outline of Phase 2 Site Investigation Requirements

3.1.1 The scope of the Phase 2 investigation was based on the Phase 1 report and recommendations by HY Consulting. The scale of site investigation was considered appropriate to provide an initial characterisation of the application site. The Phase 2 investigation comprised the following:

- Determine the thickness and nature of Made Ground and Glacial Till;
- Determine the depth to bedrock;
- Determine the groundwater depth;
- Confirm (as anticipated) that that there is no evidence of shallow mine workings at the site;
- To identify the presence and nature of potentially harmful ground gases and to define any specific gas protection measures that may be required for the new buildings;
- Produce a conceptual site model to allow the assessment of contaminant linkages and assess potential risks to identified receptors (to include property, human health and controlled waters);
- To assess the suitability of excavated material for re-use as backfill;
- Carry out chemical testing to determine the contamination status of surplus excavated material for disposal;
- To determine the aggressiveness of the chemical environment with regard to buried concrete and to define the ACEC classification;
- To identify the presence and extent of contaminated material with respect to acceptability limits for the intended site use, including general landscaping; and
- To identify the presence of any material, which may be harmful to construction workers and future site users.

3.1.2 A summary of exploratory hole rationale is shown below:

Table 3: Summary of Exploratory Hole Rationale	
Hole	**Purpose**
BH1 (including re-locations)	Ground conditions beneath proposed structure in southwest of the site
BH2	Ground conditions beneath proposed structure in central area of the site
BH3	Ground conditions beneath proposed structure in central area of the site
BH4 (including re-locations)	Ground conditions beneath proposed structure in central area of the site and monitoring gas migration from landfill to the north
BH5 (including re-locations)	Ground conditions in beneath proposed structure in central area of the site and monitoring gas migration from landfill to the north
BH6	Ground conditions beneath proposed structure in central area of the site
BH7	Ground conditions beneath proposed structure in central area of the site
WS1	Shallow ground conditions beneath proposed structure in southwest of the site.
WS2	Shallow ground conditions beneath proposed structure in central area of the site
WS3	Shallow ground conditions beneath proposed external operating areas and general site coverage
WS4	Shallow ground conditions beneath proposed external operating areas and monitoring gas migration from landfill to the north
WS5	Shallow ground conditions beneath proposed external operating areas and monitoring gas migration from landfill to the north
BH4-TP	Shallow ground conditions beneath proposed structure in central area of the site (progressed due to obstructions encountered during drilling BH4)
BH5-TP	Shallow ground conditions beneath proposed structure in central area of the site (progressed due to obstructions encountered during drilling BH5)
TP1	Shallow ground conditions beneath proposed structure in southwest of the site
TP2	General site coverage in the southwestern part of the site
TP3	Shallow ground conditions beneath proposed structure in central area of the site
TP4	Shallow ground conditions beneath proposed external operating areas
TP5	Shallow ground conditions beneath proposed external operating areas
TP6	Shallow ground conditions beneath proposed external operating areas
TP7	General site coverage in the southern part of the site and close to proposed structure
TP8	General site coverage in the southwestern part of the site
TP9	General site coverage in the southern part of the site and close to proposed structure
TP10	Shallow ground conditions beneath proposed structure in central area of the site
TP11A	Shallow ground conditions beneath proposed external operating areas
TP12	Shallow ground conditions beneath proposed structure in central area of the site
TP13	Shallow ground conditions beneath proposed structure in central area of the site
TP14	Shallow ground conditions beneath proposed external operating areas
TP15	Shallow ground conditions beneath proposed external operating areas
TP16	Shallow ground conditions beneath proposed external operating areas
TP17	Shallow ground conditions beneath proposed structure in central area of the site

3.2 Fieldwork and Monitoring

3.2.1 In order to gain the above information, the proposed scope of the fieldwork is as follows:

- 9 No cable percussive boreholes to prove bedrock or to a maximum of 10 m with U100 and SPT test in each borehole. Groundwater/gas wells were installed at all locations with the exception of BH4, BH4B and BH5 due to shallow drilled depth;
- 5 No window sample boreholes to a depth of about 4 to 5 m with hand dug pits and three SPT tests per hole. There will be the installation of groundwater/gas wells at all locations, with the exception of WS5;
- 19 No machine dug trial pits;
- Lift a concrete “cap” to determine whether it is a cap to a former mine shaft;
- Obtain samples for chemical and geotechnical testing;

- Description of the ground encountered in accordance with BS5930:1999+A2 (2010) "Code of Practice for Site Investigations;"
- Ground gas well monitoring of the new wells plus three existing wells from previous investigations (other wells from previous investigations could not be located or were inaccessible). Six monitoring visits were undertaken. Gas monitoring involved the measurement of the gas concentrations for CO_2, CH_4, O_2, CO and H_2S as well as the flow, relative pressure and ambient barometric pressure.

3.3 Geo-Environmental Laboratory Testing

3.3.1 It is proposed to test forty three soil samples for general analysis with additional analysis of asbestos, speciated polycyclic aromatic hydrocarbons (PAHs), speciated total petroleum hydrocarbons (TPHs) and volatile organic compounds (VOCs) on a number of samples. Five soil samples for leachate analysis will also be undertaken.

3.3.2 In addition to the soil contamination analysis there will be twelve groundwater samples for a general analysis of potential contaminants as well as for BRE SD1 analysis for concrete design.

3.3.3 Further details of the various suites of analysis for the soil, leachate and water are presented in Section 5.1.

3.4 Geotechnical Laboratory Testing

3.4.1 The following geotechnical laboratory testing is proposed:

- 6 No. Moisture Content Determinations in accordance with BS1377: Part 2: 1990;
- 6 No. Liquid and Plastic Limit Determinations in accordance with BS1377: Part 2: 1990;
- 7 No Particle size distribution tests (sieve and where required up to 6 No pipette) in accordance with BS1377: Part 2: 1990;
- 6 No Oedometer tests in accordance with BS1377: Part 5 Cl 2: 1990; and
- 14 No Triaxial quick undrained compression tests in accordance with BS1377: Part 7 Cl 8: 1990

4. FIELDWORK

4.1 General Observations

4.1.1 The fieldwork was carried out between 4th and 14th March 2014. TerraConsult personnel were present to supervise all work, describe the ground encountered, carry out in situ testing and decide on the depths and response zones of monitoring wells. A services search was carried out prior to the site work and a CAT scan performed at the position of each exploratory hole location.

4.1.2 Fieldwork procedures were undertaken in accordance with the relevant sections of:

- British Drilling Association "Guidance for Safe Intrusive Activities on contaminated or Potentially Contaminated Land" (2008);
- BS EN 1997-2:2007 [Eurocode 7 Part 2];
- BS5930:1999 +A2 (2010) "Code of Practice for Site Investigations;"
- BS10175:2011 + A1 (2013) "Investigation of potentially contaminated sites – Code of practice."

4.1.3 Six rounds of ground gas monitoring shall be undertaken followed by a review of the findings in order to assess potential risks to the proposed development. Additional monitoring may be required based on the findings of the assessment and the site environmental setting.

4.2 Cable Percussion Boreholes

4.2.1 Seven cable percussion boreholes were commenced within the region of the two proposed buildings on site. Multiple setups were attempted at three of the proposed locations:

- BH1, BH1A, BH1B all terminated due to obstructions in Made Ground at a depth of less than 2.0 m, BH1C then penetrated to the proposed full depth to prove rockhead.
- BH4, BH4A and BH4B terminated due to presence of fused slag
- BH5 and BH5A terminated due to presence of fused slag, BH5B then penetrated to the proposed full depth to prove rockhead

4.2.2 Of the six exploratory holes which fully penetrated the Made Ground, five of them were terminated in bedrock at depths of between 9.45 and 13.93 m with BH7 completed in bedrock at a depth of 4.83 m bgl. BH3 which attained over the 10 m requirement without reaching bedrock was terminated at a depth of 11.45mbgl.

4.2.3 The boreholes were carried out with 150 mm diameter casing using shell, clay cutter and light cable percussion techniques. Standard Penetration Tests (SPTs) were carried out in both granular and cohesive strata and to prove bedrock in general accordance with BS EN ISO 22476-3:2005. Undisturbed driven U100 samples were taken from cohesive strata

for laboratory analysis. Selected disturbed samples and bulk samples were also taken.

4.2.4 Note groundwater was not encountered during the fieldwork within the exploratory holes, except for a small strike in BH6. The strike was met at 2.95m rising to 2.92m after 20mins and related to a perched groundwater within the Made Ground.

4.2.5 Monitoring wells were installed within the six exploratory holes which achieved the required depth comprising 52 mm internal diameter HDPE pipe, being plain pipe for between the first metre and three and a half metres and completing the remain length of the borehole with slotted pipe. They were complete with a gas tap and a flush cover fixed with concrete. The remaining exploratory locations were backfilled with arisings from the excavations.

4.2.6 The logs from the cable percussion boreholes and the SPT Calibration Certificate are presented in Appendix C and should be read in conjunction with the key included therein.

4.3 Trial Pits

4.3.1 Nineteen trial pits were excavated using a 12 tonne tracked excavator, across the entire site to depths of between 0.50 m (TP11A) and 4.2 m bgl (TP5). The trial pits included TP1 to TP10, TP11A, TP12 to TP17 in addition to BH4-TP and BH5-TP. These last two trial pits were excavated in order to try to find areas where boreholes could be located because previous attempts for BH4 and BH5 had been terminated in fused slag.

4.3.2 Fifteen of the trial pits required the breaking of either concrete or macadam before the excavation commenced.

4.3.3 Groundwater strikes were encountered once within trial pits TP8, TP10 and TP15 in addition to twice within TP1. The water was found at depths of between 1.2 m (TP1) and 3.2 m bgl (TP10), noted to have a slow flow rate in all instances.

4.3.4 Eight of the trial pits were finished prematurely due to the following reasons:

Table 4: Reason For Premature Termination	
TP3	Encountering a 'flue or duct' (void) within Made Ground.
TP6	Became unstable.
TP11A	Service encountered.
TP12	Unable to deepen through slag due to hardness of material.
TP13	Unable to deepen through slag due to hardness of material
TP16	Void within Made Ground.
BH4-TP	Unable to deepen through slag due to hardness of material
BH5-TP	Unable to deepen through slag due to hardness of material

4.3.5 Once sampling and inspection were completed the exploratory holes backfilled with arisings from the excavation.

4.3.6 The trial pit logs are included as Appendix D and should be read in conjunction with the key included therein.

4.4 Dynamic (Window) Sample Boreholes

4.4.1 Dynamic sampling was carried out across the site at five borehole locations (WS1 to WS5) using a tracked EEW2 Competitor rig. These holes were located across the entire site, both within the proposed footprint of the two building and within areas of proposed hard standing.

4.4.2 The dynamic sample boreholes achieved depths of between 3.45 m (WS5) and 5.45mbgl (WS1, WS2 and WS4). Standard Penetration Tests (SPTs) were carried out at 1 m intervals to get the minimum of three per a hole and to be in general accordance with BS EN ISO 22476-3:2005.

4.4.3 Note groundwater was not encountered immediately within any of the exploratory holes.

4.4.4 Monitoring wells were installed within exploratory holes WS1 to WS4 comprising 52 mm internal diameter HDPE pipe, being plain pipe for between the first 0.4 m and 2 m and completing the remain length of the borehole with slotted pipe. They were complete with a gas tap and a flush cover fixed with concrete. The remaining dynamic sample exploratory hole WS5 was backfilled upon completion of investigation and sampling as this exploratory location was primarily for ground description, sampling and *in-situ* testing and not gas monitoring.

4.4.5 The dynamic sample logs are presented in Appendix C and should be read in conjunction with the key included therein.

4.5 Samples and Sample Containers

4.5.1 Samples for chemical testing were stored in a cool box containing ice packs to keep as cool as reasonably practicable and bubble wrap to avoid breakages, the glass vials were stored in a tub as an additional precaution. Samples were couriered directly to the testing laboratory.

Soil Samples

4.5.2 Soil samples for chemical analysis each comprised of plastic tubs for inorganic, metals, asbestos and inorganic analysis as well as an amber glass jar for organic analysis. The quantity and combination of containers is dependent of the suites discuss below in Section 5.1.

4.5.3 Each sample for geotechnical analysis comprised of either a single plastic tub or a bulk bag, dependent on the type of analysis being undertaken.

Groundwater Samples

4.5.4 Prior to taking any water samples, the wells were developed and three well volumes of water purged from the wells using dedicated disposable bailers (also called a grab

sampler). If recharge was relatively slow and not sufficient to allow a purged sample from being taken then a sample was taken of the water during the purging and the volume of purged water was noted.

4.5.5 The water samples were tested on site in accordance with EA recommendations for pH, conductivity, redox potential, temperature and dissolved oxygen. A range of different sample containers were used for sampling groundwater:

- 1 litre plastic bottles metals and inorganics;
- 1 litre glass bottles for SVOC's
- 40 millilitre amber glass vial for VOC's

4.6 Monitoring

4.6.1 After completion of the fieldwork six visits were made to the site to carry out monitoring of groundwater levels and ground gas concentrations. Ground gas monitoring was carried out in accordance with BS8576:2013 and comprised of measuring:

- VOCs using an Ion Science Photo Ionisation Detector (PID) – two occasions only;
- Landfill gases using a GasData GFM435 infra-red meter to measure atmospheric pressure, gas flow rate, methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide.

4.6.2 The results of this monitoring are presented in Appendix E. It should be noted that no free phase hydrocarbons were encountered in any of the monitoring wells.

4.7 Topographical Survey

4.7.1 A topographic survey was completed prior to TerraConsult's investigation and was supplied by the client. TerraConsult surveyed the exploratory hole locations.

5. LABORATORY TESTING

5.1 Chemical Laboratory Testing

5.1.1 The soil and water samples were submitted to Chemtest of Newmarket who are UKAS accredited in accordance with ISO17025 and are also MCERTS accredited for soil analysis in accordance with the Environment Agency's scheme. The laboratory carries out Quality Assurance and Quality Control in accordance with BS ISO 17025 and participate in external laboratory comparison and quality control schemes. Details of the accreditation and the methods of analysis are provided on the relevant test reports.

5.1.2 The selection of samples for laboratory testing and analytes to be determined were made based on historical land uses identified in the Phase 1 assessment undertaken by Entec in

2010, the excavation records and other observations during the investigations. The sample selection rational was as follows:

- to gain a good coverage across the site and of the various anthropogenic material types and strata encountered;
- to characterise samples which had visual or olfactory evidence of contamination;
- to characterise the groundwater.

5.1.3 The selected soil and groundwater samples were tested for a range of typical contamination indicators including specific tests for contaminants suspected as being present from the desk study and from observations made on site. Tests were also performed which were used for waste classification purposes and concrete design.

5.1.4 Each of the soil samples were analysed for the 'total' concentration of a suite of potential contaminants. Leachate samples were also prepared from five soil samples in accordance with BS EN 12457: Part 4: 2002. The leachate preparation was just for a 10:1 water to soil extract.

5.1.5 Twelve groundwater samples were also analysed from two separate occasions tested for a range of typical contamination indicators including specific tests for contaminants suspected as being present from the desk study and from observations made on site.

5.1.6 The results of the laboratory analysis are presented in Appendix F with summaries in Appendices I and K. The various suites of analysis for the soil, leachate and water were as follows:

Table 5: Suites of Analysis for Soil and Water Samples

Determinand	Soil Suite 1	Soil Suite 2	Leachate Suite	Water Suite
Number of Samples	43	9	5	12
Index Tests				
Asbestos Screen	**	**	-	-
pH	✓	-	✓ (L)	✓
Electrical Conductivity	-	-	✓ (L)	✓
Dissolved Solids	-	-	✓ (L)	✓
Metals				
As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn (all totals)	✓	-	✓ (L)	✓
Ba, Mo, Sb	-	-	✓ (L)	-
Inorganics				
Ammonium	-	-	-	✓
Cyanide - Total	✓	-	-	✓
Thiocyanate	✓	-	✓ (L)	✓
Chloride (2:1 extract on soil samples)	✓	-	✓ (L)	✓
Fluoride (2:1 extract on soil samples)	-	-	✓ (L)	-
Nitrate (2:1 extract on soil samples)	-	-	✓ (L)	-
Sulphate (2:1 extract on soil samples)	✓	-	✓ (L)	✓
Sulphide	✓	-	-	✓
Sulphur	✓	-	-	✓
Organics				
Phenols - Total (monohydric)	✓	✓	✓ (L)	✓
Total Organic Carbon (TOC)	-	-	TOC	-
PAH (Speciated USEPA 16)	-	✓	**✓ (S)	✓
TPH (C_8 to C_{36})	✓	-	-	-
TPH (C_8 to C_{36}) TPH CWG (RBCA) Speciation	-	✓	-	✓
Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX);	-	**	-	✓
Volatile Organic Compounds (VOCs) and Chlorinated Solvents	**	**	-	-

NOTE

✓ = Test carried out on all samples **= Test required on selected samples only

2. All soil samples to be tested and reported in accordance with EA MCERTS for Soils Scheme
3. Leachate preparation and reporting in accordance with ISO/EN/BS12457:Part 4 with results reported in terms of both mg/kg and mg/l for a 10:1 extract.
4. (S) test carried out on soil sample, (L) test on leachate prepared from soil sample in accordance with Landfill WAC Criteria
5. In addition to the above, ten samples were also tested for the presence of Asbestos fibres.
6. Three of the water samples were also tested for nitrate and magnesium as part of a BRE SD1 analysis for concrete design.

5.2 Geotechnical Laboratory Testing

5.2.1 Samples were submitted to PSL Limited in Doncaster who are UKAS accredited in accordance with ISO17025. The following geotechnical testing was undertaken:

- 6 No. Moisture Content Determinations in accordance with BS1377: Part 2: 1990;
- 6 No. Liquid and Plastic Limit Determinations in accordance with BS1377: Part 2: 1990;

- 7 No Particle size distribution tests (sieve and where required 6 No pipette) in accordance with BS1377: Part 2: 1990.
- 6 No Oedometer consolidation tests in accordance with BS1377: Part 5 Cl 3: 1990;
- 7 No Triaxial constant head permeability tests in accordance with BS1377: Part 6 Cl 6: 1990 (note that these testes were carried out in error by the laboratory and have been reported even though they were not scheduled);
- 12 No Quick Undrained Shear Strength 100mm single stage in accordance with BS 1377 1990; Part 7 Cl 8.

5.2.2 In addition to the above tests three slag expansion tests were carried out. These three tests are discussed further in Section 9.2

5.2.3 The results of the geotechnical testing are included in Appendix G.

6. GROUND CONDITIONS

6.1 General

6.1.1 The site investigations have allowed the site specific ground and groundwater conditions to be described and this information was used to provide an improved conceptual ground model. The assessment of the chemical test results and the ground gas conditions are presented in Section 7.

6.1.2 The geology encountered during the site investigations were generally consistent with that anticipated from the desk study and historical intrusive ground investigation with Made Ground deposits present at the majority of exploratory hole locations. Within Made Ground deposits voids were encountered (believed to relate to the iron works) which included a flue/drain constructed of brick (see TP3). Visual and olfactory indication of possible contaminants in Made ground shows the presence of slag, ash, timber, metal and metal powders.

6.1.3 Made Ground deposits were underlain by Glacial Till comprising mostly clay with lenses of gravel present in some exploratory holes. Some variation in the glacial deposits was encountered, especially in relation to the thickness of granular deposits within the main clay deposits.

6.1.4 Rockhead was encountered at depths of between 0.45 m and 13.80 m bgl.

6.1.5 Groundwater was encountered in Made Ground deposits in only four exploratory holes. Groundwater was not encountered within the Glacial Till deposits.

6.2 Ground Surface

6.2.1 The ground surface of the site is predominately reinforced concrete, on which the majority of exploratory holes were located.

6.2.2 There are three exploratory locations where Made Ground was at ground surface, of which there were three distinct types discussed below in Section 6.3.

6.2.3 There are small sections of landscaped soft sanding in the southern region of site where three exploratory locations were located with topsoil at ground surface. Macadam at surface in the south western corner relating to existing roads and parking where one exploratory hole was located. Topsoil is characterised as black fine to coarse sand with frequent rootlets.

6.3 Made Ground

6.3.1 Made Ground was encountered within twenty-seven of the thirty exploratory holes. It has been classified into three stratums discussed separately below. The depth to the base of the base of the Made Ground varies from 0.30 m (BH7 and TP14) to 3.45 m bgl (WS5).

6.3.2 The first type of Made Ground was sub base and was encountered within the exploratory holes located below concrete at a depth of between 0.10 m and 0.30 m bgl with the depth to the base at between 0.20 m and 0.50 m bgl. It is characterised as a grey sandy subangular to subrounded fine to medium gravel of limestone and concrete.

6.3.3 The second Made Ground encountered within twenty-four of the exploratory holes, two of which were at ground surface. The thickness of the stratum varied between 0.25 m (WS3) and 3.25 m with a maximum depth of 3.45 mbgl (WS5). The stratum is typically characterised brown slightly sandy gravel with occasional cobbles of brick however it is extremely variable and has also been noted as gravelly sand, slightly silty gravel, slightly clayey gravel and gravelly clay. The gravel is fine to coarse, usually angular to subrounded of principally concrete and brick with lesser quantities of ash, limestone, slag, wood, sandstone, tile and metal.

6.3.4 The third Made Ground was encountered within nine exploratory holes (BH4, BH4A BH4B, BH5, BH5A, BH4-TP, BH5-TP, TP12 and TP13) at a depth of between 0.80 m and 2.60 mbgl. The base of the stratum was not proven however the maximum depth it was proven was 3.20 m bgl (BH4-TP). The stratum is characterised as slag which a waste product from ore processing historically undertaken on site.

6.3.5 Voids were encountered within exploratory locations BH5B, BH6, TP3 and TP16. The void within TP3 was identified as a flue/drain likely to historically be feeding the chimneys previously on site with a thickness of 0.95 m. The void with a thickness of 0.40 m within TP16 is believed to be an historic water tank however this could not be confirmed. Exploratory locations BH5B and BH6 have voids of thicknesses of 2.00 m and 0.80 m respectfully that are thought to be other flues/drains however this could not be confirmed due to the limitations of observing ground conditions in cable percussive boreholes.

6.3.6 Visual evidence of contaminants included:

- Slag (which limited exploratory hole progression):
  - BH4 – 1.84 to at least 2.4 m bgl;
  - BH4B – 1.50 – at least 1.80 m bgl;
  - BH5 – 1.8 to at least 2.1 m bgl;
  - TP13 – 0.9 to at least 1.0 m bgl;
  - BH4-TP – 1.50 to at least 3.2 m bgl; and
  - BH5-TP – 2.0 to at least 3.1 m bgl.
- Timber – WS5
- Metal / wire – WS5, TP1 and TP2
- Bronze powder:
  - TP4 – 0.3 to 1.0 m bgl; and
  - TP10 – 0.2 to 0.6 m bgl.
- Minor amounts of slag and ash incorporated as sand and gravel sized fragments within much of the Made Ground.

6.4 Drift Deposits

Glacial Till

6.4.1 The Glacial Till was present in thirteen of exploratory holes. It was encountered below either the Made Ground or granular glacial deposits discussed below. The stratum is interbedded with granular and fine glacial deposits of glaciofluvial origin. The thickness of uninterrupted Glacial Till ranged between 0.20 m (BH7) to 7.80 m (BH5B) however the thickness was typically less than 3.00 m thick.

6.4.2 The stratum is typically stiff (locally soft, firm or very stiff in consistency) brown mottled grey slightly sandy slightly gravelly clay. The gravel was typically fine to coarse, subangular to subrounded of mudstone.

Glacial Deposits

6.4.3 There were extensive beds of characteristically yellowish brown mottled grey sandy clay found within nine of the exploratory holes interbedded the Glacial Till. The deposits are thought to be deposited locally where temporary lakes formed from melt water and allowed the settlement of fine. The thickness of these beds varied between 1.00 m (BH1C) and 4.00 m (BH3)

6.4.4 The granular glacial deposits were present in six of the exploratory holes, ranging between 0.30 m (TP14) and 2.30 m (TP7) in thickness. The deposits are seen to be interbedded with Glacial Till in all except TP7. The two types of deposits are follows:

- The first granular deposit is found within five of the exploratory locations. It is typically a brown slightly silty fine and medium sand. Locally the unit is also noted as being either silty or clayey.
- The second granular deposit is only found within TP7. It is characterised as a yellow brown clayey slightly gravelly fine to coarse sand with rare mudstone cobbles. Gravel is subangular to angular, fine to coarse of mudstone.

6.5 Solid Geology

6.5.1 Rock head was encountered at between 0.45 m (WS3) and 13.80 m bgl (BH5B) and was found to comprise very weak grey friable Mudstone. Rockhead roughly dip by approximately 13.40 m towards the NNW across the site. Note the maximum thickness of 4.00 m proven was within WS3 at its shallowest location.

6.6 Groundwater

6.6.1 Groundwater was not encountered in the majority of the exploratory holes during excavation or boring. However, groundwater was encountered within the Made Ground and the glacial deposits in four locations as follows:

- TP1 – 1.20 m and 2.70 m bgl
- TP8 – 2.95 m bgl
- TP10 – 3.20 m bgl
- TP15 – 3.00 m bgl

6.6.2 Over the monitoring period the depth to groundwater in the wells varied as follows:

Table 6: Groundwater Levels within Wells

Monitoring well	Well Base Depth (m)	Shallowest Depth (m)	Deepest Depth (m)
WS1	3.74	1.29	2.72
WS2	3.86	1.62	1.80
WS3	2.16	0.53	1.20
WS4	2.32	1.16	1.86
BH1C	9.69	7.17	7.90
BH2	9.91	6.06	6.23
BH3	10.80	4.44	4.94
BH5B	13.30	8.97	9.10
BH6	8.77	3.74	4.59
BH7	4.36	0.74	1.67
GWW1	25.64	13.76	14.35
GW2	23.27	16.05	16.54

6.6.3 There was no visual or olfactory evidence of contamination of groundwater.

6.6.4 Overall the wells which were up to 4.4 m deep had shallow groundwater between about 0.53 and 2.72 m below ground level with the deeper wells indicating groundwater levels at a depth of 6 to 16 m below ground level indicating a shallow perched groundwater level and a deeper body of groundwater.

6.7 Surface Water

6.7.1 No surface water encountered on site.

7. TIER 2 GEO-ENVIRONMENTAL RISK ASSESSMENT

7.1 Introduction

7.1.1 The assessment of contamination has been carried out in accordance with the overall guidance presented in CLR11 Model Procedures for the Management of Land Contamination using the procedures as indicated in the following sections in accordance with current relevant guidance and legislation.

7.1.2 Where possible contamination has been observed, potential contaminant linkages have been postulated and require a definitive assessment to confirm an actual contaminant linkage and hence, a requirement for remedial action.

- **Human Health**
  The overall methodology for assessing the risk to human health from potential contaminants in soil is presented in Appendix H in accordance with the guidelines as set out in the Environment Agency's guidance "Using Soil Guideline Values" SC050021/SGV Introduction, March 2009 and using the CLEA 1.06 model software. These have been used for a Tier 2 assessment of soil contamination for the protection of human health. The limited number of SGVs that have been published are for a soil organic matter of 6%. For this site the CLEA 1.06 software has been used to derive generic assessment criteria are for a soil organic matter of 1% in accordance with the following:

  - Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil;
  - Science Report SC050021/SR3: Updated technical background to the CLEA model;
  - Science Report SC050021/SR4: CLEA Software (Version) Handbook;
  - Toxicological reports and SGV technical notes;
  - Toxicological data published by LQM/CIEH (2009) and CL:AIRE/EIC/AGS (2009).

  In March 2014 six 'proposed' Category 4 Screening Levels (pC4SL) were issued by Defra. These screening values are considered to be within Category 4 as defined in the Contaminated Land Statutory Guidance. The pC4SL represent safe levels for new developments passing through the planning system. The SGV for lead has been withdrawn, and the pC4SL for lead has been derived using current best practice.

- **Controlled Waters**
  The risk posed to controlled waters from total soil concentrations cannot be directly assessed. The risk is assessed either by comparison of results of leachate tests carried out on soil samples, or from the direct testing of samples of groundwater to screening criteria. Leachate testing generally forms a

conservative assessment and is not appropriate for organic contaminants. Further details of the Tier 1 methodology is presented in Appendix J. There is a hierarchy of screening criteria which is as follows:

- Updated Recommendations on Environmental Technical Standards, River Basin Management (2015-21), April 2012 by the UK Technical Advisory Group on the Water Framework Directive;
- Environmental Quality Standards (EQS) for freshwaters;
- Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
- Surface Waters (Fishlife) (Classification) Regulations (1997)
- UK Drinking Water Standards (DWS) (Water Supply (Water Quality) Regulations 2000);
- World Health Organisation Guidelines for Drinking Water (2004)

- **Phytotoxic Risks**
  Generic assessment of phytotoxicity is by comparison with guideline values presented in the MAFF document "Code of Good agricultural practice for the protection of soil", October 1998. This is in accordance with CLR's reference to DEFRA notice CLAN 4/04.

- **Chemical attack on buildings**
  Generic assessment of the chemical attack on building materials has been assessed using guidance presented in the BRE Special Digest 1: "Concrete in aggressive ground" 2005.

- **Tier 2 Ground Gas Assessment**
  Concentrations and flow rates of ground gases (and vapours) have been assessed in accordance with the guidance given in CIRIA C665 "Assessing risks posed by hazardous gases to buildings" and BS:8485:2007 "Code of practice for the characterization and remediation from ground gas in affected developments". The assessment follows the BS8485:2007 gas characterisation system and the NHBC traffic light system in CIRIA C665.Other gases may need to be assessed on a site specific basis (e.g. hydrogen sulphide, carbon monoxide). The risk due to radon has already been assessed within the Entec Report R10387il, September 2010 and this assessment indicates that no special precautions are required due to the potential risk from radon.

- **Tier 2 Ground Gas Assessment**
  Concentrations and flow rates of ground gases (and vapours) have been assessed in accordance with the guidance given in CIRIA C665 "Assessing risks posed by hazardous gases to buildings" and BS:8485:2007 "Code of practice for the characterization and remediation from ground gas in affected developments". The assessment follows the BS8485:2007 gas characterisation system and the NHBC traffic light system in CIRIA

C665.Other gases may need to be assessed on a site specific basis (e.g. hydrogen sulphide, carbon monoxide). The risk due to radon has already been assessed during the Phase 1 investigation and this assessment indicates that no special precautions are required due to the potential risk from radon.

7.2 Assessment for the Protection of Human Health

7.2.1 The Generic Qualitative Risk Assessment (GQRA) based on a soil with a Soil Organic Matter of 1% was carried in accordance with the methodology for assessing soil samples set out in Appendix H based on an industrial end use.

7.2.2 A full summary of the chemical test results is presented in Appendix I. Exceedence of applicable Generic Assessment Criteria (GAC) threshold concentrations would be indicated in yellow (note that the results highlighted in orange do not pose a risk to health but relate to concrete design). There were no exceedences of applicable Generic Assessment Criteria (GAC) threshold concentration for any of the contaminants analysed.

Asbestos

7.2.3 Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments of asbestos and discrete fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our site staff for the presence of bulk ACMs. During the fieldwork no suspected ACMs were identified.

7.2.4 Ten soil samples were analysed for full asbestos quantification and composition analysis. This assessment confirms whether fibres of asbestos and/or fragments of suspected ACMs are present and identifies and quantifies the type of asbestos (by polarised light microscopy). No asbestos was detected by laboratory analysis (note that the laboratory detection limit for asbestos fibres is 0.001%).

Risks to Human Health (Construction Phase)

7.2.5 Based on the findings of the soil GQRA screening and observations made during the site investigation and laboratory analysis for asbestos there are no specific requirements PPE requirements for construction workers.

7.2.6 During the construction works the production of dust, whilst is not a risk with respect to contaminants, will be a statutory nuisance to the construction site workers and the occupants of the surrounding area. Normal construction practices should be implemented to ensure that the generation of dust is minimised, such as:

- Excavations in Made Ground or any spoil from the excavations should be kept damp by using a fine water mist;
- vehicles used to transport Made Ground should be enclosed or tarpaulined;
- local roads should be regularly cleaned;
- vehicle movements and speed should be kept to a minimum within the site;

- minimising drop heights of all loading and unloading activities that involve the transfer of soils and demolition materials.

7.3 Assessment for the Protection of Controlled Waters

7.3.1 The risks to controlled waters (groundwater within the Secondary (A) Aquifer and surface waters including the beck adjacent to the northern site boundary) have been assessed by carrying out a Tier 2 assessment in accordance with the EA Remedial Targets Methodology. The laboratory test data from twelve groundwater samples and five leachate tests prepared from soil samples are presented in Appendix K. In both the leachate and groundwater samples general relatively low concentrations of contaminants were encountered below the threshold criteria (DWS = Drinking Water Standard, EQS = Environmental Quality Standard). However, the screening criteria were exceeded for the following compounds and samples:

- Zinc: TP16 with 270 µg/l compared to a EQS of 250 µg/l however lower than the DWS of 5000 µg/l;
- Fluoride: WS4 with 1.6 mg/l compared to the DWS of 1.5 mg/l;
- Sulphate: Exceeding within four of the fifteen samples with between 260 mg/l (WS1) and 640 mg/l (BH2) compared to DWS of 250 mg/l, samples BH2 (640 mg/l) and BH5B (510 mg/l) also exceed the EQS of 400 mg/l;
- Unionised ammonia: Exceeding within eight of the twelve samples with between 0.02 mg/l (GWW1) and 0.17 mg/l (BH5) compared to the EQS of 0.015 mg/l.

7.3.2 It should be noted that the laboratory leachate results for the pH range from 8.9 to 11.0. Of the laboratory results for the groundwater the maximum pH encountered was 9.0 within TP17 however the pH range was typically between 8.1 and 7.2. The alkaline (high) pH values are consistent with having crushed concrete in the Made Ground.

Discussion

7.3.3 The results of groundwater monitoring shows that groundwater is present within Made Ground deposits and within the Glacial Till. During the progression of exploratory holes, groundwater was observed within Made Ground, but was not observed within the Glacial Till. Groundwater in monitoring wells screened within the Glacial Till will have accumulated over time due to the relatively low permeability of the materials.

7.3.4 The general distribution of contaminants in groundwater showing exceedences of screening levels shows no discernable patterns. For example, ammonia is present in both Made Ground and Glacial Till groundwater with the highest concentrations of ammonia encountered in Glacial Till Groundwater. Sulphate concentrations show groundwater in Made Ground and Glacial Till which show exceedences and non-exceedences of screening values. Zinc and fluoride concentrations above screening values were encountered only in Made Ground groundwater.

7.3.5 Whilst the measured concentrations of zinc, fluoride and sulphate are slightly elevated above the screening threshold criteria they are not considered to be of concern. The exceedences are localised and only marginally exceed the relevant screening value.

7.3.6 The concentrations of unionised ammonia require more detailed discussion as exceedences are in excess of the screening values and occur across the site. It is likely that the source of this is the adjacent landfill and not from within the development site itself so no remediation of the ammonia on site is proposed.

7.3.7 The closest surface water receptor is the beck adjacent to the northern boundary and the closest groundwater abstraction is 277 m southwest of the site.

7.3.8 Where bedrock was encountered below the site it was penetrated by a depth of up to 4.00 m and this was a mudstone (a non-aquifer/unproductive strata) and no sandstone was encountered. The bedrock deposits of the Pennine Lower Coal Measures Formation as a whole are classified as a Secondary A Aquifer by the Environment Agency who allocated the whole Formation with this designation. The Formation was classified as a Secondary A Aquifer due to the presence of sandstone units within the Formation which are locally important water resources but no sandstone was encountered at bedrock level.

7.3.9 The near surface bedrock has been shown to comprise very low permeability mudstone deposits. These deposits will act as an aquitard to the downward migration of contaminants into sandstone deposits at depth. Glacial Till was encountered above the bedrock across the site and this stratum will is also of low permeability further limiting vertical, and horizontal, migration of shallow groundwater

7.3.10 The distance to surface water and groundwater receptors are relatively close. However, as discussed above, lateral and vertical migration of shallow groundwater will be very limited as and no plausible pathway for migration of contaminants is present. Transport times will also be slow, allowing for processes of natural attenuation to occur, further reducing concentrations. Therefore there is no significant risk to controlled waters from the measured concentrations of ammonia in the shallow groundwater within the Glacial Till.

7.3.11 It should also be noted that the relatively high alkalinity of soil leachates is likely to be due to the localised presence of crushed concrete and slag in the Made Ground. These materials contain lime which when dissolved can result in high pH (a pH of approximately 12.4 if at equilibrium). If there is migration of this water off site the pH will be buffered during groundwater migration due to carbonic and other naturally occurring acids.

7.3.12 In summary the conceptual site model and contaminant linkage assessment indicates that the groundwater within the Made Ground has a low mobility and the slow migration off site will enable natural attenuation to occur and the concentrations to reduce to below the screening thresholds before the groundwater reaches any controlled waters receptors and therefore there is not a significant concern.

7.4 Phytotoxic Risks

7.4.1 The concentrations of the phytotoxic metals copper, chromium, nickel and zinc have the potential to be harmful to plants. Concentrations of the phytotoxic metals zinc, copper and nickel have been recorded in excess of the guideline values for the protection of

plants as presented in the MAFF document "Code of Good agricultural practice for the protection of soil"(1998). The results of the phytotoxic screening are presented in the tables below. It is acknowledged that the MAFF guidelines are based on the averaging area pH value, and that some pHs at the site have been recorded at significantly lower and higher values than these.

Table 7: Phytotoxic Risk of Made Ground

Determinand	Number of samples	Trigger Value* (mg/kg)	Maximum Value (mg/kg)	Exceeds Tier 1 Screening (Y/N)
Copper	43	200	1600	Y
Chromium	43	400	62	N
Nickel	43	110	180	Y
Zinc	43	300	2100	Y

***Trigger value from MAFF "Code of Good agricultural practice for the protection of soil" October 1998 at average pH 7.0**

7.4.2 Of the samples with exceedences only the sample from TP9 at a depth of 1.50 m bgl is within a region of proposed soft landscaping, with exceedences of copper (270 mg/kg) and zinc (980 mg/kg). As the already vegetated area is expected to undergo limited development and the contamination was at a depth of 1.50 m it is not be of concern due to the depth.

7.4.3 In landscaped areas the material with significantly elevated levels of contamination are not suitable to be reused within the areas of proposed flora, and imported clean inert materials will be required.

7.5 Chemical Attack on Structures and Materials

7.5.1 Below ground concrete structures are potentially at risk in areas of elevated sulphates and where there is low pH. An assessment of the soil data (following the protocol established in BRE Special Digest 1, 2005) indicates that conditions vary from Design Class 1 ACEC Class AC-1 to Design Class 2 ACEC Class AC-2. The groundwater test results again indicate that conditions vary from Design Class 1 ACEC Class AC-1 to Design Class 2 ACEC Class AC-2. Therefore it is recommended that all below ground concrete is designed to meet the DC-2 AC-2 conditions in terms of the durability and structural performance.

7.5.2 Gross hydrocarbon contamination can also have an adverse impact on the setting of concrete, which may affect foundation construction and piling. Based on the measured concentrations of hydrocarbons at the site there is no risk of these affecting the setting of concrete.

7.5.3 Plastic pipe materials are also potentially vulnerable to attack from elevated levels of hydrocarbons and can be pervious to phenols. This can potentially lead to contamination of potable water supplies and water supply companies also require the risk to their workers from other contaminants in the ground to be assessed. The water supply companies have their own screening criteria and these criteria are generally lower than the SGVs and GACs used in this report to assess the risk to end users of the site. However, based on the chemical test results, it is anticipated that no special precautions

are required for the design and installation of water supply pipes due to hydrocarbons and other potential contaminants.

7.6 Ground Gases

Measured Gas Concentrations

7.6.1 Six rounds of gas monitoring were carried out by TerraConsult between the 21st March and 25th April 2014 in the thirteen gas monitoring wells with atmospheric conditions varying from 981 to 1002 mbar during this period. Five of the six monitoring visits were carried out with atmospheric pressures less than 1000 mbar. A summary of the gas monitoring results are provided below including flow rates, methane and carbon dioxide concentrations, together with the lowest oxygen levels (i.e. a combination of the worst case temporal conditions recorded).

Table 8: Summary of Ground Gas Monitoring

Borehole	Response Zone mbgl	Contamination evidence	No. of monitoring occasions	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (% v/v)	Carbon Monoxide (ppm)	Hydrogen sulphide (ppm)	Steady Flow (l/hr)	Water Level mbgl	Atmospheric pressure readings mb
WS1	1.5-4.0	No	6	<0.1	0.3	18.5-19	<1	<1	0.4	1.29-2.62	983-1002
WS2	2.0-4.0	No	6	<0.1	0.1	19.9-20.1	<1	<1	<0.1	1.62-1.80	982-1002
WS3	0.4-2.0	No	6	<0.1	0.1	20.0-20.4	<1	<1	<0.1	0.53-1.20	981-1002
WS4	0.4-2.4	No	6	<0.1	1.8	15.8-17.9	<1	<1	<0.1	1.20-1.86	983-1002
BH1C	2.0-10	No	6	<0.1	0.8	18.0-19.5	<1	<1	<0.1	7.17-7.90	982-1002
BH2	3.0-10	No	6	<0.1	0.7	12.7-17.0	<1	<1	<0.1	6.06-6.23	982-1002
BH3	2.0-11	No	6	<0.1	0.1	18.9-20.1	<1	<1	<0.1	4.44-4.90	982-1002
BH5B	3.5-13.5	No	6	<0.1	0.1	19.9-20.2	<1	<1	<0.1	8.97-9.10	982-1002
BH6	4.0-9.0	No	6	<0.1	0.1	8.3-18.9	<1	<1	<0.1	3.74-4.28	981-1002
BH7	1.0-4.5	No	6	<0.1	0.1	19.6-20.0	<1	<1	<0.1	0.74-1.67	982-1002
GWW1	-	No	5	<0.1	0.6	19.6-20.1	<1	<1	<0.1	13.32-14.32	986-1002
G1	-	N/A	5	<0.1	0.2	19.6-20.1	<1	<1	<0.1	NA	986-1002
GW2	-	No	5	<0.1	0.2	19.7-20.1	<1	<1	<0.1	16.05-16.54	986-1002

Ground Gas Assessment

7.6.2 Background information relating to the origin and production of landfill and ground gases are presented in Appendix L, together with current guidance on the assessment of ground gases. In accordance with this approach and the above measured ground gas conditions are likely to be similar to those measures under the worst case temporal conditions because all sets of readings were taken at a relatively low pressures, as low as 981 mb and with falling pressure. It should also be noted that the steady gas flow rates measured

across the whole of the site at all of the monitoring visits was less than the instrument detection limit of 0.1 l/hr.

7.6.3 From Table 8.5 of CIRIA C665 the worst case Characteristic Situation for the site are as follows:

Table 9: Characteristic Gas Situations

Borehole Number	Flow	CH_4			CO_2		
	l/h	% v/v	GSV (l/hr)	Characteristic Situation	% v/v	GSV (l/hr)	Characteristic Situation
WS1	0.4	<0.1	0.0004	1	0.2	0.0008	1
WS2	<0.1	<0.1	0.0001	1	0.1	0.0001	1
WS3	<0.1	<0.1	0.0001	1	0.1	0.0001	1
WS4	<0.1	<0.1	0.0001	1	1.8	0.0018	1
BH1C	<0.1	<0.1	0.0001	1	0.8	0.0008	1
BH2	<0.1	<0.1	0.0001	1	0.5	0.0007	1
BH3	<0.1	<0.1	0.0001	1	0.1	0.0001	1
BH4	<0.1	<0.1	0.0001	1	0.1	0.0001	1
BH5B	<0.1	<0.1	0.0001	1	0.1	0.0001	1
BH6	<0.1	<0.1	0.0001	1	0.1	0.0001	1
BH7	<0.1	<0.1	0.0001	1	0.1	0.0001	1
GWW1	<0.1	<0.1	0.0001	1	0.6	0.0006	1
G1	<0.1	<0.1	0.0001	1	0.2	0.0002	1
GW2	<0.1	<0.1	0.0001	1	0.2	0.0002	1

7.6.4 It is noted that recommendations for the numbers of rounds of monitoring and the overall duration of the monitoring period suggested in CIRIA C665 are longer than the period of monitoring by TerraConsult for this project for a source of ground gas being a landfill. However, due to the absence of any positive flow rates, the number of rounds of monitoring with low ambient air pressure, no methane being recorded and the relatively low concentration of carbon dioxide; it is assessed that sufficient ground gas monitoring has been carried out to adequately determine the ground gas regime.

7.6.5 The fieldwork has shown that the Made Ground and the underlying drift deposits do not contain material that have the potential to produced ground gases.

7.6.6 Based on the Ground Gas Assessment it can be seen that Characteristic Situation 1 gas conditions occur at the site and that no protection measures are required to be incorporated into the development due to the measured ground gas concentrations.

7.6.7 Note that the Phase 1 desk study report indicates that the site is not in an area where full or basic protection radon measures are required.

7.7 Summary of Contaminant Linkage Assessment

7.7.1 The results of the risk assessments indicate that there is no significant source of contaminants present at the site so there is negligible risk to humans, plants, ecology or archaeological receptors from chemical contaminants in the soils.

7.7.2 The results of the groundwater assessment indicated that there was a slightly elevated concentration of zinc, fluoride and sulphate however these are not of significant risk to the controlled waters. There were significant exceedences of the threshold criteria for ammonia across the site and was encountered in the majority of the wells. It is considered that the most likely source of ammonia is from the adjacent landfill site rather than from the Made Ground in the development site. No remediation of the ammonia on site is proposed as the main source is off-site. The conceptual site model and contaminant linkage assessment also indicates that the groundwater within the Made Ground has a low mobility and the slow migration off-site will enable natural attenuation to occur and the concentrations to reduce to below the screening thresholds before the groundwater reaches any controlled waters receptors and therefore there is not a significant concern.

7.7.3 Based on the conceptual site model, fieldwork and the ground gas monitoring data, no specific precautions are required with respect to landfill type ground gases (Characteristic Situation 1 gas conditions occur) and hydrocarbon vapours for the development. No protection measures will be required due to the potential risk from radon.

7.7.4 All below ground concrete should be designed to meet the requirements of DS-2 ACEC Class AC-2.

8 WASTE ASSESSMENT

8.1 Waste Classification of Soils

8.1.1 All of the glacial deposits and bedrock excavated as part of the development is classified as inert waste.

8.1.2 The results of the total concentrations form the chemical testing on samples of Made Ground have been assessed to determine their potential waste classifications in accordance with the methodology outlined in Appendix M. The samples were first assessed to determine whether they are non-hazardous or are hazardous in terms of waste classification. The results of this assessment indicate none of the materials encountered during the investigation can be classified as hazardous.

8.1.3 In order to determine whether soils can be sent to a licensed landfill for disposal further testing is required comprising landfill Waste Acceptance Criteria (WAC) analysis for both total concentrations for certain chemicals and for leachate analysis. Whilst WAC analysis was not part of this Phase 2 Site Investigation, based on the other test results carried out at the site it is anticipated that the majority of the Made Ground would meet the WAC criteria for Inert Waste but some samples may fail on the leachable metals.

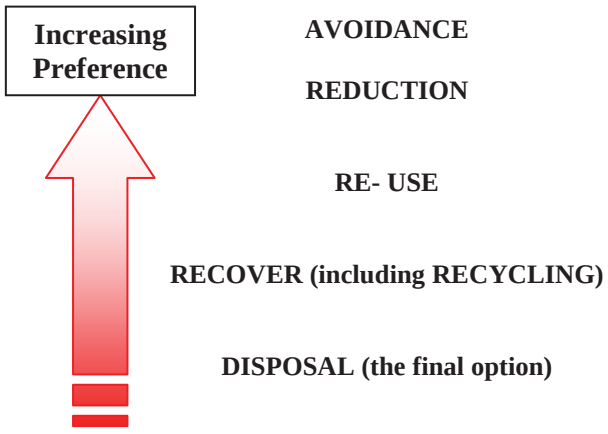
8.1.4 There are also set requirements for the required sampling and testing frequencies for materials being sent for disposal at landfills. The required testing frequencies for each different waste type are summarised in below.

Table 10: Laboratory Sampling Testing Frequencies for a Single Waste Type

Testing Level	Quantity of Waste	Number of Samples	
		Homogeneous	Heterogeneous & New Wastes
Level 1 Characterisation (Description, Total Concentrations & Leaching)	<100 T	2	5
	<500 T	3	8
	<1,000 T	5	14
	10,000 T	11	22
	Per additional 10,000T	+5 pro rata	+10 pro rata
Level 2 Compliance For Regularly Generated Wastes (Total Concentrations & Leaching)		1 per defined waste sub-population per year	3 per defined waste sub-population per year
Level 3 Verification Delivery document & visual check		Visual – Each Load	Visual – Each Load
Chemical testing as per Level 2 suite		1 per year per waste stream	3 per year per waste stream

8.2 Potential Waste Materials Currently on Site

8.2.1 In accordance with government guidance, it is required that the production and disposal of waste is managed in accordance with the following hierarchy of preference:



8.2.2 Potential wastes from groundworks comprise foundation and floor slab arisings. There will be limited potential re-use of these materials on site as part of the development due to the nature of the development. Some service trench excavation soils will be re-used

but the rest of these soils will have to be taken off site for re-use on other sites or for disposal.

8.2.3 However, where possible, arisings should be incorporated into soft landscaping with the arisings being separated into Made Ground and Glacial Till as they are excavated in order to facilitate the re-use.

8.2.4 Materials being sent off site could be sent off site as follows:

- As inert waste sent to an appropriate landfill
- To a site with a restoration permit
- Natural soils (glacial deposits and bedrock) could be sent off site for re-use on another development site in accordance with the CL:AIRE Code of Practice 'The Definition of Waste: Development Industry Code of Practice Version 2 (2011).'

8.3 Re-use of Excavated Arisings

8.3.1 When soil is excavated it is technically a waste and can only be re-used if it fulfils the following requirements:

- There is a planned use for the material;
- There is planning permission for the proposed re-use;
- The material when re-used will not be a risk to flora, fauna or controlled waters

8.3.2 In order to re-use soils this has to be carried out in accordance with one of the following procedures:

- the procedures are followed in the recently introduced CL:AIRE Code of Practice 'The Definition of Waste: Development Industry Code of Practice Version 2 (2011).' If these procedures are followed, excavated arisings can be re-used without them being defined as waste "where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated." or:
- the site applies for an Environmental Permit exemption from the Waste Management Regulations so the material can be placed without a permit (note that the rules for permit exemptions have been changed and the maximum quantity covered by a permit exemption for re-using soil is 1,000 T) , or;
- the site applies for a full Environmental Permit (either a standard rules permit or a bespoke permit) from the Environment Agency under the Environmental Permitting Regulations 2007.

8.3.3 Due to the limited re-use of arisings as part of the development it is recommended that the It is recommended that the procedures set out in the CL:AIRE document are followed for

this development. If this procedure is followed then an application will not be required to The Environment Agency for an exemption to an Environmental Permit.

9 GEOTECHNICAL ASSESSMENT & RECOMMENDATIONS

9.1 Potential Underground Voids

9.1.1 The fieldwork encountered Made Ground ranging in thickness from 0.3m (BH7) to 3.45m (WS5) and consists of heterogeneous demolition material generally comprising of slightly sandy fine-coarse gravel of concrete, slag and brick fragments.

9.1.2 Trial pits TP3, TP16 and boreholes BH5B and BH6 encountered voids. The origin of the voids at each position is not known. Anecdotal evidence has suggested that the void encountered in TP3 was used as a ventilation or gas flue as part of the old bronze works and appeared to trend in a NW-SE direction. It had also been suggested that there may be other flues or services associated with this former works under the site.

9.1.3 The origins of the possible voids located within BH5B and BH6 are less clear. They could also be related ventilation or gas flues or basements or water tanks.

9.1.4 TP16 is located at the northwest corner of the site within the proposed yard area. The trial pit encountered a possible historic water tank and related pipework.

Table 11: Voids Encountered in SI

Location	Depth Top (m)	Depth Base (m)	Comments
TP3	1.25	2.20	VOID – service/flue
BH6	3.20	4.00	VOID - Possible service/flue?
BH5B	1.50	3.50	VOID – Possible service/flue?
TP16	1.00	1.40	2 x water channels and possible tank encountered

9.2 Risk from Coal Mining

9.2.1 As indicated in Section 1.5 the overall the risk from shallow mining below the site in relation to the proposed development is negligible and no mitigation measures are required. Following submission of the mining report the local authority placed a condition on the planning consent requiring further evaluation of the possible shaft. During the site visit for the HY Consulting desk study, a small area/block of concrete was noted to be present close to the inferred location of the shaft (see Figure 3) and this could have been a shaft cap. The approach for evaluating the shaft was discussed with Mark Harrison of the CA and the principle agreed and sent to Darwen and the Coal Authority. This required initial evaluation of the area of the concrete cap.

9.2.2 As part of the agreed scope of investigation the concrete block/cap located in the approximate area of the shaft was lifted in order to determine whether this was a shaft cap. On lifting the concrete it was found that the concrete was not over a shaft and this

concrete block was resting on Made Ground. A trial pit was excavated below the block and this encountered undisturbed Glacial Till below the Made Ground. The presence of services in the area prevented the excavation of further trial holes.

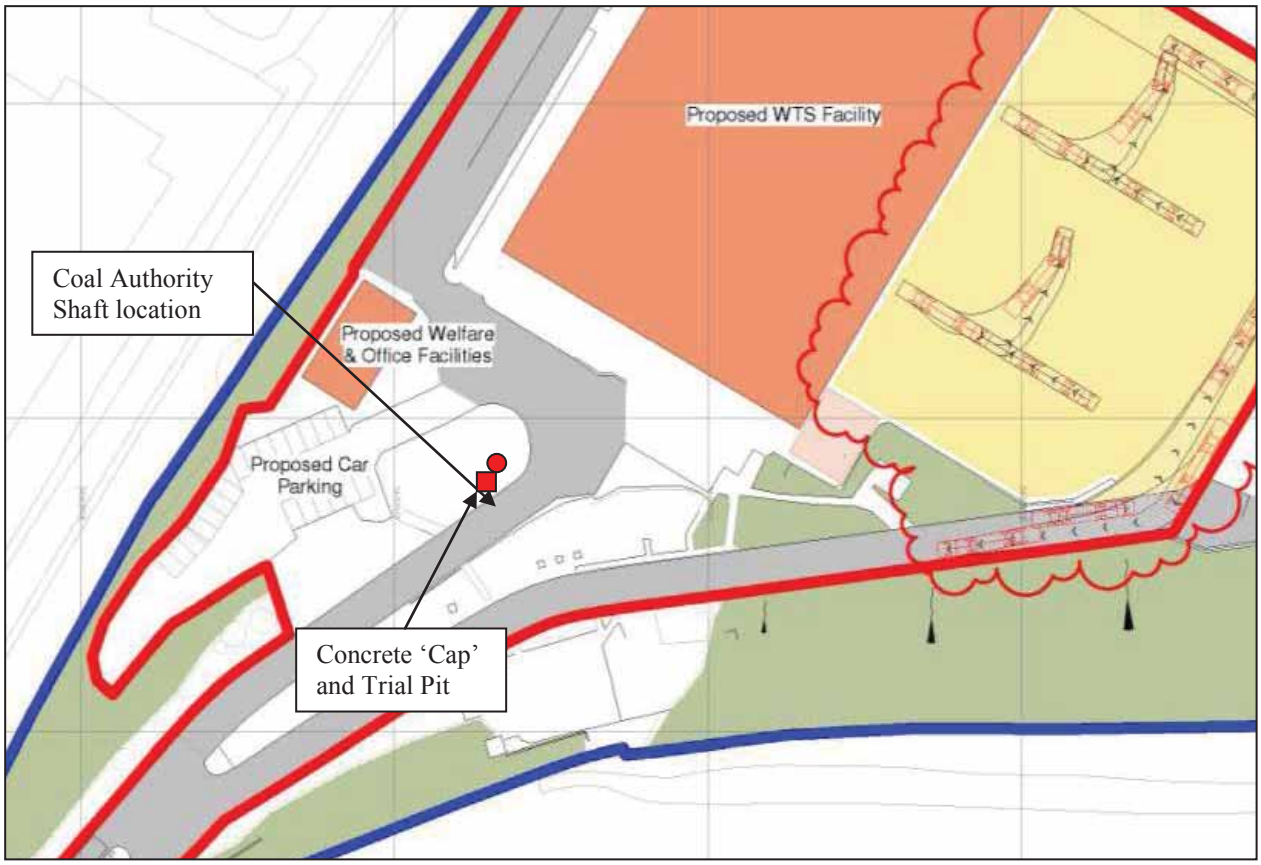


Figure 3: Location of Possible Mineshaft

9.2.3 For old shafts that pre-date the requirement to keep statutory records (such as this site) the locations are often only known to a limited accuracy (the shaft location could be within a 20 m radius of the location indicated above). The location of shafts are often particularly uncertain when the shafts pre-date statutory records and when the sites have been redeveloped in the later part of the 1800s which removes any surface expression of the shaft.

9.2.4 With this site having been redeveloped for over 120 years without any evidence of the shaft being shown on maps the shaft infill or capping appears to be a stable feature. It is recognised that there are many cases where a 100 year old shaft has collapsed with little warning, some of these cases have no anthropogenic trigger, but often current intrusive works such as investigation or excavation triggers a collapse of a meta-stable cap or a badly infilled shaft. However, at this site the shaft is present in an area where there is no significant works being carried out as part of the new development. The area in the vicinity of the shaft is hard standing and the indicated shaft location is more than 25 m from the closest proposed building.

9.2.5 The area around the indicated shaft location has previously been heavily disturbed through road construction as well as installation of extensive services. It is also currently trafficked by numerous HGVs on a daily basis without any adverse effect. This indicates

that the shaft is unlikely to be in a meta-stable condition otherwise it is likely that collapse would have occurred by now.

9.2.6 Given the location of the shaft there will be limited risk from the shaft should the unlikely event of it collapsing because the indicated shaft location is under hard standing in an area more than 25 m from the construction of new buildings so it is unlikely that the construction would trigger a collapse.

9.2.7 In the relatively unlikely event that the shaft does collapse, it is extremely unlikely that this would cause a significant risk to personnel on site or any structures. If any crown hole does occur from a shaft collapse then this could be securely fenced off whilst the site remained operational and then the shaft could be infilled and remediated using normal shaft infilling and capping methods.

9.2.8 There is a significant service corridor running adjacent to the area of the inferred shaft and below the access road, the presence of this will make it arduous to undertake further drilling works due to the easements that drilling would require and such drilling may be inconclusive given the lack of accurate information on its location. The level of work is considered disproportionate to the risk posed. Based on this and the information presented, no further works are considered necessary to evaluate the shaft and in our opinion Planning Condition 12 has been satisfied.

9.2.9 TerraConsult has consulted with the Coal Authority regarding the results of the investigations completed and the low level of assessed risk. The Coal Authority have indicated that they anticipate providing a response by 20th June 2014.

9.3 Fieldwork and Laboratory Data Review

9.3.1 The fieldwork has shown varying thicknesses of Made Ground ranging from 0.40m to 3.45 m. The Made Ground is generally heterogeneous demolition material comprising of sandy gravel and concrete, brick and slag. The slag is generally limited to an area along the northern part of the proposed main WTS building. The slag is understood to relate to the previous bronze and iron works. The slag varies from occasional fragments, zones intermixed with concrete to significant layers of fused slag.

9.3.2 Underlying the Made Ground is glacial clay, interbedded with glacial sand units overlying Carboniferous Mudstone.

9.3.3 The classification test results on the clay of the Glacial Till is summarised below:

Table 12: Summary of Geotechnical Laboratory Classification Testing										
Hole	**Depth (m)**	**Moisture Content (%)**	**% passing 425um sieve**	**Liquid Limit (%)**	**Plastic Limit (%)**	**Plasticity Index**	**Modified Plasticity Index**	**Plasticity**	**Volume Change Potential**	**Liquidity Index**
BH1	2.00	27	100	35	19	16	16.0	Low CL.	Low	0.50
BH1	4.00	26	100	53	24	29	29.0	High CH.	High	0.07
BH2	3.00	31	85	35	18	17	14.5	Low CL.	Low	0.76
BH2	5.00	27	100	39	20	19	19.0	Intermediate CI.	Medium	0.37
BH5B	5.00	23	100	50	23	27	27.0	Intermediate CI.	High	0.00
BH6	5.00	26	100	49	23	26	26.0	Intermediate CI.	High	0.12
Minimum		**23**	**85**	**35**	**18**	**16**	**14.5**	**Low**	**Low**	**0.00**
Average		**26.7**	**97.5**	**43.5**	**21.2**	**22.3**	**21.9**	**Intermediate**	**Medium**	**0.30**
Maximum		**31**	**100**	**53**	**24**	**29**	**29.0**	**High**	**High**	**0.76**

9.3.4 The natural moisture content values have been recorded at moderately high concentrations. Three of the selected samples have recorded relatively high moisture content values compared to the Plastic limit. The other three samples have recorded moisture content equal to or only slightly higher than the plastic limit indicating that the clay is over-consolidated.

9.3.5 The materials are clays ranging from low to high plasticity. The clay material encountered has shown low to high volume change potential. All design to be based on medium to high volume change potential material.

9.3.6 The summary of the triaxial results are given below:

Table 13: Summary of Undrained Shear Strength Testing					
Hole	**Depth (m)**	**Moisture Content (%)**	**Bulk Density (Mg/m^3)**	**Dry Density (Mg/m^3)**	**Shear Strength (kPa)**
BH1	2.00-2.45	27	1.98	1.56	29
BH1	4.00-4.45	26	1.97	1.57	59
BH1	6.00-6.45	32	1.93	1.45	26
BH1	8.00-8.45	25	2.05	1.64	39
BH2	5.00-5.45	27	1.98	1.56	47
BH5B	5.00-5.45	23	1.98	1.61	121
BH5B	6.00-6.45	26	2.07	1.64	37
BH5B	8.00-8.45	27	2.00	1.58	35
BH6	7.00-7.45	34	1.93	1.44	38
BH7	3.00-3.45	15	2.08	1.81	63
Minimum		15	1.93	1.44	26
Average		26.2	2.00	1.59	49
Maximum		34	2.08	1.81	121
Above table does not include two triaxial test results (BH2 at 3.00 m and BH5B at 11.50 m) which are not representative of in situ conditions.					

9.3.7 The results from the triaxial tests show great variation in the Shear strength of the clays encountered. The triaxial results have shown very low values which may have been caused by the gravel content and the resultant disturbance of the sample. Two of the results have been discounted as the disturbance has resulted in inaccurate Shear Strengths.

9.3.8 SPT N-values were recorded throughout each borehole and are summarised below for the all the main strata encountered:

Table 14: Summary of SPT N-Values

Hole No	Depth (m)	N-Value	N_{60}	Estimated Undrained Shear Strength S_u (kPa)	Material Type
WS1	1.00	22	26	143	CLAY
WS1	2.00	10	12	-	SILT
WS1	3.00	8	9	-	SAND
WS1	4.00	9	11	-	SILT
WS1	5.00	11	13	-	SILT
WS2	1.00	17	20	-	Made Ground
WS2	2.00	11	13	72	CLAY
WS2	3.00	8	9	-	SAND
WS2	4.00	11	13	-	SAND
WS2	5.00	7	8	46	CLAY
WS3	1.00	23	27	150	MUDSTONE
WS3	2.00	42	50	273	MUDSTONE
WS3	3.00	29	34	189	MUDSTONE
WS3	4.00	42	50	273	MUDSTONE
WS4	1.00	6	7	-	Made Ground
WS4	2.00	10	12	-	Made Ground
WS4	3.00	13	15	85	CLAY
WS4	4.00	11	13	72	CLAY
WS4	5.00	15	18	98	CLAY
WS5	1.00	7	8	-	Made Ground
WS5	2.00	11	13	-	Made Ground
WS5	3.00	9	11	-	Made Ground
BH1C	2.55	6	7	41	CLAY
BH1C	4.55	8	10	54	CLAY
BH1C	6.55	12	15	81	CLAY
BH1C	8.55	13	16	88	CLAY
BH1C	10.00	50	62	339	MUDSTONE
BH2	3.55	11	14	75	CLAY
BH2	5.55	19	23	129	CLAY
BH2	7.00	10	12	-	SAND
BH2	10.00	41	51	278	MUDSTONE
BH3	3.00	6	7	41	CLAY
BH3	4.00	10	12	68	CLAY
BH3	5.65	11	14	75	CLAY
BH3	7.00	17	21	115	CLAY
BH3	9.15	17	21	115	CLAY
BH3	10.00	18	22	122	CLAY
BH3	11.00	21	26	142	CLAY
BH4	1.50	130	160	-	Made Ground
BH5B	3.50	20	25	136	CLAY
BH5B	4.50	22	27	149	CLAY
BH5B	6.65	13	16	88	CLAY
BH5B	8.65	28	35	190	CLAY
BH5B	10.00	11	14	75	CLAY
BH5B	12.00	24	30	163	CLAY
BH5B	13.50	54	67	366	MUDSTONE
BH6	2.50	50	62	-	Made Ground

Table 14: Summary of SPT N-Values					
Hole No	**Depth (m)**	**N-Value**	**N_{60}**	**Estimated Undrained Shear Strength S_u (kPa)**	**Material Type**
BH6	5.65	24	30	163	CLAY
BH6	6.10	14	17	95	CLAY
BH6	7.65	27	33	183	CLAY
BH6	9.15	50	62	339	MUDSTONE
BH7	1.50	10	12	68	CLAY
BH7	2.50	17	21	115	CLAY
BH7	3.65	47	58	319	MUDSTONE
BH7	4.50	149	184	-	MUDSTONE
No of Tests		55			**Notes** Hammer Energy Efficiency, WS Er = 71 % - LCP Er = 74 %
Minimum		6	7	41	
Mean		23	29	142	
Maximum		149	184	366	No correction for rod length or effect of overburden pressure

9.3.9 Based on the SPT N-values the strength of the glacial clays range from medium (firm) to very high (very stiff). Generally the strength of the glacial clay increases with depth.

9.3.10 Glacial sand and silt deposits are limited to three boreholes (WS1, WS2 and BH2) and are generally loose to medium dense and interbedded within the glacial clay.

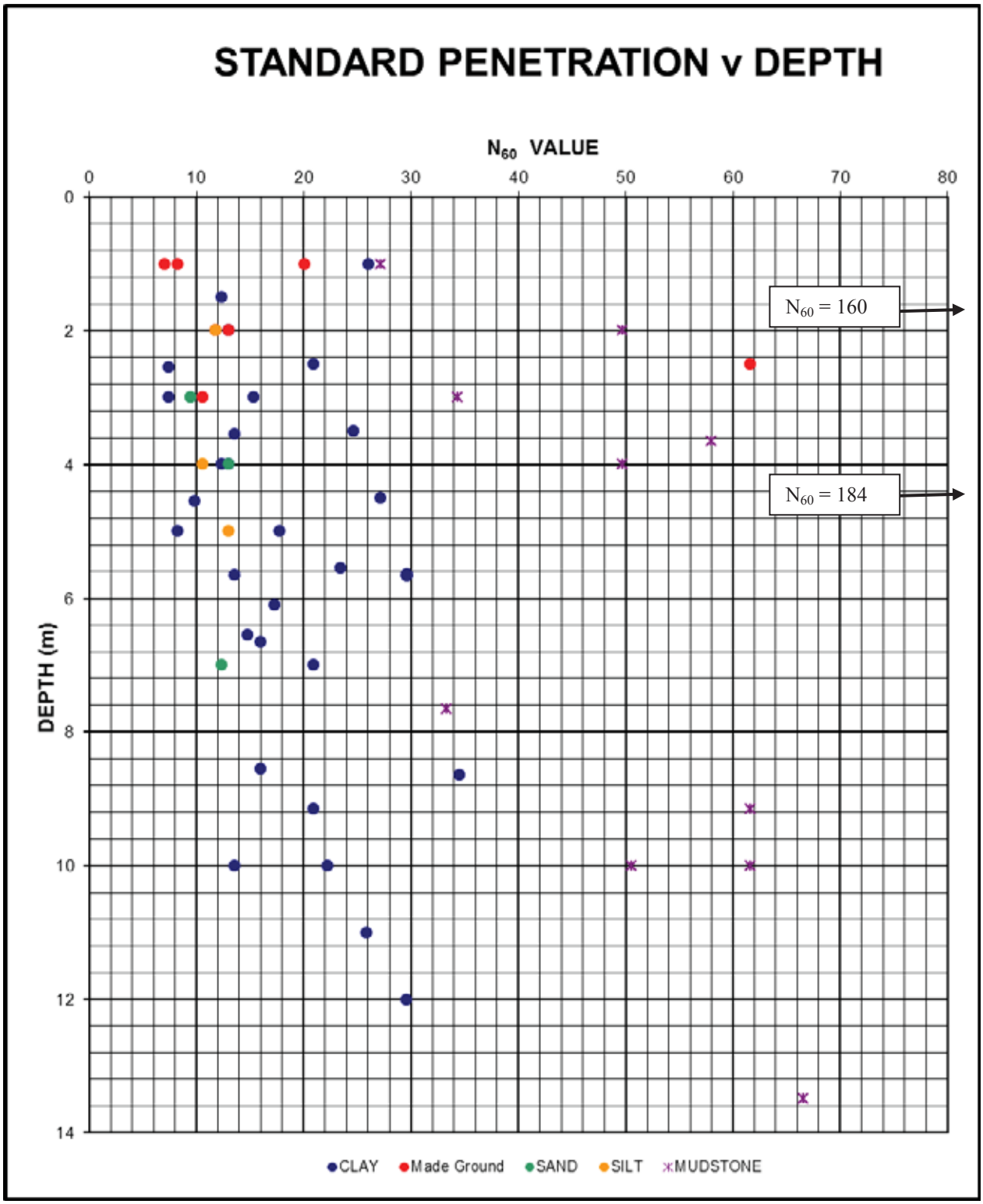


Figure 4: SPT (N_{60}) vs Depth Graph

9.3.11 The depth to the top of the weathered mudstone bedrock varies greatly across the site. Generally the depth to rockhead is deepest along the northern boundary (BH5B at 13.8m) and the top of the bedrock deepens in a northerly or north westerly direction.

9.3.12 WS3 encountered highly / completely weathered mudstone from 0.45 m depth, however this hole was extended to 4.45m without obstruction.

Table 15: Depth to Rockhead		
Hole No	**Depth to Rockhead (m)**	**Final Hole Depth (m)**
BH1C	10.20	10.42
BH2	10.30	10.45
BH3	-	11.45
BH5B	13.80	13.93
BH6	7.90	9.45
BH7	3.90	4.83
WS3	0.45	4.45

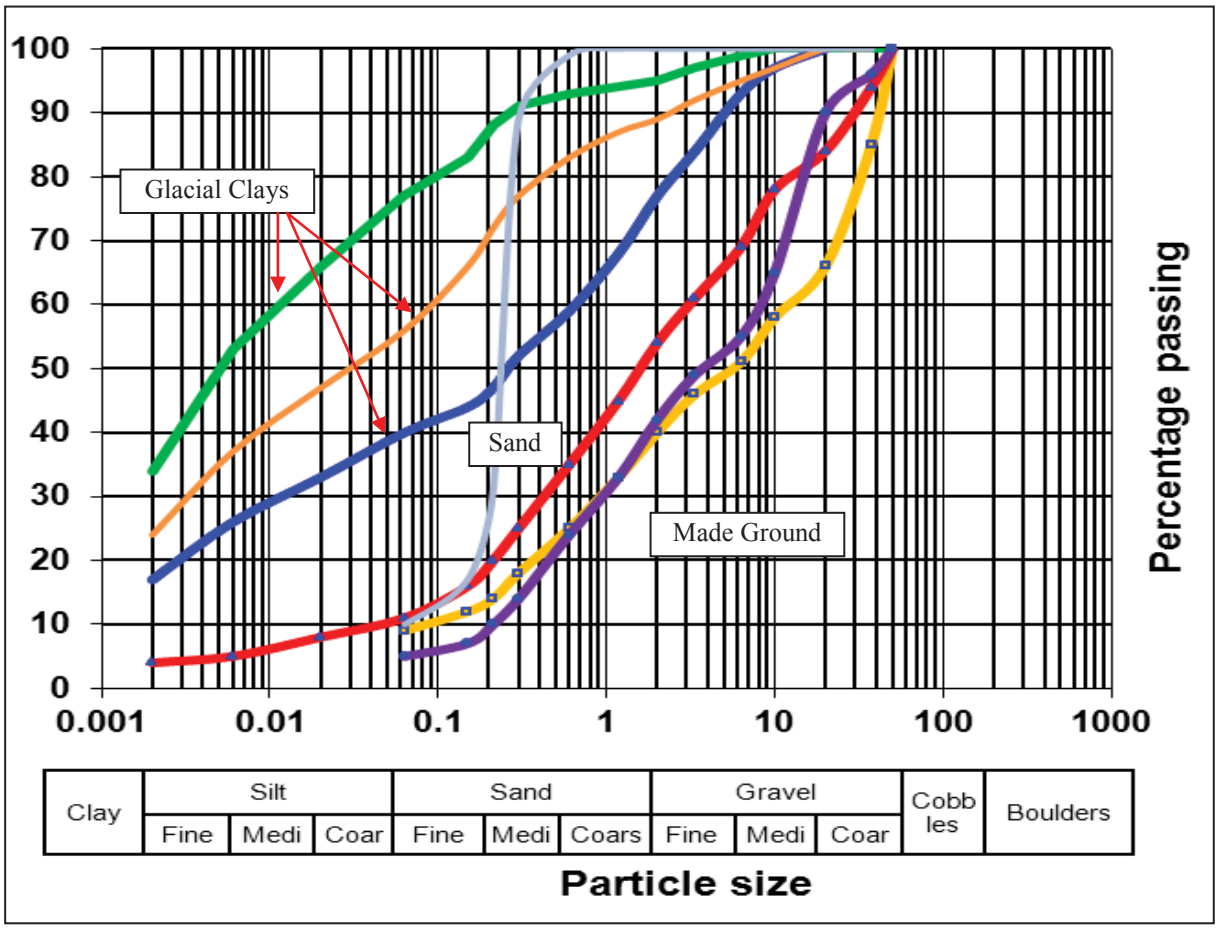


Figure 5: Summary of Particle Size Distribution Tests

9.3.13 The Particle Size Distribution graphs have shown the Made Ground to consist of fine-coarse sized sand and gravel Fill consisting of varying amounts of demolition material. The glacial clays have shown a slight variation ranging from slightly fine sandy clay to sandy gravelly clay.

Table 16: Summary of Oedometer Results					
Hole	**Depth (m)**	**Moisture Content (%)**	**Bulk Density (Mg/m^3)**	**Void Ratio e_o**	**mv (m^2/MN)**
BH1	2.00	27	1.96	0.7137	0.102
BH1	4.00	26	1.99	0.6787	0.128
BH2	3.00	31	1.91	0.8205	0.153
BH2	5.00	27	2.00	0.6859	0.080
BH5B	5.00	24	2.02	0.6342	0.083
BH6	5.00	26	2.03	0.6504	0.081

9.3.14 The results of the oedometer consolidation tests have shown low to medium compressibility clays.

9.3.15 The Made Ground encountered extensive Slag deposits within the northern area of the proposed warehouse building. The slag ranges from fragments mixed within concrete to large fused slabs, which were too hard to penetrated through and the boreholes were terminated.

9.3.16 The presence of the slag is a function of the blast furnace waste products when the site was previously an iron and magnesium works. Depending on the mineral composition of the slag, it could have expansion issues when exposed to air and / or groundwater. The slag could therefore affect the proposed foundations and floor slabs causing heave. Three samples were selected for expansion tests. A summary of the Slag expansion tests (carried out by the Emery Expansion Test method) are presented below:

Table 17: Slag Expansion Tests	
Hole No	**Expansion %**
BH4-Cystaline slag sample	0.03%
BH4 – mixed slag and concrete	0.06%
BH5-1.8-2.3m	0.09%

9.3.17 The results show the slag does not show significant expansion properties and will not have an adverse affect on the proposed development.

9.4 Foundations Options

9.4.1 The proposed WTS development is to consist of a relatively large steel framed building in the central part of the site with associated access road and external operation area (vehicle unloading, turning areas etc). A separate welfare and office building and associated car park will be located in the southwest of the site.

9.4.2 The new main facility building will be directly located over the existing concrete slab from the previous building that occupied the site. The fieldwork has shown that the slab consistently recorded thickness of 0.2m and is reinforced and appears to be in good condition.

Figure 6 – Photo looking north from SW corner of proposed warehouse building. Photo shows existing concrete slab.

New Main Facility Building

9.4.3 The fieldwork has shown Made Ground within the proposed warehouse area to range in thickness from 2.0 m to 4.0 m. The Made Ground generally consists of heterogeneous demolition material – bricks, concrete etc with sand matrix but at the northern end there is slag which has been shown not to be expansive.

9.4.4 The fieldwork has shown the presence voids underlying the proposed warehouse building. At least one of the voids is a brick lined flue/service originating from the iron works. The origin of other voids is unknown but one is thought to be an underground tank with associated pipework. Further work may be required to further assess the extent of the voids identified on the site.

9.4.5 For the main facility building there are three methods of construction which could be considered:

- Remove all existing Made Ground including voids, then re-compact to provide a homogeneous engineered platform and use spread footings;
- Piled foundations
- Re-use existing slab

Removal of Made Ground

9.4.6 This method will provide a viable solution removing all obstructions and providing an engineered high stiffness platform on which to construct new spread foundations and a ground bearing floor slab. This would involve excavation of the fused slag which would require heavy breaking and removed the risk from the presence of voids/buried water tank.

Piled Foundations

9.4.7 The fieldwork and geotechnical testing has shown that the glacial clay deposits have shown variation in shear strength. SPT N_{60} values range from 7 to 33 and generally stiff / high strength clays are encountered from 8.0 m. Undrained shear strength values have

shown a greater variation possibly due to disturbance of the samples with values ranging from 26 to 121 kPa.

9.4.8 It may be most appropriate to socket the piles into the underlying bedrock strata. The mudstone bedrock has been encountered between 3.90 m and 13.80 m in the area underlying the proposed building (depth to bedrock increasing in a northerly direction.

9.4.9 Due to the possible obstructions that could be encountered within the Made Ground including fused slag, piled foundations may not be the most suitable solution for the proposed developments and may need to be pre-bored.

9.4.10 Vibro Compaction/stone columns will not be suitable for the building due to the obstructions, slag and voids.

Reuse of existing Concrete slab

9.4.11 There is the potential that the current reinforced concrete slab could be used within the construction of the new building. A new concrete slab can be built over the top of the existing slab with a suitable thermal break between the two slabs.

9.4.12 Further assessment of the strength, condition and thickness of the current concrete slab would have to be carried out. The advantage of this approach is that earthworks will be dramatically reduced and it should be the lowest cost and most sustainable solution.

9.4.13 If this option is adopted then the voids encountered during the fieldwork would require infilling with suitable material (e.g. use grout or foamed concrete) to ensure that they do not form areas of weakness/increased compressibility. A suitable geophysical survey would be required to delineate all voids to enable them all to be located and suitably infilled.

Welfare / Office Facility

9.4.14 The building for the welfare/office facility is located at the SW corner of the site. BH1C and WS1 have shown mixed demolition Made Ground 1.0 to 2.0m thick overlying low to medium strength clay to 6.0 m overlying high strength clays proven 10.2m overlying weathered mudstone.

9.4.15 There are a number of different foundation solutions which would be appropriate in this area including a raft, vibro (stone) columns or piled foundations. Note that obstructions were encountered in BH1, BH1A and BH1B at a depth of less than 1.8 m and these should be taken into account when choosing the foundation solution.

9.5 Groundwater

9.5.1 Groundwater was generally not encountered or was limited during the fieldwork phase. During the monitoring phase to date, the wells have recorded various groundwater levels ranging from only about 0.50 m to 9.10 m. There appears to be a discontinuous ‘perched’ water table in the Made Ground and a deeper groundwater table in the bedrock.

9.5.2 Given the depth to groundwater it will be encountered in excavations. It is anticipated that any groundwater in excavations can be controlled by sump pumping. If inflows are

relatively localised, this may cause softening of the ground and require localised excavation support in order to prevent instability of the sides of excavations.

9.6 Earthworks

9.6.1 Depending on the chosen foundation design, the existing concrete slab, reinforced concrete and mass concrete footings may need to be removed prior to the redevelopment. The resulting arising's can be crushed and recompacted on site for use as 6F2 class material or similar specifications to meet requirements.

9.7 Slopes

9.7.1 With the site being approximately level there are no slopes on the proposed development site. To the south of the site there is a grassed slope up which appears stable. Assessment of slope stability will only be required if the development changes.

9.8 Buried Concrete and Pipework

9.8.1 The results of laboratory pH and sulphate content indicate that below ground concrete should be designed to meet the requirements of ACEC Class DC-2 AC-2 in accordance with BRE Special Digest 1, 2005 (the Design Concrete Class).

9.9 Access Roads and Car Parks

9.9.1 Depending on the chosen foundation / ground improvement method, it is anticipated that the sub-formation for the external operation areas, access roads and car parks would be within the Made Ground which is a mixture of demolition material within a sandy matrix. Based upon the nature of the ground conditions encountered during the site investigations it is recommended that a CBR value of 5 % is adopted for design purposes but higher CBR values could be prevalent at the site.

10 CONCLUSION

10.1 Environmental Risk Assessment

10.1.1 A Phase 2 site investigation has been carried out in order to assess the contaminant-pathway-receptor model as defined in Statutory Guidance to Part IIA of the Environment Protection Act, 1990, and in accordance with BS 10175: 2011 +A1 2013 "Investigation of Potentially Contaminated Sites – Code of Practice". This investigation has detailed the characteristic ground conditions and elements of the surrounding environment and has assisted with identifying the potential contaminants of contamination, the potential receptors of the contamination and the potential pathways between them.

10.1.2 The results of the risk assessments indicate that there is no significant source of contaminants present at the site so there is negligible risk to humans, plants, ecology or archaeological receptors from chemical contaminants in the soils.

10.1.3 The results of the groundwater assessment indicated that there was a slightly elevated concentration of zinc, fluoride and sulphate however these are not of significant risk to the controlled waters. There were significant exceedences of the threshold criteria for ammonia across the site and was encountered in the majority of the wells. It is considered that the most likely source of ammonia is from the adjacent landfill site rather than from the Made Ground in the development site. No remediation of the ammonia on site is proposed as the main source is off-site. The conceptual site model and contaminant linkage assessment also indicates that the groundwater within the Made Ground has a low mobility and the slow migration off-site will enable natural attenuation to occur and the concentrations to reduce to below the screening thresholds before the groundwater reaches any controlled waters receptors and therefore there is not a significant concern.

10.1.4 The concentrations of the phytotoxic metals copper, chromium, nickel and zinc have the potential to be harmful to plants. Due the various exceedances in these metals the material is not suitable to be reused within the areas of proposed flora, and imported clean inert materials will be required.

10.1.5 Based on the conceptual site model, fieldwork and the ground gas monitoring data, no specific precautions are required with respect to landfill type ground gases (Characteristic Situation 1 gas conditions occur) and hydrocarbon vapours for the development. No protection measures will be required due to the potential risk from radon.

10.1.6 All below ground concrete should be designed to meet the requirements of DS-2 ACEC Class AC-2.

10.2 Risk From Historic Mining

10.2.1 The overall the risk from shallow mining below the site in relation to the proposed development is negligible and no mitigation measures are required. Notwithstanding this there is the potential for a shaft to be present below an area of hard standing. The shaft predates the requirements to keep statutory records and is likely to be a relatively small diameter. Its location is not well defined and nothing is known about the infilling or capping. Because the shaft has been built over for over 120 years without any apparent stability issues and that the shaft is located below hard standing (and the current anticipated shaft location is 25 m from the nearest building), the shaft will not be disturbed by the development and poses a low level of risk to humans or structures.

10.2.2 We believe that the scope of the investigation and assessment with regard to the possible presence of the mine shaft is appropriate given the low level of risk and little would be gained from further drilling. Therefore no further investigation or mitigation works are recommended by TerraConsult with regard to the risk from historic mining. Should SITA wish to carry out further investigation or mitigate the low level of risk, this would require a series of rotary boreholes to be drilled to prove bedrock (or the shaft itself). The holes would be set out and drilled on a square spiral grid pattern taking into account of the numerous services that are present in the area around this location.

10.3 Geotechnical Design

10.3.1 The proposed project can be developed using a number of different options:

- Remove all existing Made Ground including voids, then re-compact to provide a homogeneous engineered platform and use spread footings;
- Piled foundations; and
- Re-use existing slab.

10.3.2 The final foundation option will be decided by the client/clients structural engineer. If the existing slab is to be re-used then further geophysical investigation to confirm the location of voids will be required and the voids should be backfilled with grout or concrete.

10.3.3 All below ground concrete should be designed to meet the requirements of DS-2 ACEC Class AC-2.

10.4 Recommendations for Further Works

10.4.1 Further investigation may be required as part of further investigation for geotechnical purposes of the encountered voids located within the central part of the site. Depending on the chosen foundation design, the shallow voids may require grouting with suitable material or be removed completely. It is recommended that a geophysical survey is carried out of the building footprints to determine the location of the shallow voids together with a limited scope of targeted additional intrusive investigation to confirm the nature of geophysical anomalies. These works are purely to assess the geotechnical risk and are unlikely to alter the conclusions/recommendations with respect to potential contamination of the site.

10.4.2 The findings of the final version of this report site should be agreed with the relevant authorities (e.g. local authority environmental health officer, Environment Agency etc) to discharge any planning relevant conditions prior to commencement of the works and with the local authority building control officer. Note that no remediation works are required due to the concentration of contaminants.

10.4.3 If excavated materials are to be reused at the site as part of the development, a Materials Management Plan will have to be produced and be signed off by a "Qualified Person." A verification report will be required in order to meet the requirements of the CL:AIRE protocol for re-use of arisings.

10.5 CL:AIRE Earthworks Design Statement

10.5.1 With no Remediation Strategy being required, an Earthworks Design Statement will be required in accordance with procedures in the CL:AIRE Code of Practice. This should provide the following information:

- Location where different materials are to be re-used;
- acceptability criteria for importing and soils for landscaping; and
- action to be carried out if unexpected contamination is encountered.

10.5.2 There is limited the potential for areas of previously unexpected contamination to be present, but this could be found as is the case with almost any "brownfield" site. Any significant quantities of asbestos, significant ashy soils, unusual, brightly coloured or significantly oily or odorous material should be considered in this category. If unexpected contamination is found the following procedures should be adhered to:

1. All site works at the position of the suspected contamination will cease.
2. A suitably trained geo-environmental specialist should assess the visual and olfactory observations of the condition of the ground and the extent of contamination and the Client and the Local Authority should be informed of the discovery. Should the contamination be likely to affect controlled waters the Environment Agency shall also be informed.
3. The suspected contaminated material will be investigated and tested appropriately in accordance assessed risks. The investigation works will be carried out in the presence of a suitably qualified geo-environmental engineer. The investigation works shall commence to recover samples for testing and, using visual and olfactory observations of the condition of the ground, delineate the area over which contaminated materials are present.
4. The unexpected contaminated material will either be left in situ or be stockpiled whilst testing is carried out and suitable assessments completed to determine whether the material can be re-used on site or requires to be disposed as appropriate.
5. Where the material is left in situ awaiting results it will be reburied or covered with plastic sheeting.
6. Where the potentially contaminated material is to be temporarily stockpiled it will be placed on 2000 gauge Visqueen sheeting (or other impermeable surface) and covered to prevent dust and odour emissions.
7. Any areas where unexpected visual or olfactory ground contamination is will be surveyed, a photographic record kept and testing results incorporated into the Verification Report.
8. A photographic recorded will be made of relevant observations.
9. The testing suite will be determined by the independent geo-environmental specialist on the basis of visual and olfactory observations.
10. Test results will be compared against current assessment criteria suitable for the future use of the area of the site affected.
11. The results of the investigation and testing of any suspect unexpected contamination will be used to determine the relevant actions. After consultation with the Local Authority and if necessary the Environment Agency, materials should either be:

- re-used in areas where test results indicate that it meets compliance targets so it can be reused without treatment; or
- treatment of material on site to meet compliance targets so it can be reused; or
- removal from site to a treatment centre or to a suitably licensed landfill or permitted treatment facility.

12. Verification Report will be produced for the work.

10.6 Health and Safety

10.6.1 As outlined within the HSE publication "Successful Health and Safety Management – HSG65" this report should inform your development of safe systems of work and information as an input into the safety management system. The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations 2007

10.6.2 When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999 and the CAR 2012 regulations should be followed if any asbestos is encountered during groundworks.

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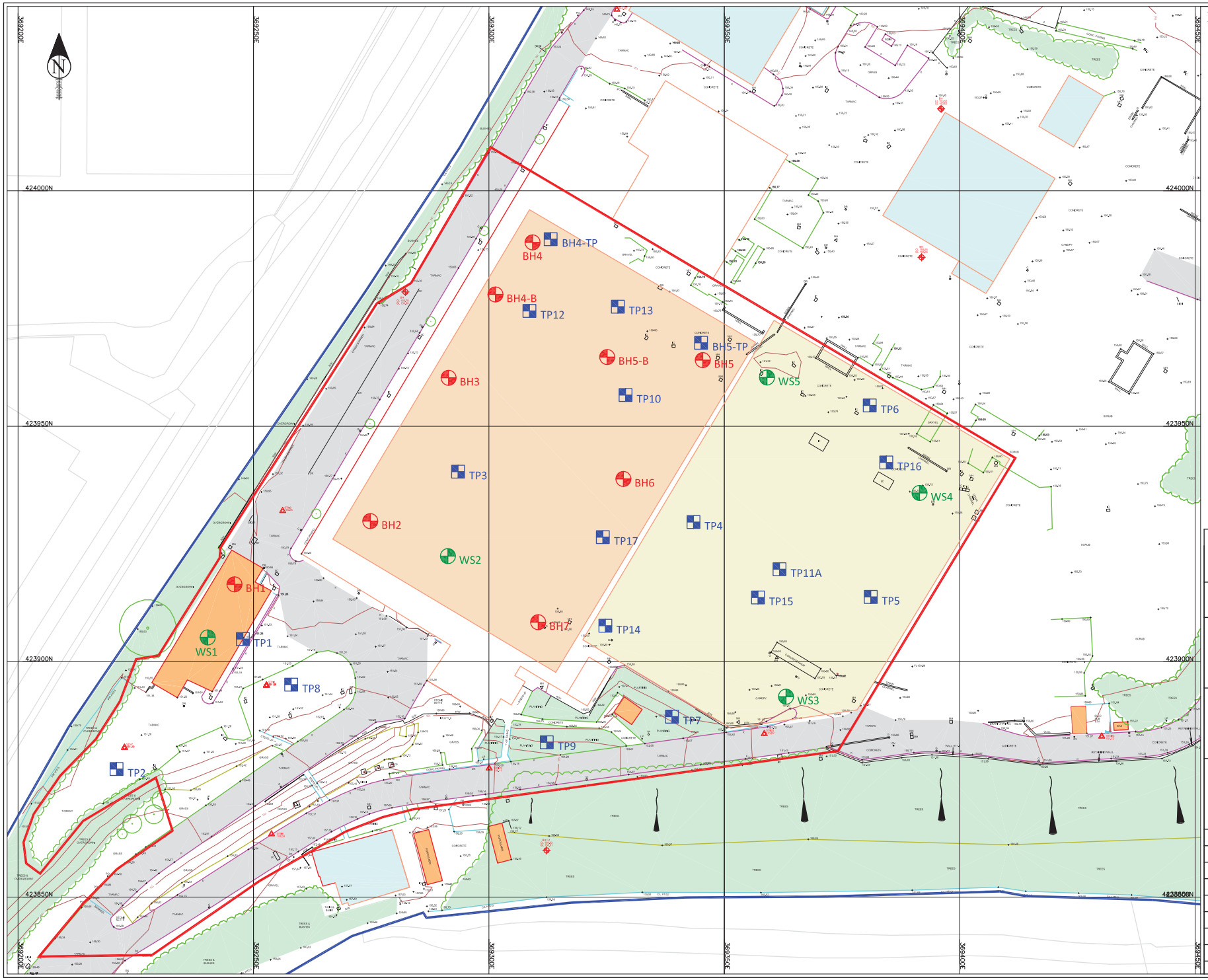
DRAWINGS

List of Drawings

1970/1/001 Exploratory Hole Location Plan



TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

Site

Darwen

Title

Exploratory Hole Location Plan

Scale	1:750	@ A3
Drawing No.	1970/1/001	

Rev	Date	Description

File	19701001explocplan.dwg		
Date	03/14	Engineer	GB
Drawn	SK	Checked	DRAFT

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APPENDIX A

Service Constraints and Report Limitations

Service Constraints and Report Limitations

This report and the site investigation (together comprise the "Services") were compiled and carried out by TerraConsult Limited (TCL) for SITA (UK) Ltd (the "client") in accordance with the terms of a contract between TCL and the "client." The Services were performed by TCL with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by TCL taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between TCL and the client.

Other than that expressly contained in the above paragraph, TCL provides no other representation or warranty whether express or implied, is made in relation to the Services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client and their consultants for the proposed development in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of TCL. If a third party relies on this report, it does so wholly at its own and sole risk and TCL disclaims any liability to such parties.

It is TCL's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without TCL 's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of TerraConsult Limited.

The report was written in June 2014 and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of TCL. In the absence of such written advice of TCL, reliance on the report in the future shall be at the client's own and sole risk. Should TCL be requested to review the report in the future, TCL shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between TCL and the client.

The observations and conclusions described in this report are based solely upon the Services that were provided pursuant to the agreement between the client and TCL. TCL has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. TCL is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, TCL did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, radon gas or other radioactive or hazardous materials.

The Services are based upon TCL's observations of existing physical conditions at the site gained from a walkover survey of the site together with TCL's interpretation of information including documentation,

obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst TerraConsult Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. Further TCL was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. TCL is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to TCL and including the doing of any independent investigation of the information provided to TCL save as otherwise provided in the terms of the contract between the client and TCL.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and TCL] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B

Environmental Risk Assessment Methodology & Terminology

ENVIRONMENTAL RISK ASSESSMENT
METHODOLOGY & TERMINOLOGY

Legislation Overview

This report includes hazard identification and environmental risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use The contaminated land regime is the statutory regime for remediation of contaminated land that causes an unacceptable level of risk and is set out in Part 2A of the Environmental Protection Act 1990 ("EPA 1990"). The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

> *"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> *(a) Significant harm is being caused or there is a significant possibility of such harm being caused;*
>
> *or*
>
> *(b) Pollution of controlled waters is being, or is likely to be, caused."*

In order to assist in establishing if there is a "*significant possibility of significant harm*" there must be a "*contaminant linkage"* for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of contaminant-pathway-receptor is termed a "contaminant linkage or CPR linkage."

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations. Key implementing legislation of the Part 2A regime includes the Contaminated Land (England) Regulations 2006 (SI 2006/1380) as recently amended by the overarching legislation for the contaminated land regime, which implements the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995), came into force on 14th July 2000 together with recent amended regulations: Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263). Revised and Contaminated Land Statutory Guidance was published by DEFRA in (DEFRA, April 2012). Part IIA defines the duties of Local Authorities in dealing with it. Part IIA places contaminated land responsibility as a part of planning and redevelopment process rather than Local Authority direct action except in situations of very high pollution risk. In the planning process guidance is provided by National Planning Policy Framework (NPPF) of March 2012 which requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. In practice, Planning Authorities require sites being developed to have a lower level of risk post development than the higher level of risk that is required in order to determine a site as being contaminated in accordance with Part IIA. This is to ensure that there is a suitable zone of safety below the level for Part IIA determination and prevent recently developed sites becoming reclassified as contaminated land if there are future legislative or technical changes (e.g. a substance is subsequently found to be more toxic than previously assessed this increases its hazard)..

The criteria for assessing levels of contaminants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

(a) to identify and remove unacceptable risks to human health and the environment;
(b) to seek to bring damaged land back into beneficial use;
(c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the "suitable for use" approach to remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

(a) *ensuring that land is suitable for its current use* - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise ("remediating" the land); the contaminated land regime provides the regulatory mechanisms to achieve this;

(b) *ensuring that land is made suitable for any new use, as planning permission is given for that new use* - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and

(c) *limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought* - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of contaminants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the use that the site has, and will have in the future.

Risk Assessment

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

"(a) The probability, or frequency, or occurrence of a defined hazard; and

(b) The magnitude (including the seriousness) of the consequences."

The UK's approach to the assessment of environmental risk is set out in by the Department of the Environment Transport and the Regions (2000) publication "A Guide to Risk Assessment and Risk Management for Environmental Protection" (also called Greenleaves II). This established an iterative, systematic staged process which comprises:

(a) Hazard identification;
(b) Hazard assessment;
(c) Risk estimation;
(d) Risk evaluation;
(e) Risk assessment;

At each stage during the development process the above steps are repeated as more detailed information becomes available for the site.

For an environmental risk to be present, all three of the following elements must be present:

- Source/Contaminant: hazardous substance that has the potential to cause adverse impacts;
- Receptor: target that may be affected by contamination: examples include human occupants/users of site, water resources (rivers or groundwater), or structures;
- Pathway: a viable route whereby a hazardous substance may come into contact with the receptor.

The absence of one or more of each component (contaminant, pathway, receptor) would prevent a contaminant linkage being established and there would be no significant environmental risk.

The identification of potential contaminant linkages is based on a Conceptual Model of the site, which is subject to continual refinement as additional data becomes available. As part of a Phase I Investigation (Desk Study and site walk over) a Preliminary Conceptual Site Model (PCSM) is formed. Based on the PCSM, potential contaminant linkages can be assessed. If the PCSM and hazard assessment indicate that a pollution linkage is not of significance then no further assessment or action is required due to this linkage. For each significant and possible linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the Conceptual Site Model and assess the level of risk from each contaminant linkage.

Definition of Risk Assessment Terminology

The criteria used for risk assessment are broadly based on those presented in DETR's "A Guide to Risk Assessment and Risk Management for Environmental Protection" (2000). The Severity of the risk is classified according to the criteria in Table B.1 below:

Table B.1 Severity/Consequence of Risk	
Severe	Acute risks to human health. Catastrophic damage to buildings/property (e.g. by explosion). Direct pollution of sensitive water receptors or serious pollution of other controlled water (watercourses or groundwater) bodies.
Medium	Harm to human health from long-term exposure. Slight pollution of sensitive controlled waters (surface waters or aquifers) or pollution of other water bodies. Significant effects on sensitive ecosystems or species.
Mild	No significant harm to human health in either short or long term. No pollution of sensitive controlled waters, no more than slight pollution of non-sensitive waters. Significant damage to buildings or structures. Requirement for protective equipment during site works to mitigate health effects.
Negligible	Damage to non-sensitive ecosystems or species. Minor damage to buildings or structures. No harm or pollution of water.

The probability of the risk occurring is classified according to criteria given in Table B.2 below:

Table B.2: Probability of Risk Occurring	
High likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Medium/Reasonably Foreseeable	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low/Unlikely	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Negligible/ Not credible	Contaminant linkage may be present but the circumstances under which harm would occur are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table B.3 below:

Table B.3: Comparison of Severity and Probability					
		Severity			
		Severe	**Medium**	**Mild**	**Negligible**
Probability	**High likelihood**	Very High Risk	High Risk	Medium/Low Risk	Low Risk
	Medium/Reasonably Foreseeable	High Risk	Medium Risk	Low Risk	Near Zero
	Low/Unlikely	High/Medium Risk	Medium/Low Risk	Low Risk	Near Zero
	Negligible/ Not credible	Medium/Low Risk	Low Risk	Low Risk	Near Zero

The various risk rankings provide guidance for recommended actions, whether this is:

AR - Action Required, Remediation or mitigation or site investigation works required
SIR - Site Investigation Required, further assessment is required.
NAR - No Action Required.

A description of the evaluated risk is as follows:

Table B.4 – Description of the Classified Risks and Likely Action Required	
Evaluated Risk	**Recommended Actions**
Very High Risk	AR: There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	AR: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate Risk	SI: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	NAR: It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Near Zero	NAR: There is a negligible possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Management of Contaminated Land

When risk assessment of the site has been completed and this indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA publication CLR11 (2004) "Model Procedures for the Management of Land Contamination." The stages of managing remediation are as follows:

(a) Options Appraisal and develop Remediation Strategy;
(b) Develop Implementation Plan and Verification Plan;
(c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

APPENDIX C

Exploratory Hole Records – Cable Percussive and Window Sample Boreholes

TerraConsult — Borehole Log

Borehole no: BH1C

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	05/03/2014
Logged by:	GB	Method:	Cable percussion boring	150	10.42 / 9.00	369245.97mE	423916.43mN	End:	05/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(2.00)	MADE GROUND: Dark brown slightly sandy clayey angular to subangular fine to coarse GRAVEL of brick and concrete. Occasional angular cobbles of brick and concrete.			1.00	ES	
			2.00			0.00	2.00 - 2.45	U	35 blows 450
			(1.00)	Firm greyish brown CLAY.	1.50	0.00	2.45 - 2.55 2.55 - 3.00 2.55 - 3.00	D S D	N=6 (1,1/2,1,1,2)
			3.00				3.00 - 4.00	B	
			(3.00)	Firm greyish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. Occasional organic content and root veins. 3.00m - 10.00m: Becoming slightly laminated.			3.50	ES	
						0.00	4.00 - 4.45	U	55 blows 450
					4.50	0.00	4.45 - 4.55 4.55 - 5.00 4.55 - 5.00	D S D	N=8 (1,2/2,2,2,2)
							5.00 - 6.00	B	
			6.00			0.00	6.00 - 6.45	U	110 blows 450
			(4.20)	Stiff greyish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. Occasional organic content and root veins.	6.00	0.00	6.45 - 6.55 6.55 - 7.00 6.55 - 7.00	D S D	N=12 (2,1/2,3,3,4)
							7.00 - 8.00	B	
						0.00	8.00 - 8.45	U	110 blows 450
					7.50	0.00	8.45 - 8.55 8.55 - 9.00 8.55 - 9.00	D S D	N=13 (1,1/2,2,3,6)
							9.00 - 10.00	B	
				Continued next sheet	Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: Depth (20 mins) sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH1C

Sheet 2 of 2

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	05/03/2014
Logged by:	GB	Method:	Cable percussion boring	150	10.42 / 9.00	369245.97mE	423916.43mN	End:	05/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			10.20 (0.22) 10.42	Stiff greyish brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. Occasional organic content and root veins. Grey very weak friable MUDSTONE. Exploratory hole ends at 10.42 m	9.00	0.00	10.00 - 10.42 10.00 - 10.42	S D	50 (6,9/11,12,16,11 for 40mm)

Casing Date	Water Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of (20 mins) inflow: Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH2

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	06/03/2014
Logged by:	GB	Method:	Cable percussion boring	150	10.45 / 9.00	369274.81mE	423929.86mN	End:	06/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	06/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete					
			(0.10) 0.30	MADE GROUND: Grey sandy angular fine to coarse GRAVEL of limestone.			0.30	ES	
			(2.70)	MADE GROUND: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick, slag and concrete.					
			3.00 (0.60)	Firm light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.		0.00	3.00 - 3.45	U	65 blows 450
							3.45 - 3.55	D	
			3.60 (0.40)	Soft brownish grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.	3.00	0.00	3.55 - 4.00 3.55 - 4.00	S D	N=11 (2,1/3,3,2,3)
			4.00 (1.50)	Firm brownish grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.			4.00 - 5.00	B	
							4.50	ES	
						0.00	5.00 - 5.45	U	80 blows 450
							5.45 - 5.55	D	
			5.50 (1.50)	Firm brownish grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.	4.50	0.00	5.55 - 6.00 5.55 - 6.00	S D	N=19 (1,2/3,5,5,6)
							6.00 - 7.00	B	
			7.00 (2.00)	medium dense brown slightly silty fine to medium SAND.	6.00	0.00	7.00 - 7.45 7.00 - 7.45	S D	N=10 (2,3/2,4,2,2)
							7.45 - 8.00 7.50	B D	
							8.45 - 10.00	B	
			9.00 (1.30)	Stiff brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.					
				Continued next sheet	Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: Depth sealed: (20 mins)

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH2

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	06/03/2014
Logged by:	GB	Method:	Cable percussion boring	150	10.45 / 9.00	369274.81mE	423929.86mN	End:	06/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	06/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.15) 10.30 / 10.45	Stiff brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.	9.00	0.00	10.00 - 10.45	S	N=41 (4,6/7,3,11,20)
				Grey very weak friable MUDSTONE.			10.00 - 10.45	D	
				Exploratory hole ends at 10.45 m					

Casing Date	Water Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of (20 mins) inflow: Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH3

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	07/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	11.45 / 10.50	369291.44mE	423960.29mN	End:	10/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	10/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete					
			(0.30) 0.50	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			0.50 - 1.00	B	
				MADE GROUND: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick and concrete.			0.50	ES	
							1.00	ES	
			(1.50)						
			2.00	Firm brown slightly sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of mudstone.			2.00 - 3.00	B	
							2.50	ES	
					3.00	0.00	3.00 - 3.45	S	N=6 (1,1/1,1,2,2)
							3.00 - 3.45	D	
			(3.00)						
					3.00	0.00	4.00 - 4.45	S	N=10 (1,2/2,2,3,3)
							4.00 - 4.45	D	
							4.45 - 5.00	D	
			5.00	Medium dense brownish grey sandy SILT			5.00 - 5.55	B	
					4.50	0.00	5.65 - 6.10	S	N=11 (2,3/2,2,3,4)
							5.65 - 6.10	D	
			(2.00)				6.10 - 7.00	B	
					07/03/2014	1800			
					6.00	0.00			
			7.00	Light brown medium dense slightly silty fine to medium SAND	10/03/2014	800	7.00 - 7.45	S	N=17 (2,3/5,5,3,4)
			(0.45)		6.00	Dry	7.00 - 7.45	D	
					6.00	0.00			
			7.45	Stiff light brown slightly sandy CLAY			7.45 - 8.00	B	
			(1.00)				8.00 - 8.50	B	
			8.45	Stiff light brown slightly sandy CLAY		0.00	8.50 - 8.95	U	150 blows 450
							8.95 - 9.15	D	
					9.00	0.00	9.15 - 9.60	S	N=17 (2,2/3,4,4,6)
							9.15 - 9.60	D	
							9.60 - 10.00	B	
			(3.00)				9.60 - 10.00	D	

Continued next sheet

Casing / Water — Date / Time — Depth — Type & No. — Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: Depth (20 mins) sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH3

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	07/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	11.45 / 10.50	369291.44mE	423960.29mN	End:	10/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	10/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
				Stiff light brown slightly sandy CLAY	9.00	0.00	10.00 - 10.45 10.00 - 10.45	S D	N=18 (2,3/4,4,5,5)
					10.50	0.00	11.00 - 11.45 11.00 - 11.45	S D	N=21 (3,3/3,3,5,10)
					10/03/2014 10.50	1200 Dry			
			11.45	Exploratory hole ends at 11.45 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: Depth sealed: (20 mins)

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH4

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:			Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to:	Casing depth:	UK National Grid		Start:	10/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	1.90	1.50	369309.27mE	423989.05mN	End:	10/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11			-		Backfilled:	10/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete			0.00 - 0.50 0.10	B ES	
			(0.20) 0.40	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			0.30	ES	
				MADE GROUND: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick and concrete.			0.50 - 1.00	B	
							0.70	ES	
			(1.44)				1.00 - 1.50	B	
							1.30	ES	
					1.50	0.00	1.50 - 1.84	C	50 (1,11/11,13,26 for 40mm)
			1.84	MADE GROUND: Slag					
			(0.56)						
			2.40	Exploratory hole ends at 2.40 m					

		Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:
ID: Type: Diam: Remarks:

General remarks:

Groundwater entries:
Struck: Rose to: Rate of inflow: Depth sealed: (20 mins)
No Groundwater Encountered

Chiselling:
From: to: Duration (min): Tool:
1.84 - 2.40 60 CHISEL

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.
Log issue: **Draft**
Scale: 1:50

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH4B

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:			Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to:	Casing depth:	UK National Grid		Start:	13/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	1.80	1.50	369301.39mE	423977.99mN	End:	13/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB12			-		Backfilled:	13/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing / Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete		0.00 - 0.50	B	
			(0.10) 0.30	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].		0.40	ES	
				MADE GROUND: Brown slightly sandy angular to subangular fine to coarse GRAVEL of brick, slag and concrete.		0.50 - 1.50	B	
			(1.20)					
			1.50 (0.30)	MADE GROUND: Slag		1.40	ES	
			1.80	Exploratory hole ends at 1.80 m				

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:
ID: Type: Diam: Remarks:

General remarks:

Groundwater entries:
Struck: Rose to: Rate of inflow: Depth sealed: (20 mins)
No Groundwater Encountered

Chiselling:
From: to: Duration (min): Tool:
1.50 - 1.80 60 CHISEL

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.
Log issue: **Draft**
Scale: 1:50

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH5

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to: / Casing depth:	UK National Grid		Start:	11/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	2.40 / 1.50	369345.43mE	423964.04mN	End:	11/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11		-		Backfilled:	11/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing / Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete		0.00 - 0.50	B	
			(0.30) 0.50	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].		0.40	ES	
			(1.30) 1.80	MADE GROUND: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick and concrete.		0.50 - 1.50	B	
						1.10	ES	
			(0.30) 2.10	MADE GROUND: Slag				
				Exploratory hole ends at 2.10 m				

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:
ID: Type: Diam: Remarks:

General remarks:

Groundwater entries:
Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:
No Groundwater Encountered

Chiselling:
From: to: Duration (min): Tool:
1.50 - 1.90 60 CHISEL

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.
Log issue: **Draft**
Scale: 1:50

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH5B

Personnel:		Equipment & methods:		Hole diameter & casing depths:			Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to:	Casing depth:	UK National Grid		Start:	13/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	13.95	13.50	369325.12mE	423964.70mN	End:	13/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11			-		Backfilled:	13/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete					
			(0.10) 0.30	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].					
				MADE GROUND: Brown slightly sandy angular to subangular fine to coarse GRAVEL of brick, slag and concrete.			0.50 - 1.50	B	
			(1.20)				0.90	ES	
			1.50	VOID. 1.50m - 3.50m: suspected void					
			(2.00)						
			3.50	Stiff yellowish brown mottled grey sandy CLAY.	3.00	0.00	3.50 - 3.95	S	N=20 (2,2/3,4,5,8)
							3.50 - 3.95	D	
							4.00 - 4.50	B	
							4.20	ES	
					4.50	0.00	4.50 - 4.95	S	N=22 (4,4/4,7,5,6)
			(2.50)				4.50 - 5.00	B	
							4.50 - 4.95	D	
						0.00	5.00 - 5.45	U	105 blows 450
							5.45 - 5.65	D	
							5.65 - 6.00	B	
			6.00	Firm becoming stiff brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mudstone.		0.00	6.00 - 6.45	U	90 blows 450
							6.45 - 6.65	D	
					6.00	0.00	6.65 - 7.10	S	N=13 (2,2/2,2,3,6)
							6.65 - 7.10	D	
			(2.65)				7.10 - 8.00	B	
							7.70	D	
						0.00	8.00 - 8.45	U	90 blows 450
							8.45 - 8.65	D	
			8.65	Firm brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mudstone.	7.50	0.00	8.65 - 9.10	S	N=28 (2,3/6,7,7,8)
							8.65 - 9.10	D	
							9.10 - 10.00	B	

Continued next sheet

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH5B

Personnel:	Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by: MH	Plant: DANDO 2000	Dia (mm): 150 to: 13.95 Casing depth: 13.50	UK National Grid	Start: 13/03/2014
Logged by: JC	Method: Cable percussion boring		369325.12mE 423964.70mN	End: 13/03/2014
Checked by: LM	Flush: N/A SPT Hammer details: JB11		-	Backfilled: 13/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(5.15)	Firm brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mudstone.	9.00	0.00	10.00 - 10.45	S	N=11 (1,1/2,3,2,4)
							10.00 - 10.45	D	
							10.45 - 11.00	B	
							11.00 - 11.45	D	
						0.00	11.50 - 11.95	U	105 blows 450
					12.00	0.00	12.00 - 12.45	S	N=24 (4,4/4,4,6,10)
							12.00 - 12.45	D	
							12.45 - 13.00	B	
							13.00 - 13.45	D	
			(0.13) 13.80 / 13.93	Bluish grey very weak friable MUDSTONE.	13.50	0.00	13.50 - 13.93	S	50 (5,7/10,15,12,13 for 55mm)
				Exploratory hole ends at 13.93 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:
Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:
No Groundwater Encountered

Chiselling:
From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.
Log issue: **Draft**
Scale: 1:50

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH6

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:			Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to:	Casing depth:	UK National Grid		Start:	11/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	9.45	9.00	369328.57mE	423938.81mN	End:	11/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11			-		Backfilled:	11/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete			0.00 - 0.50	B	
			(0.30) 0.50	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			0.40	ES	
				MADE GROUND: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL of brick, slag and concrete.			0.50 - 1.50	B	
							1.50 - 2.50	B	
			(2.70)				1.70	ES	
					1.50	0.00	2.50 - 2.93	S	N=50 (5,20 for 50mm/19,15,7,9)
							2.50 - 2.93	D	
			3.20	VOID 3.20m - 4.00m: suspected void					
			(0.80) 4.00						
				Very stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.			4.00 - 5.00	B	
							4.30	ES	
			(2.10)			0.00	5.00 - 5.45	U	150 blows 450
							5.45 - 5.65	D	
					4.50	0.00	5.65 - 6.10	S	N=24 (7,5/6,3,7,8)
							5.65 - 6.10	B	
			6.10	Stiff dark brown slightly sandy slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.	6.00	0.00	6.10 - 6.55	S	N=14 (2,2/2,3,4,5)
							6.10 - 6.55	D	
							6.55 - 7.00	B	
			(1.80)			0.00	7.00 - 7.45	U	131 blows 450
							7.45 - 7.65	D	
					7.50	0.00	7.65 - 8.10	S	N=27 (4,5/6,5,8,8)
							7.65 - 8.10	D	
			7.90	Grey very weak friable MUDSTONE.			8.10 - 9.00	B	
							8.50	D	
			(1.55)				9.00 - 9.45	D	
					9.00	0.00	9.15 - 9.60	S	N=50 (6,7/9,13,13,15)
			9.45	Exploratory hole ends at 9.45 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of (20 mins) inflow: Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: BH7

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:			Coordinates & level:		Dates:	
Drilled by:	MH	Plant:	DANDO 2000	Dia (mm):	to:	Casing depth:	UK National Grid		Start:	12/03/2014
Logged by:	JC	Method:	Cable percussion boring	150	4.83	4.50	369310.47mE	423908.39mN	End:	12/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: JB11			-		Backfilled:	12/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete			0.00 - 0.50	B	
			(0.10) 0.30	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			0.40	ES	
			(0.20) 0.50	Soft yellowish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.			0.50 - 1.50	B	
				Firm to stiff yellowish brown mottled grey sandy CLAY.			1.00	D	
					1.50	0.00	1.50 - 1.95	S	N=10 (2,2/1,3,3,3)
							1.50 - 1.95	D	
							1.95 - 2.50	B	
			(3.15)				2.20	ES	
					1.50	0.00	2.50 - 2.95	S	N=17 (2,3/4,4,4,5)
							2.50 - 3.00	B	
							2.50 - 2.95	D	
						0.00	3.00 - 3.45	U	125 blows
							3.45 - 3.65	D	
			3.65 (0.25) 3.90	Stiff to very stiff yellowish brown mottled grey sandy CLAY.	3.00	0.00	3.65 - 4.10	S	N=47 (3,3/8,12,9,18)
							3.65 - 4.10	D	
				Grey very weak friable MUDSTONE.			4.10 - 4.50	B	
			(0.93)						
					4.50	0.00	4.50 - 4.83	S	52 (5,8/8,14,30 for 30mm)
							4.50 - 4.83	D	
			4.83	Exploratory hole ends at 4.83 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: WS1

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	LS	Plant:	EEW2 Competitor Rig	Dia (mm):	to: Casing depth:	UK National Grid		Start:	05/03/2014
Logged by:	AC	Method:	Dynamic sampling			369240.28mE	423905.16mN	End:	05/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: EEW2		-		Backfilled:	05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.30) 0.30	MADE GROUND: Soft brown very gravelly CLAY. Gravel is angular to sub angular fine to coarse of brick.					
			(0.70)	MADE GROUND: Dark brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick, concrete, sandstone and tile.			0.60	ES	
			1.00	Stiff grey silty CLAY.		0.00	1.00 - 1.45	S	N=22 (6,6/7,7,6,2)
			(0.90)				1.50	D	
							1.50	ES	
			1.90 (0.30)	Soft grey sandy SILT.		0.00	2.00 - 2.45	S	N=10 (1,1/2,2,3,3)
			2.20	Loose brownish orange silty fine to medium SAND.			2.30	D	
			(0.90)						
			3.10	Medium dense brown slightly sandy SILT		0.00	3.00 - 3.45	S	N=8 (1,2/2,1,1,4)
						0.00	4.00 - 4.45	S	N=9 (1,3/2,3,2,2)
			(2.35)						
						0.00	5.00 - 5.45	S	N=11 (2,2/2,3,2,4)
			5.45	Exploratory hole ends at 5.45 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: WS2

Sheet 1 of 1

Personnel:		Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	LS	Plant: EEW2 Competitor Rig	Dia (mm): to: Casing depth:	UK National Grid	Start: 05/03/2014
Logged by:	GB	Method: Dynamic sampling		369291.30mE 423922.42mN	End: 05/03/2014
Checked by:	LM	Flush: N/A SPT Hammer details: EEW2		-	Backfilled: 05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.25) 0.25	MADE GROUND: Reinforced Concrete					
				MADE GROUND: Reworked brown fine weathered sandstone.					
			(1.35)			0.00	1.00 - 1.45	S	N=17 (6,4/4,3,4,6)
			1.60				1.60	ES	
			(0.30)	MADE GROUND: Grey slightly silty slightly sandy angular to sub angular fine to coarse GRAVEL of concrete, limestone, brick and slag.					
			1.90				1.90	ES	
			(0.20) 2.10	Dark brown slightly gravelly sandy CLAY. Gravel is sub angular to sub rounded fine to coarse of mudstone and sandstone.		0.00	2.00 - 2.45	S	N=11 (2,3/2,3,3,3)
							2.20	ES	
				Loose dark brown slightly silty fine to medium SAND.					
			(1.50)			0.00	3.00 - 3.45	S	N=8 (1,2/1,2,2,3)
			3.60						
			(0.35)	Firm grey CLAY.					
			3.95 (0.15) 4.10	Grey fine to medium SAND.		0.00	4.00 - 4.45	S	N=11 (1,3/2,3,3,3)
				Firm grey sandy CLAY.					
			(1.35)			0.00	5.00 - 5.45	S	N=7 (1,2/1,2,2,2)
			5.45	Exploratory hole ends at 5.45 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of (20 mins) inflow: Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: WS3

Sheet 1 of 1

Personnel:		Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	LS	Plant: EEW2 Competitor Rig	Dia (mm): to: Casing depth:	UK National Grid	Start: 05/03/2014
Logged by:	GB	Method: Dynamic sampling		369363.11mE 423892.57mN	End: 05/03/2014
Checked by:	LM	Flush: N/A SPT Hammer details: EEW2		-	Backfilled: 05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing / Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete				
			(0.25) 0.45	MADE GROUND: Grey slightly silty slightly sandy angular to subangular fine to coarse GRAVEL of concrete, limestone, brick and slag.		0.50	ES	
				Grey very weak friable MUDSTONE.	0.00	1.00 - 1.45	S	N=23 (4,5/5,6,6,6)
			(4.00)		0.00	2.00 - 2.45	S	N=42 (6,7/8,10,12,12)
					0.00	3.00 - 3.45	S	N=29 (8,7/8,7,7,7)
					0.00	4.00 - 4.45	S	N=42 (8,9/9,9,11,13)
			4.45	Exploratory hole ends at 4.45 m				

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of (20 mins) inflow: Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: WS4

Sheet 1 of 1

Personnel:		Equipment & methods:		Hole diameter & casing depths:		Coordinates & level:		Dates:	
Drilled by:	LS	Plant:	EEW2 Competitor Rig	Dia (mm):	to: Casing depth:	UK National Grid		Start:	05/03/2014
Logged by:	GB	Method:	Dynamic sampling			369391.46mE	423935.83mN	End:	05/03/2014
Checked by:	LM	Flush:	N/A	SPT Hammer details: EEW2		-		Backfilled:	05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing	Time / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.15) 0.15	MADE GROUND: Reinforced Concrete					
			(0.45) 0.60	MADE GROUND: Grey slightly silty slightly sandy angular to subangular fine to coarse GRAVEL of concrete, limestone, brick and slag.					
			(0.30) 0.90	MADE GROUND: Black slightly sandy silty CLAY.			0.70	ES	
			(1.50) 2.40	MADE GROUND: Dark brown slightly clayey slightly sandy angular to subangular fine to coarse GRAVEL of concrete, limestone, slag and brick. Occasional angular cobbles of brick.		0.00	1.00 - 1.45	S	N=6 (1,2/2,2,1,1)
						0.00	2.00 - 2.45	S	N=10 (2,2/2,3,2,3)
							2.00	ES	
				Firm becoming stiff dark grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.			2.40	D	
						0.00	3.00 - 3.45	S	N=13 (2,2/3,3,3,4)
			(3.05)			0.00	4.00 - 4.45	S	N=11 (2,2/2,3,3,3)
						0.00	5.00 - 5.45	S	N=15 (3,2/3,3,4,5)
			5.45	Exploratory hole ends at 5.45 m					

Casing / Date	Water / Time	Depth	Type & No.	Results

Instrumentation details:

ID:	Type:	Diam:	Remarks:
1	SP	0	0

General remarks:

Groundwater entries:

Struck: Rose to: Rate of inflow: (20 mins) Depth sealed:

No Groundwater Encountered

Chiselling:

From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:50

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult — Borehole Log

Borehole no: WS5

Sheet 1 of 1

Personnel:		Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	LS	Plant: EEW2 Competitor Rig	Dia (mm): to: Casing depth:	UK National Grid	Start: 05/03/2014
Logged by:	GB	Method: Dynamic sampling		369359.07mE 423960.36mN	End: 05/03/2014
Checked by:	LM	Flush: N/A SPT Hammer details: EEW2		-	Backfilled: 05/03/2014

Backfill/ Well Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Progress, Casing & Water Data: Date / Casing / Water	Samples & In Situ Testing: Depth	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete		0.20	ES	
				MADE GROUND: Dark brown slightly silty angular to sub angular fine to coarse GRAVEL of concrete, limestone, slag, metal, timber and brick.				
					0.00	1.00 - 1.45	S	N=7 (2,2/2,1,2,2)
						1.50	ES	
			(3.25)		0.00	2.00 - 2.45	S	N=11 (2,1/0,2,5,4)
					Dry	3.00 - 3.45	S	N=9 (2,2/2,2,2,3)
			3.45	Exploratory hole ends at 3.45 m				

Casing / Water — Date / Time	Depth	Type & No.	Results

Instrumentation details:
ID: Type: Diam: Remarks:

General remarks:

Groundwater entries:
Struck: Rose to: Rate of inflow: Depth (20 mins) sealed:
No Groundwater Encountered

Chiselling:
From: to: Duration (min): Tool:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.
Log issue: **Draft**
Scale: 1:50

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

J.B. Site Investigations
Windmill Way West
Ramparts Business Park
BERWICK-upon-TWEED
TD15 1TB

SPT Hammer Ref:	JB.11
Test Date:	05/10/2013
Report Date:	07/10/2013
File Name:	JB.11.spt
Test Operator:	JB.

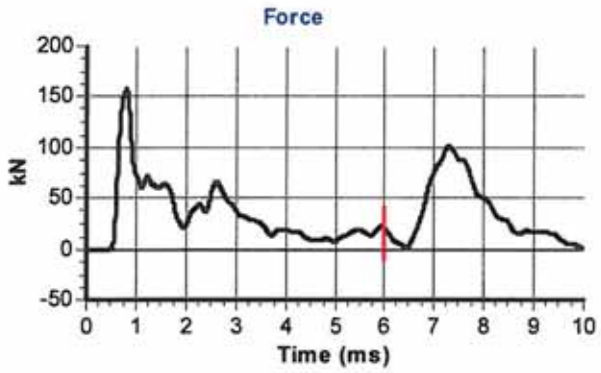
Instrumented Rod Data

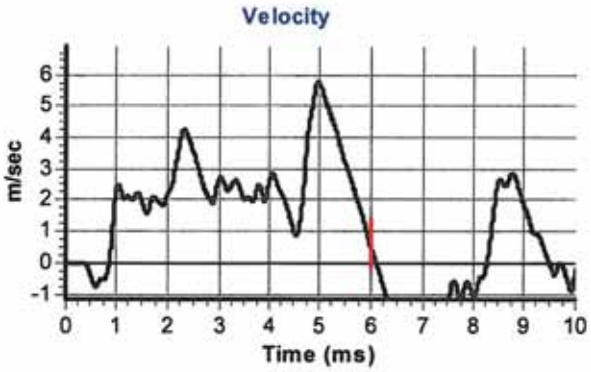
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	
Accelerometer No.2:	

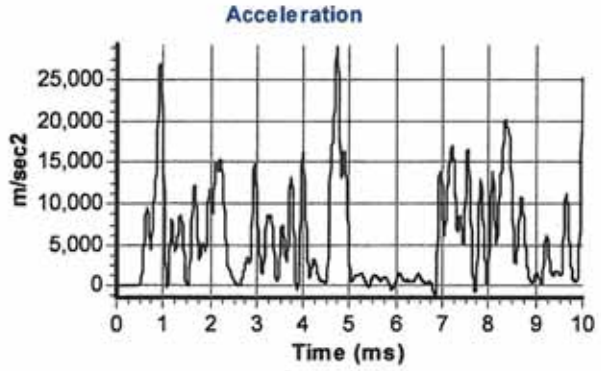
SPT Hammer Information

Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	11.0

Comments / Location







Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	352

Energy Ratio E_r (%): **74**

Signed: Jeff Burnlees

Title: Proprietor

The recommended calibration interval is 12 months

testconsult
Specialist Testing Services

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	EEW2
Test Date:	01/07/2013
Report Date:	02/07/2013
File Name:	EEW2.spt
Test Operator:	TS

UKAS 0955

Instrumented Rod Data

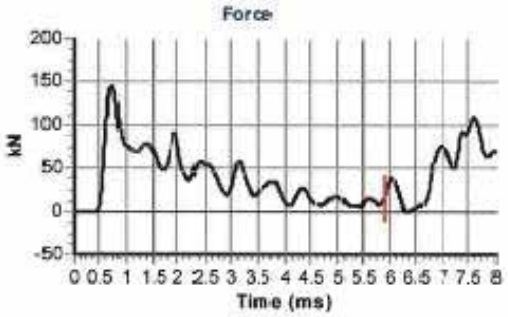
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.6
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	8355
Accelerometer No.2:	8356

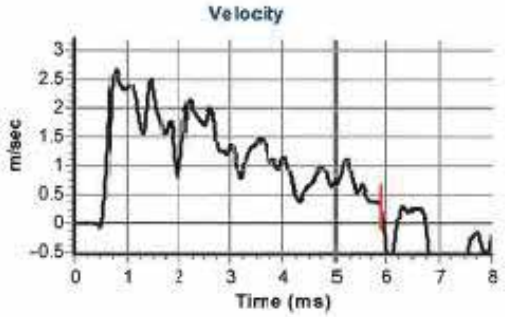
SPT Hammer Information

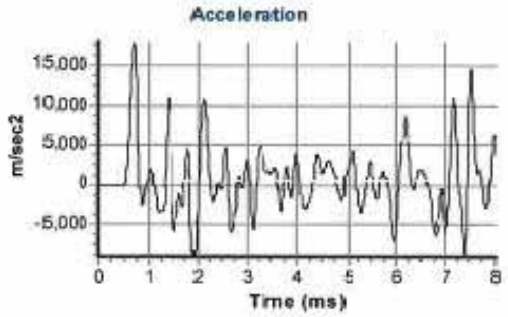
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.0

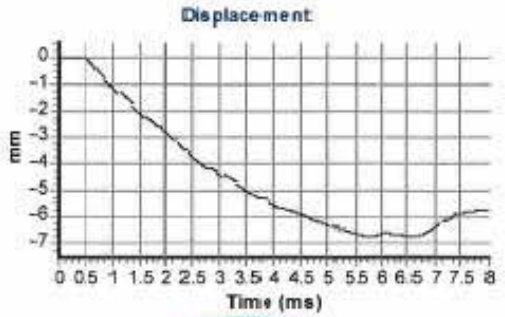
Comments / Location

Client: Earth Engineering
Location Testconsult Laboratory
Type: WS









Calculations

Area of Rod A (mm2):	983
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	335

Energy Ratio E_r (%): **71**

Signed: Tony Suchland
Title: Senior Electronics Technician

The recommended calibration interva is 12 months

APPENDIX D

Exploratory Hole Records – Trial Pits

TerraConsult Trial Pit Log

Trial pit no: BH4-TP

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 12/03/2014
Date: 12/03/2014	Plant: JCB 3CX	D / C A / B -	369309.27mE 423989.05mN	End: 12/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 12/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.20)	MADE GROUND: Reinforced Concrete			
			0.20				
			(0.10)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
			0.30	MADE GROUND: Brown slightly sandy angular to sub angular fine to coarse GRAVEL of brick, slag and concrete.			
			(1.20)				
			1.50	MADE GROUND: Slag			
			(1.70)		2.60	B	
			3.20	Exploratory hole ends at 3.20 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Spalling from 0.20 to 1.50m bgl.

Remarks: Trial Pit abandoned at 3.20m bgl when unable to deepen through slag.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: BH5-TP

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 12/03/2014
Date: 12/03/2014	Plant: JCB 3CX	D / C A - / B	369345.43mE 423964.04mN	End: 12/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 12/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.20)	MADE GROUND: Reinforced Concrete			
			0.20				
			(0.30)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
			0.50				
			(1.30)	MADE GROUND: Brown slightly sandy slightly clayey angular to sub angular fine to coarse GRAVEL of brick and concrete.			
			1.80				
			(0.80)	MADE GROUND: Brown angular to subangular fine to coarse GRAVEL of brick and concrete.	2.20	ES	
					2.50	B	
			2.60				
			(0.50)	MADE GROUND: Slag			
			3.10				
				Exploratory hole ends at 3.10 m			
					Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability:

Remarks: Trial Pit abandoned at 3.10m bgl when unable to deepen through slag.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP1

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: GB	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 04/03/2014
Date: 04/03/2014	Plant: JCB 3CX	D / C A / B -	369247.74mE 423904.82mN	End: 04/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 04/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(1.20)	MADE GROUND: Brown slightly silty sandy angular to subrounded fine to coarse GRAVEL of brick, slag, concrete, metal and wood. Moderate proportion of angular to subrounded cobbles of brick, concrete and metal.	0.10	ES	
					0.50	ES	
	▼		1.20 (0.20)	Orangish brown slightly silty fine to medium SAND.			
			1.40 (1.10)	Soft dark grey CLAY.	1.40 1.40	ES	P 25kPa
	▼		2.50 (0.60)	Yellowish silty fine to medium SAND.	2.80	ES	
			3.10 (0.70)	Stiff dark brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is fine to coarse angular to subrounded of predominantly mudstone. Cobbles are subrounded to rounded of sandstone. 3.30m: Becoming slightly laminated.	3.20		P 88kPa
			3.80	Exploratory hole ends at 3.80 m			
					Depth (m)	Type & No.	Results

Groundwater entries:

Struck:	Rose to:	Rate of inflow:
1.20	-	Slow
2.70	-	Slow

Depth related remarks:

From: To:

General remarks:

Weather: Dry
Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP2

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: GB	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 04/03/2014
Date: 04/03/2014	Plant: JCB 3CX	D / C A - / B	369220.93mE 423877.21mN	End: 04/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 04/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.10) 0.10	MADE GROUND: Tarmacadam			
					MADE GROUND: Grey sandy fine to coarse GRAVEL with a low cobble content. Gravel is angular to subrounded of brick, concrete, wire and ash.	0.30	ES	
				(0.80)				
				0.90	Stiff orangish brown slightly gravelly slightly sandy CLAY. Gravel is predominantly fine to medium angular to subangular of mudstone.	1.00 1.00	ES	P 105kPa
				(1.40)				
				2.30	Stiff grey slightly gravelly CLAY with a low cobble content. Gravel is fine to coarse angular to subrounded of predominantly mudstone. Cobbles are subrounded to rounded sandstone. 2.50m: Becoming slightly laminated.	2.30		P 120kPa
				(1.20)				
				3.50	Exploratory hole ends at 3.50 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP3

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: GB	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 04/03/2014
Date: 04/03/2014	Plant: JCB 3CX	C D A B -	369293.45mE 423940.36mN	End: 04/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 04/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.15) 0.15	MADE GROUND: Reinforced Concrete	0.10	ES	
				(0.25) 0.40	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].	0.20	ES	
				(0.80) 1.20	MADE GROUND: Black sandy rounded to subangular fine to medium GRAVEL of brick and ash.	0.50	ES	
				(0.05) 1.25	MADE GROUND: Pale yellowish bricks. 1.20m - 2.20m: Old tunnel believed to be associated with the site's former use as an industrial bronzing works			
				(0.95) 2.20	VOID			
					Exploratory hole ends at 2.20 m			
						Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks: Trial Pit abandoned at 2.20m bgl at base of tunnel

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP4

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	C D A B -	369343.46mE 423929.66mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.20)	MADE GROUND: Reinforced Concrete			
				0.20		0.20	ES	
				(0.10)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
				0.30		0.40	ES	
					MADE GROUND: Brown sandy fine to coarse angular to subangular GRAVEL of concrete and brick with a low cobble content. 0.30m - 1.00m: Bronze powder present from previous industry			
				(0.70)				
				1.00	Soft to firm yellowish brown mottled grey sandy CLAY.	1.50	ES	P 54kPa
						1.50		
				(1.30)				
				2.30	Soft to firm yellowish brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse angular to subangular of mudstone			
				(1.00)				
				3.30	Firm to stiff dark brown slightly sandy slightly gravelly CLAY with a low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subrounded of mudstone.			
				(0.50)				
				3.80	Exploratory hole ends at 3.80 m			
						Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP5

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	C D A B -	369381.11mE 423913.76mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.30)	MADE GROUND: Reinforced Concrete			
			0.30 (0.10) 0.40	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
			(1.00)	Firm to stiff yellowish brown mottled grey sandy gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are subangular of mudstone.	1.00 1.00	ES	P 69kPa
			1.40 (1.10)	Firm to stiff dark brown mottled orange slightly sandy gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mudstone. Cobbles are rounded of sandstone.			
			2.50 (1.00)	Stiff dark brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone.			
			3.50 (0.70)	Grey very weak friable MUDSTONE.	4.00	ES	
			4.20	Exploratory hole ends at 4.20 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP6

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	D / C A - / B	369380.88mE 423954.43mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.10) 0.10	MADE GROUND: Reinforced Concrete			
				(0.10) 0.20	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
					MADE GROUND: Brown sandy subangular to angular fine to coarse GRAVEL of limestone. 0.20m - 0.40m: Steel pipe oriented N-S	0.30	ES	
				(0.70)		0.50	ES	
				0.90	MADE GROUND: Dark brown sandy angular to subangular GRAVEL of bricks with a high cobble content. Cobbles are angular of brick.			
				(1.60)				
				2.50 (0.10) 2.60	MADE GROUND: Soft black slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of brick.	2.60	ES	P 20kPa
					Exploratory hole ends at 2.60 m	2.60		

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Spalling from 0.10 to 2.50m bgl.

Remarks: Trial Pit abandoned at 2.50m bgl due to spalling

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP7

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	C D A B -	369338.88mE 423888.33mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.20)	TOPSOIL: Black fine to coarse SAND. Frequent rootlets.			
			0.20		0.20	ES	
			(0.20)	Firm reddish brown CLAY	0.30		P 50kPa
			0.40	Yellowish brown slightly gravelly clayey fine to coarse SAND with a low cobble content. Gravel is subangular to angular fine to coarse of mudstone. Cobbles are subangular of mudstone.			
					1.00	ES	
			(2.30)				
					2.00		P 40kPa
			2.70	Very weak bluish grey weathered friable MUDSTONE.			
					2.80		P 120kPa
					3.00	ES	
			(1.10)				
			3.80	Exploratory hole ends at 3.80 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP8

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	C D A B -	369258.00mE 423895.13mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.40)	TOPSOIL: Black fine to coarse SAND. Frequent rootlets.			
				0.30m - 0.40m: Disused metal service pipe	0.30	ES	
			0.40	Orangish brown very clayey fine to medium SAND.			
			(1.40)		1.00	ES	
				1.30m - 1.40m: Disused clay service pipe. Mild ingress of water from this pipe.			
			1.80	Firm orangish brown mottled grey CLAY.			
					2.00		P 33kPa
			(1.20)				
			3.00	Exploratory hole ends at 3.00 m			
					Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP9

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	C D A B -	369312.30mE 423882.90mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.30)	TOPSOIL: Black fine to coarse SAND. Frequent rootlets.			
			0.30	Firm yellowish brown slightly gravelly CLAY. Gravel fine to coarse angular to subangular of mudstone.	0.40	ES	
			(0.70)				
			1.00	Soft orange sandy CLAY.			
			(0.30)		1.20		P 36kPa
			1.30	Firm brown mottled grey CLAY			
					1.50	ES	
			(1.40)				
					2.40		P 61kPa
			2.70	Soft to firm dark grey mottled brown CLAY			
					2.80		P 63kPa
			(0.50)				
			3.20	Exploratory hole ends at 3.20 m			
					Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP10

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 05/03/2014
Date: 05/03/2014	Plant: JCB 3CX	D / C A / B -	369329.03mE 423956.63mN	End: 05/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 05/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.10) 0.10	MADE GROUND: Reinforced Concrete	0.10	ES	
			(0.10) 0.20	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
			(0.40)	MADE GROUND: Brown sandy fine to coarse angular to subangular GRAVEL of concrete and brick with a low cobble content. Cobbles are subangular concrete and brick. 0.20m - 0.60m: Bronze powder present from previous industry	0.50	ES	
			0.60	MADE GROUND: Dark brown gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick and ash.			
			(1.10)				
			1.70	MADE GROUND: Dark brown gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of ash.			
			(0.20)				
			1.90	MADE GROUND: Reddish brown sandy angular to subangular fine to coarse GRAVEL of brick and ash.			
			(1.50)				
	▼				3.20	ES	
	▼						
			3.40	Exploratory hole ends at 3.40 m			
					Depth (m)	Type & No.	Results

Groundwater entries:

Struck:	Rose to:	Rate of inflow:
3.20	3.10	Slow

Depth related remarks:

From: To:

General remarks:

Weather: Showers
Stability: Stable

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP11A

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 06/03/2014
Date: 06/03/2014	Plant: JCB 3CX	D / C A - / B	369361.73mE 423919.64mN	End: 06/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 06/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.20)	MADE GROUND: Reinforced Concrete			
				0.20				
				(0.10)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].	0.30	ES	
				0.30				
				(0.20)	MADE GROUND: Orange sandy angular to subangular GRAVEL of brick and concrete with a high cobble content. Cobbles are angular of brick.			
				0.50	Exploratory hole ends at 0.50 m			
						Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Showers

Stability: Stable

Remarks: Trial Pit abandoned at 0.50m bgl due to presence of buried services.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP12

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 06/03/2014
Date: 06/03/2014	Plant: JCB 3CX	C D A B -	369308.61mE 423974.49mN	End: 06/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 06/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.10) 0.10	MADE GROUND: Reinforced Concrete			
				(0.10) 0.20	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
					MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of concrete and brick with a moderate cobble content. Cobbles are angular of concrete.	0.40	ES	
				(0.60)		0.70	ES	
				(0.05) 0.80 0.85	MADE GROUND: Slag			
					Exploratory hole ends at 0.85 m			
						Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Showers

Stability:

Remarks: Trial Pit abandoned at 0.85m bgl when unable to deepen through slag.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP13

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 06/03/2014
Date: 06/03/2014	Plant: JCB 3CX	D / C A - / B	369327.39mE 423975.39mN	End: 06/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 06/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.20)	MADE GROUND: Reinforced Concrete			
				0.20				
				(0.20)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
				0.40		0.40	ES	
				(0.20)	MADE GROUND: Brown sandy angular to subangular fine to coarse GRAVEL of concrete.			
				0.60				
				(0.30)	MADE GROUND: Dark brown gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick and concrete.			
				0.90				
				(0.10)	MADE GROUND: Slag			
				1.00	Exploratory hole ends at 1.00 m			
						Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Showers

Stability:

Remarks: Trial Pit abandoned at 1.00m bgl when unable to deepen through slag.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP14

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 06/03/2014
Date: 06/03/2014	Plant: JCB 3CX	C D A B -	369324.74mE 423907.63mN	End: 06/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 06/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level / Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
			(0.20) 0.20	MADE GROUND: Reinforced Concrete			
			(0.10) 0.30	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
			(0.30) 0.60	Yellow gravelly fine to medium SAND with a low cobble content. Gravel is subangular to angular fine to coarse of mudstone. Cobbles are subangular of mudstone.			
			(0.60) 1.20	Firm yellow mottled black and brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone.	0.80 0.80 0.80	D ES	P 111kPa
			(1.00) 2.20	Soft to firm dark grey mottled brown CLAY.	1.30	D	
			(0.10) 2.30	Soft to firm dark brown mottled grey sandy CLAY.			
			(0.90) 3.20	Soft to firm yellowish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone.	2.50		P 114kPa
			(0.70) 3.90	Weathered bedrock recovered as subangular to angular fine to coarse gravel of MUDSTONE	3.40	ES	
				Exploratory hole ends at 3.90 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Showers

Stability:

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP15

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 06/03/2014
Date: 06/03/2014	Plant: JCB 3CX	D C A - B	369357.16mE 423913.64mN	End: 06/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 06/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.20)	MADE GROUND: Reinforced Concrete			
				0.20				
				(0.20)	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
				0.40	Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of mudstone.			
				(0.90)		0.90	D	
						0.90	ES	
						1.00		P 94kPa
						1.10	ES	
				1.30	Firm dark brown mottled light brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone.			
				(1.30)				
				2.60	Grey very weak friable MUDSTONE.	2.70	D	
	▼			(0.50)		2.70	ES	
				3.10	Exploratory hole ends at 3.10 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck:	Rose to:	Rate of inflow:
3.00	-	Slow

Depth related remarks:

From: To:

General remarks:

Weather: Dry
Stability:

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**
Project No: **1970**
Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP16

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 12/03/2014
Date: 12/03/2014	Plant: JCB 3CX	D / C A - / B	369384.41mE 423942.21mN	End: 12/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 12/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.40)	MADE GROUND: Reinforced Concrete			
				0.40				
				(0.60)	MADE GROUND: Grey sandy angular to subangular fine to coarse GRAVEL of brick and concrete. 0.60m: 2 water channels encountered possible tank	0.60	ES	
				1.00	VOID			
				(0.40)				
				1.40	Exploratory hole ends at 1.40 m	1.40	W	

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability:

Remarks: Trial Pit abandoned at 1.40m bgl due to void between 1.00 and 1.40m bgl.

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

TerraConsult Trial Pit Log

Trial pit no: TP17

Sheet 1 of 1

Personnel:	Equipment & methods:	Dimensions & orientation:	Coordinates & level:	Dates:
Logged by: JC	Method: Machine excavated	Width: - Length: -	UK National Grid	Start: 12/03/2014
Date: 12/03/2014	Plant: JCB 3CX	D / C A / B -	369324.21mE 423926.45mN	End: 12/03/2014
Checked by: LM	Shoring: N/A		-	Backfilled: 12/03/2014

Backfill/ Inst.	Water-strikes	Legend	Level	Depth (Thickness)	Stratum Description	Samples & In Situ Testing: Depth (m)	Type & No.	Results
				(0.10) 0.10	MADE GROUND: Reinforced Concrete			
				(0.20) 0.30	MADE GROUND: Grey sandy subrounded to subangular fine to medium GRAVEL of limestone and concrete [Sub-base].			
				(0.40)	MADE GROUND: Brown slightly sandy angular to subangular fine to coarse GRAVEL of brick and ash with frequent glass fragments.	0.60	D	
					0.50m - 0.55m: Drainage pipe oriented N-S	0.60	ES	
				0.70		0.60	W	
				(0.70)	Firm to stiff dark brown mottled yellowish brown slightly sandy slightly gravelly CLAY.	1.30	ES	
				1.40	Exploratory hole ends at 1.40 m			

Depth (m)	Type & No.	Results

Groundwater entries:

Struck: Rose to: Rate of inflow:

No Groundwater Encountered

Depth related remarks:

From: To:

General remarks:

Weather: Dry

Stability:

Remarks:

Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue: **Draft**

Scale: 1:25

Project: **Sita Darwen**

Project No: **1970**

Client: **SITA UK**

Photograph 1: Trial Pit TP2

Photograph 2: Trial Pit TP3

Photograph 3: Trial Pit TP3

Photograph 4 Trial Pit TP6

Photograph 5: Trial Pit TP8

Photograph 6: Trial Pit TP12

Photograph 7: Trial Pit TP16 (suspected old water tank)

Photograph 8: Trial Pit BH4-TP (Layer of slag at base at approx. 1.80 m bgl)

Key To Exploratory Hole Records

SAMPLES

Undisturbed

U	Driven tube sample
TW	Pushed thin wall tube sample } nominally 100 mm diameter and full recovery unless otherwise stated
P	Pushed piston sample
L	Liner sample (from windowless or similar sampler), full recovery unless otherwise stated
CBR	CBR mould sample
BLK	Block sample
CS	Core sample (from rotary core) taken for laboratory testing
AMAL	Amalgamated sample

Disturbed

D	Small sample
B	Bulk sample

Other

W	Water sample
G	Gas sample
	Environmental chemistry samples (in more than one container where appropriate)
ES	Soil sample
EW	Water sample

Comments Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that attempt was made to take a tube sample; however, there was no recovery.

Monitoring samples taken after completion of hole construction are not shown on the exploratory hole logs.

TESTS

SPT S or SPT C — Standard Penetration Test, open shoe (S) or solid cone (C)

The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75 mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300 mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 (either in total or for a single increment) the total blow count beyond the seating drive is given (without the N = prefix).

IV	*in situ* Vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Variable head permeability tests (KFH = falling head test, KRH = rising head test, KPI = packer test), permeability value

Test results provided in Field Records column

DRILLING RECORDS

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930 (1999) and BS EN ISO 22575-1 (2006)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented.
NI	Non-intact is used where the core is fragmented.

Flush returns, estimated percentage with colour where relevant, are given in the Records column

CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

GROUNDWATER

▼	Groundwater strike
▽	Groundwater level after standing period

INSTALLATION

Standpipe/ piezometer

Details of standpipe/piezometer installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill.

The type of instrument installed is indicated by a code in the Legend column at the depth of the response zone:

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer

Inclinometer or Slip Indicator

The installation of vertical profiling instruments is indicated on the Record. The base of tubing is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column at the base of the tubing:

ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator

Settlement Points or Pressure Cells

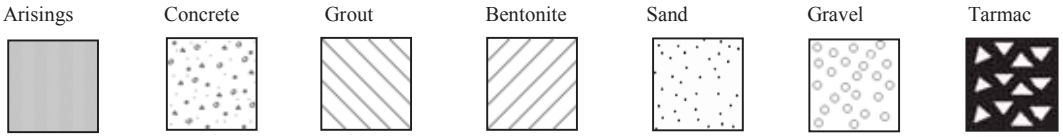
The installation of single point instruments is indicated on the Record. The location of the measuring device is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column:

ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
EPCE	Electronic embedment pressure cell
PPCE	Electronic push in pressure cell

INSTALLATION LEGENDS

A legend describing the installation is shown in the rightmost column. Legends additional to BS5930 are used to describe the backfill materials as indicated below.



NOTES

1 Soils and rocks are described in accordance with BS EN ISO 14688-1 (2002), 14688-2 (2004), 14689-1 (2003) and BS 5930 (1999) as clarified by Baldwin et al (2007).

2 Strata legends are in accordance with BS 5930 (1999).

3 Water level observations of discernible entries during the advancing of the exploratory hole are given at the foot of the log and in the Legend column. The term "none observed" is used where no discrete entries are identified although this does not necessarily indicate that the hole has not been advanced below groundwater level. Under certain conditions groundwater cannot be observed, for instance, drilling with water flush or overwater, or boring at a rate much faster than water can make its way into the borehole (ref BS5930: 1999, Clause 47.2.7). In addition, where appropriate, water levels in the hole at the time of recovering individual samples or carrying out in situ tests and at shift changes are given in the Records column.

4 Evidence of the occurrence of very coarse particles (cobbles and boulders) is presented on the logs, however, because of their size in relation to the exploratory hole these records may not be fully representative of their size and frequency in the ground mass.

5 The borehole logs present the results of Standard Penetration Tests recorded in the field without correction or interpretation. However, in certain ground conditions (eg high hydraulic head or where very coarse particles are present) some judgement may be necessary in considering whether the results are representative of in situ mass conditions.

6 The declination of bedding and joints is given with respect to the normal to the core axis. Thus in a vertical borehole this will be the dip.

7 The assessment of SCR, RQD and Fracture Spacing excludes artificial (non in situ) fractures.

NOTE

Where "tarmac" is referred to in descriptions, this refers to bound bituminous paving materials which could be blacktop, asphalt, mastic asphalt, tarmac or other type of materials. The word "tarmac" is not intended to covey that tar has been used in the material.

REFERENCES

Baldwin M, Gosling R C and Brownlie N: 2007: Soil and rock descriptions - a practical guide to the implementation of BS EN ISO 14688 and 14689. Ground Engineering, July 2007.

BS EN ISO 14688-1: 2002: Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2: 2004: Geotechnical investigation and testing - Identification and classification of soil - Part 2 Principles for a classification. British Standards Institution.

BS EN ISO 14689-1: 2003: Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22476-3: 2005: Geotechnical investigation and testing - Field testing - Part 3: Standard penetration test. British Standards Institution.

BS EN ISO 22475-1: 2007: Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1: Technical principles for execution (reproduced 2007). British Standards Institution.

BS 5930: 1999: Code of Practice for site investigations (amendment number 2, 2010). British Standards Institution

APPENDIX E

Gas and Groundwater Monitoring

No: 1970

GROUNDWATER AND GROUND GAS MONITORING

TerraConsult

Site: SITA, DARWEN

Location	Date	Monitored by	Well Details		Groundwater			Gas												Weather/Comments	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Purged (Y/N - litres)	Water Sample Taken?	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure	Steady Flow (l/h)	Peak Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)	PID (ppm)	Conditions	Ambient Temp °C
WS1	21/03/14	AC	50	3.74	1.67	8ltr purged Dry	N	983	Falling	0.02	0.4	0.4	0.1	0.0004	0.2	0.0008	18.5	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	3.74	1.29	8ltr purged	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	18.6	1	1	0.3	Overcast	12
	04/04/14	AC	50	3.74	2.47		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	18.6	1	1	-	Overcast	10
	11/04/14	AC	50	3.74	2.55		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	18.7	1	1	-	Overcast	13
	17/04/14	AC	50	3.74	2.62		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.0	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	3.74	2.72		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.3	0.0003	18.4	1	1	0.2	Overcast	11
WS2	21/03/14	AC	50	3.86	1.70	13ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.9	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	3.86	1.62	16ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	0.1	Overcast	12
	04/04/14	AC	50	3.86	1.72		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Overcast	10
	11/04/14	AC	50	3.86	1.71		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Overcast	13
	17/04/14	AC	50	3.86	1.80		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	3.86	1.67		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.4	1	1	0.1	Overcast	11
WS3	21/03/14	AC	50	2.16	0.65	5.5ltr Purged Dry	N	981	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	2.16	0.53	6 ltr Purged Dry	N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	0.1	Overcast	12
	04/04/14	AC	50	2.16	0.99		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.4	1	1	-	Overcast	10
	11/04/14	AC	50	2.16	0.98		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.2	1	1	-	Overcast	13
	17/04/14	AC	50	2.16	1.20		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.2	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	2.16	1.17		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20	1	1	0.1	Overcast	11
WS4	21/03/14	AC	50	2.32	1.16	4ltr Purged Dry	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.9	0.0009	17.9	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	2.32	1.86	2ltr Purged Dry	N	986	Steady	0.01	0.1	0.1	0.1	0.0001	1.1	0.0011	16.7	1	1	0.1	Overcast	12
	04/04/14	AC	50	2.32	1.20		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	1.2	0.0012	15.8	1	1	-	Overcast	10
	11/04/14	AC	50	2.32	1.63		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	1	0.0010	16.2	1	1	-	Overcast	13
	17/04/14	AC	50	2.32	1.54		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.8	0.0008	17.9	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	2.32	1.30		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	1.8	0.0018	15.8	1	1	0.1	Overcast	11
BH1	21/03/14	AC	50	9.69	7.39	15ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.5	0.0005	19.5	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	9.69	7.19	15ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.6	0.0006	18.6	1	1	0.2	Overcast	12
	04/04/14	AC	50	9.69	7.17		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.8	0.0008	18.0	1	1	-	Overcast	10
	11/04/14	AC	50	9.69	7.24		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.7	0.0007	18.1	1	1	-	Overcast	13
	17/04/14	AC	50	9.69	7.57		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.4	0.0004	18.5	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	9.69	7.90		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.7	0.0007	18.4	1	1	0.4	Overcast	11
BH2	21/03/14	AC	50	9.91	6.15	24ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.5	0.0005	15.4	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	9.91	6.23	24ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.5	0.0005	15.2	1	1	0.1	Overcast	12
	04/04/14	AC	50	9.91	6.06		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.5	0.0005	14.9	1	1	-	Overcast	10
	11/04/14	AC	50	9.91	6.11		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.3	0.0003	16.0	1	1	-	Overcast	13
	17/04/14	AC	50	9.91	6.10		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	17.0	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	9.91	6.17		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.7	0.0007	12.7	1	1	0.1	Overcast	11
BH3	21/03/14	AC	50	10.80	4.94	36ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	18.9	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	10.80	4.61	35ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.6	1	1	0.1	Overcast	12
	04/04/14	AC	50	10.80	4.44		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.7	1	1	-	Overcast	10
	11/04/14	AC	50	10.80	4.57		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.9	1	1	-	Overcast	13
	17/04/14	AC	50	10.80	4.55		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	10.80	4.60		N	986	Steady	0.01	0.0	0.0	0.0	0.0000	0.1	0.0000	20.1	1	1	0.1	Overcast	11

NOTES:
NM = Not Measured.
(x) = Peak value recorded.
[grey] = Below detection limit.

GSV (l/HR) = $\frac{\text{[gas concentration (\%v/v)] x [gas well flow rate (l/hr)}}{100}$

No: 1970

GROUNDWATER AND GROUND GAS MONITORING

TerraConsult

Site: SITA, DARWEN

Location	Date	Monitored by	Well Details		Groundwater			Gas												Weather/Comments	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Purged (Y/N - litres)	Water Sample Taken?	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure	Steady Flow (l/h)	Peak Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)	PID (ppm)	Conditions	Ambient Temp °C
BH5-B	21/03/14	AC	50	13.30	9.10	26ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	13.30	8.97	25ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.2	1	1	0.1	Overcast	12
	04/04/14	AC	50	13.30	9.07		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.2	1	1	-	Overcast	10
	11/04/14	AC	50	13.30	9.10		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.2	1	1	-	Overcast	13
	17/04/14	AC	50	13.30	9.00		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	13.30	9.10		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.9	1	1	0.1	Overcast	11
BH6	21/03/14	AC	50	8.77	4.00	30ltr	N	981	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	18.9	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	8.77	4.59	30ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	16.7	1	1	0.6	Overcast	12
	04/04/14	AC	50	8.77	4.45		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	8.3	1	1	-	Overcast	10
	11/04/14	AC	50	8.77	3.74		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	10.0	1	1	-	Overcast	13
	17/04/14	AC	50	8.77	3.87		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	13.2	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	8.77	4.28		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	15.6	1	1	0.3	Overcast	11
BH7	21/03/14	AC	50	4.36	1.32	19ltr	N	982	Falling	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.9	1	1	-	Sunny Becoming Cloudy	10
	28/03/14	AC	50	4.36	1.16	19ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Water level above Gas Tap	12
	04/04/14	AC	50	4.36	0.74		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Water level above Gas Tap	10
	11/04/14	AC	50	4.36	0.76		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Water level above Gas Tap	13
	17/04/14	AC	50	4.36	1.64		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	4.36	1.67		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	19.6	1	1	-	Water level above Gas Tap	11
GWW1	28/03/14	AC	50	25.64	13.78	72ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.6	0.0006	19.6	1	1	0.1	Overcast	12
	04/04/14	AC	50	25.64	14.32		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.6	0.0006	19.6	1	1	-	Overcast	10
	11/04/14	AC	50	25.64	14.35		N	987	Rising	0.01	0.1	0.1	0.1	0.0001	0.4	0.0004	20.0	1	1	-	Overcast	13
	17/04/14	AC	50	25.64	13.76		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.3	0.0003	20.0	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	25.64	13.83		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.3	0.0003	19.9	1	1	0.1	Overcast	11
G1	28/03/14	AC	19	N/A	N/A		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	19.6	1	1	0.1	Unable to remove Gas Tap	12
	04/04/14	AC	19	N/A	N/A		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	19.6	1	1	-	Unable to remove Gas Tap	10
	11/04/14	AC	19	N/A	N/A		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Unable to remove Gas Tap	13
	17/04/14	AC	19	N/A	N/A		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Unable to remove Gas Tap	12
	25/04/14	AC	19	N/A	N/A		N	996	Steady	0.01	0.1	0.1	Unable to sample, sucking up water								Unable to remove Gas Tap	11
GW2	28/03/14	AC	50	23.27	16.05	44ltr	Y	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	19.7	1	1	0.1	Overcast	12
	04/04/14	AC	50	23.27	16.47		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	19.7	1	1	-	Overcast	10
	11/04/14	AC	50	23.27	16.54		N	986	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	1	1	-	Overcast	13
	17/04/14	AC	50	23.27	16.07		N	1002	Rising	0.01	0.1	0.1	0.1	0.0001	0.1	0.0001	20.1	1	1	-	Overcast/Windy	12
	25/04/14	AC	50	23.27	16.31		N	986	Steady	0.01	0.1	0.1	0.1	0.0001	0.2	0.0002	19.8	1	1	0.1	Overcast	11

Existing Boreholes

NOTES:
NM = Not Measured.
(x) = Peak value recorded.
[grey] = Below detection limit.

GSV (l/HR) = [gas concentration (%v/v)] x [gas well flow rate (l/hr)] / 100

APPENDIX F

Laboratory Chemical Test Results

Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 31 March 2014

1970 - Sita, Darwen

Chemtest
The right chemistry to deliver results

Report Date
22 April 2014

Login Batch No					254686					
Chemtest LIMS ID					AK01962	AK01963	AK01964	AK01965	AK01966	AK01967
Sample ID					WS1	BH1	BH2	BH3	BH4	BH5-B
Sample No										
Sampling Date					28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014
Depth										
Matrix					*WATER*	*WATER*	*WATER*	*WATER*	*WATER*	*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
1010	pH	PH		U	7.9	7.2	7.4	7.5	8.1	7.5
1020	Electrical Conductivity	EC	µS cm-¹	U	760	940	1900	1000	340	1800
1300	Cyanide (total)	57125	mg l-¹	U	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Thiocyanate	302045	mg l-¹	U	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1180	Sulfur	7704349	mg l-¹	N	87	33	210	73	18	170
1220	Chloride	16887006	mg l-¹	U	12	130	200	70	9.3	180
	Ammonia (free)	7664417	mg l-¹	U	0.03	< 0.01	< 0.01	0.06	< 0.01	< 0.01
	Nitrate as N	14797558	mg l-¹	U		<0.20				<0.20
1325	Sulfide	18496258	mg l-¹	U	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1415	Magnesium	7439954	mg l-¹	U		17				37
1220	Sulfate	14808798	mg l-¹	U	260	99	640	220	55	510
1450	Arsenic	7440382	µg l-¹	U	3.2	<1.0	2.2	1.5	<1.0	2.6
	Cadmium	7440439	µg l-¹	U	<0.080	2.2	2.1	0.10	<0.080	<0.080
	Chromium	7440473	µg l-¹	U	2.2	<1.0	<1.0	<1.0	<1.0	<1.0
	Copper	7440508	µg l-¹	U	1.5	5.5	3.4	3.0	6.4	4.9
	Mercury	7439976	µg l-¹	U	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Nickel	7440020	µg l-¹	U	<1.0	6.5	1.9	<1.0	<1.0	<1.0
	Lead	7439921	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Selenium	7782492	µg l-¹	U	2.9	1.5	4.4	2.9	3.9	6.4
	Vanadium	7440622	µg l-¹	U	1.4	<1.0	<1.0	<1.0	<1.0	<1.0
	Zinc	7440666	µg l-¹	U	6.2	95	28	11	3.1	19
1675	TPH aliphatic >C5-C6		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C6-C8		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C8-C10		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1

¹The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 31/03/2014 and 22/04/2014

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 31 March 2014

1970 - Sita, Darwen

Chemtest
The right chemistry to deliver results

Report Date
22 April 2014

Login Batch No					**254686**			
Chemtest LIMS ID					AK01968	AK01969	AK01970	AK01971
Sample ID					BH6	WS2	GWW1	GW2
Sample No								
Sampling Date					28/3/2014	28/3/2014	28/3/2014	28/3/2014
Depth								
Matrix					*WATER*	*WATER*	*WATER*	*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
1010	pH	PH		U	8.6	8.5	7.5	7.6
1020	Electrical Conductivity	EC	µS cm-¹	U	810	470	640	940
1300	Cyanide (total)	57125	mg l-¹	U	<0.050	<0.050	<0.050	<0.050
	Thiocyanate	302045	mg l-¹	U	<0.50	<0.50	<0.50	<0.50
1180	Sulfur	7704349	mg l-¹	N	90	24	26	1.4
1220	Chloride	16887006	mg l-¹	U	18	13	120	52
	Ammonia (free)	7664417	mg l-¹	U	0.17	0.10	0.02	0.04
	Nitrate as N	14797558	mg l-¹	U		0.81		
1325	Sulfide	18496258	mg l-¹	U	<0.050	<0.050	<0.050	<0.050
1415	Magnesium	7439954	mg l-¹	U		15		
1220	Sulfate	14808798	mg l-¹	U	270	71	78	4.2
1450	Arsenic	7440382	µg l-¹	U	4.3	3.0	<1.0	<1.0
	Cadmium	7440439	µg l-¹	U	<0.080	<0.080	0.30	<0.080
	Chromium	7440473	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	Copper	7440508	µg l-¹	U	2.1	11	6.4	<1.0
	Mercury	7439976	µg l-¹	U	<0.50	<0.50	<0.50	<0.50
	Nickel	7440020	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	Lead	7439921	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	Selenium	7782492	µg l-¹	U	5.5	5.1	<1.0	4.3
	Vanadium	7440622	µg l-¹	U	4.2	1.0	<1.0	<1.0
	Zinc	7440666	µg l-¹	U	9.1	4.4	63	6.1
1675	TPH aliphatic >C5-C6		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 [1]
	TPH aliphatic >C6-C8		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 [1]
	TPH aliphatic >C8-C10		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 [1]

[1]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 31 March 2014

1970 - Sita, Darwen

Chemtest
The right chemistry to deliver results

Report Date
22 April 2014

					254686					
					AK01962	AK01963	AK01964	AK01965	AK01966	AK01967
					WS1	BH1	BH2	BH3	BH4	BH5-B
					28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014
					WATER	*WATER*	*WATER*	*WATER*	*WATER*	*WATER*
1675	TPH aliphatic >C10-C12		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C12-C16		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C16-C21		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C21-C35		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aliphatic >C35-C44		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C5-C7		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C7-C8		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C8-C10		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C10-C12		µg l-¹	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C12-C16		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C16-C21		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C21-C35		µg l-¹	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	TPH aromatic >C35-C44		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 ¹	< 0.1
	Total Petroleum Hydrocarbons		µg l-¹	N	< 10	< 10	< 10	< 10	< 10 ¹	< 10
	Total Aliphatic Hydrocarbons		µg l-¹	N	< 5	< 5	< 5	< 5	< 5 ¹	< 5
	Total Aromatic Hydrocarbons		µg l-¹	N	< 5	< 5	< 5	< 5	< 5 ¹	< 5
1700	Naphthalene	91203	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Acenaphthylene	208968	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Acenaphthene	83329	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Fluorene	86737	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Phenanthrene	85018	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Anthracene	120127	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Fluoranthene	206440	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Pyrene	129000	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Benzo[a]anthracene	56553	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1

¹The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 31/03/2014 and 22/04/2014

* Accreditation status

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Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 31 March 2014

1970 - Sita, Darwen

Chemtest
The right chemistry to deliver results

Report Date
22 April 2014

					254686			
					AK01968	AK01969	AK01970	AK01971
					BH6	WS2	GWW1	GW2
					28/3/2014	28/3/2014	28/3/2014	28/3/2014
					WATER	*WATER*	*WATER*	*WATER*
1675	TPH aliphatic >C10-C12		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aliphatic >C12-C16		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aliphatic >C16-C21		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aliphatic >C21-C35		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aliphatic >C35-C44		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C5-C7		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C7-C8		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C8-C10		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C10-C12		µg l-¹	M	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C12-C16		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C16-C21		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C21-C35		µg l-¹	M	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	TPH aromatic >C35-C44		µg l-¹	N	< 0.1	< 0.1	< 0.1	< 0.1 ¹
	Total Petroleum Hydrocarbons		µg l-¹	N	< 10	< 10	< 10	< 10 ¹
	Total Aliphatic Hydrocarbons		µg l-¹	N	< 5	< 5	< 5	< 5 ¹
	Total Aromatic Hydrocarbons		µg l-¹	N	< 5	< 5	< 5	< 5 ¹
1700	Naphthalene	91203	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Acenaphthylene	208968	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Acenaphthene	83329	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Fluorene	86737	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Phenanthrene	85018	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Anthracene	120127	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Fluoranthene	206440	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Pyrene	129000	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Benzo[a]anthracene	56553	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹

¹The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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Sutton, St. Helens
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LABORATORY TEST REPORT

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1970 - Sita, Darwen

Chemtest
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Report Date
22 April 2014

					254686					
					AK01962	AK01963	AK01964	AK01965	AK01966	AK01967
					WS1	BH1	BH2	BH3	BH4	BH5-B
					28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014	28/3/2014
					WATER	*WATER*	*WATER*	*WATER*	*WATER*	*WATER*
1700	Chrysene	218019	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Benzo[b]fluoranthene	205992	µg l-¹	N	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Benzo[k]fluoranthene	207089	µg l-¹	N	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Benzo[a]pyrene	50328	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Dibenzo[a,h]anthracene	53703	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Indeno[1,2,3-cd]pyrene	193395	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Benzo[g,h,i]perylene	191242	µg l-¹	U	<0.1	<0.1	<0.1	<0.1	<0.1 ¹	<0.1
	Total (of 16) PAHs		µg l-¹	U	<2	<2	<2	<2	<2 ¹	<2
1760	Benzene	71432	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Toluene	108883	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Ethylbenzene	100414	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	m- & p-Xylene	1330207	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	o-Xylene	95476	µg l-¹	U	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1920	Phenols (total)		mg l-¹	U	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03 ¹	< 0.03

¹The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 31/03/2014 and 22/04/2014

* Accreditation status

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Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 31 March 2014

1970 - Sita, Darwen

Chemtest
The right chemistry to deliver results

Report Date
22 April 2014

					254686			
					AK01968	AK01969	AK01970	AK01971
					BH6	WS2	GWW1	GW2
					28/3/2014	28/3/2014	28/3/2014	28/3/2014
					WATER	*WATER*	*WATER*	*WATER*
1700	Chrysene	218019	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Benzo[b]fluoranthene	205992	µg l-¹	N	<0.1	<0.1	<0.1	<0.1 ¹
	Benzo[k]fluoranthene	207089	µg l-¹	N	<0.1	<0.1	<0.1	<0.1 ¹
	Benzo[a]pyrene	50328	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Dibenzo[a,h]anthracene	53703	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Indeno[1,2,3-cd]pyrene	193395	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Benzo[g,h,i]perylene	191242	µg l-¹	U	<0.1	<0.1	<0.1	<0.1 ¹
	Total (of 16) PAHs		µg l-¹	U	<2	<2	<2	<2 ¹
1760	Benzene	71432	µg l-¹	U	<1.0	<1.0	<1.0	220
	Toluene	108883	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	Ethylbenzene	100414	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	m- & p-Xylene	1330207	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
	o-Xylene	95476	µg l-¹	U	<1.0	<1.0	<1.0	<1.0
1920	Phenols (total)		mg l-¹	U	< 0.03	< 0.03	< 0.03	< 0.03 ¹

¹The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles/Graham Boultbee

LABORATORY TEST REPORT

Results of analysis of 3 samples received 10 March 2014

SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
01 April 2014

Login Batch No					253001		
Chemtest LIMS ID					AJ99241	AJ99242	AJ99243
Sample ID					WS2	WS4	WS5
Sample No							
Sampling Date					5/3/2014	5/3/2014	5/3/2014
Depth					1.60m	0.70m	1.50m
Matrix					*LEACHATE*	*LEACHATE*	*LEACHATE*
SOP↓	Determinand↓	CAS No↓	Units↓	*			
1010	pH	PH		U	8.9	8.9	9.1
1020	Electrical Conductivity	EC	µS cm-¹	U	170	170	110
1300	Thiocyanate	302045	mg l-¹	U	<0.50	<0.50	<0.50
1220	Chloride	16887006	mg l-¹	U	<1.0	<1.0	<1.0
	Fluoride	16984488	mg l-¹	U	0.17	1.6	1.4
	Nitrate	14797558	mg l-¹	U	<0.50	3.7	<0.50
1610	Total Organic Carbon	TOC	mg l-¹	N	59	9.4	24
1220	Sulfate	14808798	mg l-¹	U	26	33	15
1920	Phenols (total)		mg l-¹	N	< 0.03	< 0.03	< 0.03

All tests undertaken between 10/03/2014 and 01/04/2014

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Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles/Graham Boultbee

LABORATORY TEST REPORT

Results of analysis of 44 samples
received 10 March 2014

SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
01 April 2014

Login Batch No					253001					
Chemtest LIMS ID					AJ92582	AJ92583	AJ92584	AJ92585	AJ92586	AJ92587
Sample ID					TP1	TP1	TP1	TP2	TP2	TP3
Sample No										
Sampling Date					4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014
Depth					0.50m	1.40m	2.80m	0.30m	1.00m	0.50m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	8.8	8.0	7.7	9.3	7.1	9.6
2180	Sulfur (elemental)	7704349	mg kg-¹	M	15.0	1100.0	2.9	25.0	2.6	2.9
2300	Cyanide (total)	57125	mg kg-¹	M	0.60	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-¹	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M	3.0	27	1.6	13	3.2	4.0
2220	Chloride (extractable)	16887006	g l-¹	M	<0.010	<0.010	<0.010	<0.010	0.023	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	0.088	0.064	<0.01	0.054	0.21	0.11
2450	Arsenic	7440382	mg kg-¹	M	74	15	19	39	14	43
	Cadmium	7440439	mg kg-¹	M	4.2	0.49	<0.10	2.2	0.21	4.0
	Chromium	7440473	mg kg-¹	M	19	15	<5.0	15	39	18
	Copper	7440508	mg kg-¹	M	370	72	6.0	270	69	180
	Mercury	7439976	mg kg-¹	M	1.5	0.14	0.31	0.33	0.13	0.45
	Nickel	7440020	mg kg-¹	M	45	12	12	29	35	180
	Lead	7439921	mg kg-¹	M	560	82	5.8	170	45	220
	Selenium	7782492	mg kg-¹	M	0.75	<0.20	<0.20	<0.20	0.58	<0.20
	Vanadium	7440622	mg kg-¹	M	40	23	<5.0	27	38	66
	Zinc	7440666	mg kg-¹	M	1300	190	28	410	97	670
2670	Total Petroleum Hydrocarbons		mg kg-¹	M	350	< 10	< 10	< 10	< 10	
2675	TPH aliphatic >C5-C6		mg kg-¹	N						< 0.1
	TPH aliphatic >C6-C8		mg kg-¹	N						< 0.1
	TPH aliphatic >C8-C10		mg kg-¹	N						< 0.1
	TPH aliphatic >C10-C12		mg kg-¹	M						< 1
	TPH aliphatic >C12-C16		mg kg-¹	M						< 1
	TPH aliphatic >C16-C21		mg kg-¹	M						< 1

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FAO Chris Eccles/Graham Boultbee

LABORATORY TEST REPORT

Results of analysis of 44 samples
received 10 March 2014

SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
01 April 2014

Login Batch No					**253001**						
Chemtest LIMS ID					AJ92588	AJ92589	AJ92590	AJ92591	AJ92592	AJ92593
Sample ID					TP4	TP4	TP5	TP5	TP6	TP6
Sample No										
Sampling Date					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
Depth					0.40m	1.50m	1.00m	4.00m	0.50m	2.60m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	10.2	7.8	6.2	8.8	9.9	7.6
2180	Sulfur (elemental)	7704349	mg kg-1	M	3.9	3.8	< 1.0	< 1.0	17.0	4.3
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-1	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	6.1	2.5	4.1	2.7	15	71
2220	Chloride (extractable)	16887006	g l-1	M	<0.010	<0.010	<0.010	<0.010	0.016	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.088	0.068	0.15	0.067	0.40	<0.01
2450	Arsenic	7440382	mg kg-1	M	29	8.3	7.9	7.7	6.6	3.6
	Cadmium	7440439	mg kg-1	M	4.4	0.42	0.39	0.40	<0.10	0.27
	Chromium	7440473	mg kg-1	M	32	23	23	24	23	12
	Copper	7440508	mg kg-1	M	1600	73	66	70	25	8.9
	Mercury	7439976	mg kg-1	M	0.38	<0.10	<0.10	<0.10	<0.10	<0.10
	Nickel	7440020	mg kg-1	M	41	38	33	35	16	9.1
	Lead	7439921	mg kg-1	M	690	43	37	39	22	34
	Selenium	7782492	mg kg-1	M	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Vanadium	7440622	mg kg-1	M	46	20	21	22	16	13
	Zinc	7440666	mg kg-1	M	1400	100	98	100	44	200
2670	Total Petroleum Hydrocarbons		mg kg-1	M	< 10	< 10	< 10	< 10	240	
2675	TPH aliphatic >C5-C6		mg kg-1	N						< 0.1
	TPH aliphatic >C6-C8		mg kg-1	N						< 0.1
	TPH aliphatic >C8-C10		mg kg-1	N						< 0.1
	TPH aliphatic >C10-C12		mg kg-1	M						< 1
	TPH aliphatic >C12-C16		mg kg-1	M						< 1
	TPH aliphatic >C16-C21		mg kg-1	M						< 1

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
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Login Batch No					**253001**						
Chemtest LIMS ID					AJ92594	AJ92595	AJ92596	AJ92597	AJ92598	AJ92599
Sample ID					TP7	TP7	TP7	TP8	TP8	TP9
Sample No										
Sampling Date					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
Depth					0.20m	1.00m	3.00m	0.30m	1.00m	0.40m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	8.4	8.0	7.6	9.1	8.5	8.7
2180	Sulfur (elemental)	7704349	mg kg-1	M	1.4	7.6	< 1.0	61.0	16.0	20.0
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-1	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	3.4	15	47	51	9.9	18
2220	Chloride (extractable)	16887006	g l-1	M	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	<0.01	0.013	<0.01	0.04	<0.10	<0.010
2450	Arsenic	7440382	mg kg-1	M	4.4	3.7	3.9	9.9	12	7.2
	Cadmium	7440439	mg kg-1	M	0.49	0.36	0.24	0.49	0.92	0.65
	Chromium	7440473	mg kg-1	M	13	11	10	13	15	13
	Copper	7440508	mg kg-1	M	7.3	7.6	14	27	32	26
	Mercury	7439976	mg kg-1	M	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Nickel	7440020	mg kg-1	M	8.2	7.9	7.9	15	21	16
	Lead	7439921	mg kg-1	M	41	39	37	47	100	230
	Selenium	7782492	mg kg-1	M	<0.20	<0.20	0.33	<0.20	<0.20	<0.20
	Vanadium	7440622	mg kg-1	M	16	14	13	14	15	11
	Zinc	7440666	mg kg-1	M	260	240	200	150	250	180
2670	Total Petroleum Hydrocarbons		mg kg-1	M	50	< 10	< 10	33	< 10	< 10
2675	TPH aliphatic >C5-C6		mg kg-1	N						
	TPH aliphatic >C6-C8		mg kg-1	N						
	TPH aliphatic >C8-C10		mg kg-1	N						
	TPH aliphatic >C10-C12		mg kg-1	M						
	TPH aliphatic >C12-C16		mg kg-1	M						
	TPH aliphatic >C16-C21		mg kg-1	M						

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Login Batch No					**253001**						
Chemtest LIMS ID					AJ92600	AJ92601	AJ92602	AJ92603	AJ92604	AJ92605
Sample ID					TP9	TP10	TP10	TP12	TP13	TP14
Sample No										
Sampling Date					5/3/2014	5/3/2014	5/3/2014	6/3/2014	6/3/2014	6/3/2014
Depth					1.50m	0.50m	3.20m	0.70m	0.40m	0.80m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	8.3	8.6	8.9	10.9	10.0	8.5
2180	Sulfur (elemental)	7704349	mg kg-1	M	3.5	3.8	85.0	3.6	15.0	1.0
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-1	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	16	8.0	32	3.0	15	5.5
2220	Chloride (extractable)	16887006	g l-1	M	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.031	0.34	0.083	0.13	0.17	0.013
2450	Arsenic	7440382	mg kg-1	M	35	18	17	33	35	7.9
	Cadmium	7440439	mg kg-1	M	2.6	2.4	1.7	1.3	1.4	0.79
	Chromium	7440473	mg kg-1	M	62	35	27	9.4	12	25
	Copper	7440508	mg kg-1	M	270	260	220	150	230	180
	Mercury	7439976	mg kg-1	M	0.12	0.13	<0.10	0.12	0.30	0.15
	Nickel	7440020	mg kg-1	M	33	25	18	31	33	22
	Lead	7439921	mg kg-1	M	300	290	210	120	120	75
	Selenium	7782492	mg kg-1	M	0.39	<0.20	<0.20	<0.20	<0.20	<0.20
	Vanadium	7440622	mg kg-1	M	180	83	96	13	16	26
	Zinc	7440666	mg kg-1	M	980	730	510	200	210	340
2670	Total Petroleum Hydrocarbons		mg kg-1	M	< 10	44		< 10		
2675	TPH aliphatic >C5-C6		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aliphatic >C6-C8		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aliphatic >C8-C10		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aliphatic >C10-C12		mg kg-1	M			< 1		< 1	< 1
	TPH aliphatic >C12-C16		mg kg-1	M			< 1		< 1	< 1
	TPH aliphatic >C16-C21		mg kg-1	M			< 1		< 1	< 1

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Login Batch No					**253001**						
Chemtest LIMS ID					AJ92606	AJ92607	AJ92608	AJ92609	AJ92610	AJ92611
Sample ID					TP14	TP14	TP15	TP15	TP15	WS1
Sample No										
Sampling Date					6/3/2014	6/3/2014	6/3/2014	6/3/2014	6/3/2014	5/3/2014
Depth					1.30m	3.40m	0.90m	1.10m	2.70m	0.60m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	6.5	7.4	8.2	7.1	6.4	10.0
2180	Sulfur (elemental)	7704349	mg kg-1	M	< 1.0	1.2	1.6	< 1.0	< 1.0	3.2
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-1	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	3.5	3.1	3.0	1.6	1.9	5.6
2220	Chloride (extractable)	16887006	g l-1	M	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.023	0.036	0.067	0.015	<0.010	1.1
2450	Arsenic	7440382	mg kg-1	M	6.4	3.4	8.4	5.7	2.3	30
	Cadmium	7440439	mg kg-1	M	1.00	0.29	0.61	0.10	0.19	0.85
	Chromium	7440473	mg kg-1	M	24	36	24	34	39	26
	Copper	7440508	mg kg-1	M	48	47	170	52	47	240
	Mercury	7439976	mg kg-1	M	<0.10	<0.10	<0.10	<0.10	<0.10	0.20
	Nickel	7440020	mg kg-1	M	36	54	21	56	58	34
	Lead	7439921	mg kg-1	M	34	33	89	27	26	120
	Selenium	7782492	mg kg-1	M	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Vanadium	7440622	mg kg-1	M	19	23	21	21	25	32
	Zinc	7440666	mg kg-1	M	100	110	410	100	94	330
2670	Total Petroleum Hydrocarbons		mg kg-1	M	< 10	< 10		< 10	< 10	< 10
2675	TPH aliphatic >C5-C6		mg kg-1	N			< 0.1			
	TPH aliphatic >C6-C8		mg kg-1	N			< 0.1			
	TPH aliphatic >C8-C10		mg kg-1	N			< 0.1			
	TPH aliphatic >C10-C12		mg kg-1	M			< 1			
	TPH aliphatic >C12-C16		mg kg-1	M			< 1			
	TPH aliphatic >C16-C21		mg kg-1	M			< 1			

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Login Batch No					**253001**						
Chemtest LIMS ID					AJ92612	AJ92613	AJ92614	AJ92615	AJ92616	AJ92617
Sample ID					WS1	WS2	WS2	WS2	WS3	WS4
Sample No										
Sampling Date					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
Depth					1.50m	1.90m	1.60m	2.20m	0.50m	2.00m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	8.1	8.2	9.5	8.0	8.1	8.0
2180	Sulfur (elemental)	7704349	mg kg-1	M	48.0	73.0	2.1	< 1.0	< 1.0	4.5
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-1	M	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	15	34	5.2	7.8	3.1	4.5
2220	Chloride (extractable)	16887006	g l-1	M	0.011	<0.010	<0.010	0.020	<0.010	<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	<0.010	0.055	0.064	0.020	0.025	0.057
2450	Arsenic	7440382	mg kg-1	M	5.1	13	19	2.0	13	12
	Cadmium	7440439	mg kg-1	M	<0.10	0.70	1.1	<0.10	8.2	5.8
	Chromium	7440473	mg kg-1	M	20	17	42	6.1	27	25
	Copper	7440508	mg kg-1	M	23	170	280	13	150	180
	Mercury	7439976	mg kg-1	M	<0.10	<0.10	0.10	<0.10	<0.10	<0.10
	Nickel	7440020	mg kg-1	M	9.3	15	24	5.4	30	29
	Lead	7439921	mg kg-1	M	32	580	1100	12	440	470
	Selenium	7782492	mg kg-1	M	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Vanadium	7440622	mg kg-1	M	23	22	89	<5.0	22	20
	Zinc	7440666	mg kg-1	M	31	170	300	22	850	770
2670	Total Petroleum Hydrocarbons		mg kg-1	M	< 10	12000	31000	< 10	< 10	< 10
2675	TPH aliphatic >C5-C6		mg kg-1	N			< 0.1			
	TPH aliphatic >C6-C8		mg kg-1	N			< 0.1			
	TPH aliphatic >C8-C10		mg kg-1	N			< 0.1			
	TPH aliphatic >C10-C12		mg kg-1	M			< 1			
	TPH aliphatic >C12-C16		mg kg-1	M			63			
	TPH aliphatic >C16-C21		mg kg-1	M			3200			

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Login Batch No					**253001**				
Chemtest LIMS ID					AJ92618	AJ92619	AJ92620	AJ92621	AJ92622
Sample ID					WS4	WS5	BH1	BH1	BH1
Sample No									
Sampling Date					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
Depth					0.70m	1.50m	1.00m	3.50m	5.50m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*					
2010	pH			M	8.7	8.7	8.4	8.2	5.9
2180	Sulfur (elemental)	7704349	mg kg-¹	M	15.0	21.0	2.3	290.0	13.0
2300	Cyanide (total)	57125	mg kg-¹	M	0.70	0.50	<0.50	<0.50	<0.50
	Thiocyanate	302045	mg kg-¹	M	<5.0	<5.0	<5.0	<5.0	<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M	8.8	5.8	5.5	19	3.3
2220	Chloride (extractable)	16887006	g l-¹	M	<0.010	<0.010	0.019	0.016	0.020
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	0.072	0.064	0.048	0.058	0.046
2450	Arsenic	7440382	mg kg-¹	M	71	140	85	7.7	7.3
	Cadmium	7440439	mg kg-¹	M	5.6	8.0	3.4	0.44	0.68
	Chromium	7440473	mg kg-¹	M	27	30	38	23	27
	Copper	7440508	mg kg-¹	M	160	350	190	33	33
	Mercury	7439976	mg kg-¹	M	0.30	0.50	0.35	<0.10	<0.10
	Nickel	7440020	mg kg-¹	M	47	120	92	22	39
	Lead	7439921	mg kg-¹	M	760	1200	450	42	30
	Selenium	7782492	mg kg-¹	M	0.48	0.26	0.56	<0.20	0.23
	Vanadium	7440622	mg kg-¹	M	49	84	96	23	21
	Zinc	7440666	mg kg-¹	M	1800	2100	910	150	100
2670	Total Petroleum Hydrocarbons		mg kg-¹	M	< 10	61		< 10	< 10
2675	TPH aliphatic >C5-C6		mg kg-¹	N			< 0.1		
	TPH aliphatic >C6-C8		mg kg-¹	N			< 0.1		
	TPH aliphatic >C8-C10		mg kg-¹	N			< 0.1		
	TPH aliphatic >C10-C12		mg kg-¹	M			< 1		
	TPH aliphatic >C12-C16		mg kg-¹	M			< 1		
	TPH aliphatic >C16-C21		mg kg-¹	M			< 1		

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					253001					
					AJ92582	AJ92583	AJ92584	AJ92585	AJ92586	AJ92587
					TP1	TP1	TP1	TP2	TP2	TP3
					4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014
					0.50m	1.40m	2.80m	0.30m	1.00m	0.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-1	M						< 1
	TPH aliphatic >C35-C44		mg kg-1	N						< 1
	TPH aromatic >C5-C7		mg kg-1	N						< 0.1
	TPH aromatic >C7-C8		mg kg-1	N						< 0.1
	TPH aromatic >C8-C10		mg kg-1	N						< 0.1
	TPH aromatic >C10-C12		mg kg-1	N						< 1
	TPH aromatic >C12-C16		mg kg-1	M						< 1
	TPH aromatic >C16-C21		mg kg-1	M						2.6
	TPH aromatic >C21-C35		mg kg-1	N						1.8
	TPH aromatic >C35-C44		mg kg-1	N						< 1
	Total Petroleum Hydrocarbons		mg kg-1	N						< 10
2700	Naphthalene	91203	mg kg-1	M						< 0.1
	Acenaphthylene	208968	mg kg-1	M						0.12
	Acenaphthene	83329	mg kg-1	M						0.13
	Fluorene	86737	mg kg-1	M						< 0.1
	Phenanthrene	85018	mg kg-1	M						0.31
	Anthracene	120127	mg kg-1	M						0.14
	Fluoranthene	206440	mg kg-1	M						0.71
	Pyrene	129000	mg kg-1	M						0.77
	Benzo[a]anthracene	56553	mg kg-1	M						0.33
	Chrysene	218019	mg kg-1	M						0.37
	Benzo[b]fluoranthene	205992	mg kg-1	N						0.46
	Benzo[k]fluoranthene	207089	mg kg-1	N						0.27
	Benzo[a]pyrene	50328	mg kg-1	M						0.33
	Dibenzo[a,h]anthracene	53703	mg kg-1	M						< 0.1

All tests undertaken between 10/03/2014 and 01/04/2014

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					253001					
					AJ92588	AJ92589	AJ92590	AJ92591	AJ92592	AJ92593
					TP4	TP4	TP5	TP5	TP6	TP6
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.40m	1.50m	1.00m	4.00m	0.50m	2.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-¹	M						< 1
	TPH aliphatic >C35-C44		mg kg-¹	N						< 1
	TPH aromatic >C5-C7		mg kg-¹	N						< 0.1
	TPH aromatic >C7-C8		mg kg-¹	N						< 0.1
	TPH aromatic >C8-C10		mg kg-¹	N						< 0.1
	TPH aromatic >C10-C12		mg kg-¹	N						< 1
	TPH aromatic >C12-C16		mg kg-¹	M						< 1
	TPH aromatic >C16-C21		mg kg-¹	M						< 1
	TPH aromatic >C21-C35		mg kg-¹	N						< 1
	TPH aromatic >C35-C44		mg kg-¹	N						< 1
	Total Petroleum Hydrocarbons		mg kg-¹	N						< 10
2700	Naphthalene	91203	mg kg-¹	M						< 0.1
	Acenaphthylene	208968	mg kg-¹	M						< 0.1
	Acenaphthene	83329	mg kg-¹	M						< 0.1
	Fluorene	86737	mg kg-¹	M						< 0.1
	Phenanthrene	85018	mg kg-¹	M						< 0.1
	Anthracene	120127	mg kg-¹	M						< 0.1
	Fluoranthene	206440	mg kg-¹	M						< 0.1
	Pyrene	129000	mg kg-¹	M						< 0.1
	Benzo[a]anthracene	56553	mg kg-¹	M						< 0.1
	Chrysene	218019	mg kg-¹	M						< 0.1
	Benzo[b]fluoranthene	205992	mg kg-¹	N						< 0.1
	Benzo[k]fluoranthene	207089	mg kg-¹	N						< 0.1
	Benzo[a]pyrene	50328	mg kg-¹	M						< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M						< 0.1

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					253001					
					AJ92594	AJ92595	AJ92596	AJ92597	AJ92598	AJ92599
					TP7	TP7	TP7	TP8	TP8	TP9
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.20m	1.00m	3.00m	0.30m	1.00m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-1	M						
	TPH aliphatic >C35-C44		mg kg-1	N						
	TPH aromatic >C5-C7		mg kg-1	N						
	TPH aromatic >C7-C8		mg kg-1	N						
	TPH aromatic >C8-C10		mg kg-1	N						
	TPH aromatic >C10-C12		mg kg-1	N						
	TPH aromatic >C12-C16		mg kg-1	M						
	TPH aromatic >C16-C21		mg kg-1	M						
	TPH aromatic >C21-C35		mg kg-1	N						
	TPH aromatic >C35-C44		mg kg-1	N						
	Total Petroleum Hydrocarbons		mg kg-1	N						
2700	Naphthalene	91203	mg kg-1	M						
	Acenaphthylene	208968	mg kg-1	M						
	Acenaphthene	83329	mg kg-1	M						
	Fluorene	86737	mg kg-1	M						
	Phenanthrene	85018	mg kg-1	M						
	Anthracene	120127	mg kg-1	M						
	Fluoranthene	206440	mg kg-1	M						
	Pyrene	129000	mg kg-1	M						
	Benzo[a]anthracene	56553	mg kg-1	M						
	Chrysene	218019	mg kg-1	M						
	Benzo[b]fluoranthene	205992	mg kg-1	N						
	Benzo[k]fluoranthene	207089	mg kg-1	N						
	Benzo[a]pyrene	50328	mg kg-1	M						
	Dibenzo[a,h]anthracene	53703	mg kg-1	M						

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					253001					
					AJ92600	AJ92601	AJ92602	AJ92603	AJ92604	AJ92605
					TP9	TP10	TP10	TP12	TP13	TP14
					5/3/2014	5/3/2014	5/3/2014	6/3/2014	6/3/2014	6/3/2014
					1.50m	0.50m	3.20m	0.70m	0.40m	0.80m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-1	M			< 1		< 1	< 1
	TPH aliphatic >C35-C44		mg kg-1	N			< 1		< 1	< 1
	TPH aromatic >C5-C7		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aromatic >C7-C8		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aromatic >C8-C10		mg kg-1	N			< 0.1		< 0.1	< 0.1
	TPH aromatic >C10-C12		mg kg-1	N			< 1		< 1	< 1
	TPH aromatic >C12-C16		mg kg-1	M			< 1		< 1	< 1
	TPH aromatic >C16-C21		mg kg-1	M			< 1		3.0	< 1
	TPH aromatic >C21-C35		mg kg-1	N			< 1		7.0	< 1
	TPH aromatic >C35-C44		mg kg-1	N			< 1		< 1	< 1
	Total Petroleum Hydrocarbons		mg kg-1	N			< 10		11	< 10
2700	Naphthalene	91203	mg kg-1	M			< 0.1		1.5	< 0.1
	Acenaphthylene	208968	mg kg-1	M			< 0.1		0.15	< 0.1
	Acenaphthene	83329	mg kg-1	M			< 0.1		0.11	< 0.1
	Fluorene	86737	mg kg-1	M			< 0.1		0.28	< 0.1
	Phenanthrene	85018	mg kg-1	M			< 0.1		1.9	< 0.1
	Anthracene	120127	mg kg-1	M			< 0.1		0.45	< 0.1
	Fluoranthene	206440	mg kg-1	M			0.37		3	0.23
	Pyrene	129000	mg kg-1	M			0.91		2.9	0.3
	Benzo[a]anthracene	56553	mg kg-1	M			< 0.1		1.6	< 0.1
	Chrysene	218019	mg kg-1	M			< 0.1		1.7	< 0.1
	Benzo[b]fluoranthene	205992	mg kg-1	N			< 0.1		2.2	< 0.1
	Benzo[k]fluoranthene	207089	mg kg-1	N			< 0.1		1.9	< 0.1
	Benzo[a]pyrene	50328	mg kg-1	M			< 0.1		1.4	< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-1	M			< 0.1		0.13	< 0.1

* Accreditation status

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					253001					
					AJ92606	AJ92607	AJ92608	AJ92609	AJ92610	AJ92611
					TP14	TP14	TP15	TP15	TP15	WS1
					6/3/2014	6/3/2014	6/3/2014	6/3/2014	6/3/2014	5/3/2014
					1.30m	3.40m	0.90m	1.10m	2.70m	0.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-1	M			< 1			
	TPH aliphatic >C35-C44		mg kg-1	N			< 1			
	TPH aromatic >C5-C7		mg kg-1	N			< 0.1			
	TPH aromatic >C7-C8		mg kg-1	N			< 0.1			
	TPH aromatic >C8-C10		mg kg-1	N			< 0.1			
	TPH aromatic >C10-C12		mg kg-1	N			< 1			
	TPH aromatic >C12-C16		mg kg-1	M			< 1			
	TPH aromatic >C16-C21		mg kg-1	M			< 1			
	TPH aromatic >C21-C35		mg kg-1	N			< 1			
	TPH aromatic >C35-C44		mg kg-1	N			< 1			
	Total Petroleum Hydrocarbons		mg kg-1	N			< 10			
2700	Naphthalene	91203	mg kg-1	M			< 0.1			
	Acenaphthylene	208968	mg kg-1	M			< 0.1			
	Acenaphthene	83329	mg kg-1	M			< 0.1			
	Fluorene	86737	mg kg-1	M			< 0.1			
	Phenanthrene	85018	mg kg-1	M			< 0.1			
	Anthracene	120127	mg kg-1	M			< 0.1			
	Fluoranthene	206440	mg kg-1	M			0.4			
	Pyrene	129000	mg kg-1	M			0.43			
	Benzo[a]anthracene	56553	mg kg-1	M			< 0.1			
	Chrysene	218019	mg kg-1	M			< 0.1			
	Benzo[b]fluoranthene	205992	mg kg-1	N			< 0.1			
	Benzo[k]fluoranthene	207089	mg kg-1	N			< 0.1			
	Benzo[a]pyrene	50328	mg kg-1	M			< 0.1			
	Dibenzo[a,h]anthracene	53703	mg kg-1	M			< 0.1			

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					253001					
					AJ92612	AJ92613	AJ92614	AJ92615	AJ92616	AJ92617
					WS1	WS2	WS2	WS2	WS3	WS4
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					1.50m	1.90m	1.60m	2.20m	0.50m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-¹	M			12000			
	TPH aliphatic >C35-C44		mg kg-¹	N			330			
	TPH aromatic >C5-C7		mg kg-¹	N			< 0.1			
	TPH aromatic >C7-C8		mg kg-¹	N			< 0.1			
	TPH aromatic >C8-C10		mg kg-¹	N			< 0.1			
	TPH aromatic >C10-C12		mg kg-¹	N			< 1			
	TPH aromatic >C12-C16		mg kg-¹	M			18			
	TPH aromatic >C16-C21		mg kg-¹	M			700			
	TPH aromatic >C21-C35		mg kg-¹	N			4000			
	TPH aromatic >C35-C44		mg kg-¹	N			16			
	Total Petroleum Hydrocarbons		mg kg-¹	N			20000			
2700	Naphthalene	91203	mg kg-¹	M						
	Acenaphthylene	208968	mg kg-¹	M						
	Acenaphthene	83329	mg kg-¹	M						
	Fluorene	86737	mg kg-¹	M						
	Phenanthrene	85018	mg kg-¹	M						
	Anthracene	120127	mg kg-¹	M						
	Fluoranthene	206440	mg kg-¹	M						
	Pyrene	129000	mg kg-¹	M						
	Benzo[a]anthracene	56553	mg kg-¹	M						
	Chrysene	218019	mg kg-¹	M						
	Benzo[b]fluoranthene	205992	mg kg-¹	N						
	Benzo[k]fluoranthene	207089	mg kg-¹	N						
	Benzo[a]pyrene	50328	mg kg-¹	M						
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M						

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					253001				
					AJ92618	AJ92619	AJ92620	AJ92621	AJ92622
					WS4	WS5	BH1	BH1	BH1
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.70m	1.50m	1.00m	3.50m	5.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C21-C35		mg kg-1	M			< 1		
	TPH aliphatic >C35-C44		mg kg-1	N			< 1		
	TPH aromatic >C5-C7		mg kg-1	N			< 0.1		
	TPH aromatic >C7-C8		mg kg-1	N			< 0.1		
	TPH aromatic >C8-C10		mg kg-1	N			< 0.1		
	TPH aromatic >C10-C12		mg kg-1	N			< 1		
	TPH aromatic >C12-C16		mg kg-1	M			1.5		
	TPH aromatic >C16-C21		mg kg-1	M			4.0		
	TPH aromatic >C21-C35		mg kg-1	N			8.4		
	TPH aromatic >C35-C44		mg kg-1	N			< 1		
	Total Petroleum Hydrocarbons		mg kg-1	N			14		
2700	Naphthalene	91203	mg kg-1	M			0.35		
	Acenaphthylene	208968	mg kg-1	M			0.42		
	Acenaphthene	83329	mg kg-1	M			0.33		
	Fluorene	86737	mg kg-1	M			0.6		
	Phenanthrene	85018	mg kg-1	M			1		
	Anthracene	120127	mg kg-1	M			0.55		
	Fluoranthene	206440	mg kg-1	M			1.5		
	Pyrene	129000	mg kg-1	M			1.5		
	Benzo[a]anthracene	56553	mg kg-1	M			0.83		
	Chrysene	218019	mg kg-1	M			0.87		
	Benzo[b]fluoranthene	205992	mg kg-1	N			1.2		
	Benzo[k]fluoranthene	207089	mg kg-1	N			0.86		
	Benzo[a]pyrene	50328	mg kg-1	M			0.99		
	Dibenzo[a,h]anthracene	53703	mg kg-1	M			< 0.1		

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					253001					
					AJ92582	AJ92583	AJ92584	AJ92585	AJ92586	AJ92587
					TP1	TP1	TP1	TP2	TP2	TP3
					4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014
					0.50m	1.40m	2.80m	0.30m	1.00m	0.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg⁻¹	M						0.24
	Benzo[g,h,i]perylene	191242	mg kg⁻¹	M						0.32
	Total (of 16) PAHs		mg kg⁻¹	M						4.5
2760	Methyl tert-butylether	1634044	µg kg⁻¹	M						
	Dichlorodifluoromethane	75718	µg kg⁻¹	U						
	Chloromethane	74873	µg kg⁻¹	M						
	Vinyl chloride	75014	µg kg⁻¹	M						
	Bromomethane	74839	µg kg⁻¹	M						
	Chloroethane	75003	µg kg⁻¹	U						
	Trichlorofluoromethane	75694	µg kg⁻¹	M						
	1,1-Dichloroethene	75354	µg kg⁻¹	M						
	Dichloromethane	75092	µg kg⁻¹	N						
	trans-1,2-Dichloroethene	156605	µg kg⁻¹	M						
	1,1-Dichloroethane	75343	µg kg⁻¹	M						
	cis-1,2-Dichloroethene	156592	µg kg⁻¹	M						
	Bromochloromethane	74975	µg kg⁻¹	U						
	Trichloromethane	67663	µg kg⁻¹	M						
	1,1,1-Trichloroethane	71556	µg kg⁻¹	M						
	Tetrachloromethane	56235	µg kg⁻¹	M						
	1,1-Dichloropropene	563586	µg kg⁻¹	U						
	Benzene	71432	µg kg⁻¹	M						< 1.0
	1,2-Dichloroethane	107062	µg kg⁻¹	M						
	Trichloroethene	79016	µg kg⁻¹	U						
	1,2-Dichloropropane	78875	µg kg⁻¹	M						
	Dibromomethane	74953	µg kg⁻¹	M						

All tests undertaken between 10/03/2014 and 01/04/2014

* Accreditation status

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					253001					
					AJ92588	AJ92589	AJ92590	AJ92591	AJ92592	AJ92593
					TP4	TP4	TP5	TP5	TP6	TP6
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.40m	1.50m	1.00m	4.00m	0.50m	2.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M						< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M						< 0.1
	Total (of 16) PAHs		mg kg-¹	M						< 2
2760	Methyl tert-butylether	1634044	µg kg-¹	M						< 1.0
	Dichlorodifluoromethane	75718	µg kg-¹	U						< 1.0
	Chloromethane	74873	µg kg-¹	M						< 1.0
	Vinyl chloride	75014	µg kg-¹	M						< 1.0
	Bromomethane	74839	µg kg-¹	M						< 20
	Chloroethane	75003	µg kg-¹	U						< 2.0
	Trichlorofluoromethane	75694	µg kg-¹	M						< 1.0
	1,1-Dichloroethene	75354	µg kg-¹	M						< 1.0
	Dichloromethane	75092	µg kg-¹	N						<1.0
	trans-1,2-Dichloroethene	156605	µg kg-¹	M						< 1.0
	1,1-Dichloroethane	75343	µg kg-¹	M						< 1.0
	cis-1,2-Dichloroethene	156592	µg kg-¹	M						< 1.0
	Bromochloromethane	74975	µg kg-¹	U						< 1.0
	Trichloromethane	67663	µg kg-¹	M						< 1.0
	1,1,1-Trichloroethane	71556	µg kg-¹	M						< 1.0
	Tetrachloromethane	56235	µg kg-¹	M						< 1.0
	1,1-Dichloropropene	563586	µg kg-¹	U						< 1.0
	Benzene	71432	µg kg-¹	M						< 1.0
	1,2-Dichloroethane	107062	µg kg-¹	M						< 2.0
	Trichloroethene	79016	µg kg-¹	U						< 1.0
	1,2-Dichloropropane	78875	µg kg-¹	M						< 1.0
	Dibromomethane	74953	µg kg-¹	M						< 10

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					253001					
					AJ92594	AJ92595	AJ92596	AJ92597	AJ92598	AJ92599
					TP7	TP7	TP7	TP8	TP8	TP9
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.20m	1.00m	3.00m	0.30m	1.00m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M						
	Benzo[g,h,i]perylene	191242	mg kg-¹	M						
	Total (of 16) PAHs		mg kg-¹	M						
2760	Methyl tert-butylether	1634044	µg kg-¹	M						
	Dichlorodifluoromethane	75718	µg kg-¹	U						
	Chloromethane	74873	µg kg-¹	M						
	Vinyl chloride	75014	µg kg-¹	M						
	Bromomethane	74839	µg kg-¹	M						
	Chloroethane	75003	µg kg-¹	U						
	Trichlorofluoromethane	75694	µg kg-¹	M						
	1,1-Dichloroethene	75354	µg kg-¹	M						
	Dichloromethane	75092	µg kg-¹	N						
	trans-1,2-Dichloroethene	156605	µg kg-¹	M						
	1,1-Dichloroethane	75343	µg kg-¹	M						
	cis-1,2-Dichloroethene	156592	µg kg-¹	M						
	Bromochloromethane	74975	µg kg-¹	U						
	Trichloromethane	67663	µg kg-¹	M						
	1,1,1-Trichloroethane	71556	µg kg-¹	M						
	Tetrachloromethane	56235	µg kg-¹	M						
	1,1-Dichloropropene	563586	µg kg-¹	U						
	Benzene	71432	µg kg-¹	M						
	1,2-Dichloroethane	107062	µg kg-¹	M						
	Trichloroethene	79016	µg kg-¹	U						
	1,2-Dichloropropane	78875	µg kg-¹	M						
	Dibromomethane	74953	µg kg-¹	M						

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					253001					
					AJ92600	AJ92601	AJ92602	AJ92603	AJ92604	AJ92605
					TP9	TP10	TP10	TP12	TP13	TP14
					5/3/2014	5/3/2014	5/3/2014	6/3/2014	6/3/2014	6/3/2014
					1.50m	0.50m	3.20m	0.70m	0.40m	0.80m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M			< 0.1		1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M			< 0.1		1	< 0.1
	Total (of 16) PAHs		mg kg-¹	M			< 2		21	< 2
2760	Methyl tert-butylether	1634044	µg kg-¹	M						
	Dichlorodifluoromethane	75718	µg kg-¹	U						
	Chloromethane	74873	µg kg-¹	M						
	Vinyl chloride	75014	µg kg-¹	M						
	Bromomethane	74839	µg kg-¹	M						
	Chloroethane	75003	µg kg-¹	U						
	Trichlorofluoromethane	75694	µg kg-¹	M						
	1,1-Dichloroethene	75354	µg kg-¹	M						
	Dichloromethane	75092	µg kg-¹	N						
	trans-1,2-Dichloroethene	156605	µg kg-¹	M						
	1,1-Dichloroethane	75343	µg kg-¹	M						
	cis-1,2-Dichloroethene	156592	µg kg-¹	M						
	Bromochloromethane	74975	µg kg-¹	U						
	Trichloromethane	67663	µg kg-¹	M						
	1,1,1-Trichloroethane	71556	µg kg-¹	M						
	Tetrachloromethane	56235	µg kg-¹	M						
	1,1-Dichloropropene	563586	µg kg-¹	U						
	Benzene	71432	µg kg-¹	M			< 1.0		< 1.0	< 1.0
	1,2-Dichloroethane	107062	µg kg-¹	M						
	Trichloroethene	79016	µg kg-¹	U						
	1,2-Dichloropropane	78875	µg kg-¹	M						
	Dibromomethane	74953	µg kg-¹	M						

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					253001					
					AJ92606	AJ92607	AJ92608	AJ92609	AJ92610	AJ92611
					TP14	TP14	TP15	TP15	TP15	WS1
					6/3/2014	6/3/2014	6/3/2014	6/3/2014	6/3/2014	5/3/2014
					1.30m	3.40m	0.90m	1.10m	2.70m	0.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M			< 0.1			
	Benzo[g,h,i]perylene	191242	mg kg-¹	M			< 0.1			
	Total (of 16) PAHs		mg kg-¹	M			< 2			
2760	Methyl tert-butylether	1634044	µg kg-¹	M						
	Dichlorodifluoromethane	75718	µg kg-¹	U						
	Chloromethane	74873	µg kg-¹	M						
	Vinyl chloride	75014	µg kg-¹	M						
	Bromomethane	74839	µg kg-¹	M						
	Chloroethane	75003	µg kg-¹	U						
	Trichlorofluoromethane	75694	µg kg-¹	M						
	1,1-Dichloroethene	75354	µg kg-¹	M						
	Dichloromethane	75092	µg kg-¹	N						
	trans-1,2-Dichloroethene	156605	µg kg-¹	M						
	1,1-Dichloroethane	75343	µg kg-¹	M						
	cis-1,2-Dichloroethene	156592	µg kg-¹	M						
	Bromochloromethane	74975	µg kg-¹	U						
	Trichloromethane	67663	µg kg-¹	M						
	1,1,1-Trichloroethane	71556	µg kg-¹	M						
	Tetrachloromethane	56235	µg kg-¹	M						
	1,1-Dichloropropene	563586	µg kg-¹	U						
	Benzene	71432	µg kg-¹	M			< 1.0			
	1,2-Dichloroethane	107062	µg kg-¹	M						
	Trichloroethene	79016	µg kg-¹	U						
	1,2-Dichloropropane	78875	µg kg-¹	M						
	Dibromomethane	74953	µg kg-¹	M						

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					253001					
					AJ92612	AJ92613	AJ92614	AJ92615	AJ92616	AJ92617
					WS1	WS2	WS2	WS2	WS3	WS4
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					1.50m	1.90m	1.60m	2.20m	0.50m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M						
	Benzo[g,h,i]perylene	191242	mg kg-¹	M						
	Total (of 16) PAHs		mg kg-¹	M						
2760	Methyl tert-butylether	1634044	µg kg-¹	M						
	Dichlorodifluoromethane	75718	µg kg-¹	U						
	Chloromethane	74873	µg kg-¹	M						
	Vinyl chloride	75014	µg kg-¹	M						
	Bromomethane	74839	µg kg-¹	M						
	Chloroethane	75003	µg kg-¹	U						
	Trichlorofluoromethane	75694	µg kg-¹	M						
	1,1-Dichloroethene	75354	µg kg-¹	M						
	Dichloromethane	75092	µg kg-¹	N						
	trans-1,2-Dichloroethene	156605	µg kg-¹	M						
	1,1-Dichloroethane	75343	µg kg-¹	M						
	cis-1,2-Dichloroethene	156592	µg kg-¹	M						
	Bromochloromethane	74975	µg kg-¹	U						
	Trichloromethane	67663	µg kg-¹	M						
	1,1,1-Trichloroethane	71556	µg kg-¹	M						
	Tetrachloromethane	56235	µg kg-¹	M						
	1,1-Dichloropropene	563586	µg kg-¹	U						
	Benzene	71432	µg kg-¹	M						
	1,2-Dichloroethane	107062	µg kg-¹	M						
	Trichloroethene	79016	µg kg-¹	U						
	1,2-Dichloropropane	78875	µg kg-¹	M						
	Dibromomethane	74953	µg kg-¹	M						

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					253001				
					AJ92618	AJ92619	AJ92620	AJ92621	AJ92622
					WS4	WS5	BH1	BH1	BH1
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.70m	1.50m	1.00m	3.50m	5.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M			0.63		
	Benzo[g,h,i]perylene	191242	mg kg-¹	M			0.66		
	Total (of 16) PAHs		mg kg-¹	M			12		
2760	Methyl tert-butylether	1634044	µg kg-¹	M		< 1.0			
	Dichlorodifluoromethane	75718	µg kg-¹	U		< 1.0			
	Chloromethane	74873	µg kg-¹	M		< 1.0			
	Vinyl chloride	75014	µg kg-¹	M		< 1.0			
	Bromomethane	74839	µg kg-¹	M		< 20			
	Chloroethane	75003	µg kg-¹	U		< 2.0			
	Trichlorofluoromethane	75694	µg kg-¹	M		< 1.0			
	1,1-Dichloroethene	75354	µg kg-¹	M		< 1.0			
	Dichloromethane	75092	µg kg-¹	N		ne			
	trans-1,2-Dichloroethene	156605	µg kg-¹	M		< 1.0			
	1,1-Dichloroethane	75343	µg kg-¹	M		< 1.0			
	cis-1,2-Dichloroethene	156592	µg kg-¹	M		< 1.0			
	Bromochloromethane	74975	µg kg-¹	U		< 1.0			
	Trichloromethane	67663	µg kg-¹	M		< 1.0			
	1,1,1-Trichloroethane	71556	µg kg-¹	M		< 1.0			
	Tetrachloromethane	56235	µg kg-¹	M		< 1.0			
	1,1-Dichloropropene	563586	µg kg-¹	U		< 1.0			
	Benzene	71432	µg kg-¹	M		< 1.0	< 1.0		
	1,2-Dichloroethane	107062	µg kg-¹	M		< 2.0			
	Trichloroethene	79016	µg kg-¹	U		< 1.0			
	1,2-Dichloropropane	78875	µg kg-¹	M		< 1.0			
	Dibromomethane	74953	µg kg-¹	M		< 10			

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					253001					
					AJ92582	AJ92583	AJ92584	AJ92585	AJ92586	AJ92587
					TP1	TP1	TP1	TP2	TP2	TP3
					4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014
					0.50m	1.40m	2.80m	0.30m	1.00m	0.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg⁻¹	M						
	cis-1,3-Dichloropropene	10061015	µg kg⁻¹	N						
	Toluene	108883	µg kg⁻¹	M						< 1.0
	trans-1,3-Dichloropropene	10061026	µg kg⁻¹	N						
	1,1,2-Trichloroethane	79005	µg kg⁻¹	M						
	Tetrachloroethene	127184	µg kg⁻¹	M						
	1,3-Dichloropropane	142289	µg kg⁻¹	U						
	Dibromochloromethane	124481	µg kg⁻¹	U						
	1,2-Dibromoethane	106934	µg kg⁻¹	M						
	Chlorobenzene	108907	µg kg⁻¹	M						
	1,1,1,2-Tetrachloroethane	630206	µg kg⁻¹	M						
	Ethylbenzene	100414	µg kg⁻¹	M						< 1.0
	m- & p-Xylene	1330207	µg kg⁻¹	M						< 1.0
	o-Xylene	95476	µg kg⁻¹	M						< 1.0
	Styrene	100425	µg kg⁻¹	M						
	Tribromomethane	75252	µg kg⁻¹	U						
	Isopropylbenzene	98828	µg kg⁻¹	M						
	Bromobenzene	108861	µg kg⁻¹	M						
	1,2,3-Trichloropropane	96184	µg kg⁻¹	N						
	n-Propylbenzene	103651	µg kg⁻¹	U						
	2-Chlorotoluene	95498	µg kg⁻¹	M						
	1,2,4-Trimethylbenzene	95636	µg kg⁻¹	M						
	4-Chlorotoluene	106434	µg kg⁻¹	U						
	tert-Butylbenzene	98066	µg kg⁻¹	U						
	1,3,5-Trimethylbenzene	108678	µg kg⁻¹	M						

All tests undertaken between 10/03/2014 and 01/04/2014

* Accreditation status

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					253001					
					AJ92588	AJ92589	AJ92590	AJ92591	AJ92592	AJ92593
					TP4	TP4	TP5	TP5	TP6	TP6
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.40m	1.50m	1.00m	4.00m	0.50m	2.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M						< 5.0
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N						< 10
	Toluene	108883	µg kg-¹	M						< 1.0
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N						< 10
	1,1,2-Trichloroethane	79005	µg kg-¹	M						< 10
	Tetrachloroethene	127184	µg kg-¹	M						< 1.0
	1,3-Dichloropropane	142289	µg kg-¹	U						< 2.0
	Dibromochloromethane	124481	µg kg-¹	U						< 10
	1,2-Dibromoethane	106934	µg kg-¹	M						< 5.0
	Chlorobenzene	108907	µg kg-¹	M						< 1.0
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M						< 2.0
	Ethylbenzene	100414	µg kg-¹	M						< 1.0
	m- & p-Xylene	1330207	µg kg-¹	M						< 1.0
	o-Xylene	95476	µg kg-¹	M						< 1.0
	Styrene	100425	µg kg-¹	M						< 1.0
	Tribromomethane	75252	µg kg-¹	U						< 10
	Isopropylbenzene	98828	µg kg-¹	M						< 1.0
	Bromobenzene	108861	µg kg-¹	M						< 1.0
	1,2,3-Trichloropropane	96184	µg kg-¹	N						< 50
	n-Propylbenzene	103651	µg kg-¹	U						< 1.0
	2-Chlorotoluene	95498	µg kg-¹	M						< 1.0
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M						< 1.0
	4-Chlorotoluene	106434	µg kg-¹	U						< 1.0
	tert-Butylbenzene	98066	µg kg-¹	U						< 1.0
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M						< 1.0

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					253001					
					AJ92594	AJ92595	AJ92596	AJ92597	AJ92598	AJ92599
					TP7	TP7	TP7	TP8	TP8	TP9
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.20m	1.00m	3.00m	0.30m	1.00m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M						
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N						
	Toluene	108883	µg kg-¹	M						
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N						
	1,1,2-Trichloroethane	79005	µg kg-¹	M						
	Tetrachloroethene	127184	µg kg-¹	M						
	1,3-Dichloropropane	142289	µg kg-¹	U						
	Dibromochloromethane	124481	µg kg-¹	U						
	1,2-Dibromoethane	106934	µg kg-¹	M						
	Chlorobenzene	108907	µg kg-¹	M						
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M						
	Ethylbenzene	100414	µg kg-¹	M						
	m- & p-Xylene	1330207	µg kg-¹	M						
	o-Xylene	95476	µg kg-¹	M						
	Styrene	100425	µg kg-¹	M						
	Tribromomethane	75252	µg kg-¹	U						
	Isopropylbenzene	98828	µg kg-¹	M						
	Bromobenzene	108861	µg kg-¹	M						
	1,2,3-Trichloropropane	96184	µg kg-¹	N						
	n-Propylbenzene	103651	µg kg-¹	U						
	2-Chlorotoluene	95498	µg kg-¹	M						
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M						
	4-Chlorotoluene	106434	µg kg-¹	U						
	tert-Butylbenzene	98066	µg kg-¹	U						
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M						

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					253001					
					AJ92600	AJ92601	AJ92602	AJ92603	AJ92604	AJ92605
					TP9	TP10	TP10	TP12	TP13	TP14
					5/3/2014	5/3/2014	5/3/2014	6/3/2014	6/3/2014	6/3/2014
					1.50m	0.50m	3.20m	0.70m	0.40m	0.80m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M						
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N						
	Toluene	108883	µg kg-¹	M			< 1.0		< 1.0	< 1.0
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N						
	1,1,2-Trichloroethane	79005	µg kg-¹	M						
	Tetrachloroethene	127184	µg kg-¹	M						
	1,3-Dichloropropane	142289	µg kg-¹	U						
	Dibromochloromethane	124481	µg kg-¹	U						
	1,2-Dibromoethane	106934	µg kg-¹	M						
	Chlorobenzene	108907	µg kg-¹	M						
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M						
	Ethylbenzene	100414	µg kg-¹	M			< 1.0		< 1.0	< 1.0
	m- & p-Xylene	1330207	µg kg-¹	M			< 1.0		< 1.0	< 1.0
	o-Xylene	95476	µg kg-¹	M			< 1.0		< 1.0	< 1.0
	Styrene	100425	µg kg-¹	M						
	Tribromomethane	75252	µg kg-¹	U						
	Isopropylbenzene	98828	µg kg-¹	M						
	Bromobenzene	108861	µg kg-¹	M						
	1,2,3-Trichloropropane	96184	µg kg-¹	N						
	n-Propylbenzene	103651	µg kg-¹	U						
	2-Chlorotoluene	95498	µg kg-¹	M						
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M						
	4-Chlorotoluene	106434	µg kg-¹	U						
	tert-Butylbenzene	98066	µg kg-¹	U						
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M						

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					253001					
					AJ92606	AJ92607	AJ92608	AJ92609	AJ92610	AJ92611
					TP14	TP14	TP15	TP15	TP15	WS1
					6/3/2014	6/3/2014	6/3/2014	6/3/2014	6/3/2014	5/3/2014
					1.30m	3.40m	0.90m	1.10m	2.70m	0.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M						
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N						
	Toluene	108883	µg kg-¹	M			< 1.0			
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N						
	1,1,2-Trichloroethane	79005	µg kg-¹	M						
	Tetrachloroethene	127184	µg kg-¹	M						
	1,3-Dichloropropane	142289	µg kg-¹	U						
	Dibromochloromethane	124481	µg kg-¹	U						
	1,2-Dibromoethane	106934	µg kg-¹	M						
	Chlorobenzene	108907	µg kg-¹	M						
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M						
	Ethylbenzene	100414	µg kg-¹	M			< 1.0			
	m- & p-Xylene	1330207	µg kg-¹	M			< 1.0			
	o-Xylene	95476	µg kg-¹	M			< 1.0			
	Styrene	100425	µg kg-¹	M						
	Tribromomethane	75252	µg kg-¹	U						
	Isopropylbenzene	98828	µg kg-¹	M						
	Bromobenzene	108861	µg kg-¹	M						
	1,2,3-Trichloropropane	96184	µg kg-¹	N						
	n-Propylbenzene	103651	µg kg-¹	U						
	2-Chlorotoluene	95498	µg kg-¹	M						
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M						
	4-Chlorotoluene	106434	µg kg-¹	U						
	tert-Butylbenzene	98066	µg kg-¹	U						
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M						

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					253001					
					AJ92612	AJ92613	AJ92614	AJ92615	AJ92616	AJ92617
					WS1	WS2	WS2	WS2	WS3	WS4
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					1.50m	1.90m	1.60m	2.20m	0.50m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M						
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N						
	Toluene	108883	µg kg-¹	M						
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N						
	1,1,2-Trichloroethane	79005	µg kg-¹	M						
	Tetrachloroethene	127184	µg kg-¹	M						
	1,3-Dichloropropane	142289	µg kg-¹	U						
	Dibromochloromethane	124481	µg kg-¹	U						
	1,2-Dibromoethane	106934	µg kg-¹	M						
	Chlorobenzene	108907	µg kg-¹	M						
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M						
	Ethylbenzene	100414	µg kg-¹	M						
	m- & p-Xylene	1330207	µg kg-¹	M						
	o-Xylene	95476	µg kg-¹	M						
	Styrene	100425	µg kg-¹	M						
	Tribromomethane	75252	µg kg-¹	U						
	Isopropylbenzene	98828	µg kg-¹	M						
	Bromobenzene	108861	µg kg-¹	M						
	1,2,3-Trichloropropane	96184	µg kg-¹	N						
	n-Propylbenzene	103651	µg kg-¹	U						
	2-Chlorotoluene	95498	µg kg-¹	M						
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M						
	4-Chlorotoluene	106434	µg kg-¹	U						
	tert-Butylbenzene	98066	µg kg-¹	U						
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M						

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LABORATORY TEST REPORT

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SITA Darwen

Chemtest
The right chemistry to deliver results

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					253001				
					AJ92618	AJ92619	AJ92620	AJ92621	AJ92622
					WS4	WS5	BH1	BH1	BH1
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.70m	1.50m	1.00m	3.50m	5.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Bromodichloromethane	75274	µg kg-¹	M		< 5.0			
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N		< 10			
	Toluene	108883	µg kg-¹	M		< 1.0	< 1.0		
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N		< 10			
	1,1,2-Trichloroethane	79005	µg kg-¹	M		< 10			
	Tetrachloroethene	127184	µg kg-¹	M		< 1.0			
	1,3-Dichloropropane	142289	µg kg-¹	U		< 2.0			
	Dibromochloromethane	124481	µg kg-¹	U		< 10			
	1,2-Dibromoethane	106934	µg kg-¹	M		< 5.0			
	Chlorobenzene	108907	µg kg-¹	M		< 1.0			
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M		< 2.0			
	Ethylbenzene	100414	µg kg-¹	M		< 1.0	< 1.0		
	m- & p-Xylene	1330207	µg kg-¹	M		< 1.0	< 1.0		
	o-Xylene	95476	µg kg-¹	M		< 1.0	< 1.0		
	Styrene	100425	µg kg-¹	M		< 1.0			
	Tribromomethane	75252	µg kg-¹	U		< 10			
	Isopropylbenzene	98828	µg kg-¹	M		< 1.0			
	Bromobenzene	108861	µg kg-¹	M		< 1.0			
	1,2,3-Trichloropropane	96184	µg kg-¹	N		< 50			
	n-Propylbenzene	103651	µg kg-¹	U		< 1.0			
	2-Chlorotoluene	95498	µg kg-¹	M		< 1.0			
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M		< 1.0			
	4-Chlorotoluene	106434	µg kg-¹	U		< 1.0			
	tert-Butylbenzene	98066	µg kg-¹	U		< 1.0			
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M		< 1.0			

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					253001					
					AJ92582	AJ92583	AJ92584	AJ92585	AJ92586	AJ92587
					TP1	TP1	TP1	TP2	TP2	TP3
					4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014	4/3/2014
					0.50m	1.40m	2.80m	0.30m	1.00m	0.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						
	1,3-Dichlorobenzene	541731	µg kg-¹	M						
	4-Isopropyltoluene	99876	µg kg-¹	U						
	1,4-Dichlorobenzene	106467	µg kg-¹	M						
	n-Butylbenzene	104518	µg kg-¹	U						
	1,2-Dichlorobenzene	95501	µg kg-¹	M						
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						
	Hexachlorobutadiene	87683	µg kg-¹	U						
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

All tests undertaken between 10/03/2014 and 01/04/2014

* Accreditation status

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					253001					
					AJ92588	AJ92589	AJ92590	AJ92591	AJ92592	AJ92593
					TP4	TP4	TP5	TP5	TP6	TP6
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.40m	1.50m	1.00m	4.00m	0.50m	2.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						< 1.0
	1,3-Dichlorobenzene	541731	µg kg-¹	M						< 1.0
	4-Isopropyltoluene	99876	µg kg-¹	U						< 1.0
	1,4-Dichlorobenzene	106467	µg kg-¹	M						< 1.0
	n-Butylbenzene	104518	µg kg-¹	U						< 1.0
	1,2-Dichlorobenzene	95501	µg kg-¹	M						< 1.0
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						< 50
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						< 1.0
	Hexachlorobutadiene	87683	µg kg-¹	U						< 1.0
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

* Accreditation status

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					253001					
					AJ92594	AJ92595	AJ92596	AJ92597	AJ92598	AJ92599
					TP7	TP7	TP7	TP8	TP8	TP9
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.20m	1.00m	3.00m	0.30m	1.00m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						
	1,3-Dichlorobenzene	541731	µg kg-¹	M						
	4-Isopropyltoluene	99876	µg kg-¹	U						
	1,4-Dichlorobenzene	106467	µg kg-¹	M						
	n-Butylbenzene	104518	µg kg-¹	U						
	1,2-Dichlorobenzene	95501	µg kg-¹	M						
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						
	Hexachlorobutadiene	87683	µg kg-¹	U						
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

* Accreditation status

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					253001					
					AJ92600	AJ92601	AJ92602	AJ92603	AJ92604	AJ92605
					TP9	TP10	TP10	TP12	TP13	TP14
					5/3/2014	5/3/2014	5/3/2014	6/3/2014	6/3/2014	6/3/2014
					1.50m	0.50m	3.20m	0.70m	0.40m	0.80m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						
	1,3-Dichlorobenzene	541731	µg kg-¹	M						
	4-Isopropyltoluene	99876	µg kg-¹	U						
	1,4-Dichlorobenzene	106467	µg kg-¹	M						
	n-Butylbenzene	104518	µg kg-¹	U						
	1,2-Dichlorobenzene	95501	µg kg-¹	M						
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						
	Hexachlorobutadiene	87683	µg kg-¹	U						
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

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					253001					
					AJ92606	AJ92607	AJ92608	AJ92609	AJ92610	AJ92611
					TP14	TP14	TP15	TP15	TP15	WS1
					6/3/2014	6/3/2014	6/3/2014	6/3/2014	6/3/2014	5/3/2014
					1.30m	3.40m	0.90m	1.10m	2.70m	0.60m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						
	1,3-Dichlorobenzene	541731	µg kg-¹	M						
	4-Isopropyltoluene	99876	µg kg-¹	U						
	1,4-Dichlorobenzene	106467	µg kg-¹	M						
	n-Butylbenzene	104518	µg kg-¹	U						
	1,2-Dichlorobenzene	95501	µg kg-¹	M						
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						
	Hexachlorobutadiene	87683	µg kg-¹	U						
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

* Accreditation status

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Chemtest
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Report Date
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					253001					
					AJ92612	AJ92613	AJ92614	AJ92615	AJ92616	AJ92617
					WS1	WS2	WS2	WS2	WS3	WS4
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					1.50m	1.90m	1.60m	2.20m	0.50m	2.00m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U						
	1,3-Dichlorobenzene	541731	µg kg-¹	M						
	4-Isopropyltoluene	99876	µg kg-¹	U						
	1,4-Dichlorobenzene	106467	µg kg-¹	M						
	n-Butylbenzene	104518	µg kg-¹	U						
	1,2-Dichlorobenzene	95501	µg kg-¹	M						
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U						
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M						
	Hexachlorobutadiene	87683	µg kg-¹	U						
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

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					253001				
					AJ92618	AJ92619	AJ92620	AJ92621	AJ92622
					WS4	WS5	BH1	BH1	BH1
					5/3/2014	5/3/2014	5/3/2014	5/3/2014	5/3/2014
					0.70m	1.50m	1.00m	3.50m	5.50m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	sec-Butylbenzene	135988	µg kg-¹	U		< 1.0			
	1,3-Dichlorobenzene	541731	µg kg-¹	M		< 1.0			
	4-Isopropyltoluene	99876	µg kg-¹	U		< 1.0			
	1,4-Dichlorobenzene	106467	µg kg-¹	M		< 1.0			
	n-Butylbenzene	104518	µg kg-¹	U		< 1.0			
	1,2-Dichlorobenzene	95501	µg kg-¹	M		< 1.0			
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U		< 50			
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M		< 1.0			
	Hexachlorobutadiene	87683	µg kg-¹	U		< 1.0			
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	1.2	<0.3

* Accreditation status

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LABORATORY TEST REPORT
Asbestos in Soils

Results of analysis of 10 samples
received 10 March 2014
SITA Darwin

Report Date
21 March 2014

Login Batch No: 253013

Qualitative Results

				SOP 2192	
				ACM Type	Asbestos Identification
Chemtest ID	Sample ID	Sample Desc	Depth (m)		
AJ92659	TP3		0.10	-	No Asbestos Detected
AJ92660	TP11A		0.30	-	No Asbestos Detected
AJ92661	TP12		0.40	-	No Asbestos Detected
AJ92662	TP1		0.10	-	No Asbestos Detected
AJ92663	TP10		0.10	-	No Asbestos Detected
AJ92664	TP6		0.30	-	No Asbestos Detected
AJ92665	TP4		0.20	-	No Asbestos Detected
AJ92666	WS5		0.20	-	No Asbestos Detected
AJ92667	BH4		0.10	-	No Asbestos Detected
AJ92668	External Stora		0.20	-	No Asbestos Detected

The detection limit for this method is 0.001%

Signed

Steve McGrath
Asbestos Analyst

All tests undertaken between 14-Mar-2014 and 21-Mar-2014 at our asbestos testing facility in Coventry

LIMS sample ID range AJ92659 to AJ92668

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LABORATORY TEST REPORT

Results of analysis of 2 samples received 19 March 2014

SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
27 March 2014

Login Batch No					253872	
Chemtest LIMS ID					AJ98488	AJ98489
Sample ID					BH5	BH4
Sample No						
Sampling Date					12/3/2014	12/3/2014
Depth					2.60m - 3.10m	2.50m - 3.20m
Matrix					*LEACHATE*	*LEACHATE*
SOP↓	Determinand↓	CAS No↓	Units↓	*		
1010	pH	PH		U	11.0	11.0
1020	Electrical Conductivity	EC	µS cm-¹	U	1200	230
1300	Thiocyanate	302045	mg l-¹	U	<0.50	<0.50
1220	Chloride	16887006	mg l-¹	U	84	8.3
	Fluoride	16984488	mg l-¹	U	0.19	0.18
	Nitrate	14797558	mg l-¹	U	<0.50	<0.50
1610	Total Organic Carbon	TOC	mg l-¹	N	5.9	11
1220	Sulfate	14808798	mg l-¹	U	74	24
1700	Naphthalene	91203	µg l-¹	N	<0.01	
	Acenaphthylene	208968	µg l-¹	N	<0.01	
	Acenaphthene	83329	µg l-¹	N	<0.01	
	Fluorene	86737	µg l-¹	N	<0.01	
	Phenanthrene	85018	µg l-¹	N	<0.01	
	Anthracene	120127	µg l-¹	N	<0.01	
	Fluoranthene	206440	µg l-¹	N	<0.01	
	Pyrene	129000	µg l-¹	N	<0.01	
	Benzo[a]anthracene	56553	µg l-¹	N	<0.01	
	Chrysene	218019	µg l-¹	N	<0.01	
	Benzo[b]fluoranthene	205992	µg l-¹	N	<0.01	
	Benzo[k]fluoranthene	207089	µg l-¹	N	<0.01	
	Benzo[a]pyrene	50328	µg l-¹	N	<0.01	
	Dibenzo[a,h]anthracene	53703	µg l-¹	N	<0.01	
	Indeno[1,2,3-cd]pyrene	193395	µg l-¹	N	<0.01	
	Benzo[g,h,i]perylene	191242	µg l-¹	N	<0.01	

All tests undertaken between 21/03/2014 and 27/03/2014

* Accreditation status

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FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 2 samples received 19 March 2014

SITA Darwen

Report Date
27 March 2014

					253872	
					AJ98488	AJ98489
					BH5	BH4
					12/3/2014	12/3/2014
					2.60m - 3.10m	2.50m - 3.20m
					LEACHATE	*LEACHATE*
1700	Total (of 16) PAHs		µg l-¹	N	<0.2	
1920	Phenols (total)		mg l-¹	N	< 0.03	< 0.03

All tests undertaken between 21/03/2014 and 27/03/2014

* Accreditation status

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LABORATORY TEST REPORT

Results of analysis of 7 samples received 19 March 2014

SITA Darwen

Chemtest
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Report Date
27 March 2014

Login Batch No					253872				
Chemtest LIMS ID					AJ98462	AJ98475	AJ98478	AJ98480	AJ98485
Sample ID					TP16	BH3	BH4	BH5	BH17
Sample No									
Sampling Date					12/3/2014	7/3/2014	10/3/2014	11/3/2014	12/3/2014
Depth					0.60m	1.00m	0.70m	0.40m	0.40m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*					
2010	pH			M		10.6			10.9
2180	Sulfur (elemental)	7704349	mg kg-¹	M		22.0			5.5
2300	Cyanide (total)	57125	mg kg-¹	M		<0.50			<0.50
	Thiocyanate	302045	mg kg-¹	M		<5.0			<5.0
2325	Sulfide (Easily Liberatable)	18496258	mg kg-¹	M		1.8			4.7
2220	Chloride (extractable)	16887006	g l-¹	M					<0.010
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M		0.32			0.17
2450	Arsenic	7440382	mg kg-¹	M		75			11
	Cadmium	7440439	mg kg-¹	M		2.4			0.81
	Chromium	7440473	mg kg-¹	M		20			24
	Copper	7440508	mg kg-¹	M		220			270
	Mercury	7439976	mg kg-¹	M		0.14			<0.10
	Nickel	7440020	mg kg-¹	M		46			23
	Lead	7439921	mg kg-¹	M		130			220
	Selenium	7782492	mg kg-¹	M		<0.20			<0.20
	Vanadium	7440622	mg kg-¹	M		31			22
	Zinc	7440666	mg kg-¹	M		270			280
2670	Total Petroleum Hydrocarbons		mg kg-¹	M					< 10
	TPH >C6-C10		mg kg-¹	N		< 0.1 ¹			
	TPH >C10-C21		mg kg-¹	N		< 0.1 ¹			
	TPH >C21-C40		mg kg-¹	N		< 0.1 ¹			
	Total Petroleum Hydrocarbons		mg kg-¹	M		< 10 ¹			
2675	TPH aliphatic >C5-C6		mg kg-¹	N	< 0.1		< 0.1 ¹		
	TPH aliphatic >C6-C8		mg kg-¹	N	< 0.1		< 0.1 ¹		

¹The stability time for this analyte has been exceeded - these results may be compromised. The accreditation for these results remains unaffected.

All tests undertaken between 21/03/2014 and 27/03/2014

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

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LABORATORY TEST REPORT

Results of analysis of 7 samples received 19 March 2014

SITA Darwen

Report Date 27 March 2014

					253872				
					AJ98462	AJ98475	AJ98478	AJ98480	AJ98485
					TP16	BH3	BH4	BH5	BH17
					12/3/2014	7/3/2014	10/3/2014	11/3/2014	12/3/2014
					0.60m	1.00m	0.70m	0.40m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C8-C10		mg kg-¹	N	< 0.1		< 0.1 ¹		
	TPH aliphatic >C10-C12		mg kg-¹	M	< 1		< 1 ¹		
	TPH aliphatic >C12-C16		mg kg-¹	M	< 1		< 1 ¹		
	TPH aliphatic >C16-C21		mg kg-¹	M	< 1		5.9 ¹		
	TPH aliphatic >C21-C35		mg kg-¹	M	< 1		24 ¹		
	TPH aliphatic >C35-C44		mg kg-¹	N	< 1		< 1 ¹		
	TPH aromatic >C5-C7		mg kg-¹	N	< 0.1		< 0.1 ¹		
	TPH aromatic >C7-C8		mg kg-¹	N	< 0.1		< 0.1 ¹		
	TPH aromatic >C8-C10		mg kg-¹	N	< 0.1		< 0.1 ¹		
	TPH aromatic >C10-C12		mg kg-¹	N	< 1		< 1 ¹		
	TPH aromatic >C12-C16		mg kg-¹	M	< 1		< 1 ¹		
	TPH aromatic >C16-C21		mg kg-¹	M	< 1		4.5 ¹		
	TPH aromatic >C21-C35		mg kg-¹	N	< 1		14 ¹		
	TPH aromatic >C35-C44		mg kg-¹	N	< 1		< 1 ¹		
	Total Petroleum Hydrocarbons		mg kg-¹	N	< 10		50 ¹		
2700	Naphthalene	91203	mg kg-¹	M	< 0.1		< 0.1		
	Acenaphthylene	208968	mg kg-¹	M	< 0.1		< 0.1		
	Acenaphthene	83329	mg kg-¹	M	< 0.1		< 0.1		
	Fluorene	86737	mg kg-¹	M	< 0.1		< 0.1		
	Phenanthrene	85018	mg kg-¹	M	< 0.1		< 0.1		
	Anthracene	120127	mg kg-¹	M	< 0.1		< 0.1		
	Fluoranthene	206440	mg kg-¹	M	< 0.1		0.32		
	Pyrene	129000	mg kg-¹	M	< 0.1		0.41		
	Benzo[a]anthracene	56553	mg kg-¹	M	< 0.1		< 0.1		
	Chrysene	218019	mg kg-¹	M	< 0.1		< 0.1		

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All tests undertaken between 21/03/2014 and 27/03/2014

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Terraconsult
Bold Business Centre
Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 7 samples
received 19 March 2014

SITA Darwen

Report Date
27 March 2014

					253872				
					AJ98462	AJ98475	AJ98478	AJ98480	AJ98485
					TP16	BH3	BH4	BH5	BH17
					12/3/2014	7/3/2014	10/3/2014	11/3/2014	12/3/2014
					0.60m	1.00m	0.70m	0.40m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Benzo[b]fluoranthene	205992	mg kg-1	N	< 0.1		< 0.1		
	Benzo[k]fluoranthene	207089	mg kg-1	N	< 0.1		< 0.1		
	Benzo[a]pyrene	50328	mg kg-1	M	< 0.1		< 0.1		
	Dibenzo[a,h]anthracene	53703	mg kg-1	M	< 0.1		< 0.1		
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M	< 0.1		< 0.1		
	Benzo[g,h,i]perylene	191242	mg kg-1	M	< 0.1		< 0.1		
	Total (of 16) PAHs		mg kg-1	M	< 2		< 2		
2760	Methyl tert-butylether	1634044	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Dichlorodifluoromethane	75718	µg kg-1	U	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Chloromethane	74873	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Vinyl chloride	75014	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Bromomethane	74839	µg kg-1	M	< 20		< 20 [1]	< 20 [1]	
	Chloroethane	75003	µg kg-1	U	< 2.0		< 2.0 [1]	< 2.0 [1]	
	Trichlorofluoromethane	75694	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	1,1-Dichloroethene	75354	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Dichloromethane	75092	µg kg-1	N	ne		NE [1]	NE [1]	
	trans-1,2-Dichloroethene	156605	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	1,1-Dichloroethane	75343	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	cis-1,2-Dichloroethene	156592	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Bromochloromethane	74975	µg kg-1	U	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Trichloromethane	67663	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	1,1,1-Trichloroethane	71556	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Tetrachloromethane	56235	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	
	1,1-Dichloropropene	563586	µg kg-1	U	< 1.0		< 1.0 [1]	< 1.0 [1]	
	Benzene	71432	µg kg-1	M	< 1.0		< 1.0 [1]	< 1.0 [1]	

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WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

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SITA Darwen

Report Date 27 March 2014

					253872				
					AJ98462	AJ98475	AJ98478	AJ98480	AJ98485
					TP16	BH3	BH4	BH5	BH17
					12/3/2014	7/3/2014	10/3/2014	11/3/2014	12/3/2014
					0.60m	1.00m	0.70m	0.40m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	1,2-Dichloroethane	107062	µg kg-¹	M	< 2.0		< 2.0 ¹	< 2.0 ¹	
	Trichloroethene	79016	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,2-Dichloropropane	78875	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	Dibromomethane	74953	µg kg-¹	M	< 10		< 10 ¹	< 10 ¹	
	Bromodichloromethane	75274	µg kg-¹	M	< 5.0		< 5.0 ¹	< 5.0 ¹	
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N	< 10		< 10 ¹	< 10 ¹	
	Toluene	108883	µg kg-¹	M	< 1.0		6.2 ¹	< 1.0 ¹	
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N	< 10		< 10 ¹	< 10 ¹	
	1,1,2-Trichloroethane	79005	µg kg-¹	M	< 10		< 10 ¹	< 10 ¹	
	Tetrachloroethene	127184	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,3-Dichloropropane	142289	µg kg-¹	U	< 2.0		< 2.0 ¹	< 2.0 ¹	
	Dibromochloromethane	124481	µg kg-¹	U	< 10		< 10 ¹	< 10 ¹	
	1,2-Dibromoethane	106934	µg kg-¹	M	< 5.0		< 5.0 ¹	< 5.0 ¹	
	Chlorobenzene	108907	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M	< 2.0		< 2.0 ¹	< 2.0 ¹	
	Ethylbenzene	100414	µg kg-¹	M	< 1.0		1.8 ¹	4.4 ¹	
	m- & p-Xylene	1330207	µg kg-¹	M	< 1.0		8.9 ¹	23 ¹	
	o-Xylene	95476	µg kg-¹	M	< 1.0		1.5 ¹	3.3 ¹	
	Styrene	100425	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	Tribromomethane	75252	µg kg-¹	U	< 10		< 10 ¹	< 10 ¹	
	Isopropylbenzene	98828	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	Bromobenzene	108861	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,2,3-Trichloropropane	96184	µg kg-¹	N	< 50		< 50 ¹	< 50 ¹	
	n-Propylbenzene	103651	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	2-Chlorotoluene	95498	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	

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WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

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Chemtest
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Report Date
27 March 2014

					253872				
					AJ98462	AJ98475	AJ98478	AJ98480	AJ98485
					TP16	BH3	BH4	BH5	BH17
					12/3/2014	7/3/2014	10/3/2014	11/3/2014	12/3/2014
					0.60m	1.00m	0.70m	0.40m	0.40m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	1,2,4-Trimethylbenzene	95636	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	4-Chlorotoluene	106434	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	tert-Butylbenzene	98066	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,3,5-Trimethylbenzene	108678	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	sec-Butylbenzene	135988	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,3-Dichlorobenzene	541731	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	4-Isopropyltoluene	99876	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,4-Dichlorobenzene	106467	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	n-Butylbenzene	104518	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,2-Dichlorobenzene	95501	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U	< 50		< 50 ¹	< 50 ¹	
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M	< 1.0		< 1.0 ¹	< 1.0 ¹	
	Hexachlorobutadiene	87683	µg kg-¹	U	< 1.0		< 1.0 ¹	< 1.0 ¹	
2920	Phenols (total)		mg kg-¹	M		<0.3			<0.3

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WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 9 samples
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Report Date
27 March 2014

Login Batch No					253872	
Chemtest LIMS ID					AJ98463	AJ98464
Sample ID					TP16	TP17
Sample No						
Sampling Date					12/3/2014	12/3/2014
Depth						
Matrix					*WATER*	*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*		
1010	pH	PH		U	7.7	9.0
1020	Electrical Conductivity	EC	µS cm-¹	U	840	280
1300	Cyanide (total)	57125	mg l-¹	U	<0.050	<0.050
	Thiocyanate	302045	mg l-¹	U	<0.50	<0.50
1180	Sulfur	7704349	mg l-¹	N	150	17
1220	Chloride	16887006	mg l-¹	U	10	13
	Ammonia (free)	7664417	mg l-¹	U	0.03	0.10
1325	Sulfide	18496258	mg l-¹	U	<0.050	<0.050
1220	Sulfate	14808798	mg l-¹	U	460	52
1450	Arsenic (total)	7440382	µg l-¹	U	<1.0	<1.0
	Cadmium (total)	7440439	µg l-¹	U	<0.08	<0.08
	Chromium (total)	7440473	µg l-¹	U	<1.0	<1.0
	Copper (total)	7440508	µg l-¹	U	130	32
	Mercury (total)	7439976	µg l-¹	U	<0.5	<0.5
	Nickel (total)	7440020	µg l-¹	U	<1.0	<1.0
	Lead (total)	7439921	µg l-¹	U	<1.0	<1.0
	Selenium (total)	7782492	µg l-¹	U	<1.0	3.1
	Vanadium	7440622	µg l-¹	U	<1.0	<1.0
	Zinc (total)	7440666	µg l-¹	U	270	14
1675	TPH aliphatic >C5-C6		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C6-C8		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C8-C10		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C10-C12		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C12-C16		µg l-¹	N	< 0.1 ²	< 0.1 ²

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[2]The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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Terraconsult
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WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

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SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
27 March 2014

					253872	
					AJ98463	AJ98464
					TP16	TP17
					12/3/2014	12/3/2014
					WATER	*WATER*
1675	TPH aliphatic >C16-C21		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C21-C35		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aliphatic >C35-C44		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C5-C7		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C7-C8		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C8-C10		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C10-C12		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C12-C16		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C16-C21		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C21-C35		µg l-¹	N	< 0.1 ²	< 0.1 ²
	TPH aromatic >C35-C44		µg l-¹	N	< 0.1 ²	< 0.1 ²
	Total Petroleum Hydrocarbons		µg l-¹	N	< 10 ²	< 10 ²
	Total Aliphatic Hydrocarbons		µg l-¹	N	< 5 ²	< 5 ²
	Total Aromatic Hydrocarbons		µg l-¹	N	< 5 ²	< 5 ²
1700	Naphthalene	91203	µg l-¹	U	<0.1 ²	<0.1 ²
	Acenaphthylene	208968	µg l-¹	U	<0.1 ²	<0.1 ²
	Acenaphthene	83329	µg l-¹	U	<0.1 ²	<0.1 ²
	Fluorene	86737	µg l-¹	U	<0.1 ²	<0.1 ²
	Phenanthrene	85018	µg l-¹	U	<0.1 ²	<0.1 ²
	Anthracene	120127	µg l-¹	U	<0.1 ²	<0.1 ²
	Fluoranthene	206440	µg l-¹	U	<0.1 ²	<0.1 ²
	Pyrene	129000	µg l-¹	U	<0.1 ²	<0.1 ²
	Benzo[a]anthracene	56553	µg l-¹	U	<0.1 ²	<0.1 ²
	Chrysene	218019	µg l-¹	U	<0.1 ²	<0.1 ²
	Benzo[b]fluoranthene	205992	µg l-¹	N	<0.1 ²	<0.1 ²

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Terraconsult
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Bold Lane
Sutton, St. Helens
WA9 4TX

FAO Chris Eccles

LABORATORY TEST REPORT

Results of analysis of 9 samples
received 19 March 2014

SITA Darwen

Chemtest
The right chemistry to deliver results

Report Date
27 March 2014

					253872	
					AJ98463	AJ98464
					TP16	TP17
					12/3/2014	12/3/2014
					WATER	*WATER*
1700	Benzo[k]fluoranthene	207089	µg l-¹	N	<0.1 ²	<0.1 ²
	Benzo[a]pyrene	50328	µg l-¹	U	<0.1 ²	<0.1 ²
	Dibenzo[a,h]anthracene	53703	µg l-¹	U	<0.1 ²	<0.1 ²
	Indeno[1,2,3-cd]pyrene	193395	µg l-¹	U	<0.1 ²	<0.1 ²
	Benzo[g,h,i]perylene	191242	µg l-¹	U	<0.1 ²	<0.1 ²
	Total (of 16) PAHs		µg l-¹	U	<2 ²	<2 ²
1760	Benzene	71432	µg l-¹	U	<1.0 ²	<1.0 ²
	Toluene	108883	µg l-¹	U	<1.0 ²	<1.0 ²
	Ethylbenzene	100414	µg l-¹	U	<1.0 ²	<1.0 ²
	m- & p-Xylene	1330207	µg l-¹	U	<1.0 ²	<1.0 ²
	o-Xylene	95476	µg l-¹	U	<1.0 ²	<1.0 ²
1920	Phenols (total)		mg l-¹	N	< 0.03 ²	< 0.03 ²

¹The stability time for this analyte has been exceeded - these results may be compromised. The accreditation for these results remains unaffected.
²The sample container/fill level was not appropriate for the specified analysis - these results may be compromised. The accreditation for these results remains unaffected.

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APPENDIX G

Laboratory Geotechnical Test Results

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL14/1371

Client's Reference: Report Date: 16 April 2014

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Chris Eccles

Contract Title: SITA, Darwen

Date Received: 19/3/2014
Date Commenced: 19/3/2014
Date Completed: 16/4/2014

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
M Beastall (Laboratory Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)

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
BH1		U	2.00-2.45	Soft brown sandy very silty CLAY.
BH1		U	4.00-4.65	Firm brown slightly sandy very silty CLAY.
BH1		U	6.00-6.45	Soft brown slightly gravelly sandy very silty CLAY.
BH1		U	8.00-8.45	Soft brown slightly gravelly sandy very silty CLAY.
BH2		U	3.00-3.45	Very soft brown gravelly sandy very silty CLAY.
BH2		U	5.00-5.45	Firm brown sandy very silty CLAY.
BH5		B	0.50-1.50	MADE GROUND brown very sandy slightly clayey silty gravel.
BH5B		B	0.50-1.50	MADE GROUND brown slightly clayey silty sand & gravel.
BH5B		U	5.00-5.45	Stiff dark brown slightly sandy very silty CLAY.
BH5B		U	6.00-6.45	Soft brown slightly gravelly sandy very silty CLAY.
BH5B		U	8.00-8.45	Soft brown sandy very silty CLAY.
BH5B		U	11.50-11.95	Very soft brown sandy very silty CLAY.
BH6		B	0.50-1.50	MADE GROUND brown very sandy slightly silty gravel.
BH6		U	5.00-5.45	Brown sandy very silty CLAY.
BH6		U	7.00-7.45	Soft brown slightly sandy very silty CLAY.
BH7		U	3.00-3.45	Firm brown very gravelly very sandy very silty CLAY
TP14		D	1.30	Brown mottled grey gravelly very sandy very silty CLAY.
WS1		D	2.30	Brown mottled grey silty SAND.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	16/04/14		16/04/14		16/04/14

SITA, DARWEN.

Contract No: PSL14/1371

Client Ref: 1970

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 5.4	% Passing .425mm	Remarks
BH1		U	2.00-2.45	27				35	19	16	100	Low plasticity CL.
BH1		U	4.00-4.65	26				53	24	29	100	High plasticity CH.
BH2		U	3.00-3.45	31				35	18	17	85	Low plasticity CL.
BH2		U	5.00-5.45	27				39	20	19	100	Intermediate plasticity CI.
BH5B		U	5.00-5.45	23				50	23	27	100	Intermediate plasticity CI.
BH6		U	5.00-5.45	26				49	23	26	100	Intermediate plasticity CI.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	16/04/14		16/04/14		16/04/14

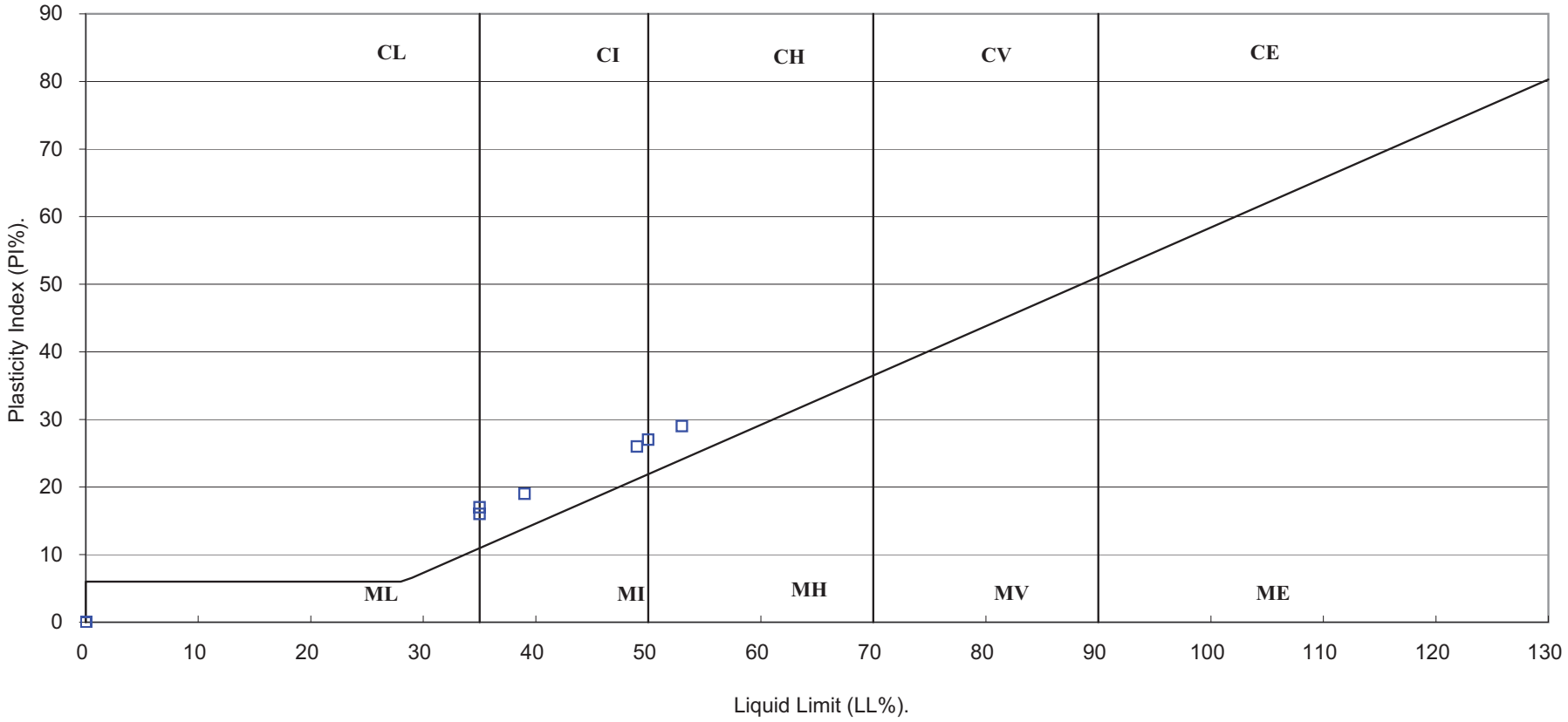
SITA, DARWEN.

Contract No: PSL14/1371

Client Ref: 1970

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		16/04/14		16/04/14		16/04/14
	SITA, DARWEN.				Contract No:	PSL14/1371
					Client Ref:	1970

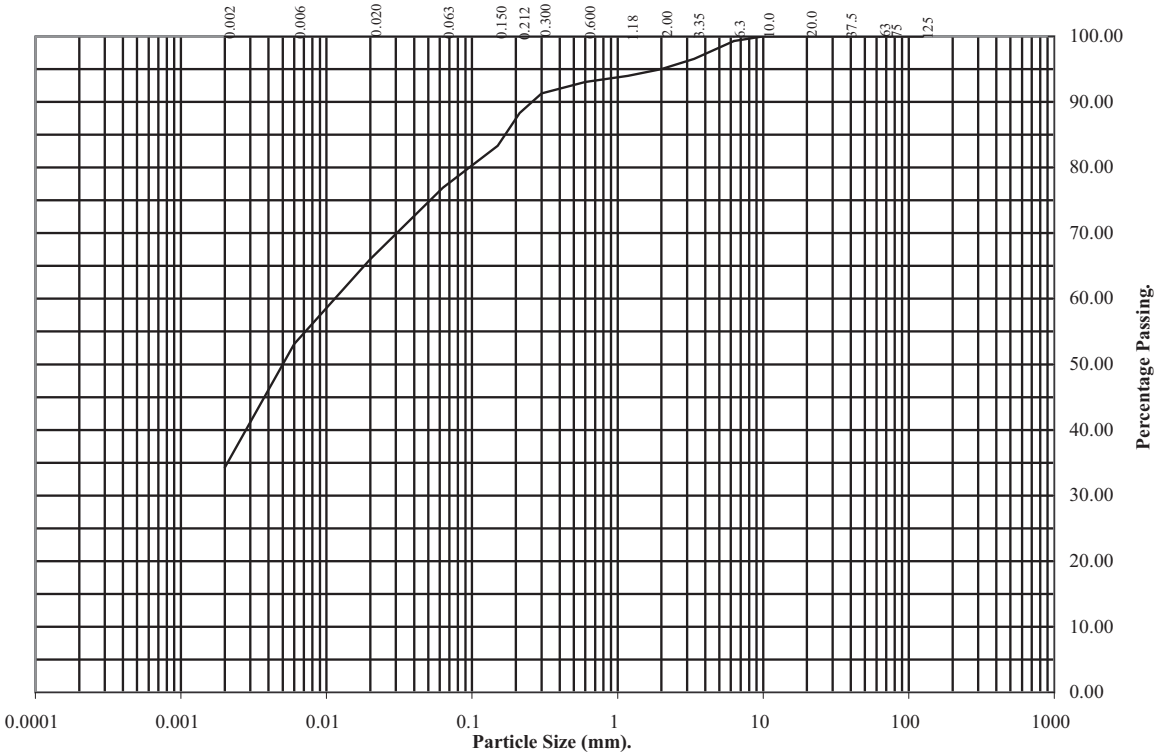
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH1 **Depth (m):** 6.00-6.45

Sample Number: **Sample Type:** U



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	97
2	95
1.18	94
0.6	93
0.3	91
0.212	88
0.15	83
0.063	77

Particle Diameter	Percentage Passing
0.02	66
0.006	53
0.002	34

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	18
Silt	43
Clay	34

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

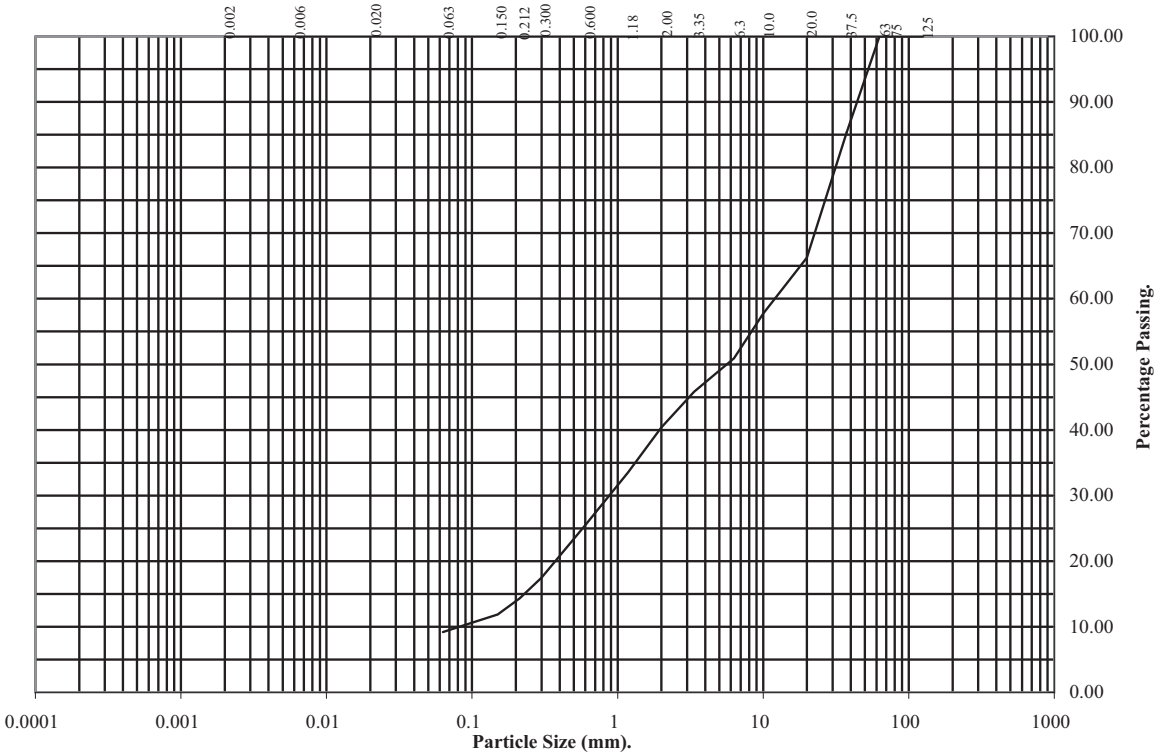
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH5 **Depth (m):** 0.50-1.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	85
20	66
10	58
6.3	51
3.35	46
2	40
1.18	33
0.6	25
0.3	18
0.212	14
0.15	12
0.063	9

Soil Fraction	Total Percentage
Cobbles	0
Gravel	60
Sand	31
Silt / Clay	9

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

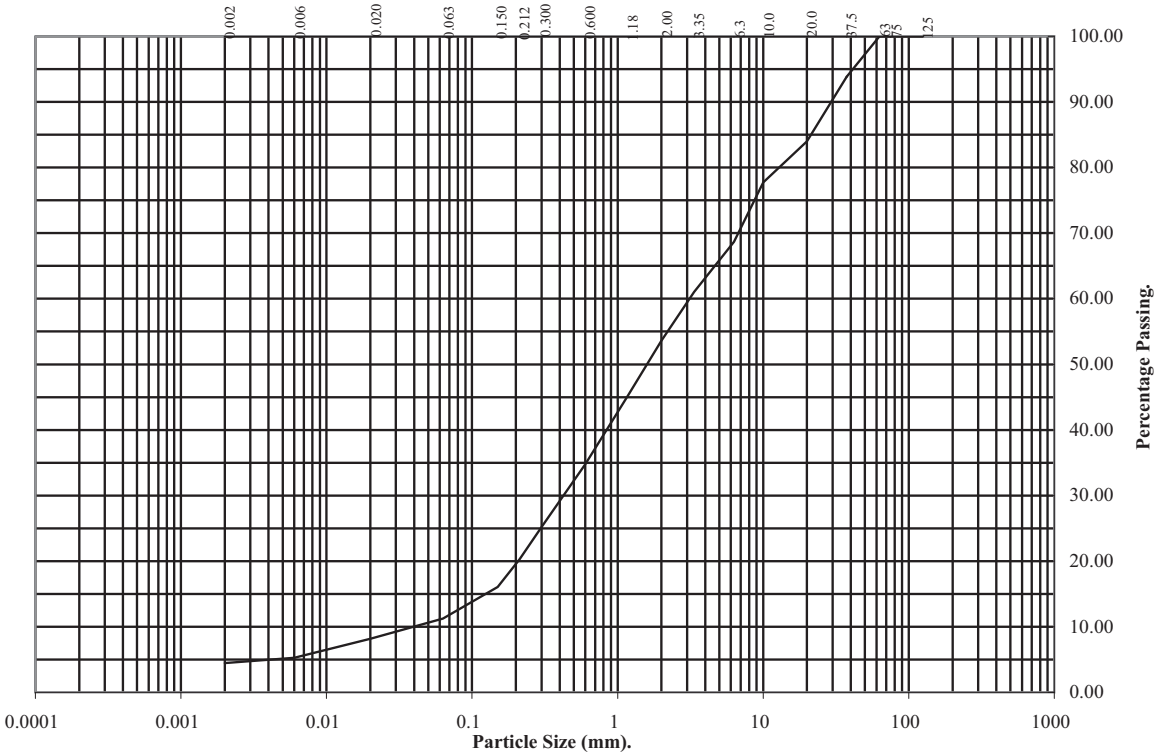
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH5B **Depth (m):** 0.50-1.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	94
20	84
10	78
6.3	69
3.35	61
2	54
1.18	45
0.6	35
0.3	25
0.212	20
0.15	16
0.063	11

Particle Diameter	Percentage Passing
0.02	8
0.006	5
0.002	4

Soil Fraction	Total Percentage
Cobbles	0
Gravel	46
Sand	43
Silt	7
Clay	4

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

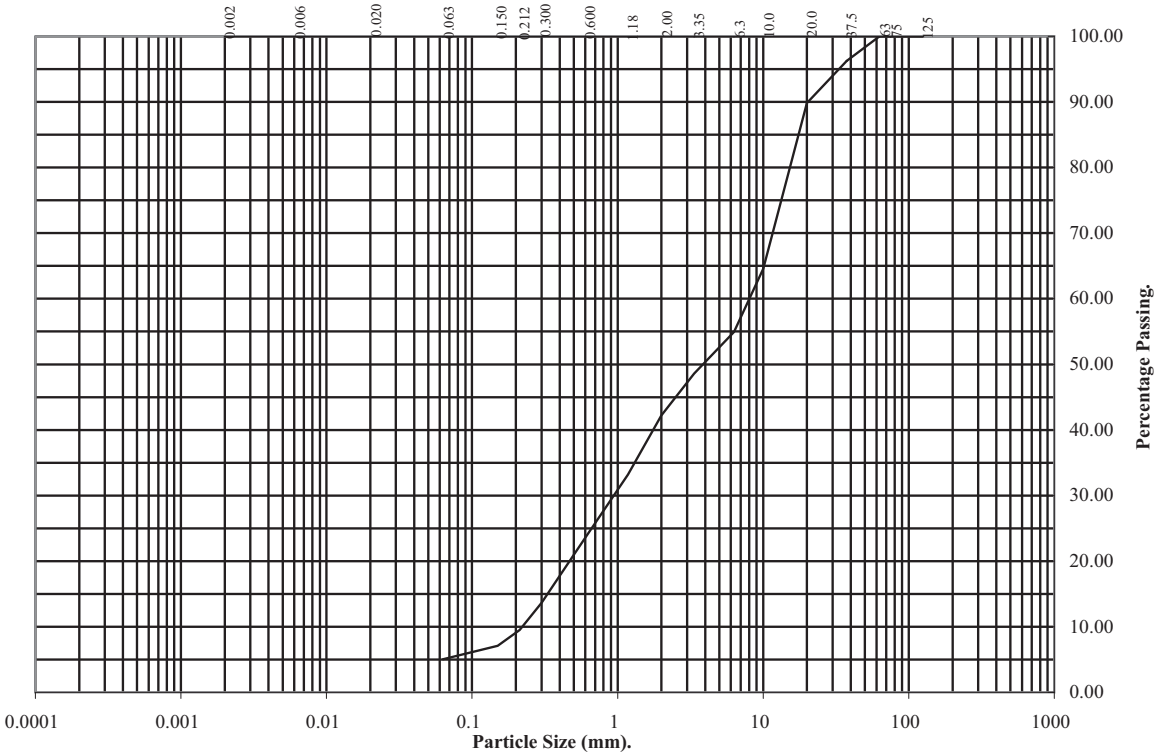
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH6 **Depth (m):** 0.50-1.50

Sample Number: **Sample Type:** B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	96
20	90
10	65
6.3	55
3.35	49
2	42
1.18	33
0.6	24
0.3	14
0.212	10
0.15	7
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	58
Sand	37
Silt / Clay	5

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

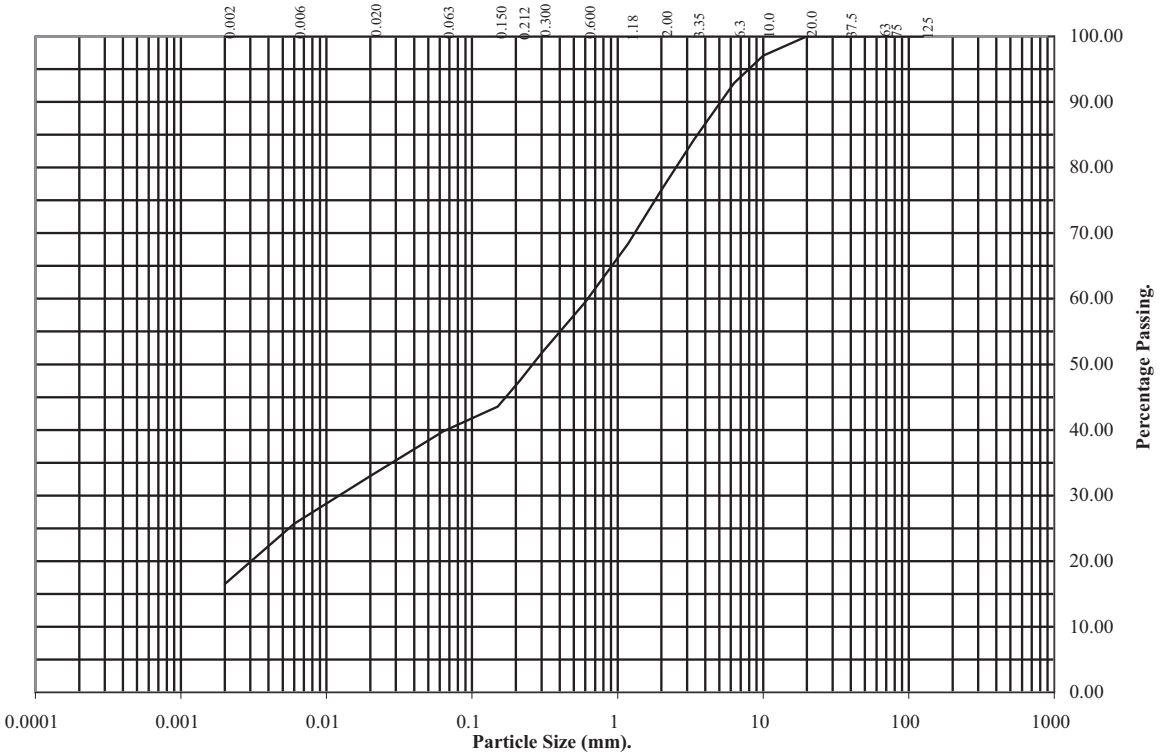
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH7 **Depth (m):** 3.00-3.45

Sample Number: **Sample Type:** U



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	93
3.35	84
2	77
1.18	68
0.6	59
0.3	52
0.212	47
0.15	44
0.063	40

Particle Diameter	Percentage Passing
0.02	33
0.006	26
0.002	17

Soil Fraction	Total Percentage
Cobbles	0
Gravel	23
Sand	37
Silt	23
Clay	17

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

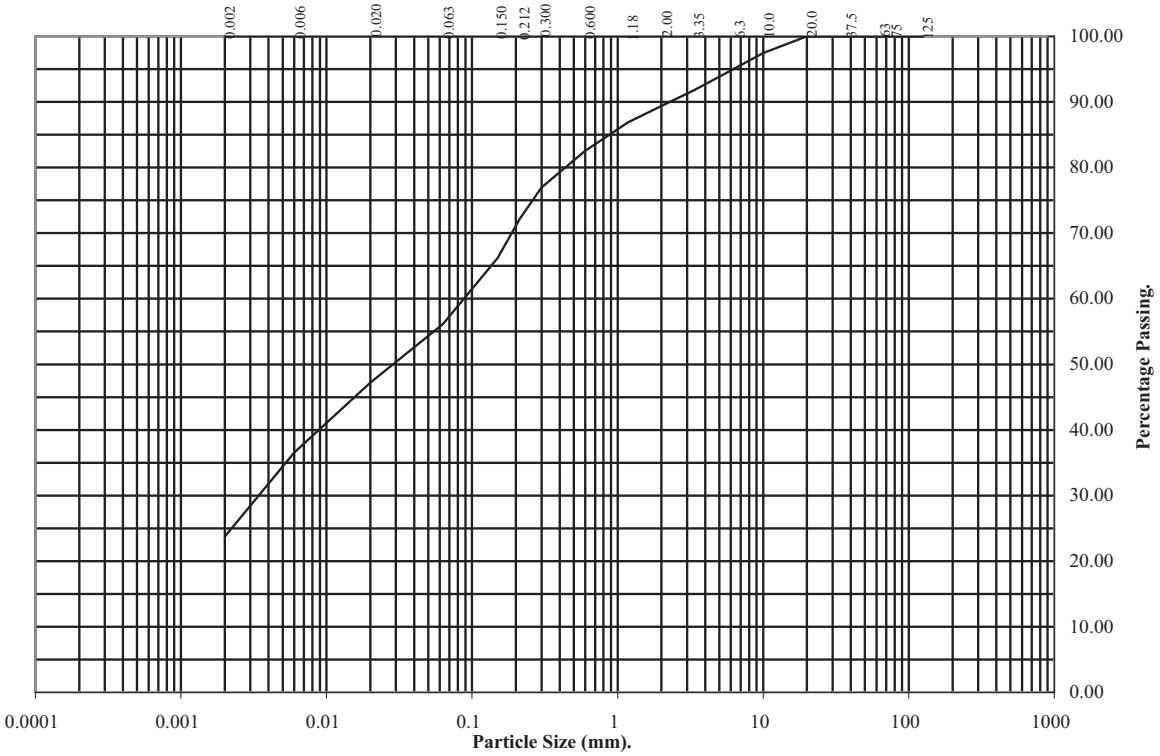
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP14 **Depth (m):** 1.30

Sample Number: **Sample Type:** D



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	95
3.35	92
2	89
1.18	87
0.6	83
0.3	77
0.212	72
0.15	66
0.063	56

Particle Diameter	Percentage Passing
0.02	47
0.006	37
0.002	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	11
Sand	33
Silt	32
Clay	24

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
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PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

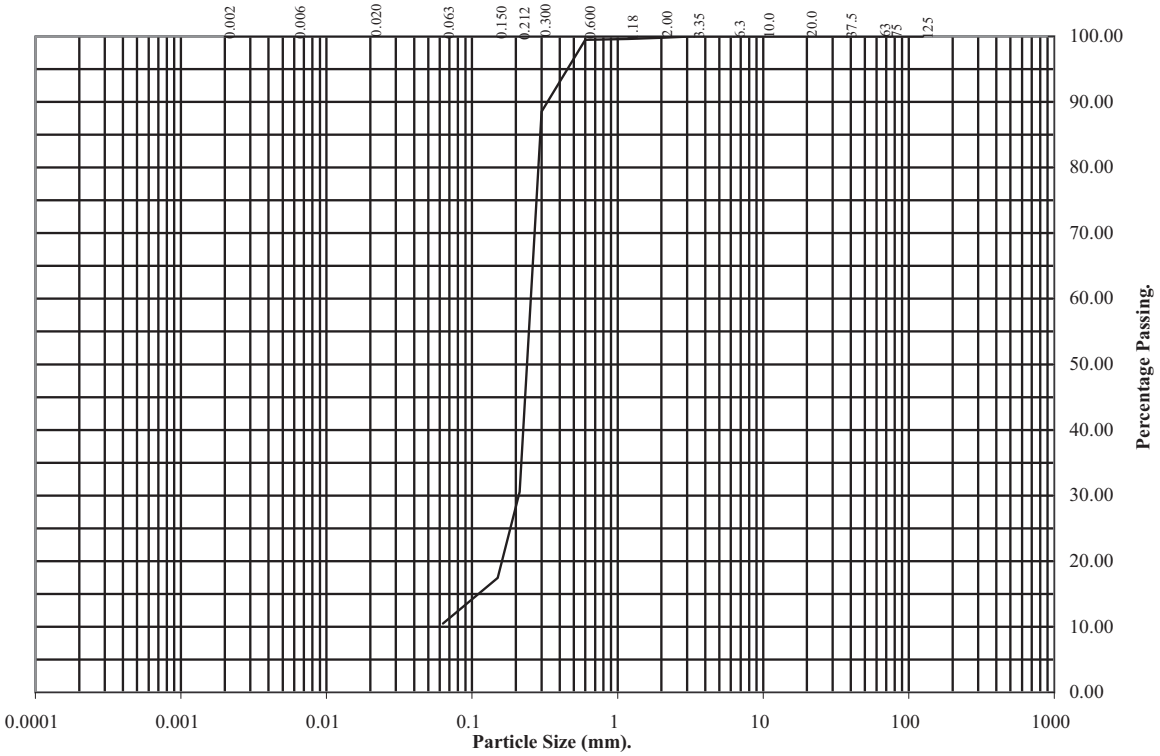
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS1 **Depth (m):** 2.30

Sample Number: **Sample Type:** D



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	89
0.212	31
0.15	17
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	90
Silt / Clay	10

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory	**SITA, DARWEN.**	**Contract No.: PSL14/1371**

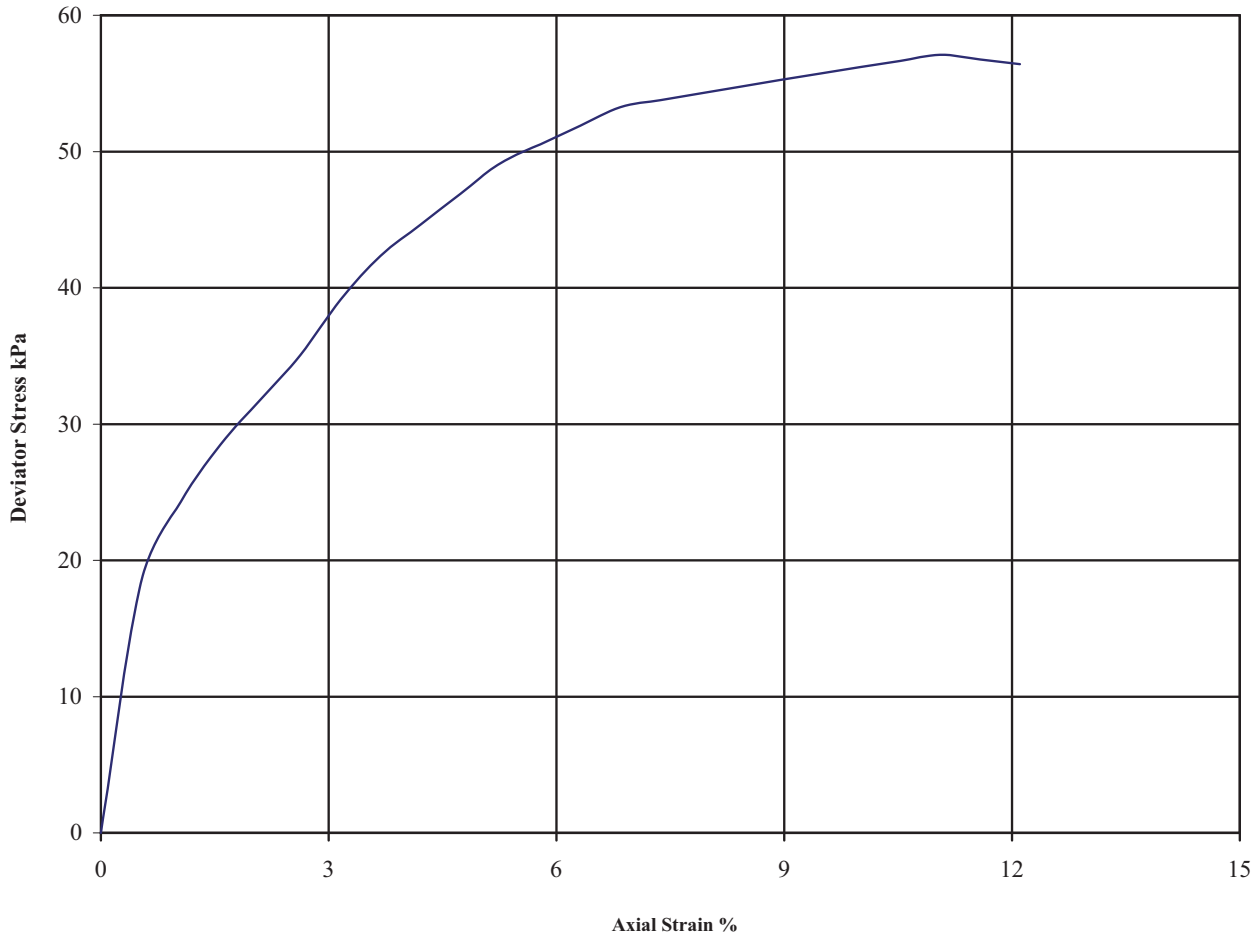
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH1 **Depth (m): 2.00-2.45**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	27	1.98	1.56	100	57	29	11.1	Compound	See summary of soil descriptions

Checked and Approved By Date

16/04/14

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SITA, DARWEN. **Contract No: PSL14/1371**

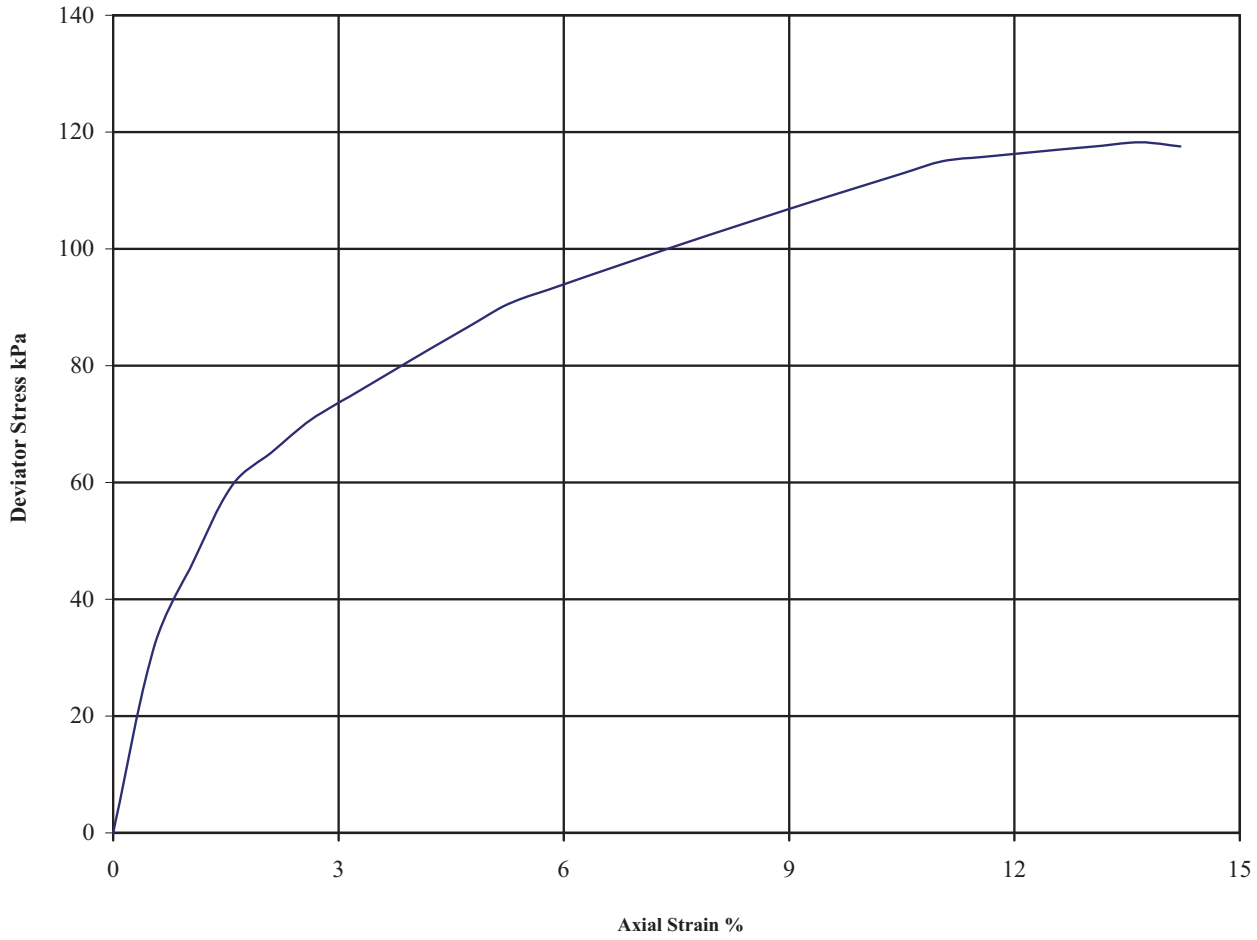
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH1 **Depth (m): 4.00-4.65**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	26	1.97	1.57	100	118	59	13.7	Compound	See summary of soil descriptions

Checked and Approved By Date

16/04/14

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SITA, DARWEN. **Contract No: PSL14/1371**

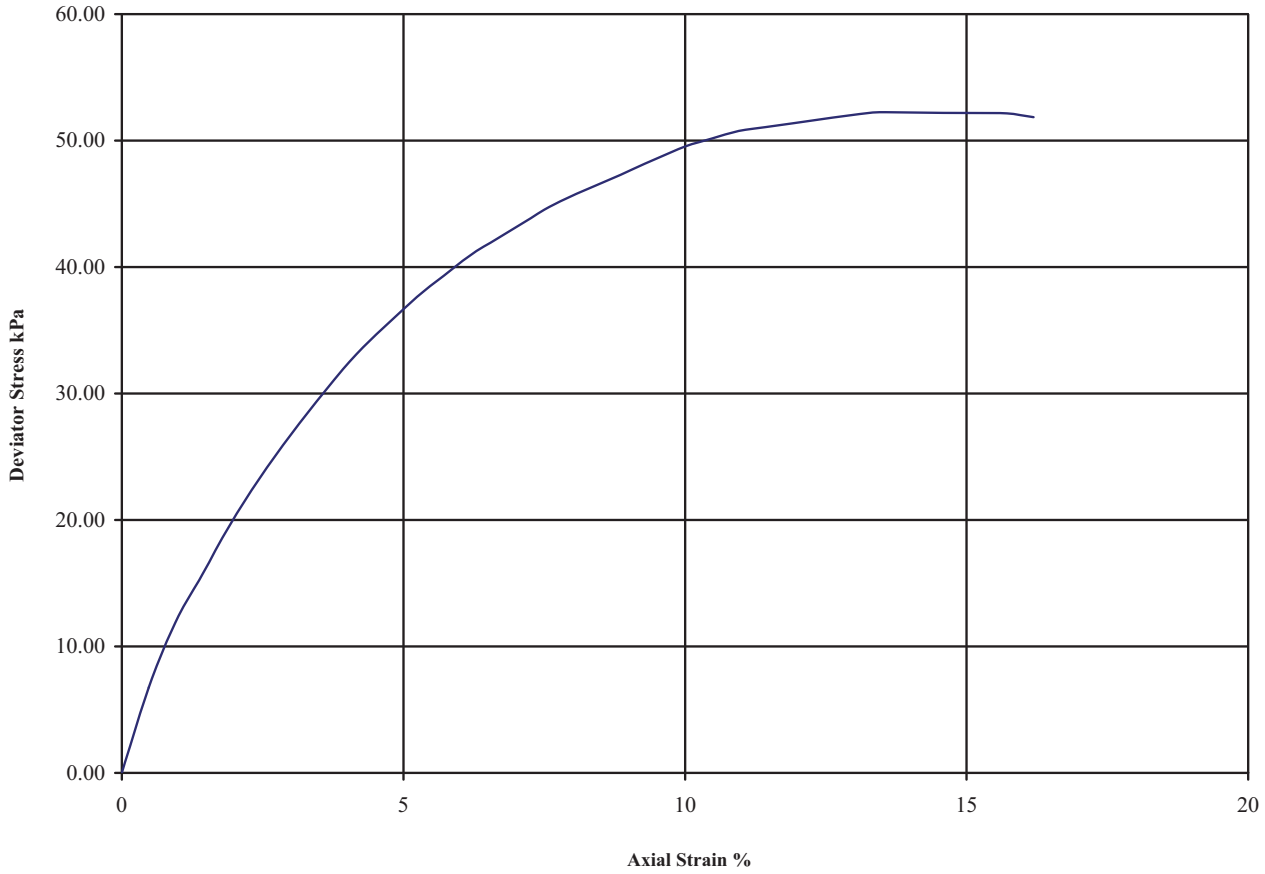
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH1 **Depth (m):** 6.00-6.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	32	1.93	1.46	130	52	26	13.3	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.35 kPa See summary of soil descriptions.

Checked	Date	Approved	Date
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SITA, DARWEN.

Contract No: PSL14/1371

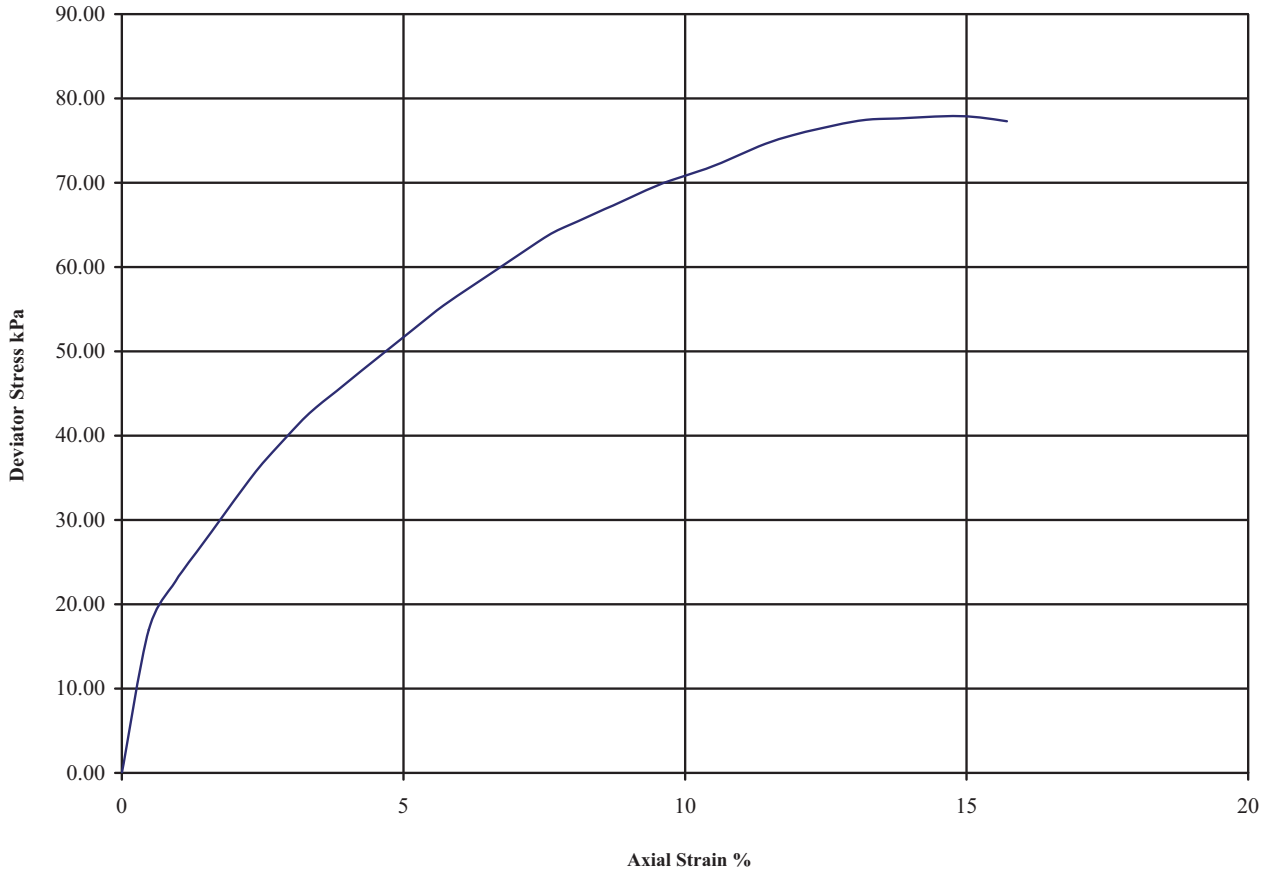
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH1 **Depth (m):** 8.00-8.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	25	2.05	1.64	170	78	39	14.8	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.34 kPa See summary of soil descriptions.

Checked	Date	Approved	Date
	16/04/14		16/04/14

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SITA, DARWEN.

Contract No: PSL14/1371

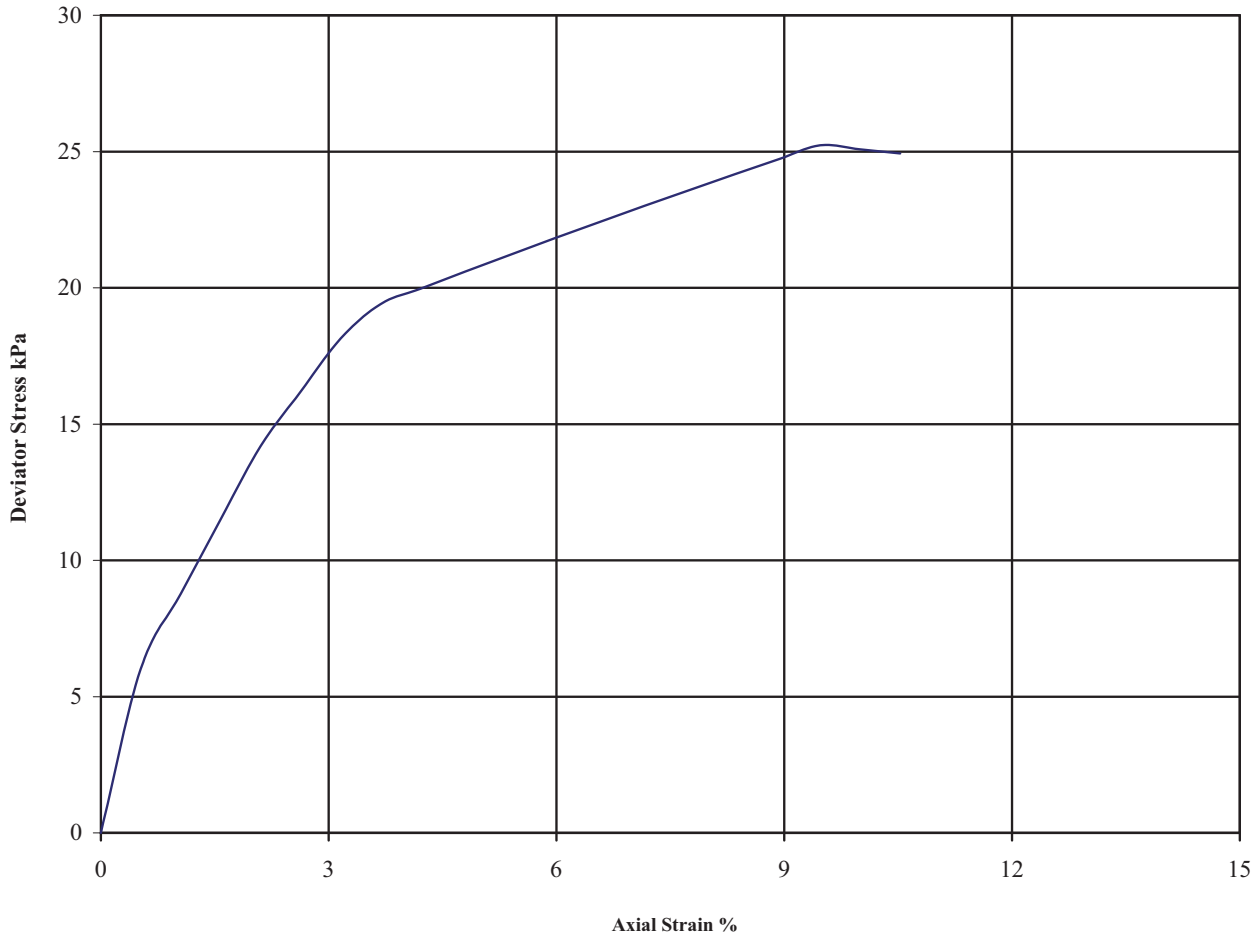
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH2 **Depth (m): 3.00-3.45**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	31	1.94	1.48	100	25	13	9.5	Plastic	See summary of soil descriptions

Checked and Approved By Date

16/04/14

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SITA, DARWEN. **Contract No: PSL14/1371**

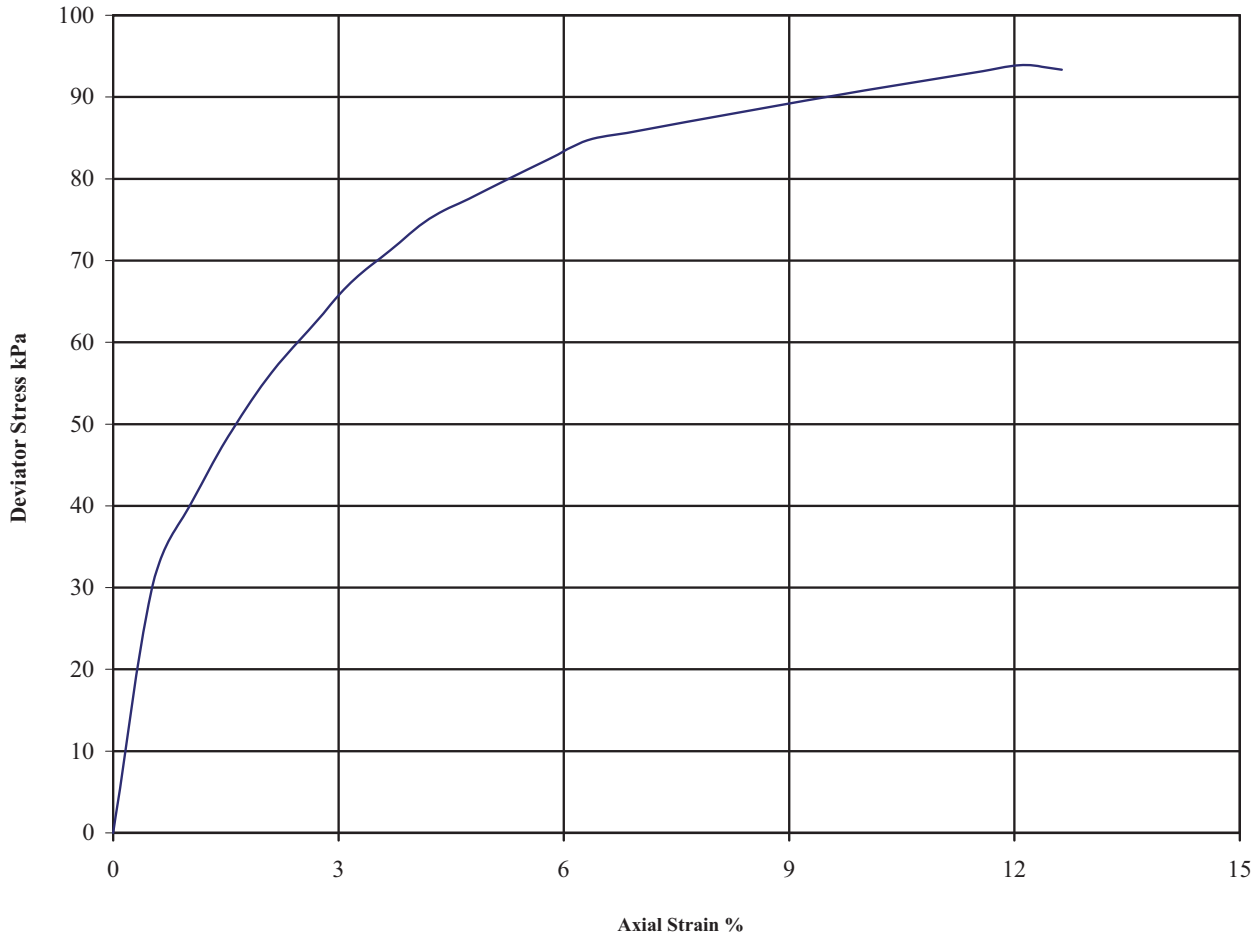
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH2 **Depth (m): 5.00-5.45**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	27	1.98	1.56	110	94	47	12.1	Compound	See summary of soil descriptions

Checked and Approved By Date

16/04/14

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SITA, DARWEN. **Contract No: PSL14/1371**

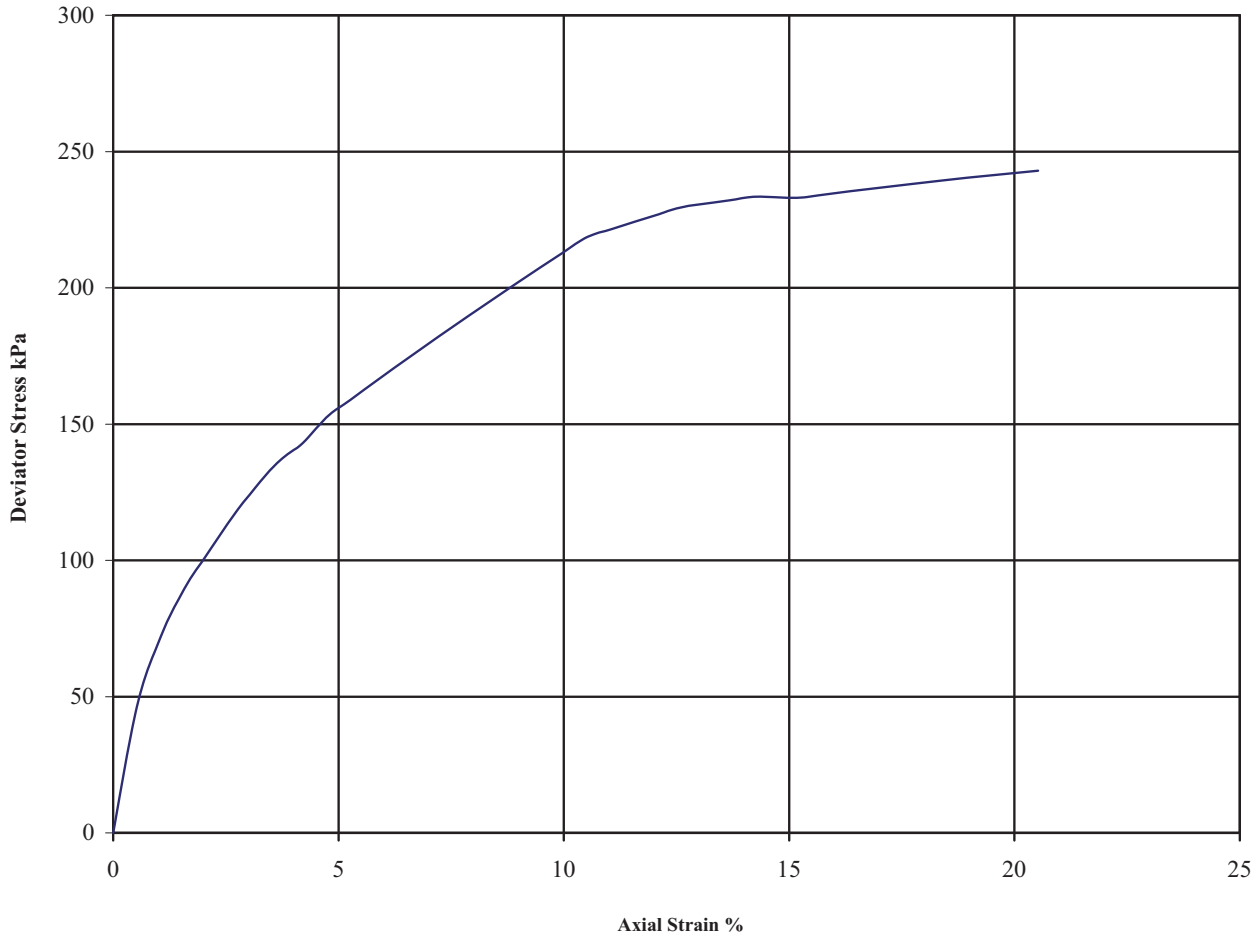
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH5B **Depth (m): 5.00-5.45**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	23	1.98	1.61	110	243	121	20.5	Compound	See summary of soil descriptions

Checked and Approved By Date

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SITA, DARWEN. **Contract No: PSL14/1371**

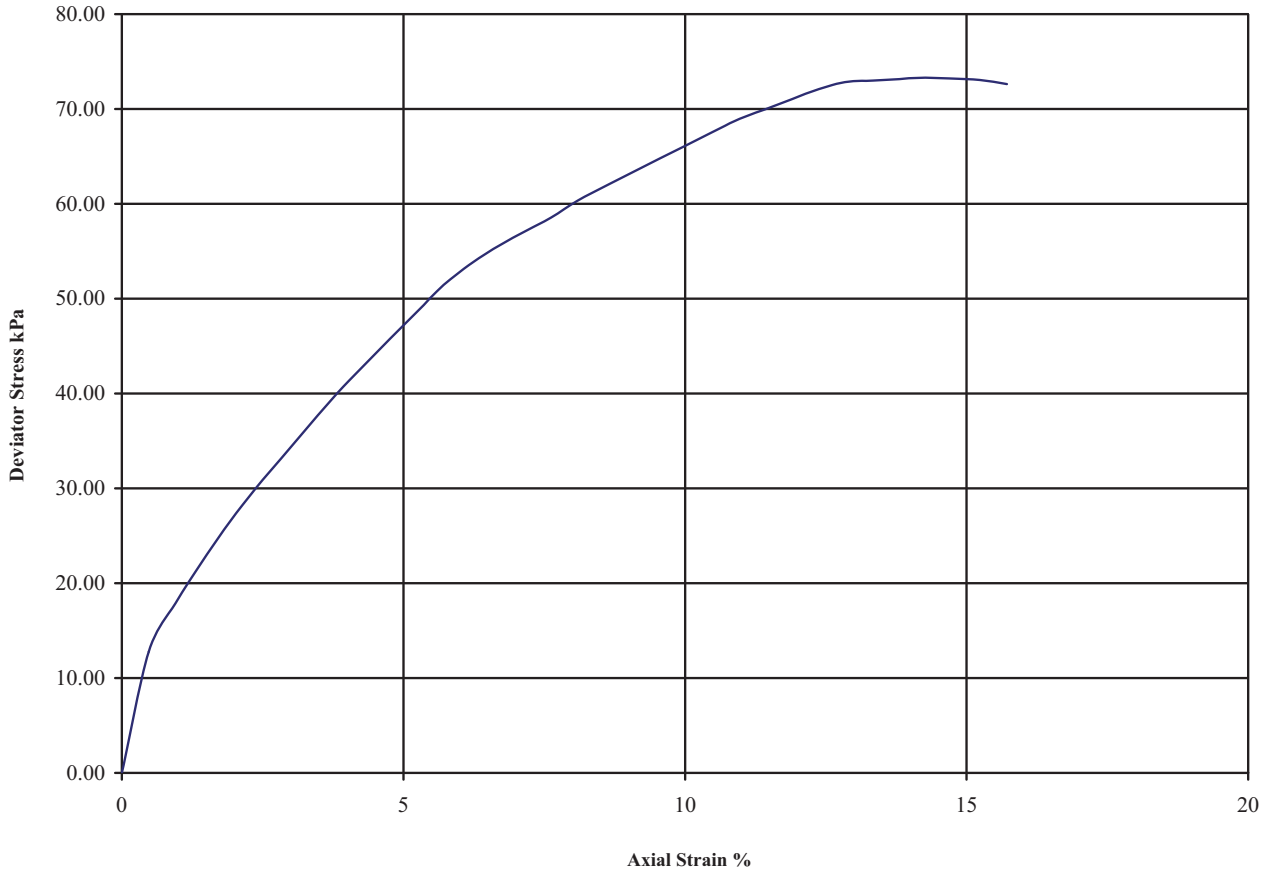
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH5B **Depth (m):** 6.00-6.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	26	2.07	1.64	130	73	37	14.3	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.34 kPa See summary of soil descriptions.

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SITA, DARWEN.

Contract No: PSL14/1371

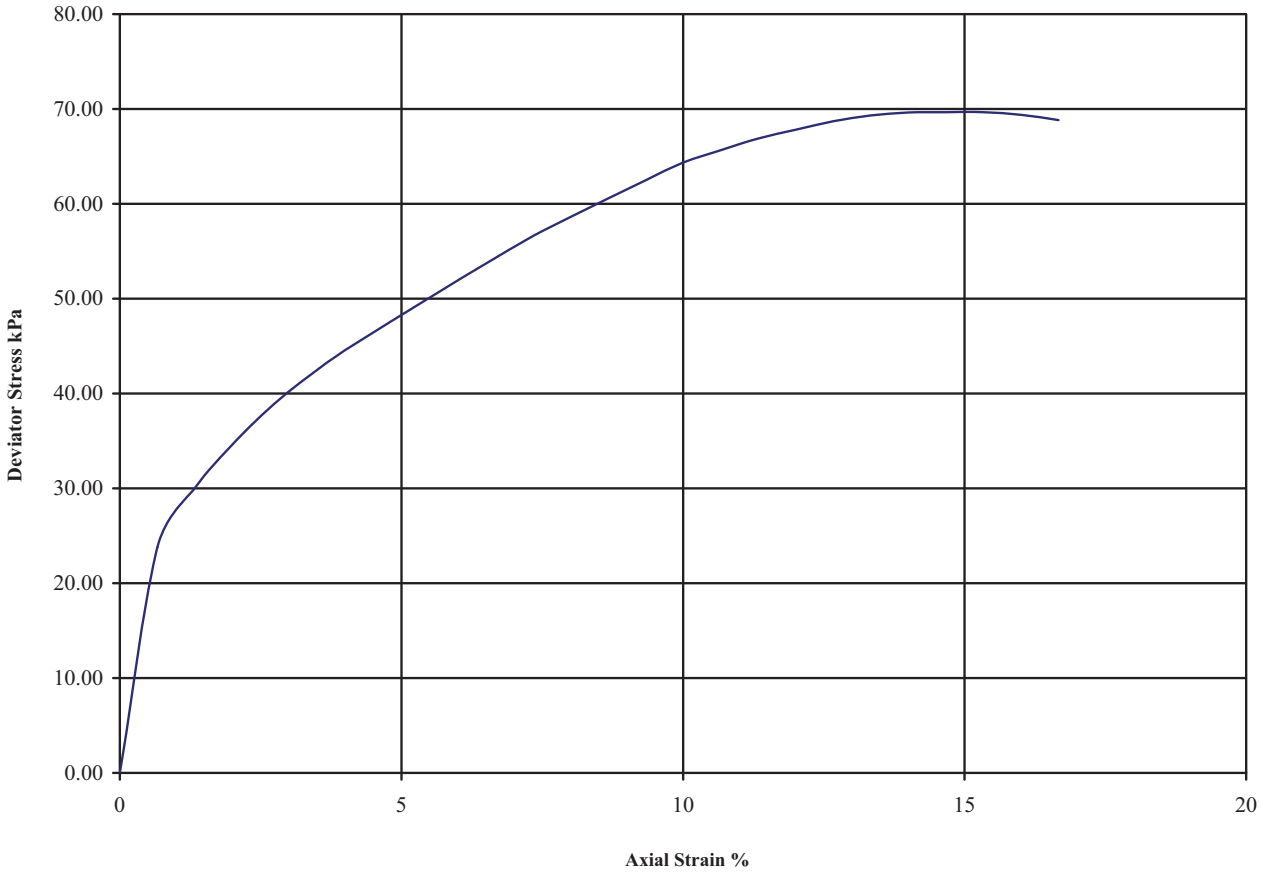
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH5B **Depth (m):** 8.00-8.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		150.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	27	2.00	1.58	170	70	35	15.3	Compound	Sample taken from top of tube Rate of strain = 2.6 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.34 kPa See summary of soil descriptions.

Checked	Date	Approved	Date
	16/04/14		16/04/14

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SITA, DARWEN.

Contract No: PSL14/1371

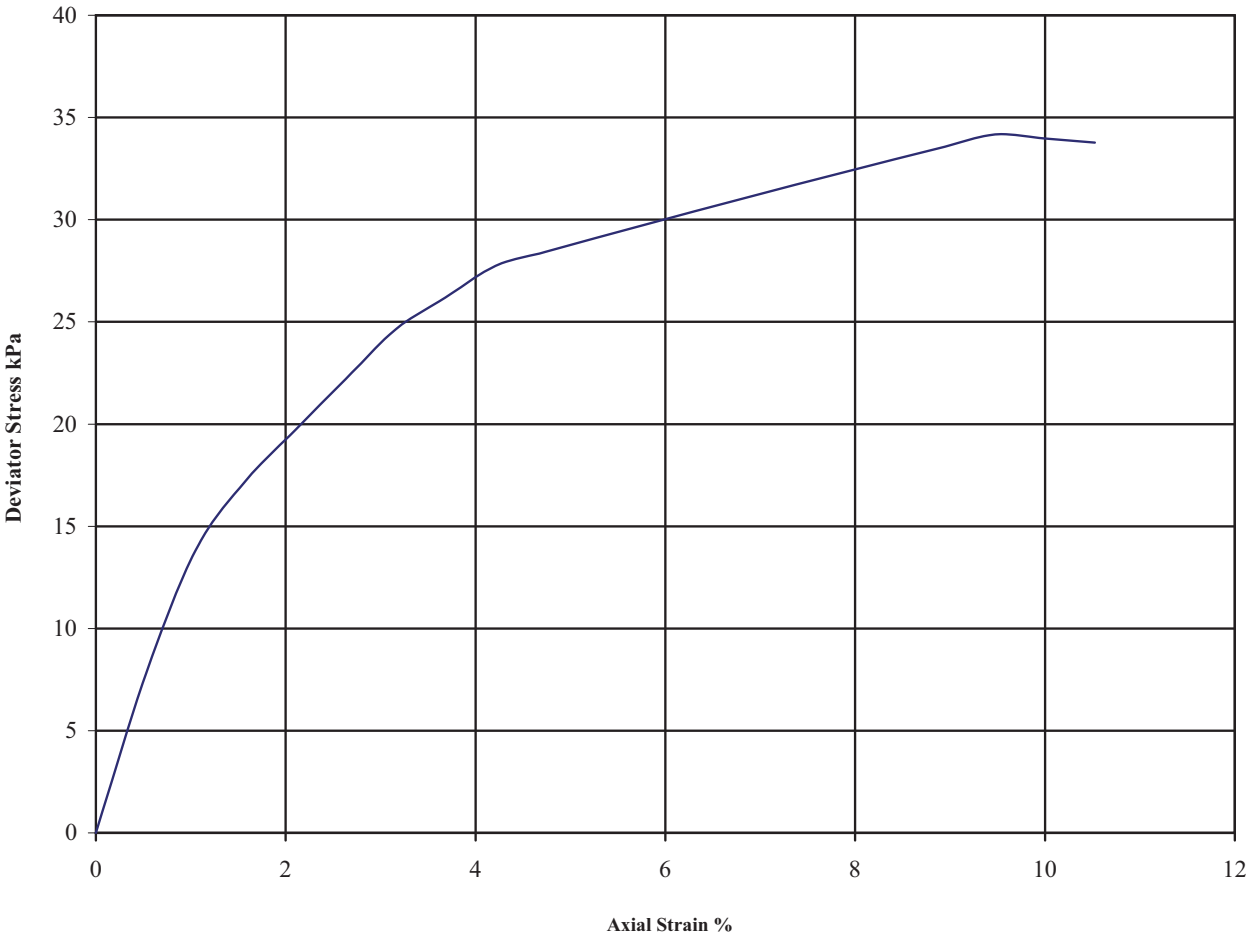
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Borehole Number: BH5B **Depth (m): 11.50-11.95**

Sample Number: **Sample Type: U**



Diameter (mm):		38	Height (mm):		76	Test:	38 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Shear Strength (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	34	1.86	1.38	220	34	17	9.5	Plastic	See summary of soil descriptions

Checked and Approved By Date

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SITA, DARWEN. **Contract No: PSL14/1371**

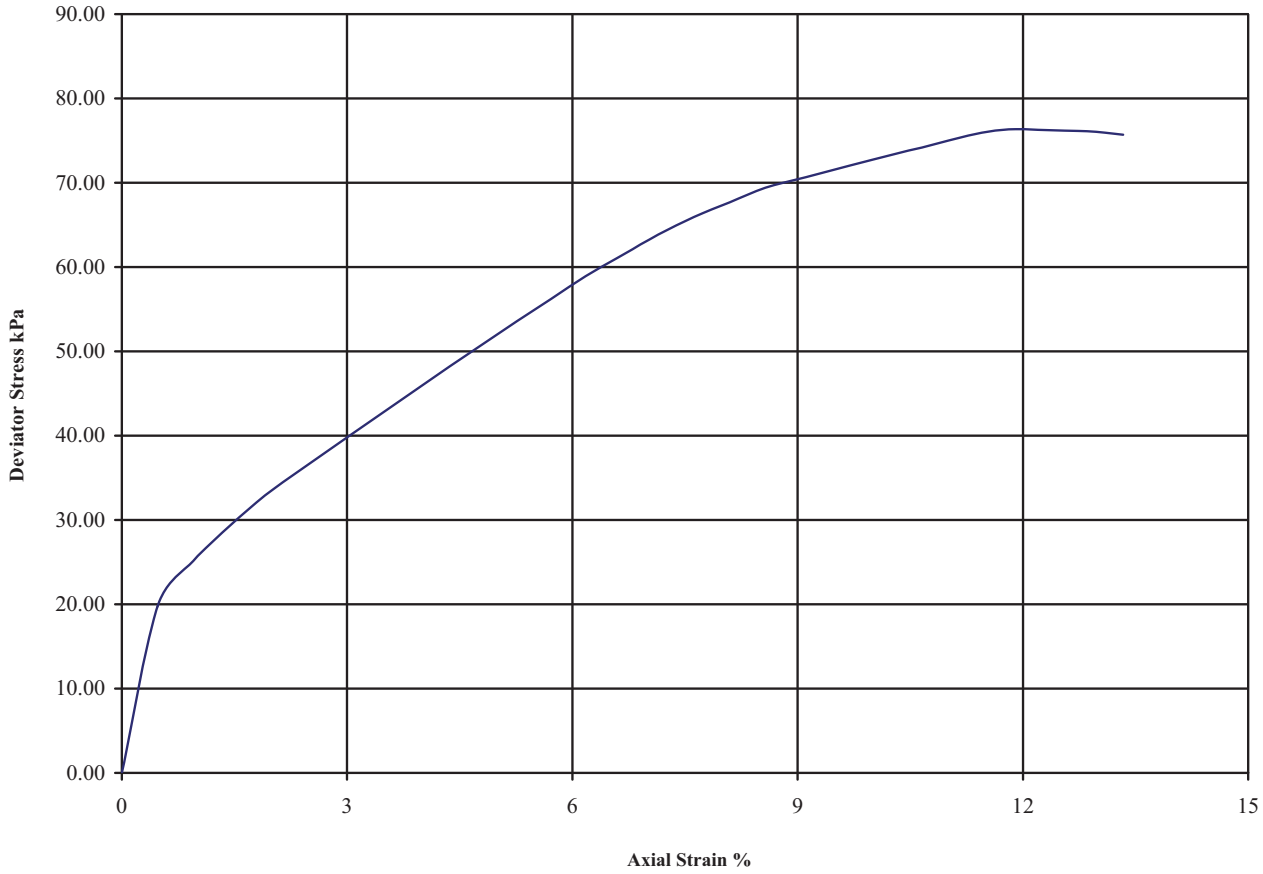
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH6 **Depth (m):** 7.00-7.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	34	1.93	1.44	150	76	38	11.9	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.35 kPa See summary of soil descriptions.

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SITA, DARWEN.

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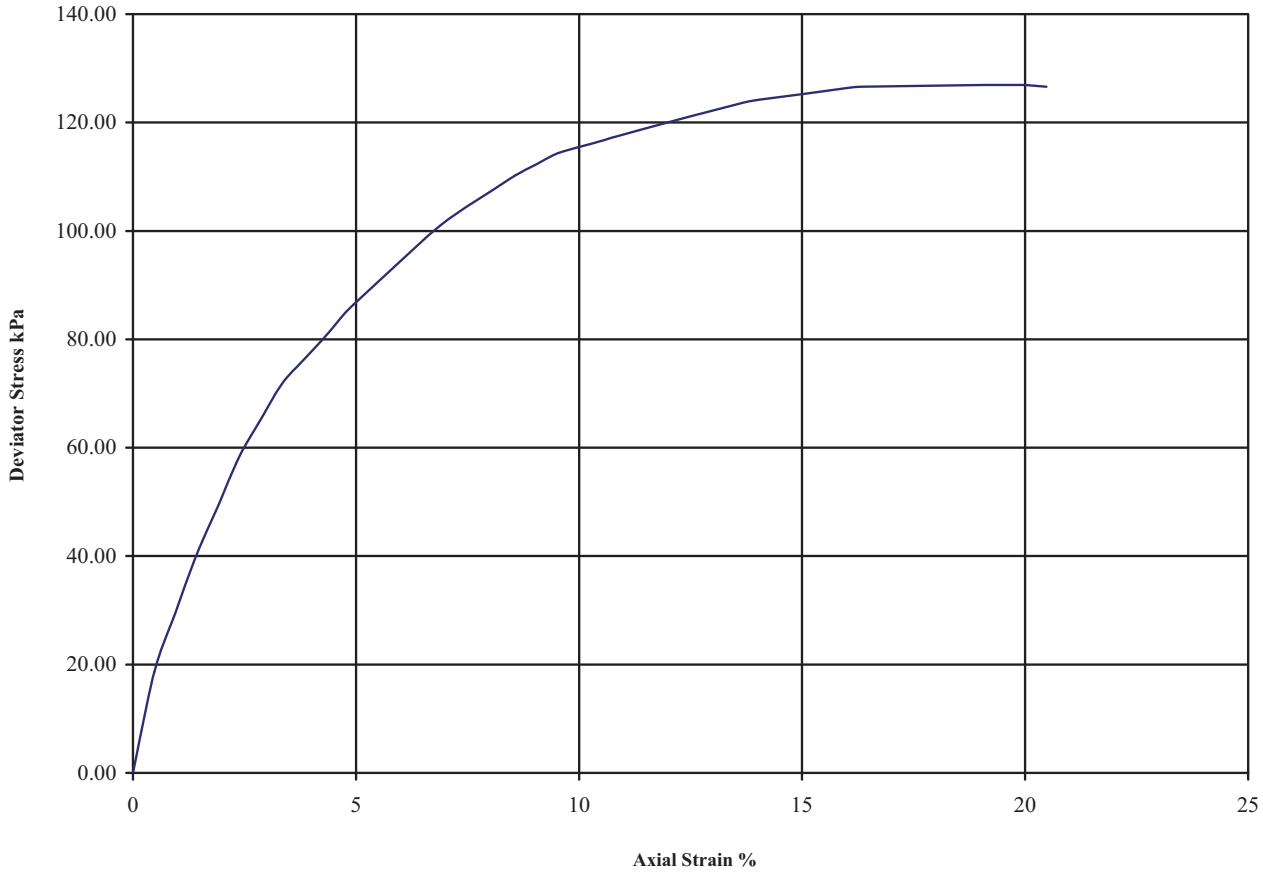
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: BH7 **Depth (m):** 3.00-3.45

Sample Number: **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	15	2.08	1.81	100	127	63	20.0	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.33 kPa See summary of soil descriptions.

Checked	Date	Approved	Date
	16/04/14		16/04/14

PSL Professional Soils Laboratory

SITA, DARWEN.

Contract No: PSL14/1371

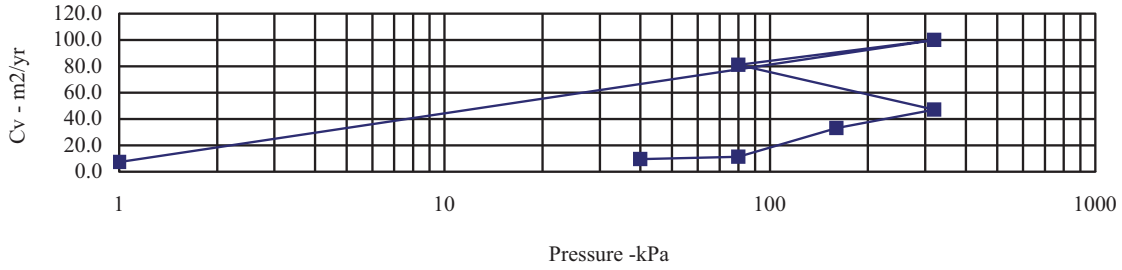
One Dimensional Consolidation Properties

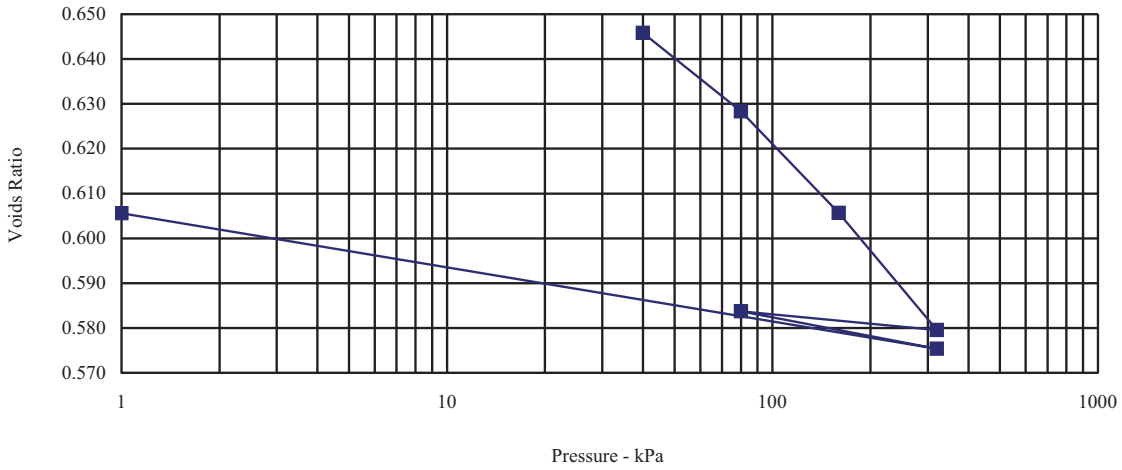
BS 1377: Part 5: 1990

Hole Number: **BH1** **Depth (m):** **2.00-2.45**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	27							
Bulk Density (Mg/m3):	1.96	0	-	40	0.990	9.560	Method used to	
Dry Density (Mg/m3):	1.55	40	-	80	0.266	11.350	determine CV:	t90
Voids Ratio:	0.7137	80	-	160	0.174	33.220	Nominal temperature	
Degree of saturation:	99.1	160	-	320	0.102	47.159	during test ' C:	20
Height (mm):	20.08	320	-	80	0.011	81.149	Remarks:	
Diameter (mm)	75.12	80	-	320	0.022	100.103	See summary of soils description.	
Particle Density (Mg/m3):	2.65	320	-	1	0.060	7.277		
Assumed								





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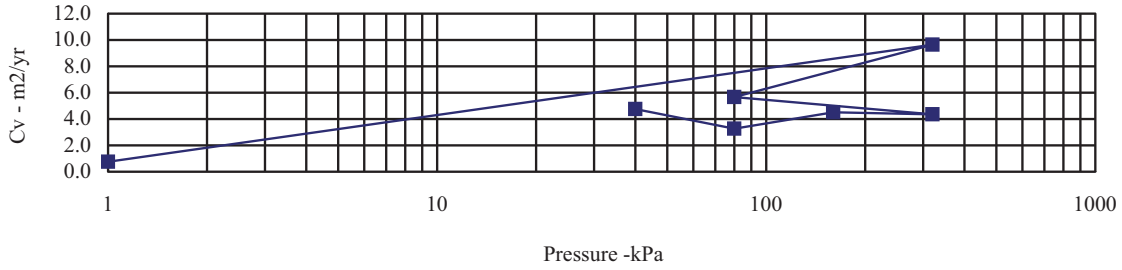
One Dimensional Consolidation Properties

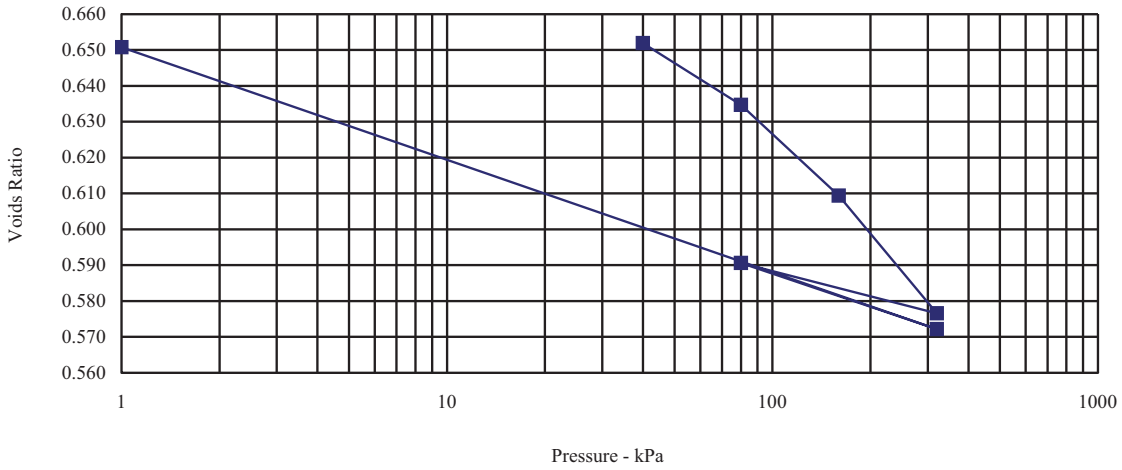
BS 1377: Part 5: 1990

Hole Number: **BH1** **Depth (m):** **4.00-4.65**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	26							
Bulk Density (Mg/m3):	1.99	0	-	40	0.398	4.765	Method used to	
Dry Density (Mg/m3):	1.58	40	-	80	0.261	3.258	determine CV:	t90
Voids Ratio:	0.6787	80	-	160	0.194	4.520	Nominal temperature	
Degree of saturation:	102.7	160	-	320	0.128	4.360	during test ' C:	20
Height (mm):	20.03	320	-	80	0.037	5.663	Remarks:	
Diameter (mm)	75.09	80	-	320	0.048	9.641	See summary of soils description.	
Particle Density (Mg/m3):	2.65	320	-	1	0.157	0.766		
Assumed								





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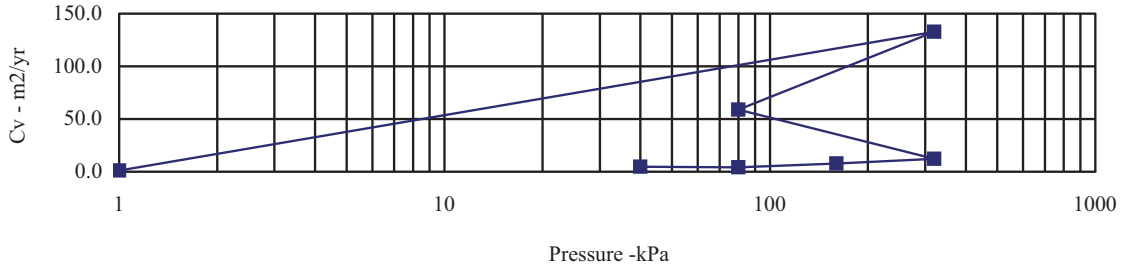
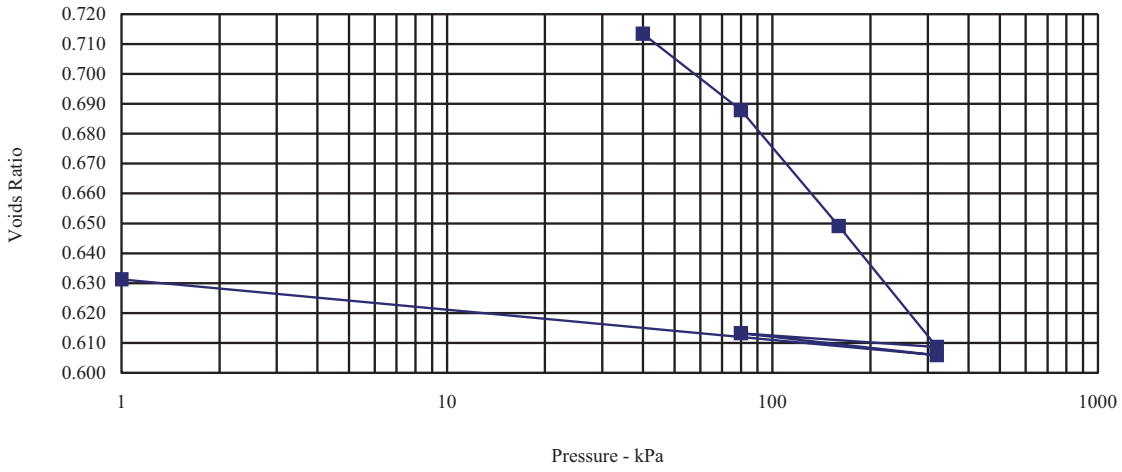
Hole Number: **BH2** **Depth (m):** **3.00-3.45**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	31							
Bulk Density (Mg/m3):	1.91	0	-	40	1.469	4.699	Method used to	
Dry Density (Mg/m3):	1.46	40	-	80	0.374	4.086	determine CV:	t90
Voids Ratio:	0.8205	80	-	160	0.287	7.866	Nominal temperature	
Degree of saturation:	99.7	160	-	320	0.153	12.245	during test ' C:	20
Height (mm):	20.33	320	-	80	0.012	58.902	Remarks:	
Diameter (mm)	75.07	80	-	320	0.019	132.845	See summary of soils description.	
Particle Density (Mg/m3):	2.65	320	-	1	0.050	1.166		
Assumed								





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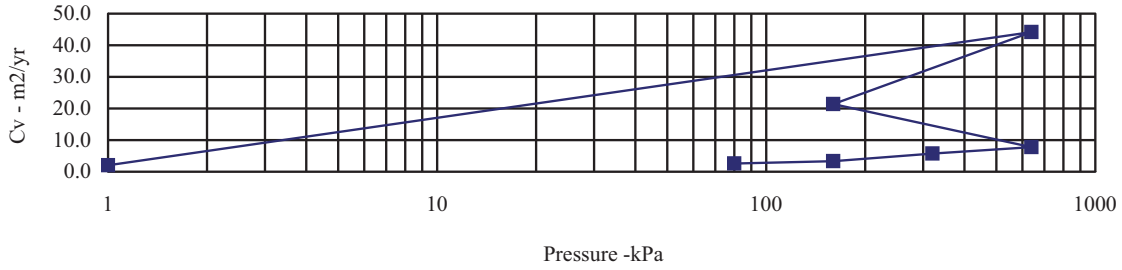
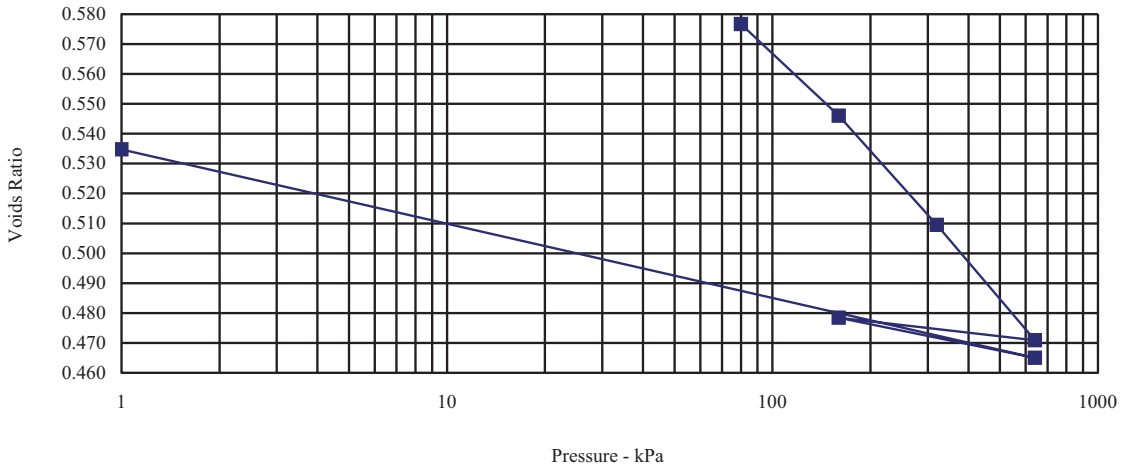
BS 1377: Part 5: 1990

Hole Number: **BH2** **Depth (m):** **5.00-5.45**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	27							
Bulk Density (Mg/m3):	2.00	0	-	80	0.810	2.579	Method used to	
Dry Density (Mg/m3):	1.57	80	-	160	0.243	3.329	determine CV:	t90
Voids Ratio:	0.6859	160	-	320	0.148	5.727	Nominal temperature	
Degree of saturation:	105.5	320	-	640	0.080	7.749	during test ' C:	20
Height (mm):	20.05	640	-	160	0.011	21.343	Remarks:	
Diameter (mm)	75.11	160	-	640	0.019	44.173	See summary of soils description.	
Particle Density (Mg/m3):	2.65	640	-	1	0.075	2.019		
Assumed								





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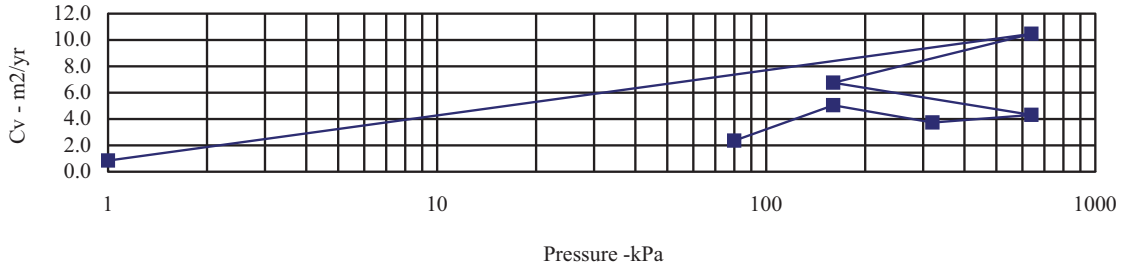
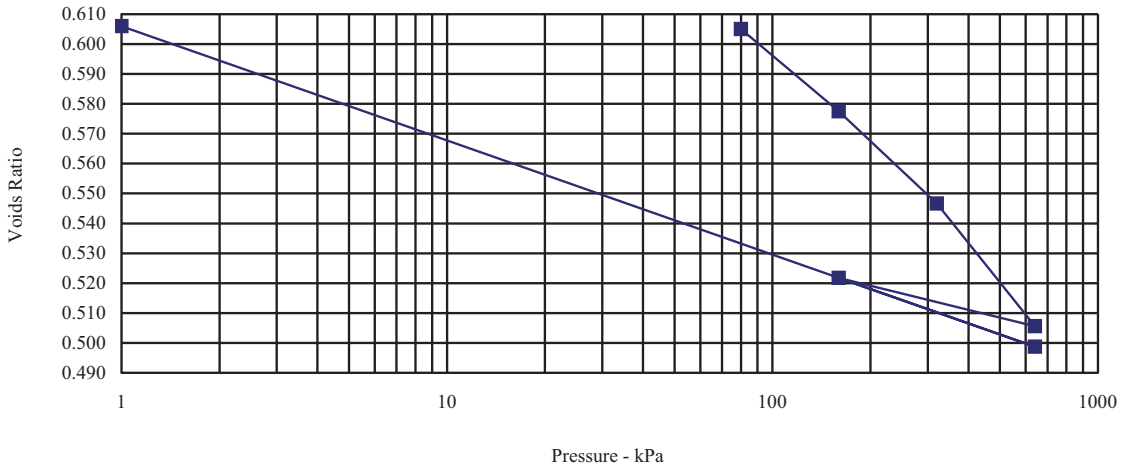
Hole Number: **BH5B** **Depth (m):** **5.00-5.45**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	24							
Bulk Density (Mg/m3):	2.02	0	-	80	0.223	2.353	Method used to	
Dry Density (Mg/m3):	1.62	80	-	160	0.214	5.036	determine CV:	t90
Voids Ratio:	0.6342	160	-	320	0.122	3.729	Nominal temperature	
Degree of saturation:	102.0	320	-	640	0.083	4.320	during test ' C:	20
Height (mm):	19.93	640	-	160	0.022	6.753	Remarks:	
Diameter (mm)	75.09	160	-	640	0.032	10.458	See summary of soils description.	
Particle Density (Mg/m3):	2.65	640	-	1	0.112	0.848		
Assumed								





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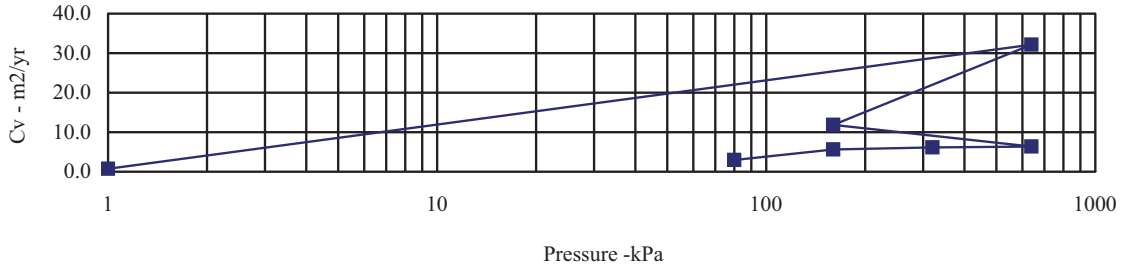
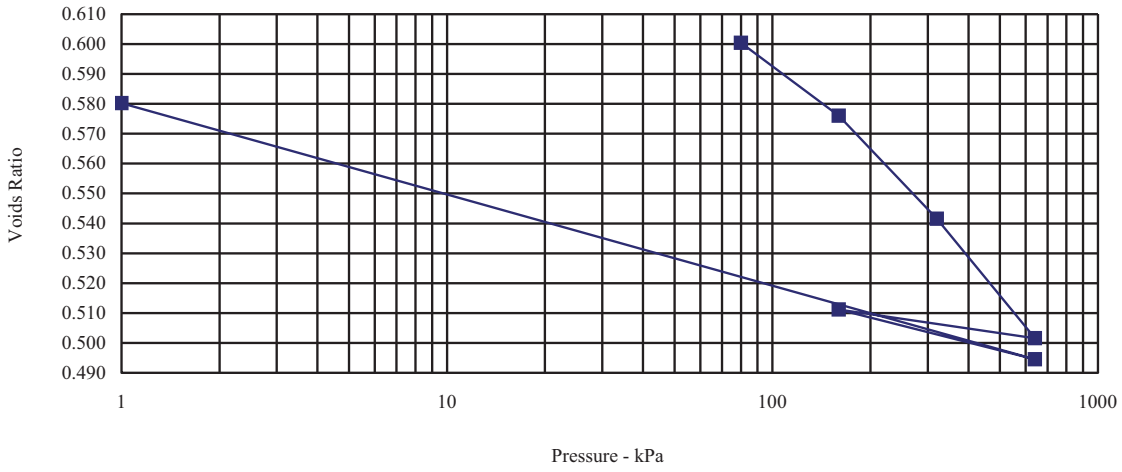
Hole Number: **BH6** **Depth (m):** **5.00-5.45**

Sample Number: **Sample Type:** **U**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	26							
Bulk Density (Mg/m3):	2.03	0	-	80	0.379	2.955	Method used to	
Dry Density (Mg/m3):	1.61	80	-	160	0.191	5.642	determine CV:	t90
Voids Ratio:	0.6504	160	-	320	0.137	6.136	Nominal temperature	
Degree of saturation:	106.9	320	-	640	0.081	6.360	during test ' C:	20
Height (mm):	19.6	640	-	160	0.013	11.843	Remarks:	
Diameter (mm)	75.07	160	-	640	0.023	32.148	See summary of soils description.	
Particle Density (Mg/m3):	2.65	640	-	1	0.090	0.731		
Assumed								





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Permeability in a Triaxial Cell

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Specimen Details

Borehole		BH01
Sample Number		-
Sample Depth	m	2.00-2.45
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	102.00
Area	mm^2	8171.28
Volume	cm^3	817.13
Bulk Density	Mg/m^3	1.99
Dry Density	Mg/m^3	1.57
Moisture Content	%	27
Voids Ratio		0.690
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	23
Bulk Density	Mg/m^3	1.94
Dry Density	Mg/m^3	1.57

Test Setup

Date Started		03/07/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	2
Permeability Time	Days	2

Checked and Approved By **Date 16/04/2014**

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Permeability in a Triaxial Cell

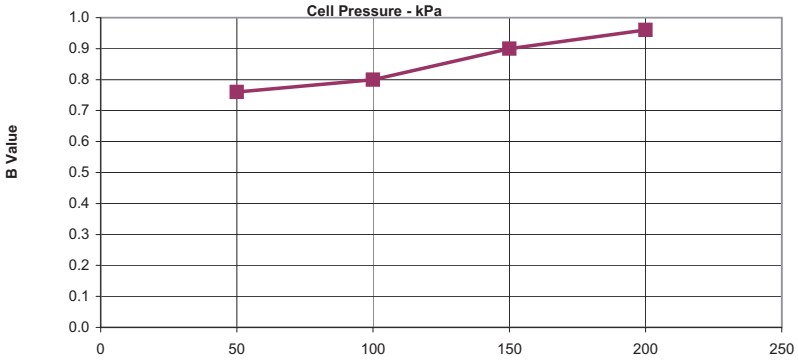
BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH01
Sample No.		-
Depth:	m	2.00-2.45

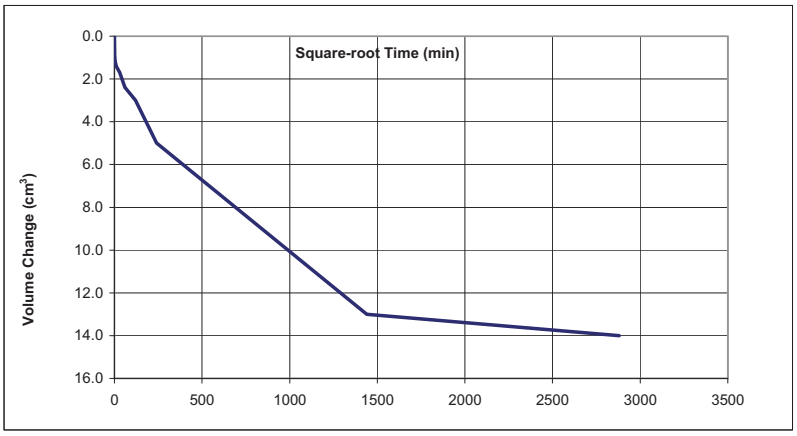
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	200
Final B Value		0.96



Consolidation

Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	302
PWP dissipation	%	97



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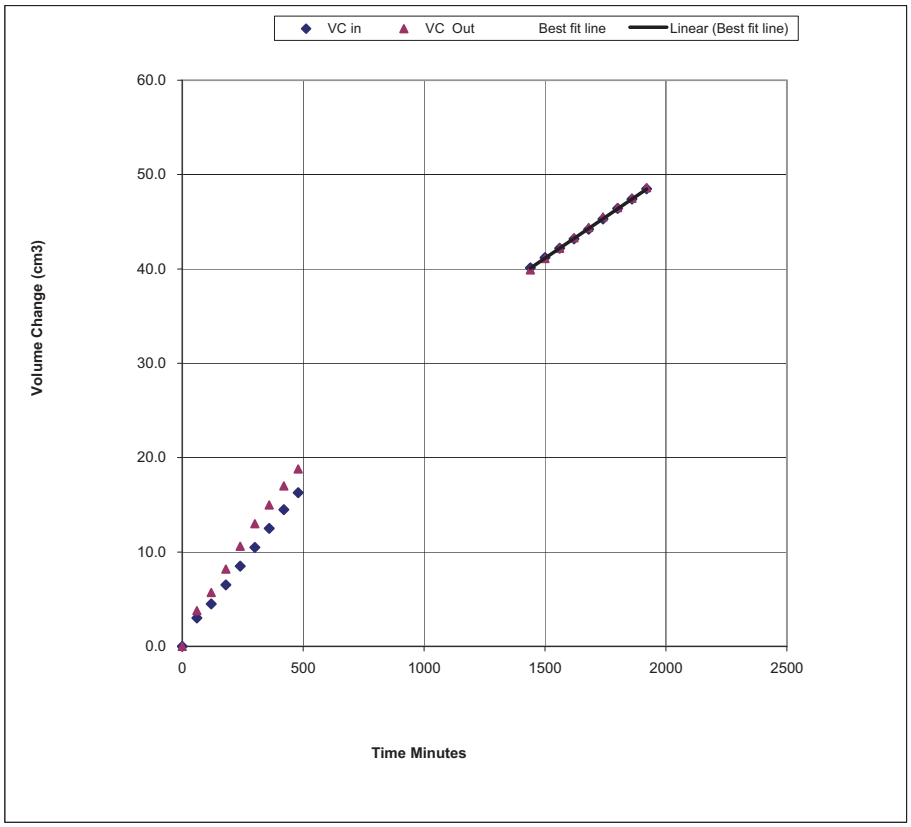
Specimen Details

Borehole		BH01
Sample No.		-
Depth	m	2.00-2.45

Permeability Stage



Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0175
Average Temperature	'C	20
Vertical Permeability Kv	m/s	3.5×10^{-9}

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Permeability in a Triaxial Cell

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Specimen Details

Borehole		BH01
Sample Number		-
Sample Depth	m	4.00-4.45
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	99.00
Area	mm^2	7697.69
Volume	cm^3	769.77
Bulk Density	Mg/m^3	1.98
Dry Density	Mg/m^3	1.57
Moisture Content	%	26
Voids Ratio		0.693
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	24
Bulk Density	Mg/m^3	1.95
Dry Density	Mg/m^3	1.57

Test Setup

Date Started		02/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	2

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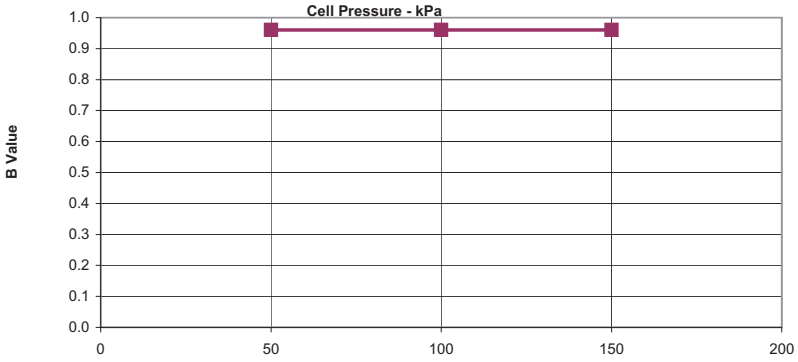
Specimen Details

Borehole		BH01
Sample No.		-
Depth:	m	4.00-4.45

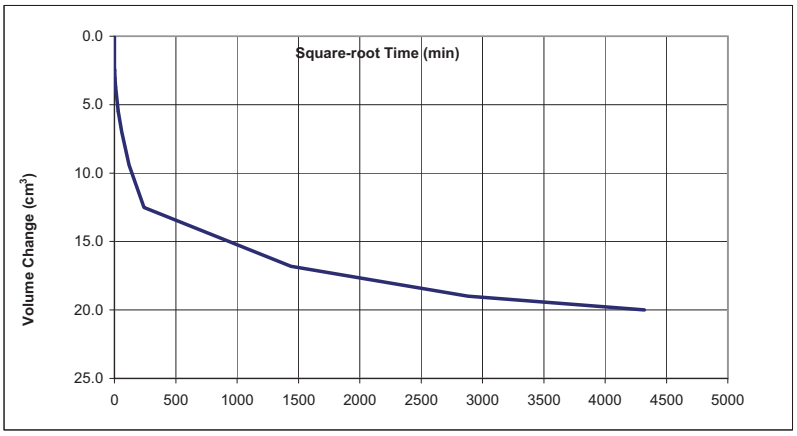
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	150
Final B Value		0.96



Consolidation

Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	301
PWP dissipation	%	98



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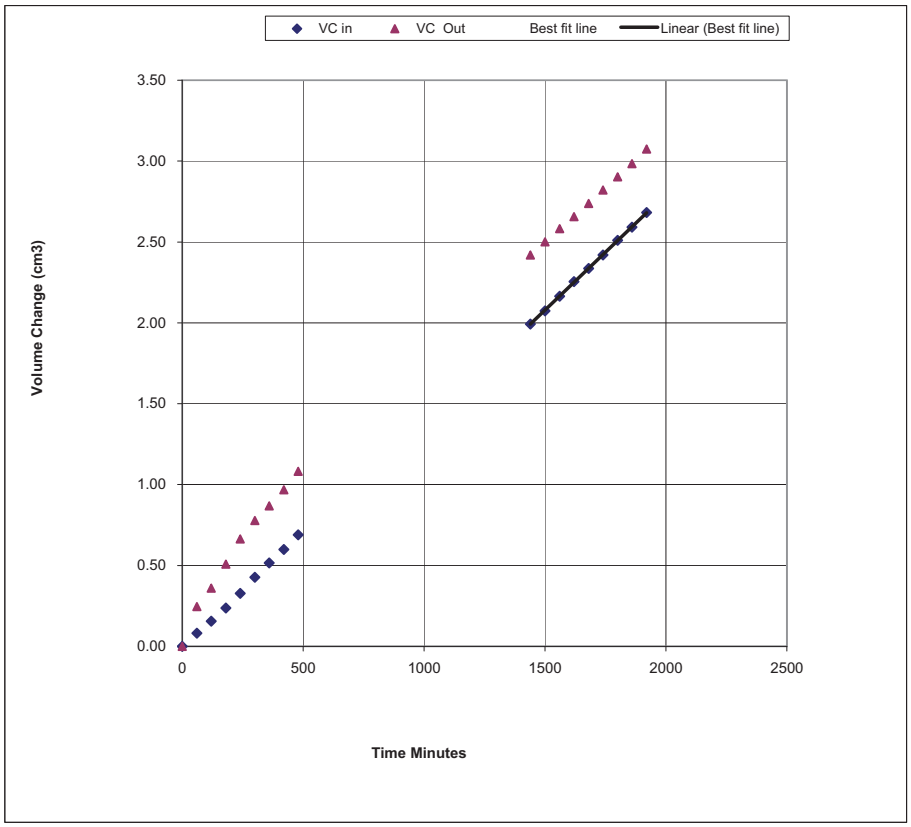
Specimen Details

Borehole		BH01
Sample No.		-
Depth	m	4.00-4.45

Permeability Stage



Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0014
Average Temperature	'C	20
Vertical Permeability Kv	m/s	3.0×10^{-10}

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Permeability in a Triaxial Cell

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Specimen Details

Borehole		BH02
Sample Number		-
Sample Depth	m	3.00-3.45
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	100.00
Area	mm^2	7853.98
Volume	cm^3	785.40
Bulk Density	Mg/m^3	1.96
Dry Density	Mg/m^3	1.50
Moisture Content	%	31
Voids Ratio		0.770
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	26
Bulk Density	Mg/m^3	1.89
Dry Density	Mg/m^3	1.50

Test Setup

Date Started		03/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	2
Permeability Time	Days	2

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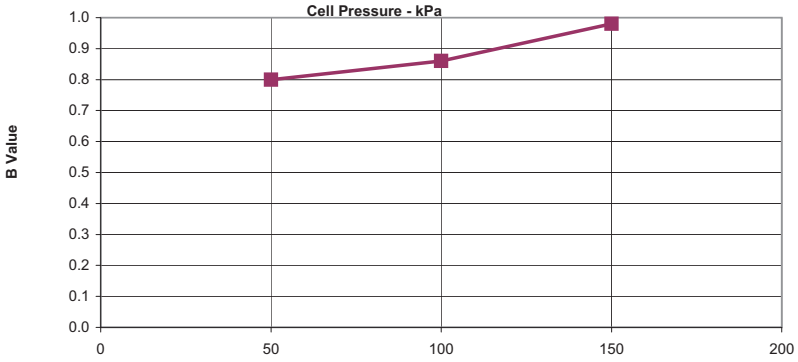
Specimen Details

Borehole		BH02
Sample No.		-
Depth:	m	3.00-3.45

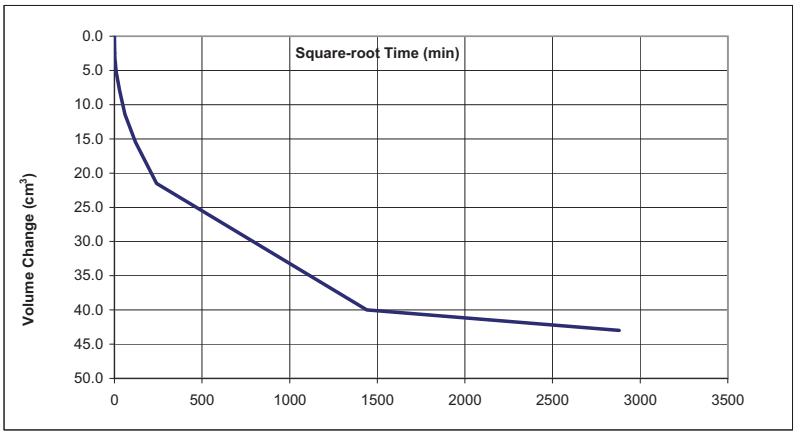
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	150
Final B Value		0.98



Consolidation

Effective Pressure	kPa	100
Cell Pressure	kPa	400
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	97



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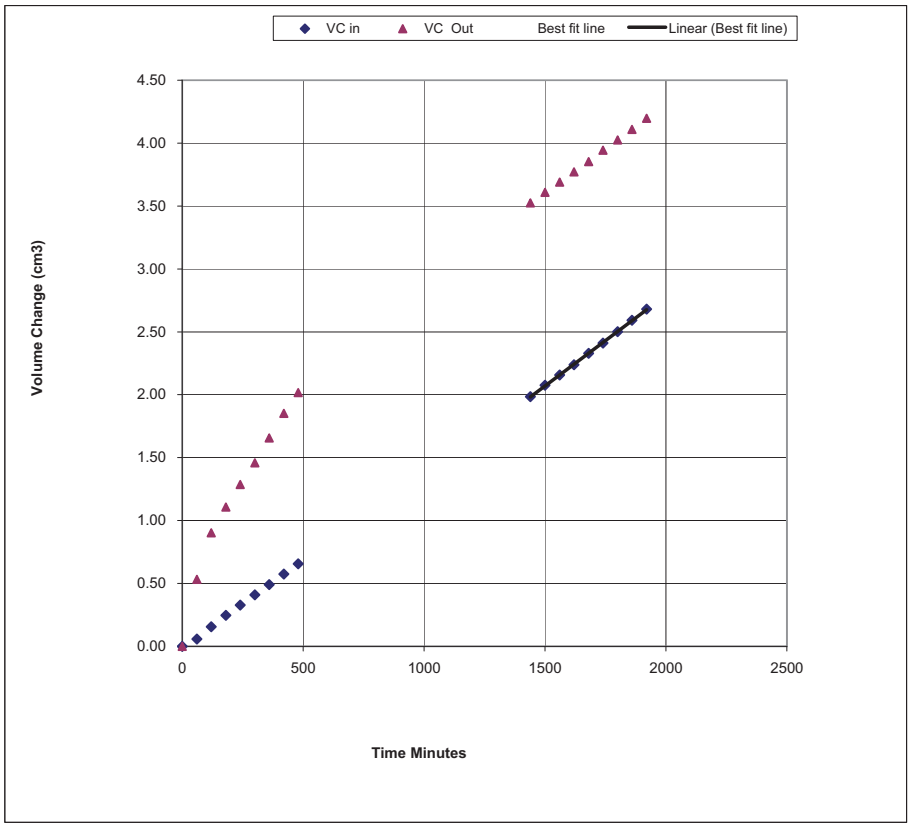
Specimen Details

Borehole		BH02
Sample No.		-
Depth	m	3.00-3.45

Permeability Stage



Cell Pressure	kPa	400
Mean Effective Stress	kPa	100
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0015
Average Temperature	'C	20
Vertical Permeability Kv	m/s	3.0×10^{-10}

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Specimen Details

Borehole		BH02
Sample Number		-
Sample Depth	m	5.00-5.45
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	101.00
Diameter	mm	102.00
Area	mm^2	8171.28
Volume	cm^3	825.30
Bulk Density	Mg/m^3	2.05
Dry Density	Mg/m^3	1.61
Moisture Content	%	27
Voids Ratio		0.644
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	22
Bulk Density	Mg/m^3	1.97
Dry Density	Mg/m^3	1.61

Test Setup

Date Started		02/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	2

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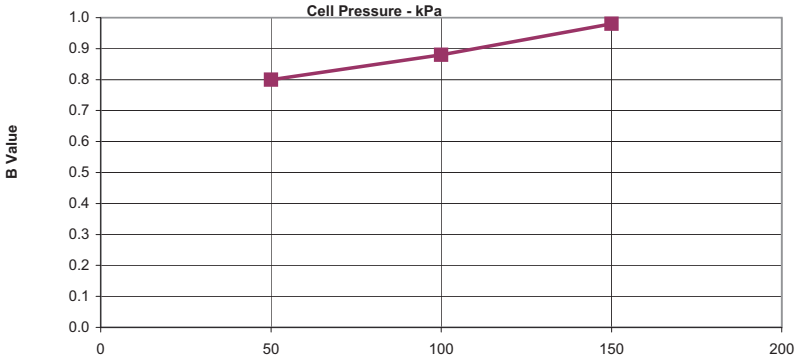
Specimen Details

Borehole		BH02
Sample No.		-
Depth:	m	5.00-5.45

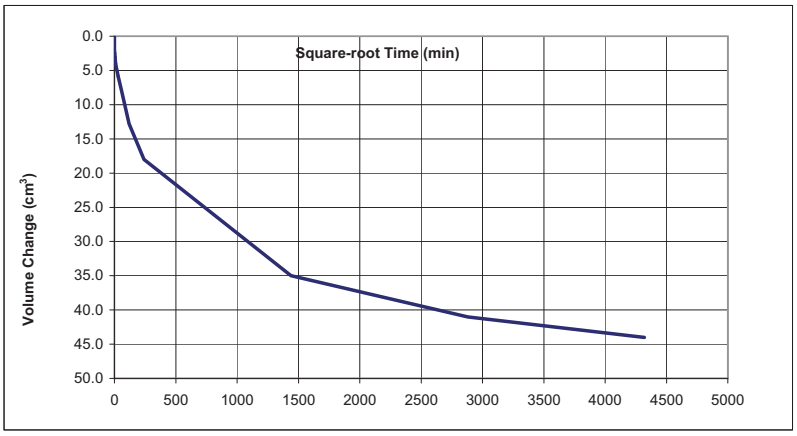
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	150
Final B Value		0.98



Consolidation

Effective Pressure	kPa	110
Cell Pressure	kPa	410
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	96



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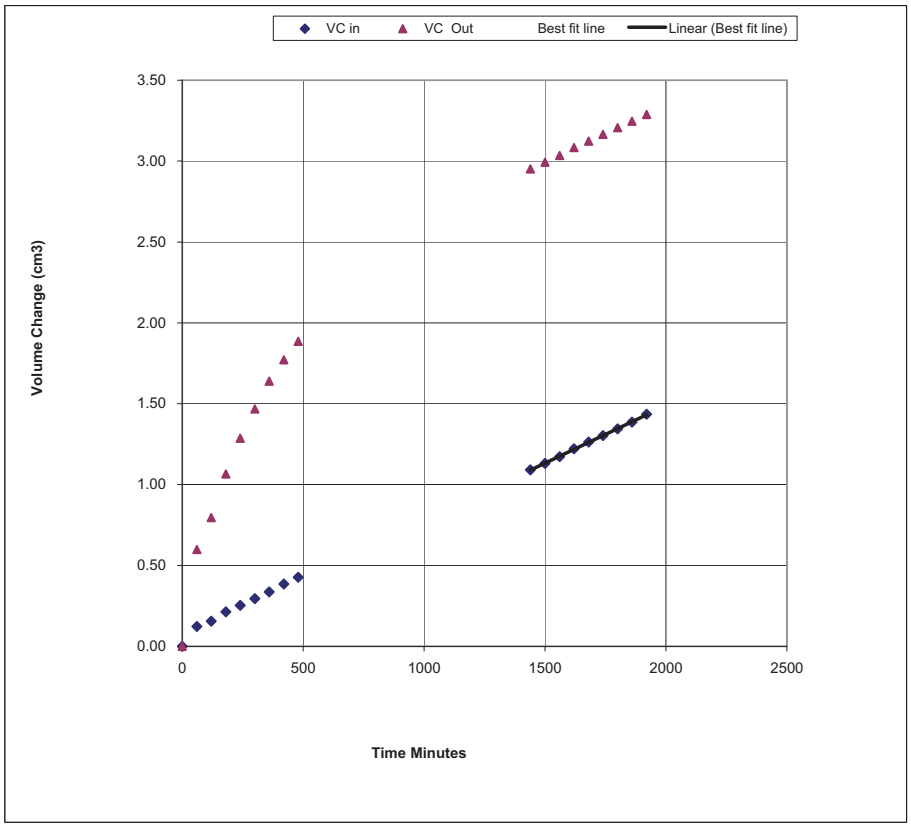
Specimen Details

Borehole		BH02
Sample No.		-
Depth	m	5.00-5.45

Permeability Stage



Cell Pressure	kPa	410
Mean Effective Stress	kPa	110
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0007
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.5×10^{-10}

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SITA, DARWEN.

Client Ref
1970
Contract No
PSL14/1371

Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH03
Sample Number		-
Sample Depth	m	8.50-8.95
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	100.00
Area	mm^2	7853.98
Volume	cm^3	785.40
Bulk Density	Mg/m^3	1.96
Dry Density	Mg/m^3	1.53
Moisture Content	%	28
Voids Ratio		0.736
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	23
Bulk Density	Mg/m^3	1.88
Dry Density	Mg/m^3	1.53

Test Setup

Date Started		02/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	2
Consolidation Time	Days	3
Permeability Time	Days	2

Checked and Approved By **Date 16/04/2014**

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SITA, DARWEN.

Client Ref
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Contract No
PSL14/1371

Permeability in a Triaxial Cell

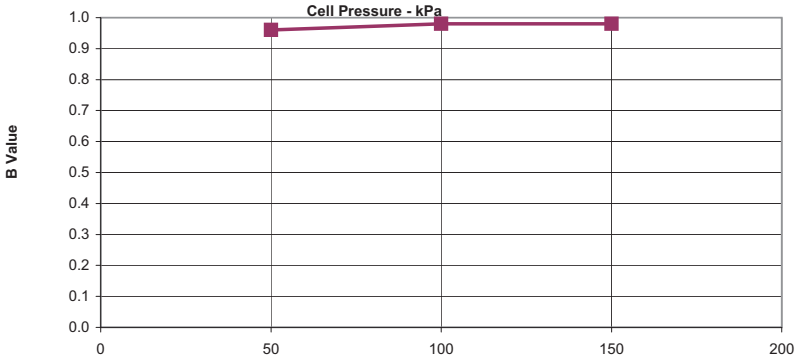
BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH03
Sample No.		-
Depth:	m	8.50-8.95

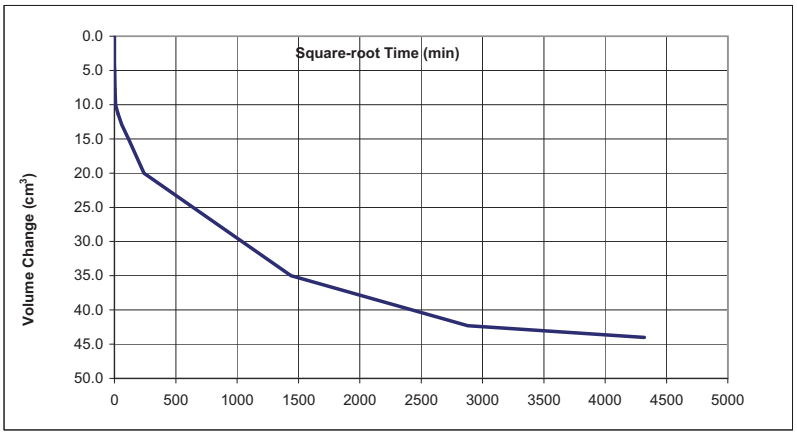
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	150
Final B Value		0.98



Consolidation

Effective Pressure	kPa	220
Cell Pressure	kPa	520
Back Pressure	kPa	300
Final PWP	kPa	306
PWP dissipation	%	97



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Client Ref
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Contract No
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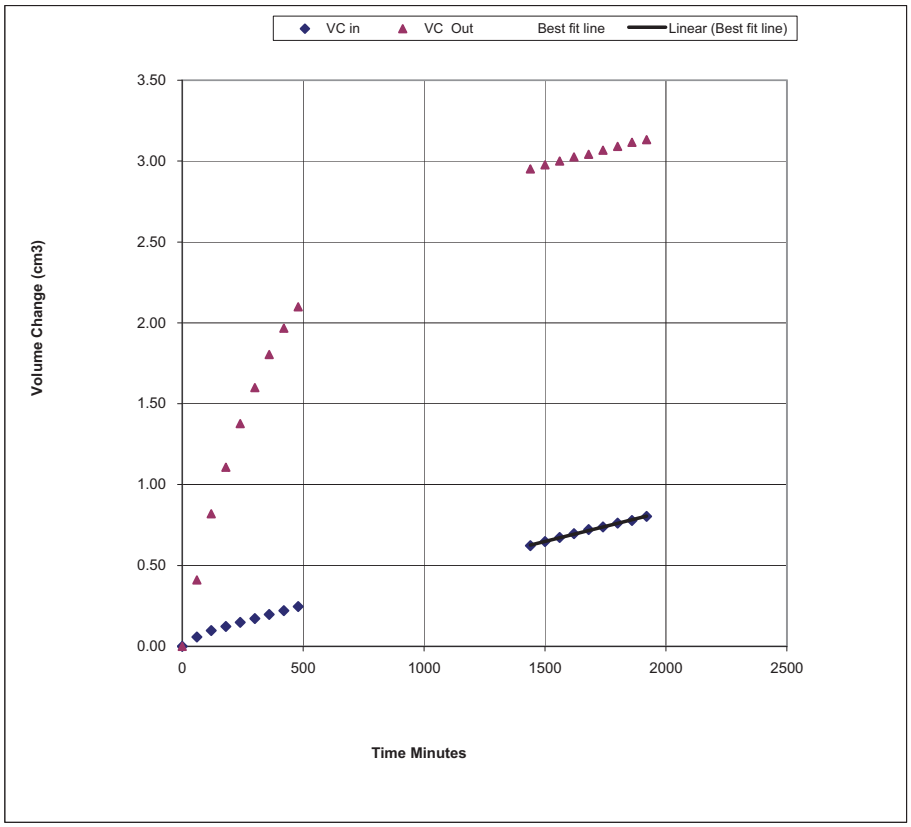
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH03
Sample No.		-
Depth	m	8.50-8.95

Permeability Stage



Cell Pressure	kPa	520
Mean Effective Stress	kPa	220
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0004
Average Temperature	'C	20
Vertical Permeability Kv	m/s	7.8×10^{-11}

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Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample Number		-
Sample Depth	m	8.00-8.50
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	99.00
Area	mm^2	7697.69
Volume	cm^3	769.77
Bulk Density	Mg/m^3	2.00
Dry Density	Mg/m^3	1.56
Moisture Content	%	28
Voids Ratio		0.704
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	26
Bulk Density	Mg/m^3	1.97
Dry Density	Mg/m^3	1.56

Test Setup

Date Started		03/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	2
Permeability Time	Days	2

Checked and Approved By **Date** **16/04/2014**

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Client Ref
1970
Contract No
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Permeability in a Triaxial Cell

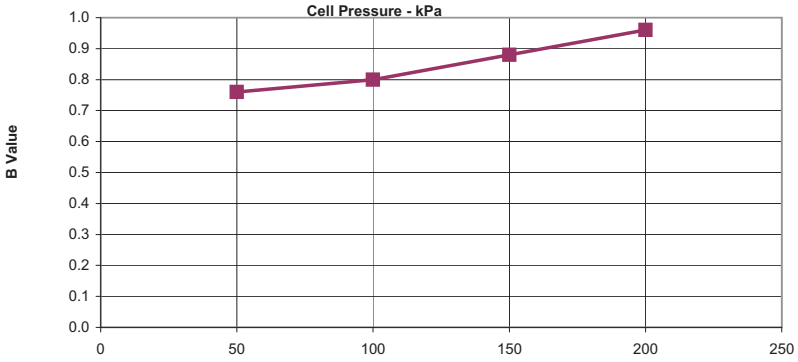
BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample No.		-
Depth:	m	8.00-8.50

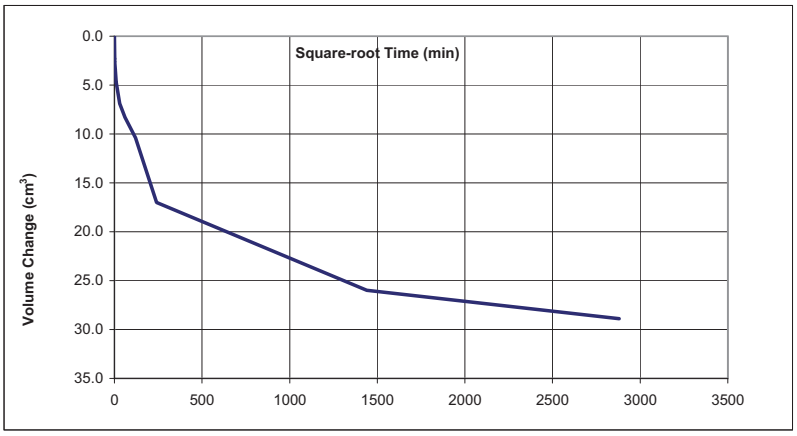
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	200
Final B Value		0.96



Consolidation

Effective Pressure	kPa	170
Cell Pressure	kPa	470
Back Pressure	kPa	300
Final PWP	kPa	303
PWP dissipation	%	98



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Client Ref
1970
Contract No
PSL14/1371

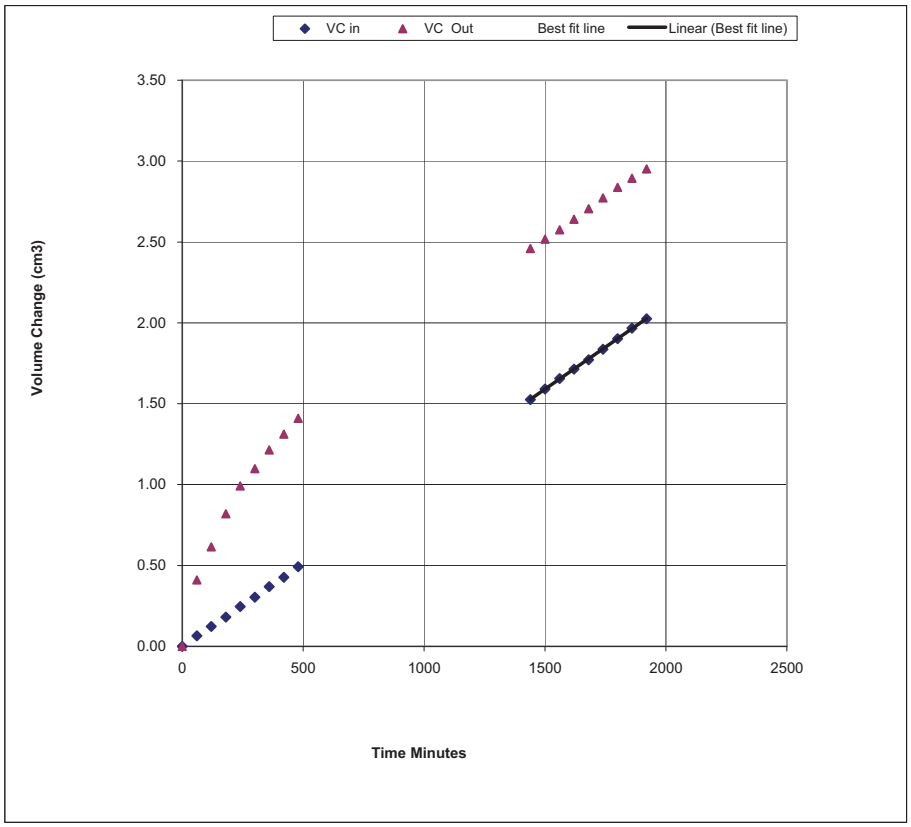
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample No.		-
Depth	m	8.00-8.50

Permeability Stage



Cell Pressure	kPa	470
Mean Effective Stress	kPa	170
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0010
Average Temperature	'C	20
Vertical Permeability Kv	m/s	2.2×10^{-10}

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Client Ref
1970
Contract No
PSL14/1371

Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample Number		-
Sample Depth	m	11.50-11.95
Sample Type		U
Date		16/04/2014
Disturbed / Undisturbed		Undisturbed

Description of Specimen

See summary of soil descriptions.

Initial Specimen Conditions

Height	mm	100.00
Diameter	mm	100.00
Area	mm^2	7853.98
Volume	cm^3	785.40
Bulk Density	Mg/m^3	1.87
Dry Density	Mg/m^3	1.39
Moisture Content	%	34
Voids Ratio		0.908
Specific Gravity	Mg/m^3	2.65
(assumed/measured)		assumed

Final Specimen Conditions

Moisture Content	%	30
Bulk Density	Mg/m^3	1.80
Dry Density	Mg/m^3	1.39

Test Setup

Date Started		02/04/2014
Date Finished		09/04/2014
Top Drain Used		Y
Base Drain Used		Y
Method of Saturation		By back pressure
Direction Of Flow		Vertically Downwards
Saturation Time	Days	3
Consolidation Time	Days	2
Permeability Time	Days	2

Checked and Approved By **Date 16/04/2014**

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SITA, DARWEN.

Client Ref
1970
Contract No
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Permeability in a Triaxial Cell

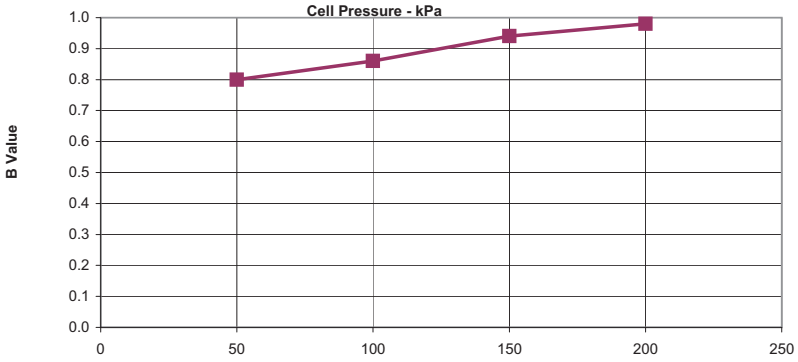
BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample No.		-
Depth:	m	11.50-11.95

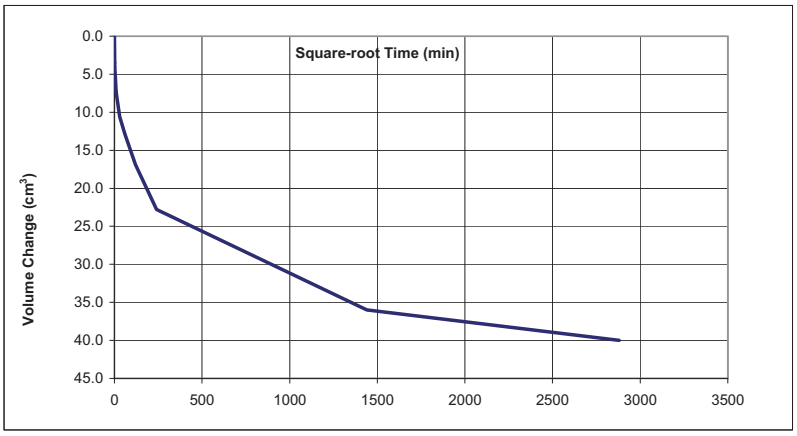
Saturation

Cell Pressure Incr.	kPa	50
Back Pressure Incr.	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	200
Final B Value		0.98



Consolidation

Effective Pressure	kPa	220
Cell Pressure	kPa	520
Back Pressure	kPa	300
Final PWP	kPa	302
PWP dissipation	%	99



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Client Ref
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Contract No
PSL14/1371

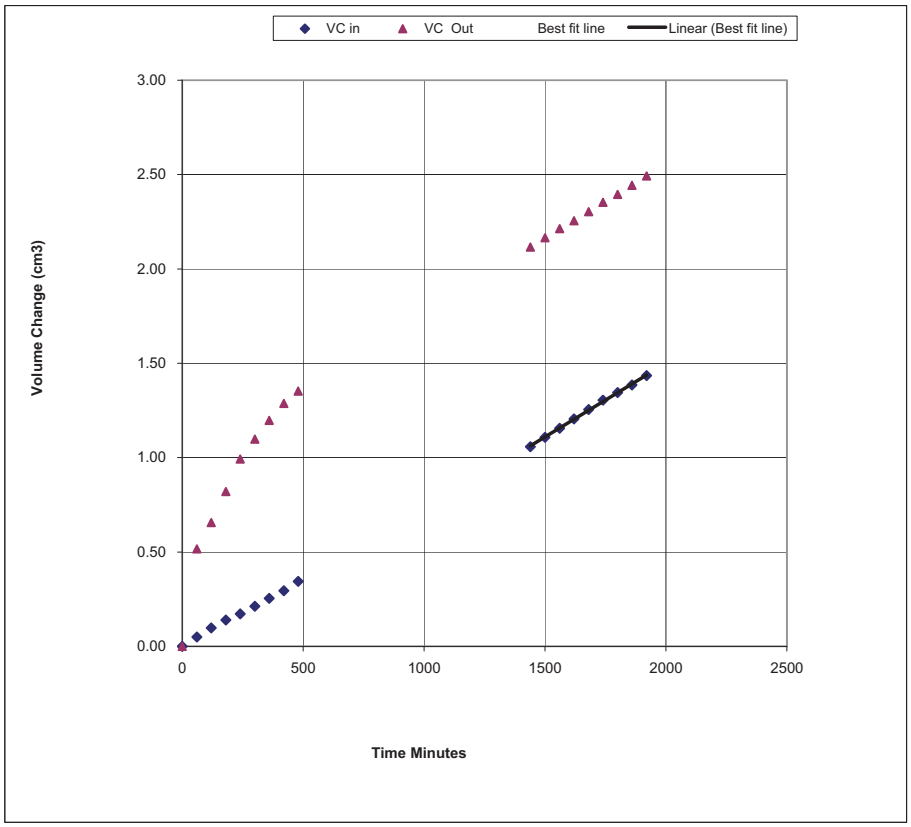
Permeability in a Triaxial Cell

BS 1377 : Part 6 : 1990 Clause 6

Specimen Details

Borehole		BH05B
Sample No.		-
Depth	m	11.50-11.95

Permeability Stage



Cell Pressure	kPa	520
Mean Effective Stress	kPa	220
Back Pressure Diff.	kPa	10
Mean Rate of Flow	ml/min	0.0008
Average Temperature	'C	20
Vertical Permeability Kv	m/s	1.6×10^{-10}

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LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL14/1857

Client's Reference: Report Date: 25 April 2014

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Chris Eccles

Contract Title: SITA Darwen

Date Received: 15/4/2014
Date Commenced: 15/4/2014
Date Completed: 25/4/2014

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

Checked and Approved Signatories:

R Gunson (Director) | A Watkins (Director) | M Beastall (Laboratory Manager)

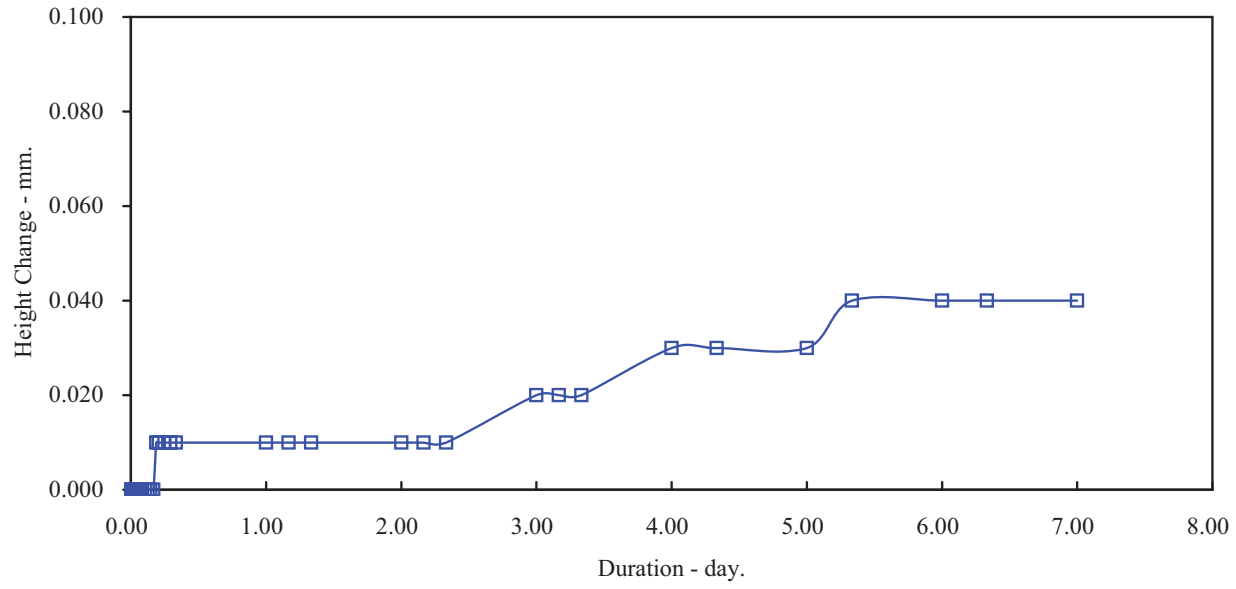
5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

Borehole / Sample Number:	BH4 / 1	Description.: Dark grey slag.	
INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	126.70	Final Height - mm:	126.74
Initial Diameter - mm:	151.80	Final Mass - g:	5123.00
Initial Mass - g:	5036.00	Final Volume - cm3:	2293.76
Initial Volume - cm3:	2293.00	Dry Mass - g:	4855.00
Dry Mass - g:	4855.00	Final Moisture Content - %:	5.2
Initial Moisture Content - %:	3.6	Final Bulk Density - Mg/m3:	2.23
Initial Bulk Density - Mg/m3:	2.20	Final Dry Density - Mg/m3:	2.12
Initial Dry Density - Mg/m3:	2.12	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	210	0	0.00	5760	3	0.03
5	0	0.00	240	0	0.00	6240	3	0.03
10	0	0.00	270	1	0.01	7200	3	0.03
15	0	0.00	300	1	0.01	7680	4	0.04
20	0	0.00	360	1	0.01	8640	4	0.04
25	0	0.00	420	1	0.01	9120	4	0.04
30	0	0.00	480	1	0.01	10080	4	0.04
40	0	0.00	1440	1	0.01			
50	0	0.00	1680	1	0.01			
60	0	0.00	1920	1	0.01			
75	0	0.00	2880	1	0.01			
90	0	0.00	3120	1	0.01			
105	0	0.00	3360	1	0.01			
120	0	0.00	4320	2	0.02			
150	0	0.00	4560	2	0.02			
180	0	0.00	4800	2	0.02			



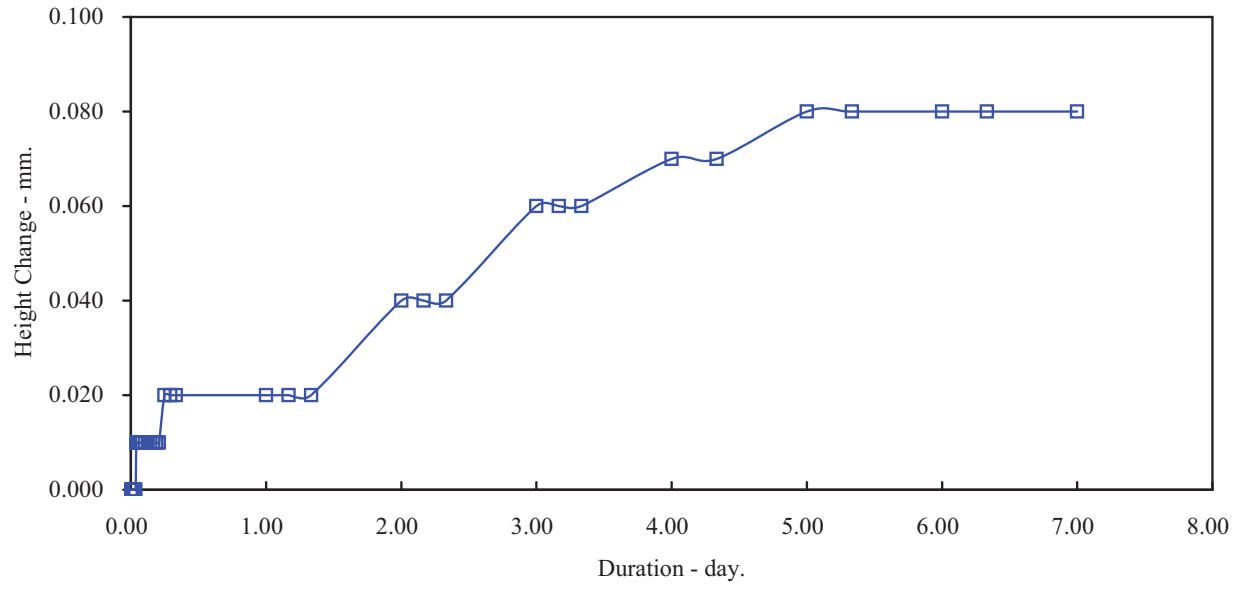
PSL Professional Soils Laboratory	Compiled	Date	Checked	Date	Approved	Date
		25/04/14		25/04/14		25/04/14
	SITA DARWEN.				Contract No: PSL14/1857	
					Figure.	

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

Borehole / Sample Number:	BH4 / 2	Description.: Dark grey slag.	
INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.00	Final Height - mm:	127.08
Initial Diameter - mm:	152.50	Final Mass - g:	5085.00
Initial Mass - g:	4997.00	Final Volume - cm3:	2321.17
Initial Volume - cm3:	2320.00	Dry Mass - g:	4651.00
Dry Mass - g:	4651.00	Final Moisture Content - %:	8.5
Initial Moisture Content - %:	6.9	Final Bulk Density - Mg/m3:	2.19
Initial Bulk Density - Mg/m3:	2.15	Final Dry Density - Mg/m3:	2.02
Initial Dry Density - Mg/m3:	2.01	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	210	1	0.01	5760	7	0.07
5	0	0.00	240	1	0.01	6240	7	0.07
10	0	0.00	270	1	0.01	7200	8	0.08
15	0	0.00	300	1	0.01	7680	8	0.08
20	0	0.00	360	2	0.02	8640	8	0.08
25	0	0.00	420	2	0.02	9120	8	0.08
30	0	0.00	480	2	0.02	10080	8	0.08
40	0	0.00	1440	2	0.02			
50	0	0.00	1680	2	0.02			
60	1	0.01	1920	2	0.02			
75	1	0.01	2880	4	0.04			
90	1	0.01	3120	4	0.04			
105	1	0.01	3360	4	0.04			
120	1	0.01	4320	6	0.06			
150	1	0.01	4560	6	0.06			
180	1	0.01	4800	6	0.06			



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Compiled	Date	Checked	Date	Approved	Date
	25/04/14		25/04/14		25/04/14

SITA DARWEN.

Contract No: PSL14/1857

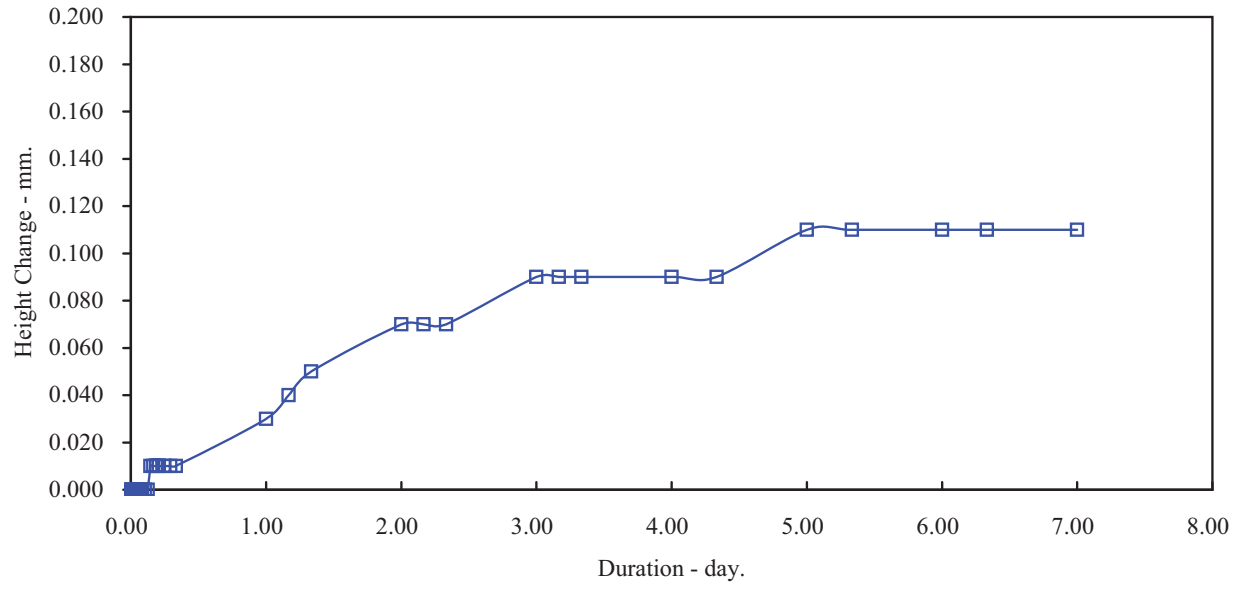
Figure.

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

Borehole Number / Depth (m):	BH5 / 1.80 - 2.30m	Description.: Dark grey slag.	
INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.21	Final Height - mm:	127.32
Initial Diameter - mm:	152.01	Final Mass - g:	5164.00
Initial Mass - g:	4986.00	Final Volume - cm3:	2310.63
Initial Volume - cm3:	2309.00	Dry Mass - g:	4687.00
Dry Mass - g:	4687.00	Final Moisture Content - %:	9.2
Initial Moisture Content - %:	6.0	Final Bulk Density - Mg/m3:	2.23
Initial Bulk Density - Mg/m3:	2.16	Final Dry Density - Mg/m3:	2.05
Initial Dry Density - Mg/m3:	2.04	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	210	1	0.01	5760	9	0.09
5	0	0.00	240	1	0.01	6240	9	0.09
10	0	0.00	270	1	0.01	7200	11	0.11
15	0	0.00	300	1	0.01	7680	11	0.11
20	0	0.00	360	1	0.01	8640	11	0.11
25	0	0.00	420	1	0.01	9120	11	0.11
30	0	0.00	480	1	0.01	10080	11	0.11
40	0	0.00	1440	3	0.03			
50	0	0.00	1680	4	0.04			
60	0	0.00	1920	5	0.05			
75	0	0.00	2880	7	0.07			
90	0	0.00	3120	7	0.07			
105	0	0.00	3360	7	0.07			
120	0	0.00	4320	9	0.09			
150	0	0.00	4560	9	0.09			
180	0	0.00	4800	9	0.09			



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Compiled	Date	Checked	Date	Approved	Date
	25/04/14		25/04/14		25/04/14

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Contract No: PSL14/1857

Figure.

APPENDIX H

Current Guidance on Interpretation of Chemical Analysis of Soils for Human Health Assessment

Current Guidance on Interpretation of Chemical Analysis of Soils

Contaminated land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a 'suitable for use' based approach to the risk assessment of contaminated land. The site specific risk assessment is based upon an assessment of plausible contaminant linkages, referred to as the contaminant-pathway- receptor model, based upon the current or proposed use of the site.

Before undertaking a risk assessment a conceptual site model is devised in order to identify the potential contaminants, pathways and receptors. The individual contaminants, pathways and receptors then need to be further investigated in order to refine the initial assessment and risk assessment undertaken.

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents were withdrawn and the following documents have been published as revised guidance to the CLEA assessment:

- Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.
- Environment Agency : 2008: Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- Environment Agency : 2008: Science Report SC050021/SR3: Updated technical background to the CLEA model.
- Environment Agency : 2008 :Compilation of Data for Priority Organic Contaminants for Derivation of Soil Guideline Values Science report SC050021/SR7
- Science Report SC050021/SR4: CLEA Software (Version) Handbook.

Additional guidance on statistical assessment replacing CLR 7 is partly provided in:

- CL:AIRE :2009: Guidance on Comparing Data With a Critical Concentration

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to assess whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE :2009 "Guidance on Comparing Data With a Critical Concentration".

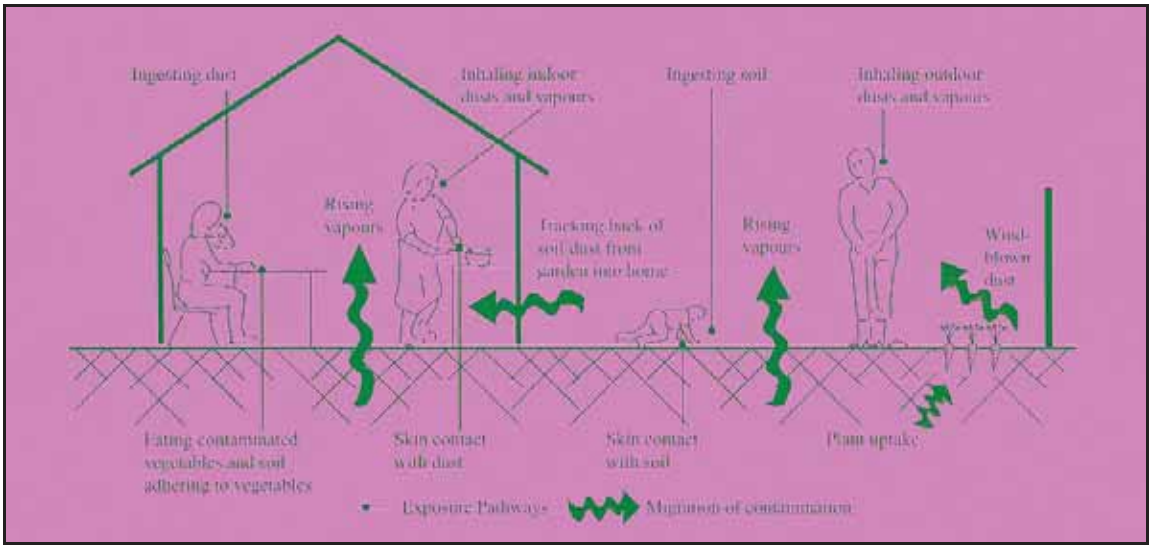
Soil Guideline Values

A program for the derivation of SGVs based on the above guidance is provided by the Environment Agency and is entitled "CLEA Software Version 1.06". These reports, together with supporting toxicology reviews ("Tox" or Supplementary Information Reports) for individual substances (which will be gradually updated), Soil Guideline Value Reports and other guidance referred to in the above documents, provide guidance and the scientific basis for assessing the risk to human health from potential contaminants. Soil Guideline Value Reports (SGV Reports) have been published for a number of contaminants and these are published on the Environment Agency website. Eventually the reports will include SGVs for:

- heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead, mercury nickel, and selenium;
- benzene, ethylbenzene, toluene and xylenes;
- phenol;
- dioxins and dioxin-like polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAHs) – 11 substances.

In addition CIEH through LQM and the EIC have published generic assessment criteria (GACs) for a wide variety of other parameters including metals, hydrocarbons, solvents, PAHs and explosive substances for three standard land uses. These have been produced to supplement the Environment Agency guidance. These GACs will be replaced by SGVs when or if the EA publishes any more SGVs.

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:



- **Ingestion**
  - ingestion of outdoor soil;
  - ingestion of indoor dust;
  - ingestion of home grown vegetables;
  - ingestion of soil attached to home grown vegetables.

- **Dermal Contact**
  - dermal contact with outdoor soil;
  - dermal contact with indoor dust.

- **Inhalation**
  - inhalation of outdoor dust;
  - inhalation of indoor dust;
  - inhalation of outdoor soil vapour;
  - inhalation of indoor soil vapour.

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g. certain organic compounds can pass through plastic water pipes into drinking water supply.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential land use;
- allotments;
- commercial and industrial land use.

The land use categories defined in the CLEA are detailed below.

Residential: This land use category assumes that people live in a variety of dwellings including terraced, detached and semi detached houses up to two storeys high. The structure of buildings varies. Default parameters for building materials and building design are included in CLEA documents to calculate the relevant multi-layer diffusion coefficients for vapour intrusion and to model indoor vapour intrusion. The CLEA model assumes that regardless of the style of housing the residents will have access to either a private garden or community open space nearby, and that soil tracked into the home will form indoor dust. It allows for the ingestion pathways from home grown vegetables.

Allotments: The CLEA model incorporates an assessment of land provided by local authorities specifically for people to grow fruit and vegetables for their own consumption. Consumption of such fruit and vegetables present several exposure pathways; plants absorb contaminants mainly via water uptake through roots, the contaminants move to edible portions of plants via translocation and contaminated soil particles become trapped in the skin and between leaves. At present the model fails to account for exposure through the consumption of animals, and their products (e.g. eggs), which have been reared on contaminated land.

Commercial/Industrial: Although there are a wide variety of workplaces and work-related activities, the CLEA assessment of this land-use assumes that work occurs in a permanent, three-storey structure, where employees spend most time indoors, conducting office-based or light physical work. The model assumes employees sit outside during breaks for most of the year. Limitations in applying this land-use to different industries is detailed in EA publication "Updated technical background to the CLEA model" (2011). The generic model assumes that the site would not be covered by hard standing. Risk of exposure to contaminants would be clearly less where commercial land is essentially all buildings and hard standing.

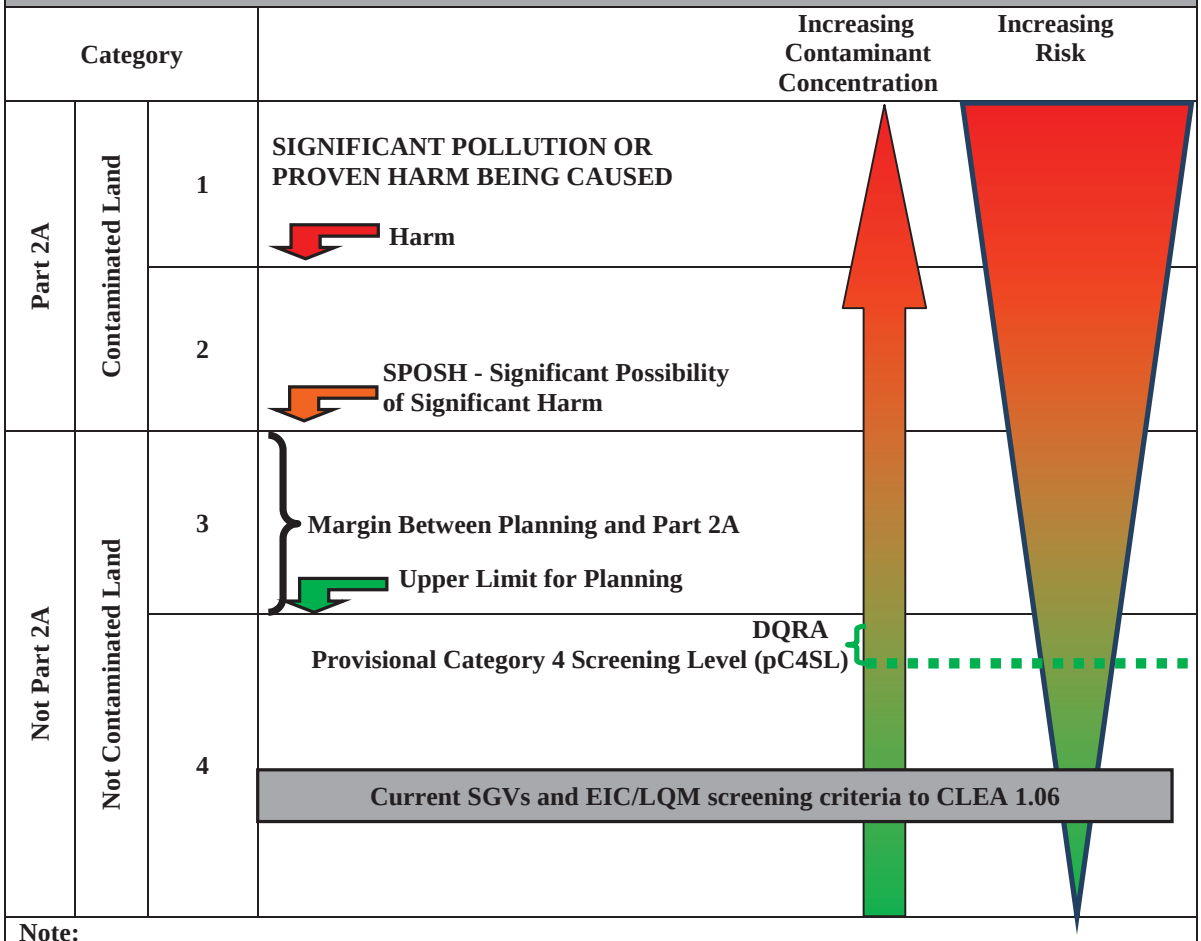
Based on the assumptions of each land use and the associated applicable exposure pathways, a 'Soil Guideline Value' (SGV) may be calculated for each contaminant under consideration for a particular land use in order to determine whether certain contaminant soil concentrations pose a significant risk to human health. The primary purpose of the CLEA SGVs are as 'trigger values' – indicators to a risk assessor that soil concentrations below this level require no further assessment as it can be assumed that the soil is suitable for the proposed use. Where soil concentrations occur above the SGV then further assessment of the results is required. The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012 provides new clarity on the assessment of risk where soil concentrations exceed the SGV. The guidance introduces a four stage classification system relating to concentration of contaminants and the assessed risk which indicates appropriate actions. Category 1 and 2 sites are classified as "Contaminated Land" as defined in Part IIA of The Environmental Protection Act (1990). Category 3 and 4 sites are not considered as "Contaminated Land" in accordance with the Act. This can be explained using the figure on the following page.

For new developments progressing through the planning regime, it is desirable that the soil concentrations are within Category 4 where there is a valid contaminant linkage. The upper boundary between Category 4 and 3 is not defined in the guidance. From communication with senior personnel in the Homes and Communities Agency this boundary will be at about three to five times higher than the SGV calculated in accordance with CLEA 1.06 but this is contaminant and site specific. This boundary can also be better defined by carrying out a Detailed Quantified Risk Assessment (DQRA) and this is discussed later in this appendix. DEFRA have let a research project to CL:AIRE to generate new Category 4 Screening Levels (C4SL) which will define this boundary and provide a simple test for deciding whether land is suitable for use without any remediation. Preliminary C4SLs were published in March 2014 for six contaminants and represent a new set of screening levels that are more pragmatic (but strongly precautionary) compared to the existing soil guideline values (SGVs and the other GACs calculate in accordance with the existing CLEA methodology). The pC4SLs provide cautious estimates of contaminant concentrations in soil that are still considered to present an acceptable level of risk, within the context of Part 2A, by combining information on toxicology, exposure assessment and normal levels of exposure to these contaminants.

There are also difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be 'unacceptable' and that they would lead to "significant possibility of significant harm" as defined in Part IIA of The Environmental Protection Act (1990) and determine that the land is "contaminated." This

ultimately requires detailed 'toxicological' information of the health effects of individual contaminants and also a scientific judgement on what constitutes an 'unacceptable' risk. It is for local authorities or the Environment Agency to determine whether a particular site is contaminated land and it is for local Planning Authorities to determine whether land affected by contamination can be redeveloped.

Relationship Between Contaminant Concentration, Risk and Screening Values



Note:
The vertical scale should not be considered as being linear and will be site and contaminant specific.

- The upper limit for planning could be 3 to 5 times the SGV/EIC/LQM screening concentration.
- SPOSH concentrations could be 10 to 100 times the SGV/EIC/LQM screening concentration.

Given the SGVs have been derived only for a limited number of contaminants and there was little prospect of further SGVs being published, two professional groupings have produced Generic Assessment Criteria (GACs) in accordance with the CLEA model for a large number of additional contaminants. These GACs were recognised in the new Contaminated Land Statutory Guidance (DEFRA, 2012) and have been produced as follows:

LQM/CIEH : 2009 Nathaniel CP, McCaffrey C, Ashmore MH, Cheng YY, Gillett A, Ogden R & Scott D : 2009 . The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition). Land Quality Press, Nottingham.

CL:AIRE/EIC/AGS: 2009 : Soil Generic Assessment Criteria (GAC) for Human Health Risk Assessment. Contaminated Land: Applications in Real Environments, Environment Industries Commission & Association of Geotechnical and Environmental Specialists. December 2009.

Detailed Quantified Risk Assessment (DQRA)

The SGVs and the GACs are based on a number of basic assumptions. There are two main options for developing Site Specific Assessment Criteria by adjusting the CLEA model so that they have greater relevance to the site:

- **Simple adjustment of the generic SGV model**. Such adjustment is restricted to the choice of exposure routes selected for the generic land use, building type, soil type and soil organic matter content within the CLEA software.

- **Detailed adjustment.** It may be relevant to make greater modifications to the model due to the specific use of the land in question. This can include modification to any parameter value, including exposure assumptions, building parameters, and the choice and application of fate and transport models. This is equally relevant to site-specific modifications of existing generic land uses, the development of new land uses, and the inclusion of additional exposure pathways. Much of this can be undertaken using the CLEA software. Depending on the complexity of the detailed adjustments required, it may be necessary to use other tools either alone or in conjunction with the CLEA software. Both options should follow established protocols for DQRA and require sufficient justification and supporting information for the adjustments made. Detailed adjustments are likely to require substantially greater technical justification and supporting documentation, especially if modifications are based on information not contained within the SGV framework documents.

The two choices present the risk assessor with three options/decisions:

(1) Use a published SGV/GAC if it can be demonstrated that the assumptions inherent in the value are appropriate to the site in question. If they are not, proceed to either option 2 or 3 below.

(2) Make simple site-specific adjustments to the generic exposure model used to derive the SGV/GAC. Three examples of when this could be appropriate are:

   a. High density residential development with no exposed contaminated soil at surface. It is appropriate in this case to consider the relevance of direct contact pathways and consumption of homegrown produce.

   b. Soil type is significantly different (specifically when soil type is likely to be less protective e.g. made ground) to that assumed in the SGV/GAC.

   c. Soil organic matter content is significantly different to that assumed in the derivation of the SGV/GAC.

(3) If simple adjustments are not sufficient to reflect site conditions, undertake a DQRA. This may be undertaken using the CLEA software or by using an alternative risk assessment methodology that is relevant, appropriate, authoritative and scientifically based. In the context of this guidance, simple adjustments of a generic land use scenario for soil type or SOM content for example are not considered sufficient to be classed as a DQRA. The resultant screening values from such simple adjustment remain generic in terms of the balance of the assumptions being made.

DQRAs should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The pC4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling in line with current scientific understanding of lead toxicology.

Public Open Space

The Defra report (December 2013) has also introduced exposure scenarios for two other commonly occurring land uses which require assessment (under the planning and Part 2A regimes) on a relatively frequent basis. These exposure scenarios are:

- Public Open Space – Space Near Residential Housing (POS_{resi}); and
- Public Open Space – Public Park (POS_{park}).

Potential use of pC4SL relating to Public Open Space (POS) require care due to the significant variability in exposure characteristics. For example, POS may include:

- Children's play areas, public parks where children practise sport several times a week and teenagers only once a week;
- Grassed areas adjacent to residential properties which are rarely used;
- Dedicated sports grounds where exposure is only to players and groundworkers; and
- Nature reserves or open ground with low level activity (for example, dog walking).

Within the Defra report (December 2013) the following exposure scenarios have been modelled as these are considered the most important for potential exposure for the critical receptor ie young children:

- Green open space close to housing, including tracking back of soil (POS_{resi}); and
- Park-type scenario where distance is considered sufficient to discount tracking back of soil (POS_{park}).

Representative Data

The type, quantity and quality of the available soil data influence the method chosen to obtain a site representative soil concentration that is compared with a SGV in the screening process. The soil data should be representative of the exposure scenario being considered. This can include factors such as:

- averaging area over which exposure occurs;
- sample depth;
- heterogeneity of soil

where the 'averaging area' is defined as:

> *That area (together with a consideration of depth) of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions'.*

Site investigations take discrete samples from a given area (and to a certain depth). It has to be assumed that these samples are to some degree representative of the contaminant concentration throughout that volume of soil. The critical soil volume (taking into account area and depth) which might be usefully compared with a SGV is a site-specific decision, but a starting point is the generic land use scenarios used in the derivation of the SGV. The critical soil volume depends on two factors:

- Contaminant distribution and vertical profile (bands of highly contaminated material or lateral hot spots should not necessarily be averaged out with more extensive cleaner areas of soil without justification)
- Contribution to average exposure underpinning the SGV. Direct contact exposure pathways depend on the adult or child coming into contact with near-surface soils and the area over which that exposure occurs is usually important (i.e. the averaging area). Vapour pathways are less dependent on surface area, for example vapour intrusion may result from a highly concentrated hot spot beneath a building leading to elevated average indoor air concentrations. For the three standard land uses for which SGVs are derived, relevant considerations are:

- For the standard **residential or allotment land use**, the critical soil volume is the area of an individual garden, communal play area or working plot from the surface to a depth of between 0.5m and 1.0m. This is the ground over which children are most likely to come into contact with soil or from which vegetable and fruit produce will be harvested. In the case of volatile contaminants, it may also be appropriate to consider the volume of soil underneath the footprint of the building although vapour intrusion may be driven by a soil volume much smaller than this if the contaminant source is highly concentrated.
- For the standard **commercial land use**, the critical soil volume has to be decided on a case-by- case basis due to the wide range of possible site layouts. However, for non-volatile contaminants, landscaped and recreational areas around the perimeter of office buildings are likely to be most important. For volatile contaminants, the footprint occupied by the building itself should also be considered.
- For **most exposure pathways**, the contamination is assumed to be at or within one metre of the surface.

The use of averaging areas must be justified on the basis of relevance to the exposure scenario. SGVs are relevant only when the exposure assumptions inherent in them are appropriate for the identified exposure averaging area. Further guidance on critical soil volumes and the consideration of averaging exposure areas can be found in:

- *Secondary model procedure for the development of appropriate soil sampling strategies for land contamination* (Environment Agency, 2000);
- *Guidance on comparing soil contamination data with a critical concentration* (CIEH/CL:AIRE, 2009).

It is the mean soil concentration for the individual contaminant within an individual averaging area, which is compared to the SGV. However, as contaminant concentrations vary across a site, and sampling and analysis will introduce measurement errors, the comparison between measured mean concentration and the SGV must take this uncertainty into account.

There are two principal options available to obtain site representative soil concentrations from a site investigation dataset; statistical and non-statistical methods. Data objectives, quality and quantity are likely to determine which approach is most appropriate. If statistical methods such as those presented in CIEH/CL:AIRE (2011) are to be used, sufficient data need to be available or obtained. No one single statistical approach is applicable to all sites and circumstances. The wider range of robust statistical techniques developed by organisations including the US Environmental Protection Agency (USEPA) are also important tools. Risk assessors should choose an appropriate statistical approach on the basis of the specific site and the decision that is being made. For further guidance on the appropriate use of statistical approaches, refer to USEPA 2006 or good environmental monitoring statistics textbooks.

When statistical approaches are inappropriate (this will depend on the objectives of the site investigation), individual or composite samples should be compared directly to the SGV. Guidance on use of alternative data handling approaches such as the use of composite sampling can be found in documents such as:

- *Verification of remediation of land contamination* (Environment Agency, 2010);
- *Sampling and testing of wastes to meet landfill Waste Acceptance Criteria* (Environment Agency, 2005);
- *Guidance on choosing a sampling design for environmental data collection* (USEPA, 2002);
- *Soil Quality – Sampling, ISO 10381 series* (ISO, 2002–2007).

The statistical tests should not be used as arbiters for decisions under Part 2A. They are an additional, useful line of evidence to assist in decision-making. The implications of the basis for the derivation of the site representative soil concentration must be taken into account in any decision-making process and clearly documented.

Where the statistical tests are conducted in accordance with the method described in CL:AIRE 2009:

- For the Planning situation, the regulator needs to check whether the concentration of contaminants is low compared to the SGV/SSTL. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the SGV/SSTL.
- For the Part 2A scenario the regulator needs to determine whether the concentration of contaminants is greater than the SGV/SSTL. This decision is based on whether there is at least a 95% confidence level

that the true mean of the dataset is higher than the SGV/SSTL. However, the regulator may proceed with determination if there is just a 51% probability, "on the balance of probabilities".

If the screening levels are exceeded then more sophisticated quantitative risk assessment can be undertaken or remedial action may be taken to break the contaminant linkages. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation. Further information about the use of soil guideline values is provided in Environment Agency : 2008: Using Soil Guideline Values SC050021/SGV Introduction, March 2008.

APPENDIX I

Summary of Chemical Test Results of Soil Samples

Job No.: 1970
Site: LOWER ECCLESHILL ROAD, DARWEN, LANCASHIRE

TerraConsult

CHEMICAL STATISTICAL ANALYSIS - based on CLEA v1.06 (Sandy Loam 1% SOM)

		Results																														
	Consultant																															
	Exploratory Location	TP1	TP1	TP1	TP2	TP2	TP3	TP4	TP4	TP5	TP5	TP6	TP6	TP6	TP7	TP7	TP7	TP8	TP8	TP9	TP9	TP10	TP10	TP10	TP11A	TP12	TP12	TP13	TP14	TP14	TP14	TP15
	Depth (m bgl)	0.50	1.40	2.80	0.30	1.00	0.50	0.40	1.50	1.00	4.00	0.30	0.50	2.60	0.20	1.00	3.00	0.30	1.00	0.40	1.50	0.10	0.50	3.20	0.30	0.40	0.70	0.40	0.80	1.30	3.40	0.90
	Soil Type	MADE GROUND	CLAY	SAND	MADE GROUND	CLAY	MADE GROUND	MADE GROUND	CLAY	CLAY	MUDSTONE	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	SAND	MUDSTONE	TOPSOIL	SAND	CLAY	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	CLAY	MUDSTONE	CLAY
	Date Sampled	04/03/14	04/03/14	04/03/14	04/03/14	04/03/14	04/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	06/03/14	06/03/14	06/03/14	06/03/14	06/03/14	06/03/14	06/03/14
Analyte	**Limit of Detection**																															
Asbestos																																
Bulk ACMs	Field ID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Asbestos Fibres	<0.001%	Negative	-	-	-	-	Negative	Negative	-	-	-	Negative	-	-	-	-	-	-	-	-	-	Negative	-	-	Negative	Negative	-	-	-	-	-	-
Asbestos Type		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																																
Arsenic (total)	<2 mg/kg	74.0	15.0	19.0	39.0	14.0	43.0	29.0	8.3	7.9	7.7	-	6.6	3.6	4.4	3.7	3.9	9.9	12.0	7.2	35.0	-	18.0	17.0	-	-	33.0	35.0	7.9	6.4	3.4	8.4
Cadmium (total)	<0.1 mg/kg	4.20	0.49	0.10	2.20	0.21	4.00	4.40	0.42	0.39	0.40	-	0.10	0.27	0.49	0.36	0.24	0.49	0.92	0.65	2.60	-	2.40	1.70	-	-	1.30	1.40	0.79	1.00	0.29	0.61
Chromium (total)	<2 mg/kg	19	15	5	15	39	18	32	23	23	24	-	23	12	13	11	10	13	15	13	62	-	35	27	-	-	9	12	25	24	36	24
Copper (total)	<4 mg/kg	370.0	72.0	6.0	270.0	69.0	180.0	1600.0	73.0	66.0	70.0	-	25.0	8.9	7.3	7.6	14.0	27.0	32.0	26.0	270.0	-	260.0	220.0	-	-	150.0	230.0	180.0	48.0	47.0	170.0
Lead (total)	<3 mg/kg	560	82	6	170	45	220	690	43	37	39	-	22	34	41	39	37	47	100	230	300	-	290	210	-	-	120	120	75	34	33	89
Mercury (total inorganic)	<0.1 mg/kg	1.50	0.14	0.31	0.33	0.13	0.45	0.38	0.10	0.10	0.10	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.12	-	0.13	0.10	-	-	0.12	0.30	0.15	0.10	0.10	0.10
Nickel (total)	<3 mg/kg	45.0	12.0	12.0	29.0	35.0	180.0	41.0	38.0	33.0	35.0	-	16.0	9.1	8.2	7.9	7.9	15.0	21.0	16.0	33.0	-	25.0	18.0	-	-	31.0	33.0	22.0	36.0	54.0	21.0
Selenium (total)	<0.2 mg/kg	0.75	0.20	0.20	0.20	0.58	0.20	0.20	0.20	0.20	0.20	-	0.20	0.20	0.20	0.20	0.33	0.20	0.20	0.20	0.39	-	0.20	0.20	-	-	0.20	0.20	0.20	0.20	0.20	0.20
Zinc (total)	<3 mg/kg	1300	190	28	410	97	670	1400	100	98	100	-	44	200	260	240	200	150	250	180	980	-	730	510	-	-	200	210	340	100	110	410
Vanadium	<5 mg/kg	40	23	5	27	38	66	46	20	21	22	-	16	13	16	14	13	14	15	11	180	-	83	96	-	-	13	16	26	19	23	21
Inorganic																																
pH Value	pH Units	8.8	8.0	7.7	9.3	7.1	9.6	10.2	7.8	6.2	8.8	-	9.9	7.6	8.4	8.0	7.6	9.1	8.5	8.7	8.3	-	8.6	8.9	-	-	10.9	10.0	8.5	6.5	7.4	8.2
Chloride (2:1)	<10 mg/kg	10.0	10.0	10.0	10.0	23.0	10.0	10.0	10.0	10.0	10.0	-	16.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	-	10.0	10.0	-	-	10.0	10.0	10.0	10.0	10.0	10.0
Cyanide (total)	<0.5 mg/kg	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	0.5	0.5	-	-	0.5	0.5	0.5	0.5	0.5	0.5
Thiocyanate	< 5 mg/kg	5	5	5	5	5	5	5	5	5	5	-	5	5	5	5	5	5	5	5	5	-	5	5	-	-	5	5	5	5	5	5
Sulphate (2:1)	<0.01 g/l	0.088	0.064	0.010	0.054	0.210	0.110	0.088	0.068	0.150	0.067	-	0.400	0.010	0.010	0.013	0.010	0.040	0.010	0.010	0.031	-	0.340	0.083	-	-	0.130	0.170	0.013	0.023	0.036	0.067
Sulphide	<0.5 mg/kg	3.0	27.0	1.6	13.0	3.2	4.0	6.1	2.5	4.1	2.7	-	15.0	71.0	3.4	15.0	47.0	51.0	9.9	18.0	16.0	-	8.0	32.0	-	-	3.0	15.0	5.5	3.5	3.1	3.0
Sulphur	<1 mg/kg	15.0	1100.0	2.9	25.0	2.6	2.9	3.9	3.8	1.0	1.0	-	17.0	4.3	1.4	7.6	1.0	61.0	16.0	20.0	3.5	-	3.8	85.0	-	-	3.6	15.0	1.0	1.0	1.2	1.6
Organic																																
Phenols (Total Monohydric)	<0.3 mg/kg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-	0.3	0.3	-	-	0.3	0.3	0.3	0.3	0.3	0.3
PAH																																
Naphthalene	<0.1 mg/kg	-	-	-	-	-	0.10	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.50	0.10	-	-	0.10
Acenaphthylene	<0.1 mg/kg	-	-	-	-	-	0.12	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.15	0.10	-	-	0.10
Acenaphthene	<0.1 mg/kg	-	-	-	-	-	0.13	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.11	0.10	-	-	0.10
Fluorene	<0.1 mg/kg	-	-	-	-	-	0.10	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.28	0.10	-	-	0.10
Phenanthrene	<0.1 mg/kg	-	-	-	-	-	0.31	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.90	0.10	-	-	0.10
Anthracene	<0.1 mg/kg	-	-	-	-	-	0.14	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.45	0.10	-	-	0.10
Fluoranthene	<0.1 mg/kg	-	-	-	-	-	0.71	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.37	-	-	-	3.00	0.23	-	-	0.40
Pyrene	<0.1 mg/kg	-	-	-	-	-	0.77	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.91	-	-	-	2.90	0.30	-	-	0.43
Benz(a)anthracene	<0.1 mg/kg	-	-	-	-	-	0.33	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.60	0.10	-	-	0.10
Chrysene	<0.1 mg/kg	-	-	-	-	-	0.37	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.70	0.10	-	-	0.10
Benzo(b)fluoranthene	<0.1 mg/kg	-	-	-	-	-	0.46	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	2.20	0.10	-	-	0.10
Benzo(k)fluoranthene	<0.1 mg/kg	-	-	-	-	-	0.27	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.90	0.10	-	-	0.10
Benzo(a)pyrene	<0.1 mg/kg	-	-	-	-	-	0.33	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.40	0.10	-	-	0.10
Indeno(123cd)pyrene	<0.1 mg/kg	-	-	-	-	-	0.24	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.00	0.10	-	-	0.10
Dibenzo(ah)anthracene	<0.1 mg/kg	-	-	-	-	-	0.10	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	0.13	0.10	-	-	0.10
Benzo(ghi)perylene	<0.1 mg/kg	-	-	-	-	-	0.32	-	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	0.10	-	-	-	1.00	0.10	-	-	0.10
Total EPA-16 PAHs	<2 mg/kg	-	-	-	-	-	4.5	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	2.0	-	-	-	21.0	2.0	-	-	2.0
BTEX																																
Benzene	<1 µg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Toluene	<1 µg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Ethyl Benzene	<1 µg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Xylene (m & p)	<1 µg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Xylene (o)	<1 µg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
MTBE	<1 µg/kg	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH																																
Total TPH (independent test)	<10 mg/kg	350	10	10	10	10	-	10	10	10	10	-	240	-	50	10	10	33	10	10	10	-	44	-	-	-	10	-	-	10	10	-
Aliphatic+Aromatic C_5-C_{10}	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aliphatic+Aromatic C_{10}-C_{21}	<0.1 mg/kg	-	-	-	-	-	2.6	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	3.0	0.1	-	-	0.1
Aliphatic+Aromatic C_{21}-C_{40}	<0.1 mg/kg	-	-	-	-	-	1.8	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	7.0	0.1	-	-	0.1
Aliphatic >C_5 - C_6	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aliphatic >C_6 - C_8	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aliphatic >C_8 - C_{10}	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aliphatic >C_{10} - C_{12}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Aliphatic >C_{12} - C_{16}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Aliphatic >C_{16} - C_{21}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Aliphatic >C_{21} - C_{35}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Total Aliphatic >C_{10} - C_{40}	<6 mg/kg	-	-	-	-	-	6.0	-	-	-	-	-	-	6.0	-	-	-	-	-	-	-	-	-	6.0	-	-	-	6.0	6.0	-	-	6.0
Aromatic C_6 - C_7	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aromatic C_7 - C_8	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aromatic >C_8 - C_{10}	<0.1 mg/kg	-	-	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	-	-	-	0.1	0.1	-	-	0.1
Aromatic >C_{10} - C_{12}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Aromatic >C_{12} - C_{16}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Aromatic >C_{16} - C_{21}	<1 mg/kg	-	-	-	-	-	2.6	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	3.0	1.0	-	-	1.0
Aromatic >C_{21} - C_{35}	<1 mg/kg	-	-	-	-	-	1.8	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	7.0	1.0	-	-	1.0
Aromatic >C_{35} - C_{40}	<1 mg/kg	-	-	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	1.0	-	-	1.0
Total Aromatic >C_5 - C_{40}	<6 mg/kg	-	-	-	-	-	6.0	-	-	-	-	-	-	6.0	-	-	-	-	-	-	-	-	-	6.0	-	-	-	10.0	6.0	-	-	6.0
VOCs																																
Suite	<10 or 50 µg/kg	-	-	-	-	-	-	-	-	-	-	-	-	all below	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Below Detection Limits.
ND	No suspected bulk asbestos containing materials detected on site through visual assessment
	Exceeded Threshold Criteria

Notes
1. Generic Qualitative Assessment Criteria have been used where appropriate based on the current CLEA 1.06 Model (default values, sandy loam 1%SOM). Where no CLEA generic guideline value has been calculated no assessment has been made. The maximum and mean concentrations shown is to provide a reasonable prediction of the range of data rather than to provide any detailed statistical appraisal.
2. When the test result is recorded as being less than the detection limit, the result used for the analysis is the detection limit.
3. Cyanide (total)*, in the absence of a GQAC based on current CLEA 1.06 Model, the Atrisk Soil Value for Cyanide (free) has been used.
4. For metals, where an SGV has been published, this value has been used. Note that the published SGVs do not include the residential without plant uptake scenario. CLEA v1.06 has therefore been used to derive GACs for this scenario. For organics, CLEA v1.06 has been used (as the SGV assumes 6% SOM)

Job No.: 1970
Site: LOWER ECCLESHILL ROAD, DARWEN, LANCASHIRE

TerraConsult

CHEMICAL STATISTICAL ANALYSIS - based on CLEA v1.06 (Sandy Loam 1% SOM)

Analyte	Limit of Detection	Results																						Statistical Analysis					SGV /GAC statistical Results		PC4SL Criteria Screening		Criteria Source	
Consultant																																		
Exploratory Location		TP15	TP15	TP16	WS1	WS1	WS2	WS2	WS2	WS3	WS4	WS4	WS5	WS5	BH1C	BH1C	BH1C	BH3	BH4	BH4	BH5	BH7	External storage area											
Depth (m bgl)		1.10	2.70	0.60	0.60	1.50	1.90	1.60	2.20	0.50	2.00	0.70	0.20	1.50	1.00	3.50	5.50	1.00	0.10	0.70	0.40	0.40	0.20											
Soil Type		CLAY	MUDSTONE	MADE GROUND	MADE GROUND	CLAY	CLAY	MADE GROUND	SAND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND											
Date Sampled		06/03/14	06/03/14	12/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	05/03/14	07/03/14	05/03/14	10/03/14	11/03/14	12/03/14	05/03/14	n	Standard Deviation	Mean	Minimum	Maximum	Commercial & Industrial Tier 1	Pass/ Fail	Commercial & Industrial Tier 1	Pass/ Fail	Source of Screening Criteria	Source of Toxicological Data
Asbestos																																		
Bulk ACMs	Field ID	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	53	-	-	-	-	-	N/A	-	-	-	-
Asbestos Fibres	<0.001%	-	-	-	-	-	-	-	-	-	-	-	Negative	-	-	-	-	-	Negative	-	-	-	Negative	53	0.000	0.000%	0.000%	0.00%	-	N/A	-	-	-	-
Asbestos Type		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	-	-	-	-	-	N/A	-	-	-	-
Metals																																		
Arsenic (total)	<2 mg/kg	5.7	2.3	-	30.0	5.1	13.0	19.0	2.0	13.0	12.0	71.0	-	140.0	85.0	7.7	7.3	75.0	-	-	-	11.0	-	53	28.02	22.6	2.0	140.0	635	Pass	640	Pass	SC050021*	SC050021
Cadmium (total)	<0.1 mg/kg	0.10	0.19	-	0.85	0.10	0.70	1.10	0.10	8.20	5.80	5.60	-	8.00	3.40	0.44	0.68	2.40	-	-	-	0.81	-	53	2.08	1.6	0.1	8.2	230	Pass	417	Pass	SC050021*	SC050021
Chromium (total)	<2 mg/kg	34	39	-	26	20	17	42	6	27	25	27	-	30	38	23	27	20	-	-	-	24	-	53	11.13	23.3	5.0	62.0	30400	Pass	-	-	CLEA v1.06	LQM 2009
Copper (total)	<4 mg/kg	52.0	47.0	-	240.0	23.0	170.0	280.0	13.0	150.0	180.0	160.0	-	350.0	190.0	33.0	33.0	220.0	-	-	-	270.0	-	53	247.99	160.7	6.0	1600.0	71700	Pass	-	-	CLEA v1.06	LQM 2009
Lead (total)	<3 mg/kg	27	26	-	120	32	580	1100	12	440	470	760	-	1200	450	42	30	130	-	-	-	220	-	53	286.47	217.5	5.8	1200.0	-	Pass	6000	Pass	Former SGV	Former SGV
Mercury (total inorganic)	<0.1 mg/kg	0.10	0.10	-	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.30	-	0.50	0.35	0.10	0.10	0.14	-	-	-	0.10	-	53	0.23	0.2	0.1	1.5	3640	Pass	-	-	SC050021*	SC050021
Nickel (total)	<3 mg/kg	56.0	58.0	-	34.0	9.3	15.0	24.0	5.4	30.0	29.0	47.0	-	120.0	92.0	22.0	39.0	46.0	-	-	-	23.0	-	53	31.52	34.5	5.4	180.0	1790	Pass	-	-	SC050021*	SC050021
Selenium (total)	<0.2 mg/kg	0.20	0.20	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.48	-	0.26	0.56	0.20	0.23	0.20	-	-	-	0.20	-	53	0.12	0.2	0.2	0.8	13000	Pass	-	-	SC050021*	SC050021
Zinc (total)	<3 mg/kg	100	94	-	330	31	170	300	22	850	770	1800	-	2100	910	150	100	270	-	-	-	280	-	53	480.10	413.6	22.0	2100.0	662000	Pass	-	-	CLEA v1.06	LQM 2009
Vanadium	<5 mg/kg	21	25	-	32	23	22	89	5	22	20	49	-	84	96	23	21	31	-	-	-	22	-	53	33.31	34.5	5.0	180.0	3160	Pass	-	-	CLEA v1.06	LQM 2009
Inorganic																																		
pH Value	pH Units	7.1	6.4	-	10.0	8.1	8.2	9.5	8.0	8.1	8.0	8.7	-	8.7	8.4	8.2	5.9	10.6	-	-	-	10.9	-	53	1.18	8.5	5.9	10.9	-	N/A	-	-	-	-
Chloride (2:1)	<10 mg/kg	10.0	10.0	-	10.0	11.0	10.0	10.0	20.0	10.0	10.0	10.0	-	10.0	19.0	16.0	20.0	-	-	-	-	0.01	-	53	3.74	11.1	0.0	23.0	-	N/A	-	-	-	-
Cyanide (total)	<0.5 mg/kg	0.5	0.5	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	-	0.5	0.5	0.5	0.5	0.5	-	-	-	0.5	-	53	0.03	0.5	0.5	0.7	-	N/A	-	-	-	-
Thiocyanate	< 5 mg/kg	5	5	-	5	5	5	5	5	5	5	5	-	5	5	5	5	5	-	-	-	5	-	53	0.00	5.0	5.0	5.0	-	N/A	-	-	-	-
Sulphate (2:1)	<0.01 g/l	0.015	0.010	-	1.100	0.010	0.055	0.064	0.020	0.025	0.057	0.072	-	0.064	0.048	0.058	0.046	0.320	-	-	-	0.170	-	53	0.18	0.1	0.01	1.1	-	N/A	-	-	-	-
Sulphide	<0.5 mg/kg	1.6	1.9	-	5.6	15.0	34.0	5.2	7.8	3.1	4.5	8.8	-	5.8	5.5	19.0	3.3	1.8	-	-	-	4.7	-	53	14.88	12.0	1.6	71.0	-	N/A	-	-	-	-
Sulphur	<1 mg/kg	1.0	1.0	-	3.2	48.0	73.0	2.1	1.0	1.0	45.0	15.0	-	21.0	2.3	290.0	13.0	22.0	-	-	-	5.5	-	53	171.14	45.3	1.0	1100.0	-	N/A	-	-	-	-
Organic																																		
Phenols (Total Monohydric)	<0.3 mg/kg	0.3	0.3	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-	0.3	0.3	1.2	0.3	0.3	-	-	-	0.3	-	53	0.14	0.3	0.3	1.2	24200	Pass	-	-	CLEA v1.06	SC050021
PAH																																		
Naphthalene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.35	-	-	-	-	0.10	-	-	-	53	0.46	0.3	0.1	1.5	200	Pass	-	-	CLEA v1.06	LQM 2009
Acenaphthylene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.42	-	-	-	-	0.10	-	-	-	53	0.11	0.1	0.1	0.4	84000	Pass	-	-	CLEA v1.06	LQM 2009
Acenaphthene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.33	-	-	-	-	0.10	-	-	-	53	0.08	0.1	0.1	0.3	8500	Pass	-	-	CLEA v1.06	LQM 2009
Fluorene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.60	-	-	-	-	0.10	-	-	-	53	0.17	0.2	0.1	0.6	64000	Pass	-	-	CLEA v1.06	LQM 2009
Phenanthrene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	1.00	-	-	-	-	0.10	-	-	-	53	0.63	0.4	0.1	1.9	22000	Pass	-	-	CLEA v1.06	LQM 2009
Anthracene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.55	-	-	-	-	0.10	-	-	-	53	0.18	0.2	0.1	0.6	530000	Pass	-	-	CLEA v1.06	LQM 2009
Fluoranthene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	1.50	-	-	-	-	0.32	-	-	-	53	0.95	0.7	0.1	3.0	23000	Pass	-	-	CLEA v1.06	LQM 2009
Pyrene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	1.50	-	-	-	-	0.41	-	-	-	53	0.90	0.8	0.1	2.9	54400	Pass	-	-	CLEA v1.06	LQM 2009
Benz(a)anthracene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.83	-	-	-	-	0.10	-	-	-	53	0.52	0.4	0.1	1.6	92	Pass	-	-	CLEA v1.06	LQM 2009
Chrysene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.87	-	-	-	-	0.10	-	-	-	53	0.55	0.4	0.1	1.7	138	Pass	-	-	CLEA v1.06	LQM 2009
Benzo(b)fluoranthene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	1.20	-	-	-	-	0.10	-	-	-	53	0.74	0.5	0.1	2.2	100	Pass	-	-	CLEA v1.06	LQM 2009
Benzo(k)fluoranthene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.86	-	-	-	-	0.10	-	-	-	53	0.61	0.4	0.1	1.9	140	Pass	-	-	CLEA v1.06	LQM 2009
Benzo(a)pyrene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.99	-	-	-	-	0.10	-	-	-	53	0.49	0.4	0.1	1.4	14	Pass	76	Pass	CLEA v1.06	LQM 2009
Indeno(123cd)pyrene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.63	-	-	-	-	0.10	-	-	-	53	0.32	0.3	0.1	1.0	60	Pass	-	-	CLEA v1.06	LQM 2009
Dibenzo(ah)anthracene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.10	-	-	-	-	0.10	-	-	-	53	0.01	0.1	0.1	0.1	13	Pass	-	-	CLEA v1.06	LQM 2009
Benzo(ghi)perylene	<0.1 mg/kg	-	-	0.10	-	-	-	-	-	-	-	-	-	-	0.66	-	-	-	-	0.10	-	-	-	53	0.33	0.3	0.1	1.0	650	Pass	-	-	CLEA v1.06	LQM 2009
Total EPA-16 PAHs	<2 mg/kg	-	-	2.0	-	-	-	-	-	-	-	-	-	-	12.0	-	-	-	-	2.0	-	-	-	53	6.68	5.5	2.0	21.0	-	N/A	-	-	-	-
BTEX																																		
Benzene	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	1.0	1.0	-	-	53	0.00	1.0	1.0	1.0	43.6	Pass	100	Pass	CLEA v1.06	SC050021
Toluene	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	6.2	1.0	-	-	53	1.57	1.5	1.0	6.2	86200	Pass	-	-	CLEA v1.06	SC050021
Ethyl Benzene	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	1.8	4.4	-	-	53	1.03	1.4	1.0	4.4	25000	Pass	-	-	CLEA v1.06	SC050021
Xylene (m & p)	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	8.9	23.0	-	-	53	6.82	3.7	1.0	23.0	9,630	Pass	-	-	CLEA v1.06	SC050021
Xylene (o)	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	1.5	3.3	-	-	53	0.69	1.3	1.0	3.3	10,700	Pass	-	-	CLEA v1.06	SC050021
MTBE	<1 µg/kg	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	1.0	1.0	-	-	53	0.00	1.0	1.0	1.0	-	N/A	-	-	-	-
TPH																																		
Total TPH (independent test)	<10 mg/kg	10	10	10	10	10	12000	31000	10	10	10	10	-	61	-	10	10	10	-	50	-	10	-	53	5337.21	1161.0	10.0	31000.0	-	N/A	-	-	-	-
Aliphatic+Aromatic C_5-C_{10}	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	0.1	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	-	N/A	-	-	-	-
Aliphatic+Aromatic C_{10}-C_{21}	<0.1 mg/kg	-	-	0.1	-	-	-	3981.0	-	-	-	-	-	-	5.5	-	-	0.1	-	10.4	-	-	-	53	1199.65	363.9	0.1	3981.0	-	N/A	-	-	-	-
Aliphatic+Aromatic C_{21}-C_{40}	<0.1 mg/kg	-	-	0.1	-	-	-	16346.0	-	-	-	-	-	-	8.4	-	-	0.1	-	38.0	-	-	-	53	4926.83	1491.1	0.1	16346.0	-	N/A	-	-	-	-
Aliphatic >C_5 - C_6	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	3400	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_6 - C_8	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	8300	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_8 - C_{10}	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	2100	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_{10} - C_{12}	<1 mg/kg	-	-	1.0	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	53	0.00	1.0	1.0	1.0	10000	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_{12} - C_{16}	<1 mg/kg	-	-	1.0	-	-	-	63.0	-	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	53	19.61	7.2	1.0	63.0	61000	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_{16} - C_{21}	<1 mg/kg	-	-	1.0	-	-	-	3200.0	-	-	-	-	-	-	1.0	-	-	-	-	5.9	-	-	-	53	1011.44	321.4	1.0	3200.0	1600000	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_{21} - C_{35}	<1 mg/kg	-	-	1.0	-	-	-	12000.0	-	-	-	-	-	-	1.0	-	-	-	-	24.0	-	-	-	53	3793.62	1203.2	1.0	12000.0	1600000	Pass	-	-	CLEA v1.06	LQM 2009
Aliphatic >C_{35} - C_{44}	<1 mg/kg	-	-	1.0	-	-	-	330.0	-	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	53	104.04	33.9	1.0	330.0	1600000	Pass	-	-	CLEA v1.06	LQM 2009
Total Aliphatic >C_{10} - C_{40}	<8 mg/kg	-	-	6.0	-	-	-	15593.0	-	-	-	-	-	-	6.0	-	-	-	-	29.9	-	-	-	53	4928.21	1567.1	6.0	15593.0	-	N/A	-	-	-	-
Aromatic C_6 - C_7	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	28000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic C_7 - C_8	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	59000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_8 - C_{10}	<0.1 mg/kg	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-	53	0.00	0.1	0.1	0.1	3700	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_{10} - C_{12}	<1 mg/kg	-	-	1.0	-	-	-	1.0	-	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	53	0.00	1.0	1.0	1.0	17000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_{12} - C_{16}	<1 mg/kg	-	-	1.0	-	-	-	18.0	-	-	-	-	-	-	1.5	-	-	-	-	1.0	-	-	-	53	5.36	2.8	1.0	18.0	36000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_{16} - C_{21}	<1 mg/kg	-	-	1.0	-	-	-	700.0	-	-	-	-	-	-	4.0	-	-	-	-	4.5	-	-	-	53	220.69	71.9	1.0	700.0	28000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_{21} - C_{35}	<1 mg/kg	-	-	1.0	-	-	-	4000.0	-	-	-	-	-	-	8.4	-	-	-	-	14.0	-	-	-	53	1263.65	403.6	1.0	4000.0	28000	Pass	-	-	CLEA v1.06	LQM 2009
Aromatic >C_{35} - C_{40}	<1 mg/kg	-	-	1.0	-	-	-	16.0	-	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	53	4.74	2.5	1.0	16.0	28000	Pass	-	-	CLEA v1.06	LQM 2009
Total Aromatic >C_5 - C_{40}	<6 mg/kg	-	-	6.0	-	-	-	4734.0	-	-	-	-	-	-	13.9	-	-	-	-	18.5	-	-	-	53	1494.27	481.2	6.0	4734.0	-	N/A	-	-	-	-
VOCs																																		
Suite	<10 or 50 µg/kg	-	-	All Below	-	-	-	-	-	-	-	-	-	All Below	-	-	-	-	-	All Below	All Below	-	-	53	0.00	0.0	0.0	0.0	-	N/A	-	-	-	-

Below Detection Limits.
ND — No suspected bulk asbestos containing materials detected on site through visual assessment
Exceeded Threshold Criteria

Notes
1. Generic Qualitative Assessment Criteria have been used where appropriate based on the current CLEA 1.06 Model (default values, sandy loam 1%SOM). Where no CLEA generic guideline value has been calculated no assessment has been made. The maximum and mean concentrations shown is to provide a reasonable prediction of the range of data rather than to provide any detailed statistical appraisal.
2. When the test result is recorded as being less than the detection limit, the result used for the analysis is the detection limit.
3. Cyanide (total)*, in the absence of a GQAC based on current CLEA 1.06 Model, the Atrisk Soil Value for Cyanide (free) has been used.
4. For metals, where an SGV has been published, this value has been used. Note that the published SGVs do not include the residential without plant uptake scenario. CLEA v1.06 has therefore been used to derive GACs for this scenario. For organics, CLEA v1.06 has been used (as the SGV assumes 6% SOM)

APPENDIX K

Current Guidance for Controlled Waters Risk Assessment

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Summary of Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 [4] (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995 [5], which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

> *"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> *(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *(b) Pollution of controlled waters is being, or is likely to be, caused."*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

> *"the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter"*

Part IIA is supported by a substantial quantity of guidance and other Regulations, especially for England, The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012. The document re-confirms the duties of Enforcing Authorities in dealing with contamination including the role of the Environment Agency which has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process rather than Local Authority or Environment Agency taking direct action except in situations of very high pollution risk or where harm is occurring. In the planning process guidance is provided by National Planning Policy Framework (NPPF) of March 2012. This requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be readily agreed with the planners.

Environment Agency Guidance

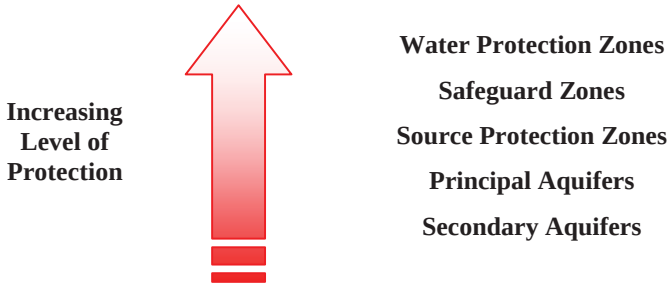
Legislation and guidance surrounding the protection of controlled waters in the UK is numerous and can be complex. The Environment Agency's overall position on groundwater is *"To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify"* (Groundwater Protection : Policy and Practice GP3, 2012). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled

by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the Environment Agency Policy document *Groundwater Protection: Policy and Practice (GP3), Version 1* of November 2012. The following diagram indicates the three main parts of GP3:

Structure of GP3

The Environment Agency follows a tiered, risk based approach to drinking water protection and this should be taken into account when carrying out controlled waters risk assessment:



Tools available for Risk Assessment of Controlled Waters

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. A number of tools are available for this purpose and the general approach is detailed further in Part 3 of GP3.

Three main stages apply to any risk assessment of controlled waters, these are:

i) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting etc)
ii) Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)
iii) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

The process is summarised below (Taken from the Environment Agency GP3 draft consultation document, 2006):

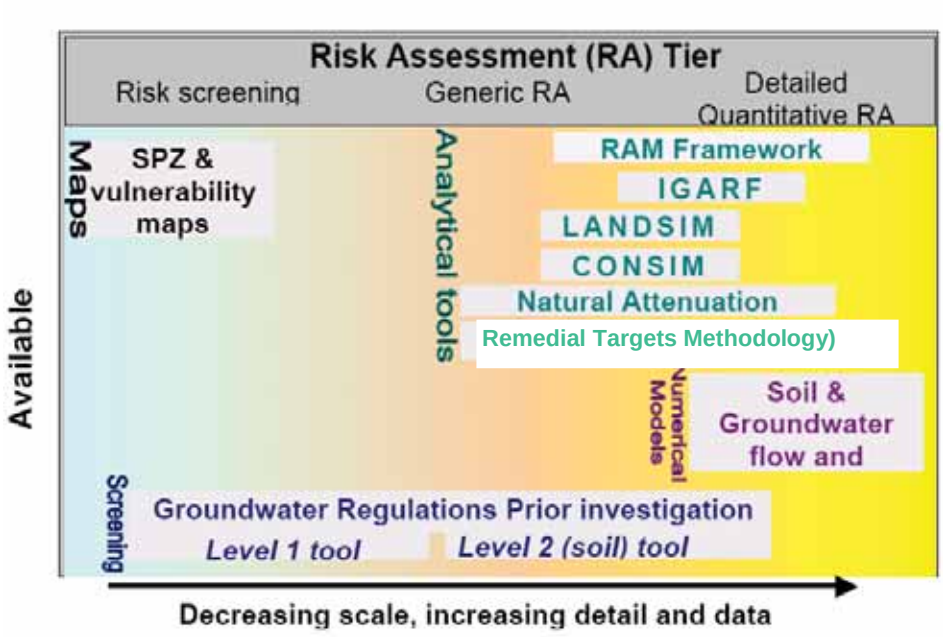


Figure 1-1 Environment Agency groundwater assessment tools, mapped against the different levels of risk assessment.

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology "Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination" Environment Agency (2006). The methodology has four tiers of assessment:

Tier 1 utilises either a soil concentration (calculation of pore water concentrations based on partitioning calculations), leaching test or pore-water concentration of perched water as a source concentration input and these are contrasted directly to water quality standards. No dilution or attenuation is considered at Level 1.

Tier 2 (groundwater) considers dilution of the contaminant within the underlying receiving groundwater or surface water body. To determine a dilution factor the infiltration rate of pore water and the discharge of groundwater beneath the source must be determined. Level 2 Assessment is comprises a comparison between measured groundwater concentrations with to water quality standards.

Tier 3 considers natural attenuation in the form of dispersion, retardation and degradation of the contaminant. As the levels are progressed, the assessment becomes increasingly more detailed and less conservative as the data requirements are increased with each successive tier. The Environment Agency has released Excel Worksheets to carry out basic calculations using a conservative approach up to Tier 3. However, in this case the conceptual model is a simple one and assumes there is a simple migration of contaminants from the source zone into the aquifer receptor. Using these worksheets requires a sensitivity analysis showing how by varying each parameter, what effect it might have on the outcome of the assessment. Groundwater conceptual models are not always this simple.

Tier 4 is for more complex conceptual models where multiple sources, multiple pathways, multiple receptors and complex water balances can be assessed. The Tier 4 assessment is not supported by the RTM software.

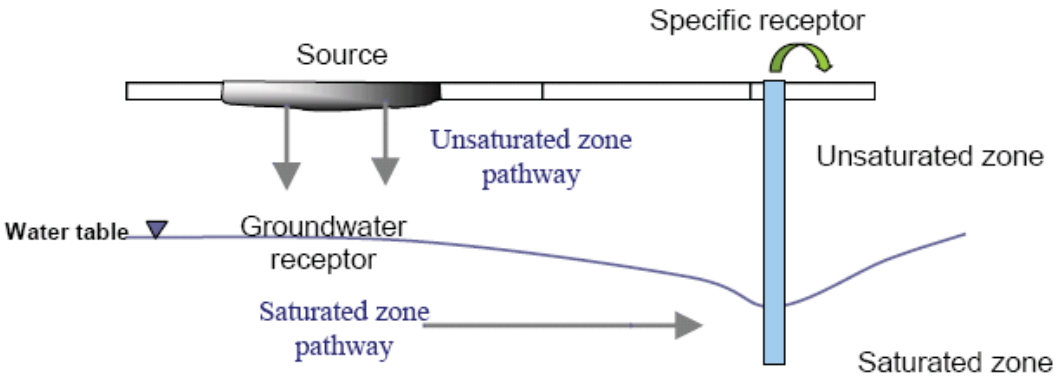
A slightly more advanced program, ConSim 2, developed on behalf of the Environment Agency, allows for the introduction of additional geological horizons and is used mainly to determine whether soil contaminants will reach their target within a specified timeframe. This model as inbuilt sensitivity, however, due to its greater complexity

requires more time to run. The overall approach and basic calculations required within the Remedial Targets Methodology framework are incorporated within ConSim 2. These models assess only the dissolved phase contaminants. There are many further models commercially available for use in controlled waters risk assessment, particularly for more complex situations, however, these should be used with caution and only once agreement has been obtained from the Environment Agency. All have the overall aim of the protection of controlled waters.

General notes on each stage of the controlled waters risk assessment process

Risk Screening

The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic Source-Pathway-Receptor concept is given below (taken from the Environment Agency GP3, 2012):



Generic Risk Assessment

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

- Updated Recommendations on Environmental Technical Standards, River Basin Management (2015-21), April 2012 by the UK Technical Advisory Group on the Water Framework Directive;
- Environmental Quality Standards (EQS) for freshwaters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives);
- Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
- Surface Waters (Fishlife) (Classification) Regulations (1997)
- UK Drinking Water Standards (DWS) (Water Supply (Water Quality) Regulations 2000);
- Dutch Ministry of Housing, Spatial Planning and Environment (2001) Intervention Values and Target Values – soil quality standards;
- World Health Organisation Guidelines for Drinking Water (2004)

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;

- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be dependant on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or *compliance point*. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Definition of Controlled Waters

The term 'controlled waters' is defined in Section 104 of the Water Resources Act 1991 as:

> *"Territorial Waters…which extend seawards for three miles…, coastal waters…, inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata."*

Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

Environment Agency's Aquifer Designations

The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The maps are split into two different types of aquifer designation:

- **Superficial (Drift)** – permeable unconsolidated (loose) deposits.
- **Bedrock** – solid permeable formations e.g. sandstone, chalk, limestone.

The aquifer designations displayed on the Environment Agency maps are as follows:

- **Principal Aquifers (formerly termed Major Aquifers) –** These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer.

- **Secondary Aquifers (formerly termed Minor Aquifers) –** These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:

    - **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;

    - **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

    - **Secondary Undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

- **Unproductive Strata (formerly termed Non-Aquifer) –** These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX K

Summary of Chemical Test Results of Water & Leachate Samples

Job No: 1970
Site: Lower Eccleshill Road, Darwen, Lancashire
Summary of Groundwater Data - Tier 1 Screening

TerraConsult

Sample Location	Units	Drinking Water Standard	EQS Freshwater	Other	TerraConsult Site Investigation Data															
					05/03/14	05/03/14	05/03/14	12/03/14	12/03/14	12/03/14	12/03/14	28/03/14	28/03/14	28/03/14	28/03/14	28/03/14	28/03/14	28/03/14	28/03/14	28/03/14
					WS2	WS4	WS5	BH5	BH4	TP16	TP17	WS1	BH1	BH2	BH3	BH4	BH5-B	BH5	WS2	GWW1	GW2
					Leachate	Leachate	Leachate	Leachate	Leachate	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Water Quality																					
pH	pH units	-	-	-	8.90	8.90	9.10	11.00	11.00	7.70	9.00	7.90	7.20	7.40	7.50	8.10	7.50	8.60	8.50	7.50	7.60
Electrical Conductivity	uS/cm	-	-	-	170	170	110	1200	230	840	280	760	940	1900	1000	340	1800	810	470	640	940
Metals																					
Arsenic	ug/l	10	50	50	-	-	-	-	-	1	1	3.2	1	2.2	1.5	1	2.6	4.3	3.0	1	1
Cadmium	ug/l	5	5	5	-	-	-	-	-	0.08	0.08	0.08	2.2	2.1	0.10	0.08	0.08	0.08	0.08	0.30	0.08
Chromium (Total)	ug/l	50	200*	-	-	-	-	-	-	1	1	2.2	1	1	1	1	1	1	1	1	1
Copper	ug/l	2000	28*	28	-	-	-	-	-	130	32	2	5.5	3.4	3.0	6.4	4.9	2.1	11	6.4	1
Lead	ug/l	25	125*	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Mercury	ug/l	1	1	-	-	-	-	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Nickel	ug/l	20	150*	200	-	-	-	-	-	1	1	1	6.5	1.9	1	1	1	1	1	1	1
Selenium	ug/l	10	-	10	-	-	-	-	-	1	1	2.9	1.5	4.4	2.9	3.9	6.4	5.5	5.1	1	4.3
Zinc	ug/l	5000	250*	500	-	-	-	-	-	270	14	6.2	95	28	11	3.1	19	9.1	4.4	63	6.1
Vanadium	ug/l	-	-	-	-	-	-	-	-	1	1	1.4	1	1	1	1	1	4.2	1	1	1
Cations (Dissolved)																					
Magnesium	mg/l	50	-	-	-	-	-	-	-	-	-	-	17	-	-	-	37	-	15	-	-
Inorganic																					
Chloride	mg/l	250	250	250	1	1	1	84	8.3	10	13	12	130	200	70	9.3	180	18	13	120	52
Fluoride	mg/l	1.5	-	1.5	0.17	1.6	1.4	0.19	0.18	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/l	-	50.0	-	0.5	3.7	0.5	0.5	0.5	-	-	-	0.2	-	-	-	0.2	-	0.81	-	-
Sulphate (as SO4)	mg/l	250	400	250	26	33	15	74	24	-	-	260	99	640	220	55	510	270	71	78	4.2
Sulphur	mg/l	-	-	-	-	-	-	-	-	150	17	87	33	210	73	18	170	90	24	26	1.4
Sulphide	mg/l	-	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Unionized Ammonia as N**	mg/l	-	0.015	1.50	-	-	-	-	-	0.03	0.1	0.03	0.01	0.01	0.06	0.01	0.01	0.17	0.10	0.02	0.04
Ammonium (as NH4)	mg/l	0.5			-	-	-	-	-	3.20	0.63	2.05	-	-	10.24	-	-	2.46	1.79	3.40	5.43
Total Cyanide	ug/l	50	-	70	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Thiocyanate	mg/l	-	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Organics																					
Phenol	ug/l	0.5	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
TOC	mg/l	-	-	-	59	9.4	24	5.9	11	-	-	-	-	-	-	-	-	-	-	-	-
PAH																					
Naphthalene	ug/l	10^{-3}	10	10	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthylene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluorene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phenanthrene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluoranthene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Pyrene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[a]anthracene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chrysene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[b]fluoranthene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[k]fluoranthene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[a]pyrene	ug/l	0.01	-	0.01	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno[1,2,3-cd]pyrene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
dibenzo[a,h]anthracene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[ghi]perylene	ug/l	-	-	-	-	-	-	0.01	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total EPA-16 PAHs	ug/l	-	-	-	-	-	-	0.20	-	2.00	2.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
TPH																					
Aliphatic >C5 - C6	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C6 - C8	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C8 - C10	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C10 - C12	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C12 - C16	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C16 - C21	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C21 - C35	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C35- C44	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic (C5 - C35)	ug/l	10	-	-						5	5	5	5	5	5	5	5	5	5	5	5
Aromatic >C5 - C7	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C7 - C8	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C8 - C10	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C10 - C12	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C12 - C16	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C16 - C21	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C21 - C35	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C35 - C44	ug/l	-	-	-	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic (C5 - C35)	ug/l	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	5	5
Aromatic (C5 - C35)	ug/l	-	-	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	5	5
Total TPH (C5 - C35)	ug/l	10	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10	10	10
Benzene	ug/l	1	30	10	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1
Toluene	ug/l	-	50	700	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1
Ethylbenzene	ug/l	-	20	300	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1
p & m-xylene	ug/l	-	30	500	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1
o-xylene	ug/l	-	30	500	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1

Note:

Fail: Above UK EQS
Fail: Above UK DWS
Result below Detection Limit

* EQS for substances based on >100-150 mg/l CaCO3 Hardness band and Cyprinid designation for receiving water
** Calculated from ammoniacal nitrogen and pH results using an assumed water temperature of 10 degrees.
# Total of 4 Drinking Water Standard PAHs: Benzo[b]fluoranthene, Benzo[k]fluoranthene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene

APPENDIX L

Current Guidance for Ground Gas Risk Assessment

Current Guidance for Ground Gas Risk Assessment

Origin of Ground and Landfill Gases

When carrying out a ground gas risk assessment, the origin or source of the gases is important as potential risks will vary depending on the source. This Appendix relates to the risk of the two main ground gases of concern: methane and carbon dioxide, and does not apply to other ground gases (e.g. radon or vapours from hydrocarbon spills). Methane and carbon dioxide are major constituents of landfill gas but can also occur from a variety of anthropogenic and natural sources, as summarised in Table G1 below:

Table G1. Potential Sources of Ground Gases

Gas	Source	Comments
Landfill Gas	Anaerobic decomposition of degradable waste within landfill sites. Typically 60% methane and 40% carbon dioxide during methanogenic phase.	Composition varies over time, particularly in early stages. Contains a range of minor constituents (particularly carbon monoxide and hydrogen sulphide).
Landfill Associated Gases	- Anaerobic degradation of leachate external to the site; - Degassing of dissolved gases in groundwater; - Evolution of gases following interaction between leachate and groundwater	Can result in secondary (external) production of methane or carbon dioxide.
Made Ground	Anaerobic degradation of organic components	Very variable depending on source
Sewer Gas, Cess Pits	Anaerobic degradation of organic components of sewage producing methane and carbon dioxide.	Often characterised by hydrogen sulphide odour.
Mains Gas	Leakage from underground pipework or storage tanks. Mainly methane but often contains higher alkanes.	An odouriser is added to permit detection of leaks. Typically 90% CH_4, but 1 to 27% C_2-C_4 alkanes, May also contain other trace gases e.g. CO, helium and CO_2 (from degradation of CH_4 in the ground).
Other Anthropogenic Sources	- Degradation of leaked or spilled hydrocarbons or other industrial chemicals; - Anaerobic degradation of organic contaminants in groundwaters (e.g. silage liquor); - Reactions between monitoring well construction components and environment; - Burial grounds/cemeteries.	Hydrocarbon spillages often have an 'oily' odour. Fuel spillages common – Petrol or Diesel and can contain a wide range of VOC's. Can degrade to produce methane / carbon dioxide.
Alluvium / Marsh / Peat Gas	Anaerobic microbial degradation of organic material (usually waterlogged vegetation / peat). Often associated with the presence of alluvial deposits or dredgings.	
Geogenic Gas	Natural seepages of carbon dioxide and hydrocarbon gases derived from geologic sources such as coal seams and deep oil / gas source formations. Can be present in solution in groundwaters.	Methane most common but can contain carbon dioxide and higher alkanes.
Mine Gases	Various types. Most common is "fire damp" with high methane, produced by the desorption of gas trapped in coal. "Black damp" (Stythe gas) with high carbon dioxide and denser than air. "White damp" is high in carbon monoxide.	Methane most common. Can contain higher alkanes, carbon dioxide and carbon monoxide. Often low in oxygen.
Natural Shallow Ground Gas	Various types - high carbon dioxide formed by subsurface aerobic activity leading to depleted oxygen and elevated carbon dioxide; - chemical degradation of rocks (e.g. carbonates) producing carbon dioxide; - carbon dioxide production in root zone of soils by plants.	Gases can be emitted from ground under falling barometric pressure conditions.

This Appendix concentrates on the assessment of risk from methane and carbon dioxide. This Appendix does not provide guidance for the assessment of risk when other gases are present due to 'Other Sources' from the above table (particularly organic compounds such as BTEX and VOC's or for the risk from radon or hydrogen sulphide).

To determine the origin of the gas a range of factors must be considered together, including;

1. Proximity of likely sources;
2. Ground conditions (geology, hydrogeology, anthropogenic pathways etc);
3. Properties of gases present including:
   - Chemical composition;
   - Physical properties;
   - Ratios of components e.g. methane : carbon dioxide.
4. Timeframe of activities such as infilling periods, capping works, installation of gas control systems etc.

Identification of the originating source may be problematic given that there may be more than one source present and trace gas analysis may be required. Identification of the sources of the gases encountered during monitoring is usually carried out through a process of eliminating the most unlikely potential sources (given the site setting) and selecting those which are the more likely candidates.

Hazards Associated with Presence of Ground Gases

Methane gas is combustible and potentially explosive. When the concentration of methane in air is between the limits of 5.0%v/v and 15.0%v/v an explosive mixture is formed. The Lower Explosive Limit (LEL) of methane is 5.0%v/v, which is equivalent to 100% LEL. The 15.0%v/v limit is known as the Upper Explosive Limit (UEL), but concentrations above this level cannot be assumed to represent safe concentrations. Further, the LEL and UEL will vary (up and down) depending upon the proportion of other gases (including oxygen). However, the fact that methane is a colourless, odourless gas means that there is no simple indicator of the presence of the gas until such a time as explosive limits are reached and an incident occurs. Methane is lighter than air and has a low toxicity. However, at high concentrations it can result in asphyxiation due to oxygen displacement.

Carbon dioxide is a colourless, odourless gas, which, although non-flammable, is both toxic and an asphyxiant. As carbon dioxide is denser than air, it will collect in low points and depressions. The UK Health & Safety Executive (HSE) has published information relating to concentrations of carbon dioxide that humans may be exposed to, which uses concentrations contained in the Control of Substances Hazardous to Health Regulations 2002 (as amended). These are the Long Term Occupational Exposure Limit (LTOEL, 8 hour period) and the Short Term Occupational Exposure Limit (STOEL, 15 minute period), which are 0.5% and 1.5% carbon dioxide, respectively.

Parameters Influencing the Rate of Ground Gas Production

Figure G2 is taken from EA guidance document LFTGN 03 illustrates typical ground gas generation curves from biodegradable materials:

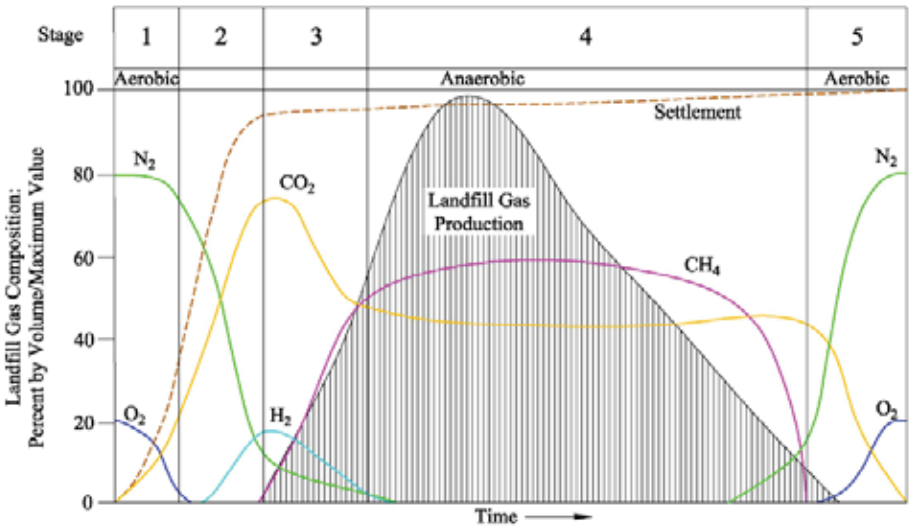


Figure G2. Idealised Representation of Landfill Gas Generation.

The production of methane and carbon dioxide at a landfill site may be expected to be considerable and ongoing. Concentrations of methane will eventually decrease, followed by concentrations of carbon dioxide, but the duration and rate of gas production can vary markedly between sites. Five distinct phases of gas production occur during the process which are, in order of event (as marked on Figure G2), as follows:

1. An aerobic phase involving oxygen depletion and temperature increase through aerobic respiration;
2. The establishment of anaerobic conditions and the evolution of carbon dioxide and hydrogen through acidogenic activity;
3. Commencement of methanogenic activity; the establishment of populations of methanogenic bacteria;
4. A phase of stable methanogenic activity, which may go on for many tens of years;
5. A phase of decreasing methanogenic activity, representing depletion of the organic material and a return to aerobic conditions.

The time scale for the return to the normal ground gas concentrations will be highly variable, depending upon the types and quantities of materials present. In addition, the optimum parameters influencing the rate of decomposition and ground gas production within the ground at a site are as follows:

- High water content with adequate rainfall and water infiltration to provide moisture content between approximately 20 to 26%;
- Conditions that either are or are very close to anaerobic;
- High proportion of biodegradable materials;
- A pH between 6.5 and 8.5, ideally verging slightly on the acidic between pH 6 to 7;
- Temperature between 25°C and 55°C;
- The ratio of the biochemical and chemical oxygen demands (BOD:COD);
- High permeability;
- Small particle size, as finer subsurface materials possess a greater surface area to provide a growing ‘face’ for the micro-organisms but high fines levels reduces permeability and reduces decomposition rate.

For this reason, it is vital that sources of methane and carbon dioxide are identified prior to the commencement of any work on a construction site, and that the ground gas regime is characterised at the worst temporal conditions a site may experience. From this, a risk assessment is carried out to identify the risk at the site from ground gases so that suitable protection measures can be designed and incorporated into a development to prevent a dangerous build-up of gas occurring.

Factors Influencing the Migration and Behaviour of Ground Gases

There are many factors that influence the migration of ground gases which can effect the risk from a gassing source:

- driving force – pressure differential along a pathway, diffusion and dissolved in solution;
- meteorological conditions – short term and seasonal conditions including atmospheric pressure changes (e.g. rapidly falling pressure causes gas to expand increasing emission rates), rainfall, frozen ground and thawing, temperature;
- geological and groundwater conditions – these can have the over riding influence on the direction/pathways and quantity of migrating gas;
- anthropogenic influences – man-made pathways include mine shafts, service runs/drains, foundation piles, underground voids/pits/basements, foundation/building design/construction

Guidance Documents

Currently in the UK, there are no statutory threshold limits for hazardous gases in the ground as site specific variables mean that standard threshold values cannot be applied. The published guidance relating to development of sites where methane and carbon dioxide are present has been produced in response to building projects on or close to landfill sites, as both gases are principal constituents of landfill gas. Much of the historic guidance that has been produced on gas risk assessment focused on landfill sites and as a result there has previously been a lack of clarity when relating the process to gas conditions on non-landfill sites.

Statutory guidance regarding methane in the ground has previously taken a limiting concentration of 1.0 % by volume methane (equal to 20% of the lower explosive limit of methane in air) above which necessary actions will be appropriate. For carbon dioxide the limiting recommended trigger was 1.5 % by volume (the Long Term Exposure Limit for carbon dioxide). Above these concentrations the Building Regulations Approved Document C (1992) stated that consideration should be given to whether actions may be appropriate, whilst more specific solutions would be likely to be necessary at concentrations greater than 5% by volume of carbon dioxide (Building Regulations Approved Document C, 1992). However, the latest fully revised version of Approved Document C (DoE, 2004) no longer endorses this approach and instead requires the use of a risk-based approach in interpreting the findings of a gas monitoring survey. Further, the latest EA documentation on landfill gas (LFTGN 03, 2004) continues to sanction the use of a risk-based approach through a structured approach to the assessment of ground gases and links with the risk assessment process outlined within CLR 11 for soil contaminants.

With the above in mind, recent guidance has been produced in 2006 and 2007 with the aim of providing up to date advice in relation to residential and commercial development. The guidance does not address issues associated with gas derived from landfills, for this refer to *"Guidance on the Management of Landfill Gas"* (Environment Agency 2004) for an overview.

Recent guidance relevant to gas assessments for residential and commercial development includes;

- **Wilson *et al.* (CIRIA C665, December 2007) *"Assessing Risks Posed by Hazardous Ground Gases for Buildings."***

  This document provides up to date advice on all aspects of ground gas risk assessment such as investigation, monitoring programmes, data collection and interpretation. The guidance presents separate methodologies for the characterisation of:

  - **All development types except low rise housing with gardens and for Low Rise Buildings without a 150mm void** (Situation A) (Table 8.5 CIRIA C665)

  and;

  - **Low rise housing with gardens with a 150mm ventilated sub-floor void** (Situation B) (Table 8.7 CIRIA C665)
    (See below for further explanation of the methods of characterisation)

- **Boyle and Witherington (NHBC / RSK Group, Report 10627-R01(04) January 2007) *"Guidance on the Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present."***
  This document presents the "Traffic Lights System" detailed below and is relevant only for low rise properties (e.g. bungalows and town houses) that have a ventilated sub-floor void (i.e. Situation B as described in CIRIA C665).

- **Wilson and Card (CIEH, expected 2011) *"Ground Gas Handbook for Designers and Regulators"***
  This document is expected to provide practical guidance on ground gas assessments and the design and evaluation of protection measures.

- **British Standard (BS 8485, December 2007) *"Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments"***
  This document provides an overview of gas characterisation and assessment. The Standard is intended to be used by designers of gas protection measures and regulators involved in the assessment of design solutions. The Standard provides a framework in line with CLR11 allowing designers to judge the adequacy of ground gas and related site investigation data. The document provides an approach to determine appropriate ground gas parameters that can be used to identify a range of possible construction solutions mitigating against the presence of ground gas on a development site.

Each of these documents continues to highlight the importance of, and give further guidance towards, carrying out a tiered risk-based decision-making process in accord with government policy on dealing with contamination from historic or natural sources and highlight the importance of the Conceptual Model in site characterisation. These documents also stress the importance that the assessor should be confident that the ground gas monitoring results are representative of the likely worse case ground gas regime on a site and that the data collected from the site is sufficient. With this in mind, CIRIA C665 sets out ideal monitoring periods as below.

Idealised Frequency and Period of Monitoring (after Table 5.5a and 5.5b, CIRIA C665)						
		Generation Potential of Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with Gardens)	6/3	9/6	12/6	24/12	24/24

Notes

1. First number is the number of readings and the second is the minimum period in months (e.g. 6/2 – six sets of readings over two months).

2. At least two sets of readings must be at low (preferably under 1,000 mb) and falling pressure.

3. High sensitivity end use on high or very high hazard site will not normally be acceptable unless the source is treated to reduce gassing potential.

Before the latest guidance, good practice for site characterisation had been based upon the method proposed by Wilson and Card (1999). CIRIA C665 (2007) effectively supersedes Wilson and Card (1999) and includes a modified version of the Wilson and Card method (Tables 8.5, 8.6 and Box 8.1). Gas concentrations and flow rates for either methane and/or carbon dioxide measured at a site to 'Characteristic Situations.' Appropriate protection measures are selected from Table 8.6 (if using modified Wilson & Card method) and from Box 8.4 from CIRIA C665 (if using the NHBC traffic lights method). Throughout the risk assessment process, strong regard must be given to the nature of the gassing source, the flow rates and the estimated surface emissions. Note that certain protection measures are stated in CIRIA Report 149 that are now considered wholly inappropriate to certain developments and consequently should not be used without modification. Throughout the process, it is important to remember that these tables are not intended to be used as a definitive design tool and have been prepared to show the typical scope of measures for gas control.

Both the NHBC (2007) and CIRIA (2007) guidance documents and BS 8485 (2007) propose that both ground gas concentrations and flow rates are used to calculate the limiting gas well gas volume flow rates for methane and carbon dioxide, based on the ground gas conditions monitored for during the worse-case temporal conditions. This limiting gas well volume flow rate is termed the Gas Screening Value (GSV, note that this was termed borehole gas volume flow), and is calculated as follows:

$$\textbf{GSV}\ (\text{l/hr}) = \frac{[\text{gas well gas concentration (\%v/v)}]\ \textbf{x}\ [\text{gas well flow rate (l/hr)}]}{100}$$

These GSVs are then compared to generic 'Traffic Lights' contained within the NHBC guidance, which present typical maximum gas concentrations and limiting GSV's, for 'Situation B Development' (Low rise housing with gardens).

Table 8.7 NHBC Traffic light system for 150 mm void

Traffic light	Methane [1]		Carbon dioxide [2]	
	Typical max concentration [3] (% by volume)	Gas screening value [2,4] (litres /hour)	Typical max concentration [3] (% by volume)	Gas screening value [2,4] (litres /hour)
Green	1	0.13	5	0.78
Amber 1	5	0.63	10	1.60
Amber 2	20	1.60	30	3.10
Red				

Notes:
1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

Box 8.4 of CIRIA C665 Gas protection measures for low-rise housing development based upon allocated NHBC Traffic light (Boyle and Witherington, 2007)

Traffic Light Classification	Protection Measures Required
Green	Negligible gas regime identified and gas protection measures are not considered necessary.
Amber 1	Low to intermediate gas regime identified, which requires low-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.
Amber 2	Intermediate to high gas regime identified, which requires high-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to prevent the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Membranes should always be fitted by a specialist Contractor. As with Amber 1, ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours. Certification that these passive protection measures have been installed correctly should be provided.
Red	High gas regime identified. It is considered that standard residential housing would not normally be acceptable without a further Gas Risk Assessment and/or possible remedial mitigation measures to reduce and/or remove the source of gas.

For a 'Situation A Development' (All development except low rise housing with gardens), the GSV value is used to derive the appropriate Characteristic Situation from Table 8.5 of CIRIA C665 (below):

Table 8.5 from CIRIA C665 Modified Wilson and Card Classification

Characteristic Situation (CIRIA R149)	Comparable Partners in Technology gas Regime (see Box 8.2)	Risk Classification	Gas Screening Value (CH_4 or CO_2) (l/hr)[1]	Additional Factors	Typical Source of Generation
1	A	Very low risk	<0.07	Typically methane ≤ 1% and/or carbon dioxide ≤ 5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking susceptible to flooding, completed landfill (WMP 26B criteria)
5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	F	Very high risk	>70		Recent landfill site

It was intended in CIRIA C665 that the characteristic situation allocated to the development from the table above would then be used in Table 8.6 of CIRIA C665 in order to determine the level of gas protection the development requires. However, BS8485:2007 superseded this document and a different set of mitigation standards were put forward.

The recommended gas protection measures should be selected based on the building type. For the majority of development situations the gas protection measures can be based on Tables 2 and 3 of BS8485:2007 (see below).

The first step in the decision making process is to obtain the level of gas protection necessary in the range 0 to 7 from Table 2. Then a combination of ventilation and /or barrier systems should be chosen from Table 3 to meet that requirement. The guidance value is allocated to reflect the risk associated with the characteristic gas situation and the combined effectiveness of the elements in Table 3. The level of gas protection necessary should take into account the characteristic gas situation and a number of other factors. The whole decision making process should be made transparent, where all parties can see the approach being taken, can understand the various steps and decisions made and be confident that a risk-assessed solution has been designed and installed commensurate with the construction and site constraints.

Where the gas situation is 4 or more (and for NHBC Red situations according to CIRIA C665), the site requires a comprehensive risk assessment to confirm the scope of protection measures. These are higher risk sites and reliance on Table 2 and 3 alone is not sufficient.

BS8485:2007 Table 2 Required gas protection by characteristic gas situation and type of building					
Characteristic Gas Situation, CS	**NHBC traffic light**	**Required gas protection**			
		Non-managed property e.g. private housing	**Public building (a)**	**Commercial buildings**	**Industrial buildings (b)**
1	*Green*	0	0	0	0
2	*Amber 1*	3	3	2	1 (c)
3	*Amber 2*	4	3	2	2
4	*Red*	6 (d)	5(d)	4	3
5			6(e)	5	4
6				7	6
NOTE Traffic light indications are taken from NHBC Report no.:10627-RO1 (04) and are mainly applicable to low-rise residential housing[1]. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.					
a) Public buildings include, for example, managed apartments, schools and hospitals. b) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building. c) Maximum methane concentration 20% otherwise consider and increase to CS3, d) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations. e) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any gas protection scheme.					

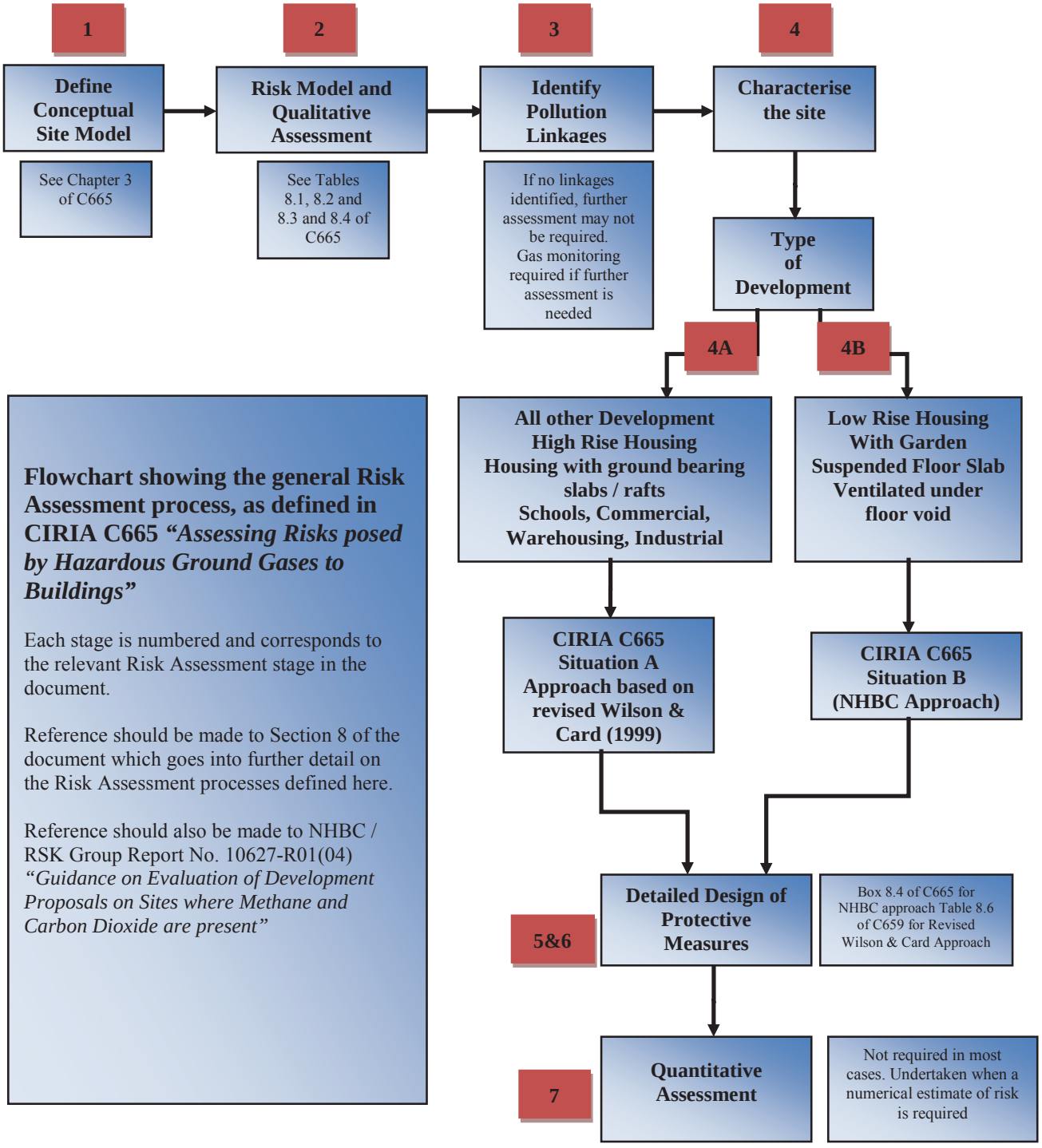
[1] The NHBC guidance and CIRIA C665 guidance refers to low rise housing (which is up to three storeys without lifts) that is constructed with a 150mm ventilated sub-floor void.

For a site which is impacted by migratory gases from an off-source, the development may be protected by imposing pathway intervention methods, which if successfully validated, could also remove the need for further analysis. It is essential that the gas regime in these circumstances has been fully characterised and that the only source impacting the site is located off site and that the pathway is clearly defined and its interception equally proven before construction commences. Pathway intervention methods may include vertical membrane installations, venting trenches, rows of stone columns, activated trenches and various proprietary systems. These systems are particularly relevant to domestic housing where there is limited scope for foundation type solutions.

Having selected the appropriate gas protection for the building from Table 2, an element, or combination of elements should be chosen from Table 3a, Table 3b, Table 3c and Table 3d, and combined to achieve the required gas protection. A combination of elements should be chosen where high gas protection is required, unless professional judgement and risk assessment show otherwise. The scores are not proportionate and are not to be taken as an indication of relative quantitative performance. This method relies upon the method developed in CIRIA C665 and is intended to be consistent with the CIRIA approach while developing the principle. As such, minor inconsistencies in result might be observed between the two methods.

BS8485:2007 Table 3 Solution Scores			
PROTECTION ELEMENT/SYSTEM		**SCORE**	**COMMENTS**
a) Venting/dilution (See Annex A BS8485)			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]	Very good performance	2.5	*Ventilation performance in accordance with Annex A (BS8485)* *If passive ventilation is poor this is generally unacceptable and some form of active system will be required.*
	Good performance	1	
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]		2.5	*There have to be robust management systems in place to ensure the continued maintenance of any ventilation system. Active ventilation can always be designed to meet good performance.*
Ventilated car park (basement or undercroft)		4	*Mechanically assisted systems come in two forms: extraction and positive pressurization.*
b) Barriers			
Floor slabs			
Block and beam floor slab		0	*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.*
Reinforced concrete ground bearing slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended floor slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation [B,C]		0.5	*The performance of membranes is heavily dependent on the quality of design of the installation, resistance to damage after installation, and the integrity of joints.*
Proprietary gas resistant membrane to reasonable levels of workmanship /in line with good practice under independent inspection (CQA)[B,C]		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	*Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.*
Permanent monitoring and alarm system [A]	Installed in the underfloor venting/dilution system	2	
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	*This can consist of site protection measures for off-site or on-site sources (see Annex A, BS8485)*
NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection			
A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.			
B) If a 1 200g DPM material is to function as a gas barrier it should be installed according to BRE 212 /BRE 414 being taped and sealed to all penetrations			
C) Polymeric Materials> 1200 g (proportional to thickness) but their physical properties mean that they are more robust and resistant to damage.			

To summarise the main stages in the risk assessment process set out in CIRIA C665 and followed by TerraConsult are as follows:



Flowchart showing the general Risk Assessment process, as defined in CIRIA C665 *"Assessing Risks posed by Hazardous Ground Gases to Buildings"*

Each stage is numbered and corresponds to the relevant Risk Assessment stage in the document.

Reference should be made to Section 8 of the document which goes into further detail on the Risk Assessment processes defined here.

Reference should also be made to NHBC / RSK Group Report No. 10627-R01(04) *"Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are present"*

APPENDIX M

Summary of Guidance for Classification of Soil as a Waste Material

Guidance for Classification of Soil for Off Site Disposal at a Landfill Site

Many site developments create a portion of excess soils and Made Ground which if not re-usable, are required to be disposed off site at a suitably licensed landfill site. The regulations and associated guidance published by the Environment Agency is relatively complex and lengthy. This guidance provides a summary of the following documents which should be referred to when assessing soil (and common constituents found within Made Ground on remediation sites) for off site disposal:

- Guidance for Waste destined for disposal in landfills: Interpretation of the Waste Acceptance Requirements of the Landfill (England and Wales) Regulations 2002 (as amended) (EA, 2004);
- Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance Procedures (EA, April 2005);
- WM2 - Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Wastes Version 3 (EA, May 2013 and October 2013 errata);
- Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4);
- Guidance on Waste Destined for Disposal in Landfill (EA, June 2006);
- Treatment of Non-hazardous wastes for Landfill (EA, February 2007).

It is important to distinguish between the waste classification system and the designation of materials as "suitable for use" on site. A material may be retained on site for an appropriate end use if that end-use is clearly designated and that a site-specific risk assessment ensures that it does not pose a risk to human health or controlled waters. However, if this material is excavated and sent for disposal, the material is then subject to waste management regulations and the two systems cannot be directly correlated. It is therefore important to note that classifying a material as hazardous (should it be excavated and become a waste) does not necessarily indicate that it might not be suitable to be kept on site for re-use. Separate guidance in the form of a Code of Practice (CL:AIRE Version 2, 2011) has been developed jointly between the development industry and the Environment Agency to provide best practice when assessing whether materials are wastes or not, and for determining when waste can cease to be waste for a particular use.

In accordance with the current waste regulations (or Landfill Directive, as they are more commonly known), from 30th October 2007 all waste materials produced from construction sites have to be pre-treated prior to disposal. Pre-treatment includes waste minimisation, recovery (e.g. separation of demolition waste to be used as hardcore) and separation of materials into different waste categories (e.g. separate inert waste from hazardous waste etc). Mixing of different waste types shall be avoided and intentional mixing of inert materials with hazardous waste to 'dilute it' and hence change its waste classification, is illegal.

The current waste regulations (based on the EU landfill directive) introduced a two tier classification system for waste materials, defining them as either being hazardous or non-hazardous. Landfills are licensed to take wastes based on a three tier classification system with the non- hazardous waste divided into two sum-categories:

- Non-Hazardous - inert;
- Non-Hazardous - non-hazardous;
- Hazardous.

Waste materials are categorised with a six figure numeric code in the European Waste Catalogue. Commonly found construction and demolition wastes including excavated soil from contaminated sites and Made Ground with their waste codes are summarised below (this is not a comprehensive list):

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 01 01 Concrete	Concrete, possibly with reinforcement (from Construction & Demolition)	✓		
17 01 02 Bricks		✓		
17 01 06* Mixtures of concrete, bricks, tiles & ceramics containing dangerous substances	These are not normally considered hazardous but if they are contaminated (e.g. by asbestos) then could be hazardous – see comment above			✓
17 01 07 Mixtures of concrete, bricks, tiles & ceramics other than those in 17 01 06	This is mixed inerts c.f. 17 09 04	✓		
17 05 03* soils and stones containing dangerous substances				✓
17 05 04 soils and stones other than those mentioned in 17 05 03	Soil and stones only (excluding top soil, peat, soil and stones from contaminated sites)	✓		
17 06 05* Construction materials containing asbestos	e.g. corrugated asbestos sheeting			✓
17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01	Plaster & plasterboard (although specific disposal requirements are required for high sulphate waste – see EA guidance 'Understanding the Landfill Directive' version 1.0 March 2010.		✓	
17 09 01* Construction & demolition wastes containing mercury				✓
17 09 02* Construction & demolition wastes containing PCBs	Waste with more than 50 mg/kg of PCB's are hazardous			✓
17 09 03* Other mixed construction & demolition wastes containing dangerous substances	Broad range of potentially (see notes below – if asterix the waste is hazardous) hazardous wastes			✓
17 09 04 Mixed construction & demolition wastes other than those mentioned in 17 09 01, 17 09 02 & 17 09 03	Mixed inerts with soil, tarmac, cables, vegetation, plaster, etc. (this waste can only be considered inert if it passes the waste acceptance criteria identified in the regulations).	✓	✓	

Note: all wastes with an asterix code are hazardous regardless of whether they are mirror or absolute entries in the EWC list the decision to with regard to composition must come before applying the code for mirror entries.

Some materials are classified as Inert Waste based in its origin (e.g. 17 01 01 Concrete, or glass) without any requirement for laboratory chemical analysis.

However, most soils will require laboratory testing to confirm whether they are classified as Hazardous Waste. The protocol for assessing these materials and the appropriate threshold values is complicated and are set out in the Environment Agency's "Technical Guidance *WM2* Hazardous Waste – Interpretation of the Definition and Classification of Hazardous Waste" Version 3 (2013). If the test results for the waste indicates that it is not hazardous then further analysis of the waste is required to determine whether it is Inert Waste. If the waste does not meet the criteria for either Hazardous or Inert, then it is by default classified as Non-hazardous Waste.

As an alternative location to landfills for off-site disposal of inert and non-hazardous waste, there are a number of sites which have Waste Permit Exemptions that can accept certain categories of inert and non-hazardous wastes. Additionally some quarries can accept certain types of wastes to be used for quarry restoration material. For both alternatives to disposal at landfill sites the material still requires chemical testing as these sites have site specific acceptance criteria for wastes. It should also be noted that these types of site do not incur landfill tax which in the 2013/14 tax year is £2.50 for inactive waste (inert and some types of non-hazardous waste) and £72.00/Tonne for active waste (some types of non-hazardous waste and hazardous waste and for 2014/15 the landfill tax for active waste will be £80.00/Tonne. Note that the Inland Revenue uses a different classification scheme for waste for tax purposes to the European Waste Classification scheme.

Waste Categorisation

The process of determining the category of wastes is a three stage process:

- Stage 1 – is the waste either Hazardous or Inert by definition without the requirement for chemical analysis (if it is then Stages 2 and 3 are not required);
- Stage 2 - Waste characterisation;
- Stage 3 - WAC classification.

Waste characterisation determines if a waste is hazardous or not. Excavated soil is characterised using a system based on the contaminants present and their hazardous properties. The system uses total concentrations of the contaminants. Thresholds (as a percentage of the waste) have been set for the various hazardous properties.

Fourteen hazardous properties together with other scenarios where material could cause a hazard have been defined:

- Hazardous properties: explosive, oxidising, highly flammable/flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic and ecotoxic;
- Substances which can release toxic/very toxic gases in contact with water, acid or air;
- Substances which, after disposal, can yield another substance, e.g. a leachate, which possesses any of the above hazardous properties.

Some of the hazardous properties are sub-divided e.g. there are three categories of carcinogenic, mutagenic and toxic for reproduction substances. The hazardous properties were originally defined in the European

Hazardous Waste Directive 91/689/EC. Should a waste contain a contaminant with one or more of the listed hazardous properties at a concentration equal to or above the threshold value for the particular property, then the waste is hazardous. The hazardous properties of a wide range of chemicals are sourced from CHIP4 (2009).

There are many reasons why waste soil is classified as being hazardous but the majority of reasons can be divided into the following four groups:

- Hydrocarbons – this is probably the most common reason for the hazardous classification of soils. For most soils hydrocarbon analysis will be required for both Polycyclic Aromatic Hydrocarbons (PAH) and speciated Petroleum Hydrocarbons (PHCs) but depending on the site's history other groups of organic contaminants may also be is included in any analysis suite for soil samples;
- Metals – Particularly sites from former metal processing or mining sites and also some types of ash have metal concentrations that are sufficiently high to characterise materials requiring disposal as hazardous waste.
- Asbestos;
- Anions – e.g. sulphate in plasterboard (there are special disposal requirements for high sulphate waste and specific WAC requirements); it is possible that sulphate salts of metals and semi-metals could make the waste hazardous – the sulphate concentration could possibly be significant under H12, H13 and H14.

The characterisation of wastes with significant metal concentrations involves some processing of the analysis data. The chemical analysis results for inorganic substances are generally reported as total concentrations e.g. total lead, total arsenic, total sulphate etc. However, CHIP4 (2009) deals with the hazardous properties of actual compounds e.g. lead sulphate, arsenic pentoxide, nickel carbonate. Therefore, the total metal results have to be converted into assessed chemical analysis results for the compound most likely to be present in the soil samples. For example, if the sample contains high total lead concentrations and high sulphate concentrations, then the lead is likely to be present in the soil as lead sulphate. The most likely compounds can often be determined from a desk study or previous site uses. If the site has been derelict for a number of years, consideration should be given as to whether water soluble compounds should or should not be chosen, as rainfall could have removed them from the soil (this does not apply if the soil has been taken from below under a concrete slab etc). Chemical knowledge and common sense needs to be used in choosing a suitable compound.

If no data is available, then a worst case scenario has to be assumed and the most hazardous compound likely to be present has to be chosen. For example, metal chromates (lead chromate, nickel chromate) are often the most hazardous compounds formed by many metals, but if the chromium concentrations in the soil are low, chromates are unlikely to be present. It should also be noted that for many of the hazard categories, the cumulative hazard from different compounds is added (e.g. add the concentrations of the copper, lead and zinc compounds together to assess the Hazard Category H14 Ecotoxicity).

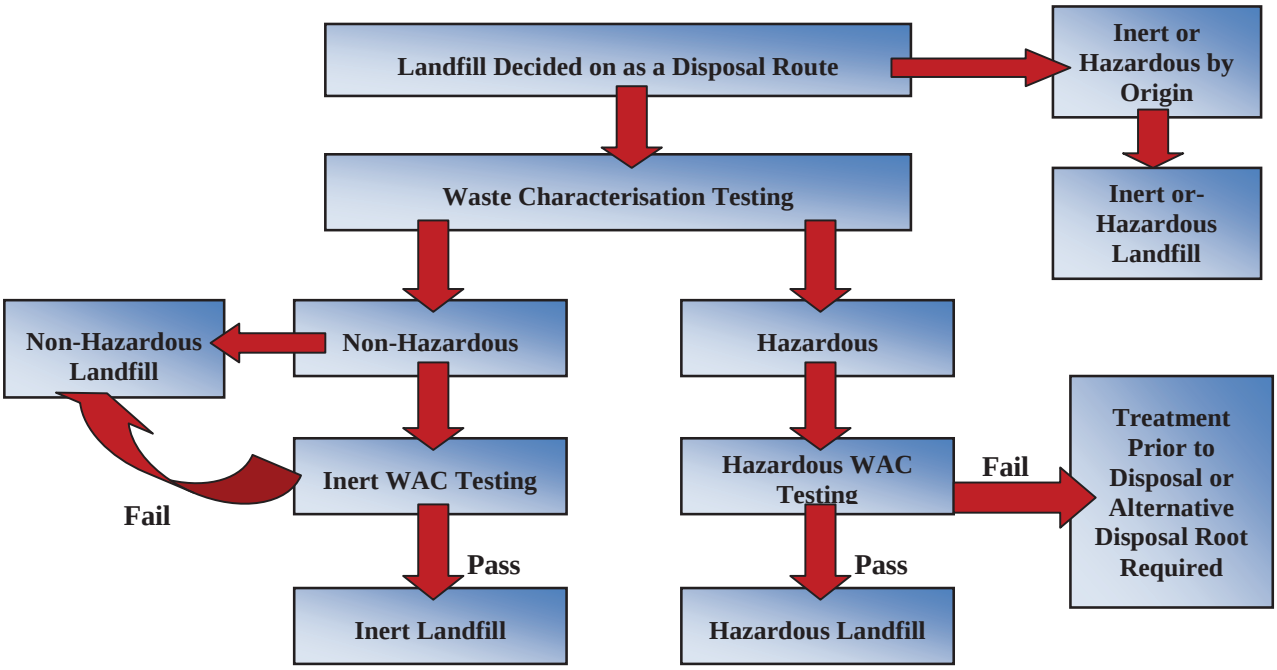
If the results of the above assessment determine that the waste is hazardous, it must then be analysed for the Waste Acceptance Criteria (WAC) analysis contained within appropriate Environmental Permitting Regulations (this comprises mainly leachate but also analysis for TOC and Loss on ignition). WAC limit values have been set for the listed determinands. If any of the determinands exceed their limit value, the waste must be pre-treated to reduce concentrations to below the limit values before the waste may be disposed of at a landfill site licensed to take hazardous waste.

For waste classified as not being hazardous, then there are two options available. Currently, waste correctly characterised as not being hazardous may be disposed of without WAC testing to a non-hazardous landfill. Alternatively WAC testing for Inert Waste can be carried out (this is similar to the list for hazardous waste with the addition of PAH's, BTEX and Mineral Oil). If the results pass the Inert WAC criteria it can be disposed of at an Inert Waste Landfill. If any of the WAC test results exceed the Inert WAC criteria the waste has to be disposed at a non- hazardous landfill. There are WAC limits for non-hazardous waste set for pH and TOC. If these two criteria are not met then the waste must be pre-treated to so that it meets the criteria before it can be disposed.

If materials fail the WAC criteria they can be pre-treated on site or taken to a soil treatment centre for pre-treatment (such as at the facility run by Biffa at Risley near Warrington). Here the soil's hazardous properties may be reduced (e.g. by bioremediation of hydrocarbons).

It should be noted that in order to dispose of Hazardous Waste, the site must register as a producer of Hazardous Waste with the Environment Agency. When disposing of waste materials to landfill sites the appropriate Duty of Care Waste Transfer procedures must be followed.

Landfilled Waste Decision Tree

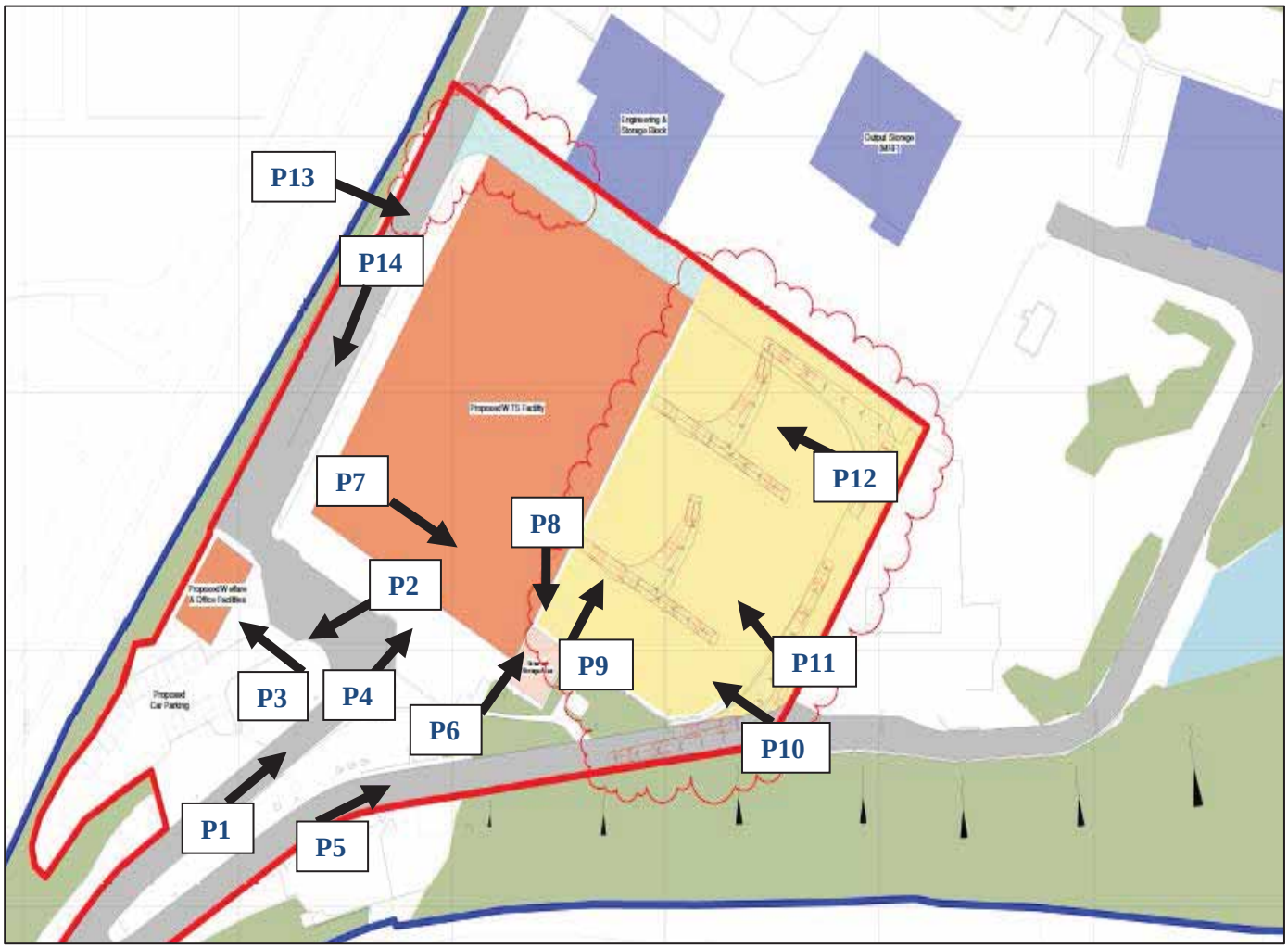


Landfill Tax

It should be noted that HM Revenue and Customs (HMRC) classify wastes for tax purposes using a different scheme to the three fold landfill EU Landfill Directive scheme (i.e. the hazardous, non-hazardous and inert). HMRC have a two-fold system for landfill tax. The Standard Landfill Tax is currently £72/T (rising by £8/T per year) and applies to all wastes unless they qualify for the reduced rate of landfill tax of £2.50/T. The wastes that qualify for the reduced rate of Landfill Tax are set out in The Landfill Tax (Qualifying Material) Order 2011 with supplementary information on the interpretation of these regulations in HMRS "Notice LFT1 – A General Guide to Landfill Tax" (May 2012) and HMRC Briefing Notes 15/12 and 18/12.

APPENDIX N

Photographs of the Site



Location of Photographs

(Proposed Site Plan drawing number 2001 rev E, from April 2012)

Photograph 1: Looking north east across the site from the main access road

Photograph 2: Area of proposed car parking in the south west

Photograph 3: Area of proposed welfare & office facilities in south west

Photograph 4: Area of proposed WTS Facility in the eastern area of the site

Photograph 5: Looking north east across the site from the main access road

Photograph 6: Area of proposed WTS Facility in the eastern area of the site

Photograph 7: Looking east across the southern area of the proposed WTF facility

Photograph 8: Area of proposed external storage area in the southern area of the site

Photograph 9: Looking north across the central area of the proposed WTS Facility

Photograph 10: Looking west across the southern area of the proposed WTF facility

Photograph 11: Looking north east across the area of the proposed WTF facility

Photograph 12: Looking west across the northern area of the proposed WTF facility

Photograph 13: Looking east across the northern area of the proposed WTF facility

Photograph 14: Looking south along the western boundary







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