South Tyneside Hospital, South Shields
Phase 2 Site Investigation Report
S140408
South Tyneside District Hospital

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PHASE 2 SITE INVESTIGATION REPORT

SOUTH TYNESIDE HOSPITAL, SOUTH SHIELDS

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APPENDICES

Revision	Date	Prepared By	Checked By
Final	May 2014	A. Cutts *Engineering Geologist*	S. Fisk *Geotechnical Engineer*

1 EXECUTIVE SUMMARY

Site Address	South Tyneside District Hospital, Harton Lane, South Shields, NE34 0PL
Site Description	The site lies at the north eastern corner of the hospital grounds and currently comprises an undeveloped grassed plot of land. A single storey brick building lies in the south eastern corner of the site which is currently occupied by the Estates and Works Department. Residential properties lie to the north and east. Hospital access roads form the southern and western boundaries with hospital buildings and parking areas beyond. A brick wall was present along the northern boundary along with a number of semi mature to mature deciduous trees.
Proposed Development	The site is outlined for the development of a new Care Hub for the elderly. This will also include parking areas and soft landscaping.
Fieldwork	• 4no Cable percussive boreholes to depths of 10.0mbgl. • 5no machine excavated trial pits to depths of between 0.80mbgl and 1.80mbgl. • 3no soakaway tests.
Ground Conditions	• Made ground to a maximum depth of 0.80mbgl, comprising topsoil over clay fill locally gravel fill. Fill materials comprised brick rubble, concrete, ceramics, ash pockets and coal. Land drains encountered at 0.80mbgl in north west of site. • Natural firm becoming stiff slightly sandy locally indistinctly thinly laminated clay was encountered directly below the made ground to depths of between 6.8 and 7.3mbgl. This overlies stiff locally very stiff sandy slightly gravelly clay to 10.0mbgl. • Groundwater not encountered during fieldwork.
Contamination Testing Results	• 2no samples (1 clay fill and 1 gravel fill) subject to testing; no raised contaminant levels. • No asbestos fibres noted.
Contamination Analysis	• No remediation required beneath hard cover and building footprint. • Made ground should generally be classed as slightly contaminated with respect to construction workers. PPE required for workers. Damping down of site during dry windy conditions. • Clean cover of topsoil (300mm) for proposed soft landscaped areas subject to compliance testing. • Ground and surface water are not considered to be at risk. • With respect to utility suppliers, raised arsenic and mercury recorded, as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-1 ACEC (Class AC-1s). Static water conditions.
Geotechnical Testing Results	• Moisture contents between 31% and 53%. • Clay one result soft and remaining results firm (36-58kPa) from triaxial results. • Clay one result soft with remaining results firm to very stiff from SPT N values. • pH slightly alkaline. • High shrinkage clay.
Mining Assessment	Not undertaken.
Geotechnical Analysis & Foundation Recommendations	• Bearing capacity of 161kN/m^2 at minimum depth of 1.0mbgl; 0.6m wide strips or 1m^2 pads. • Settlements within 25mm. • **High** shrinkage potential in relation to NHBC guidance, Chapter 4.2. • Normal earthworks plant for excavations. • No significant volume of groundwater expected at shallow depth. • Soakaways not effective.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Billinghurst George and Partners on behalf of South Tyneside District Hospital within the grounds of South Tyneside Hospital, South Shields.

2.2 Scope of Works

The site is outlined for the development of a new Care Hub for the elderly. This will also include parking areas and soft landscaping. A drawing showing the position of the site is included in Appendix A (Figure 1).

A geotechnical and environmental investigation was requested. A ground gas assessment and desk study was beyond the scope of this investigation and as such no details of the site's history has been assessed.

The fieldwork and testing was generally carried out according to the recommendations of BS5930: 1999 "Code of Practice for Site Investigations" and all stratum descriptions are as recommended in that publication. The information provided in this report is based on the investigation fieldwork, and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information become available or be provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory positions is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

3 SITE DESCRIPTION AND FIELDWORK

This area of site lies at the north eastern corner of the hospital grounds and currently comprises an undeveloped grassed plot of land. A single storey brick building lies in the south eastern corner of the site which is currently occupied by the Estates and Works Department.

The site is bound to the north by Harton Lane and to the east by Macany Avenue. Residential properties lie beyond to the north and east. Hospital access roads form the southern and western boundaries with hospital buildings and parking areas beyond. A brick wall was present along the northern boundary along with a number of semi mature to mature deciduous trees.

The site is accessed from Harton Lane in the north of the site.

3.1 Fieldwork

The fieldwork was carried out between 6th and 7th May 2014 and comprised:

- Four cable percussive boreholes (BH1 to BH4) drilled to depths of 10.0m below ground level (bgl).
- Five machine excavated trial pits (TP1 to TP4, including TP3A) to depths of between 0.80mbgl and 1.80mbgl.
- Soakaway testing in TP1, TP2 and TP4.

Standard penetration tests (SPT) and undisturbed (U100) samples were undertaken at various depths within the boreholes along with disturbed samples. Insitu hand vane readings and disturb sampling was undertaken within the trial pits by a Solmek engineer.

The samples were retrieved for chemical and geotechnical laboratory testing.

Descriptions of the strata encountered in the boreholes and trial pits together with details of testing, sampling and groundwater are presented in Appendix B of this report. A plan showing the location of the boreholes and trial pits can be found in Appendix A, (Figure 2).

4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below.

4.1 Made Ground

Made ground was encountered within the trial pits and the boreholes at depths of between 0.4mbgl and 0.8mbgl. Grass over clayey and sandy locally gravelly topsoil was encountered from ground level to depths of between 0.1mbgl (TP3) and 0.45mbgl (BH1). The underlying deposits comprised slightly sandy clay fill and slightly sandy slightly gravelly clay fill with brick rubble, concrete, ceramics and coal fragments. Localised ash pockets were also encountered. Clay fill was proven from ground level in TP4. A thin layer of sandy gravel fill was encountered in TP1 between 0.25mbgl and 0.30mbgl.

Land drains were encountered in TP3 and TP3A at a depth of 0.80mbgl and the trial pits were terminated at this depth.

4.2 Natural Deposits

The natural deposits comprised firm becoming stiff slightly sandy locally indistinctly thinly laminated clay with sandstone fragments. This was encountered directly below the made ground to depths of between 6.8 and 7.3mbgl. This overlies stiff locally very stiff sandy slightly gravelly clay with sandstone, limestone and mudstone fragments to the termination depth of the boreholes at 10.0mbgl.

4.3 Groundwater

No groundwater was recorded by the driller within the boreholes or the engineer undertaking the trial pits during the investigation.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

5 CONTAMINATION TESTING RESULTS

The site is outlined for the development of a new Care Hub for the elderly. This will also include parking areas and soft landscaping.

5.1 Contamination Testing

To provide information upon the possibility of ground contamination one sandy gravel fill sample from TP1 at 0.25mbgl and one clay fill sample from TP3 at 0.30mbgl were subject to chemical contamination analysis.

A suite of metals, semi-metals, non-metals, inorganics and asbestos soil screening were carried out on all the samples.

5.2 Test Results

Given the sites end use, the test results have been compared to a series of Solmek Generic Assessment Criteria (GAC) thresholds based on a commercial land use. Solmek GAC were derived using the EA CLEA Software Version 1.06 (May 2011) which produce Model Output Reports to compare the contamination concentrations against. In the absence of Solmek GAC values, WS Atkins Soil Screening Values (SSV) for commercial land use have been used (which have been derived using EA CLEA Version 1.06, May 2011).

Solmek used the following input parameters within the CLEA Model to generate the GAC values:

- **Land use:** Commercial
- **Receptor:** Female (Com)
- **Building Type:** Office (Post 1970)

- **Soil Type:** Sandy Clay Loam
- **Soil pH:** 7.5 (lowest recorded value)
- **Soil Organic Matter:** 13% (lowest recorded value)

The test results are presented in Appendix C, and a summary is provided below in Table 1.

The CLEA UK Model Output Reports have been included in Appendix C. The CLEA Model output reports show three assessment criteria (Oral, Inhalation and Combined). Where all three boxes are shaded red the threshold values have been assumed to be the soil saturation limit.

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinant	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Threshold Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	2	0.6	1.0	230	0
Chromium	mg/kg	2	31	39	30400	0
Chromium (VI)	mg/kg	0	<1	-	34.8	0
Copper	mg/kg	2	84	240	71700	0
Lead	mg/kg	2	59	290	5370*	0
Mercury	mg/kg	2	0.10	1.5	3640	0
Nickel	mg/kg	2	50	61	1790	0
Zinc	mg/kg	2	77	260	506000	0
Semi metals and non metals						
Arsenic	mg/kg	2	14	30	635	0
Boron	mg/kg	2	1.3	1.4	6270	0
Selenium	mg/kg	1	<0.5	0.5	13000	0
Inorganic chemicals						
Cyanide (total)	mg/kg	1	<0.1	0.3	1580	0
W.S. Sulphate	mg/l	2	27	57	500***	0
Other						
pH	pH	2	7.5	7.6	<5.5**	0
Phenols	mg/kg	0	<0.3	-	39500	0

** Atkins SSV (GAC), CLEA Software Version 1.06*
*** EA Upper Tier Threshold Values*
**** BRE Special Digest 1: 2005*

5.3 Metals, Semi Metals and Non Metals

From the samples tested no raised levels of metals or metalloids exceeded the threshold values for long term risk to human health.

5.4 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded at 27 and 57mg/l. This lies below the 500mg/l threshold limit which would affect the mix of concrete required in contact with the fill.

The result of the pH testing was 7.5 and 7.6 which is consistent with slightly alkaline conditions.

5.5 Asbestos

No asbestos fibres were detected in the two tested samples.

5.6 Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".* Part 2A

uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."* Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

See Appendix E for additional notes on contamination guidelines.

6 CONTAMINATION ANALYSIS

6.1 Users of the Site Once Development is Complete

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of Solmek GAC thresholds based on commercial land use.

The results indicate that the concentrations of contamination within the samples were below the threshold values for long term risk to human health and are unlikely to pose a risk to the current and future users of the site. Remediation is therefore not required for areas beneath proposed building footprints and other areas of hardstanding.

If any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

6.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Using guidance in the HSE publication *"Protection of Workers and the General Public during the Development of Contaminated Land"*, the made ground can generally be classed as slightly contaminated with mercury, nickel and zinc raised. Copper and nickel were slightly elevated and fall into the contaminated category.

It is considered that levels of contamination are unlikely to pose a significant risk to construction workers and users of surrounding sites providing that correct PPE is employed. It is recommended that appropriate PPE in accordance with HSE and Environment Agency guidance is adopted for the duration of the contractor works and good practice is adopted to minimise the release of potential contaminants during ground works.

During dry weather, excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to off-site receptors.

6.3 Vegetation

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, nickel, and zinc.

To establish if the levels of contaminants present on site may pose a risk to vegetation the results of the contamination testing have been compared to a series of threshold values published in "*Code of Good Agricultural Practice for the Protection of Soil"*. Following elevated mercury and copper was recorded within the clay fill sample from TP3 at 0.3mbgl. None of the remaining phytotoxic determinands were above the corresponding thresholds.

Should soft landscaped areas be proposed the existing topsoil onsite should be suitable for re-use provided it is first screened to remove any deleterious material. The deleterious materials encountered can be placed beneath areas of permanent hardcover. The remaining topsoil will require compliance testing in order to assess it suitability within a clean capping layer. A clean cover system comprising at least 300mm of screened, clean topsoil should be placed in all proposed soft landscaped areas.

6.4 Ground and Surface Water

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology.

There are no surface water features in close vicinity of the site. Groundwater was not encountered in the boreholes or trial pits during the investigation. Therefore given the low contamination profile of the made ground, lack of groundwater and presence of extensive continuous natural clay layers and the fact that the development will cover the site reducing infiltration, the risk to controlled waters is considered low.

6.5 Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material; e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

BRE Special Digest One: *"Concrete in Aggressive Ground"*: 2005 3rd Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and sulphate tests fall into Class DS-1, ACEC (Class AC-1s) requirements for concrete protection assuming static groundwater conditions.

The levels of potential contaminants detected have been compared to thresholds supplied in the Water Regulations Advisory Scheme Guidance Note 9-04-03 *"The Selection of materials for Water Supply Pipes to be laid in Contaminated Land"*. Based on the contamination test results concentrations of arsenic and mercury were present in levels exceeding the threshold values. Consultation with the utility providers is recommended should this be a requirement for a water pipe supply to the development. As a minimum services should be placed within clean service trenches.

7 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes underwent a series of geotechnical tests (BS 1377:1990) to aid foundation design and soil description. In addition, insitu Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

7.1 Strength and Density

Five undisturbed U100 samples were subjected to quick, undrained triaxial testing. The samples tested were from BH1 (2.0-2.45mbgl), BH2 (1.2-1.65mbgl), BH3 (1.2-1.65mbgl) and BH4 (1.2-1.65mbgl and 3.0-3.45mbgl). The results indicated one strength of 36kPa (soft) with the reminder in the range 50 to 58kPa indicating firm conditions.

SPT N values within the natural clay ranged from 6 to 32, when multiplied by five the SPT N values roughly equate to shear strength in cohesive deposits. Therefore, shear strengths ranging from 30kPa (soft) to 160kPa (very stiff) can be assumed. The average N value was 16 (80kPa) indicating a stiff range.

7.2 Moisture Contents

Seven samples were recovered from the boreholes and subject to moisture content testing at depths of between 0.70 and 3.00mbgl. The moisture levels were between 31 and 53%.

7.3 Atterberg Limit Determinations

Three Atterberg Limit Determination tests were carried out on samples of natural cohesive material to classify the fine grained soil. The results were compared to the Casagrande Chart published in BS 5930 and showed the samples to be clay of high to very high plasticity.

The Plasticity Indices were between 36 and 47 with the moisture contents recorded above the corresponding plastic limit. The cohesive material can be assessed as having a **high** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

BS EN ISO 14688-2, Geotechnical Investigation and Testing - Identification and Classification of Soil, Part 2, Section 5.4, Table 6 outlines the strength of cohesive soils based on the Consistency Index. This is given by the numerical difference between the liquid limit and the water content expressed as a percentage ratio of the plasticity index. The Consistency Index of the samples range from 0.7 to 0.9 indicating a firm to stiff (75kN/m^2 plus) range.

7.4 pH and Sulphate Results

Two samples of natural ground from depths of between 1.20 and 2.00mbgl were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the pH testing was 7.6 and 8.0 indicating slightly alkaline conditions. The soluble sulphates were recorded at 74 and 95mg/l.

7.5 Foundations

Foundations for the proposed new development are likely to be traditional strip or pad footings on the natural clay.

Based on plasticity index results, all cohesive soils at the site should be regarded as being of **high** volume change potential. Foundations should therefore be placed at a minimum depth of 1.0m below original or finished ground level, whichever is the lower. Based on the average shear strength around 1.0mbgl (69kN/m^2) a safe bearing capacity of 161kN/m^2 has been calculated for a 0.6m wide strip footing or 1m^2 pad. Providing the imposed load of the structures do not exceed the bearing capacity then settlement should be within normal tolerances.

The plasticity index value indicated that the clay tested and located at foundation depth has a **high** shrinkage potential. Reference should be made to NHBC Standards, Chapter 4.2 to determine the depth of foundations in the vicinity of existing trees and proposed trees. Foundations may require deepening and be provided with appropriate heave precautions.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

Further advice should be sought from Solmek if unexpected ground conditions are encountered during

redevelopment.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-1s, assuming static groundwater conditions.

7.6 Floor Slabs

In accordance with NHBC guidelines, a ground slab can be adopted where made ground is less than 0.6m in thickness. Where made ground exceeds 0.6m in thickness to utilise ground bearing slabs, made ground could be removed from beneath the footprint of the buildings and a blanket of compacted granular fill placed in accordance with an engineering specification; alternatively a suspended floor slab will be required.

7.7 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant. Land drains are likely to be encountered locally across the western parts of the site. Stability of excavations will be poor to moderate in the made ground but should improve within the natural clay. Sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: “Trenching Practice”.

7.8 Groundwater

No groundwater was recorded by the driller during the fieldwork or the engineer during the trial pitting. Therefore, no significant volume of groundwater is expected at shallow depth.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Due to the cohesive strata encountered dewatering may be necessary if excavations are left open for prolonged periods during inclement weather conditions.

7.9 Soakaway Testing

Three soakaway tests were undertaken within the clay at depths of 1.5 and 1.8mbgl. The water level was monitored for a period of three hours however no fall in water level was recorded. Results of $0.0m/s^{10-6}$ were therefore obtained which is unsuitable for soakaway design.

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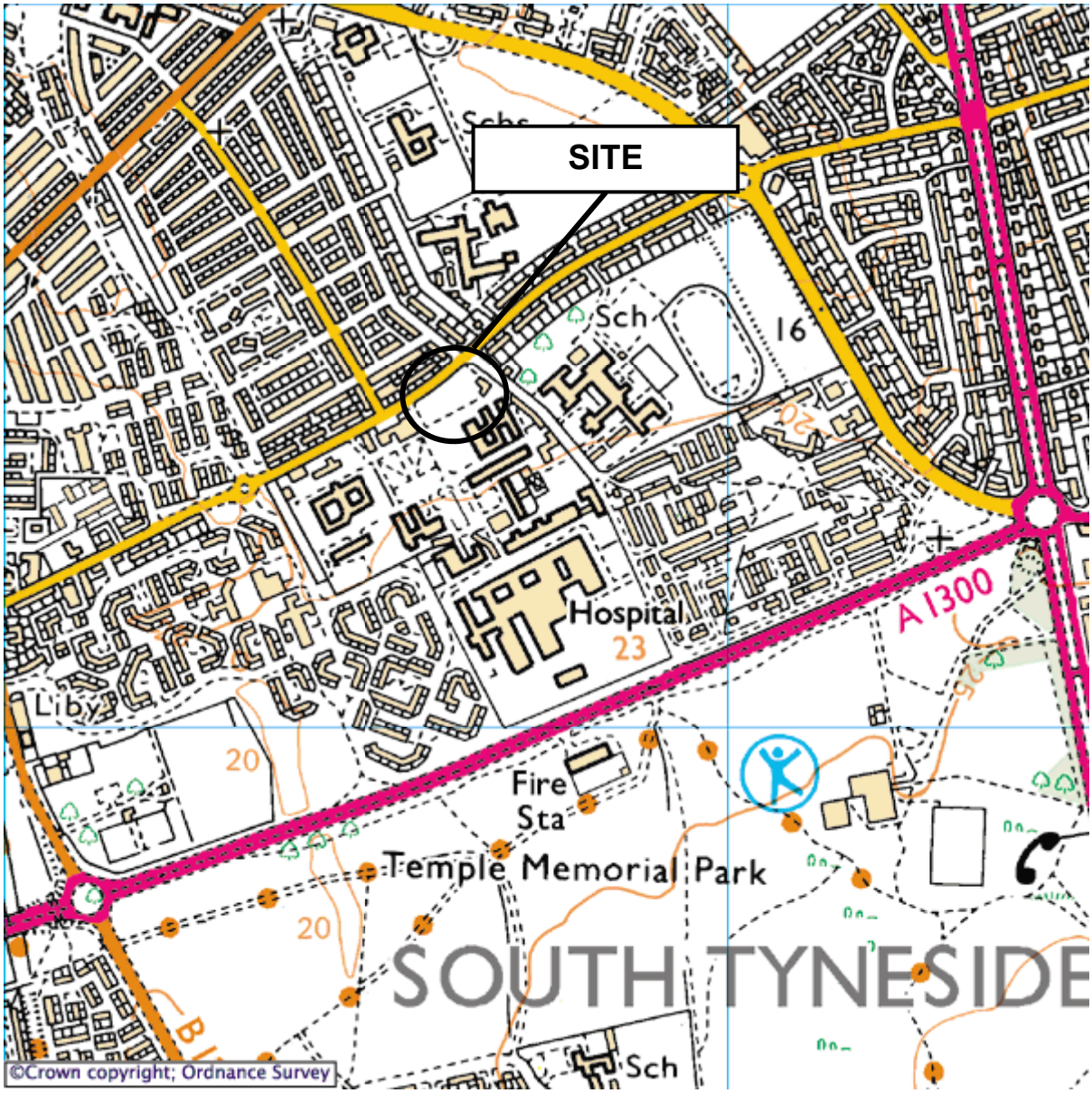
APPENDIX A



Client:	South Tyneside District Hospital	
Project:	South Tyneside Hospital	
Title:	Site Location Map	
Drawing No:	Figure 1	Scale: NTS
Date	May 2014	

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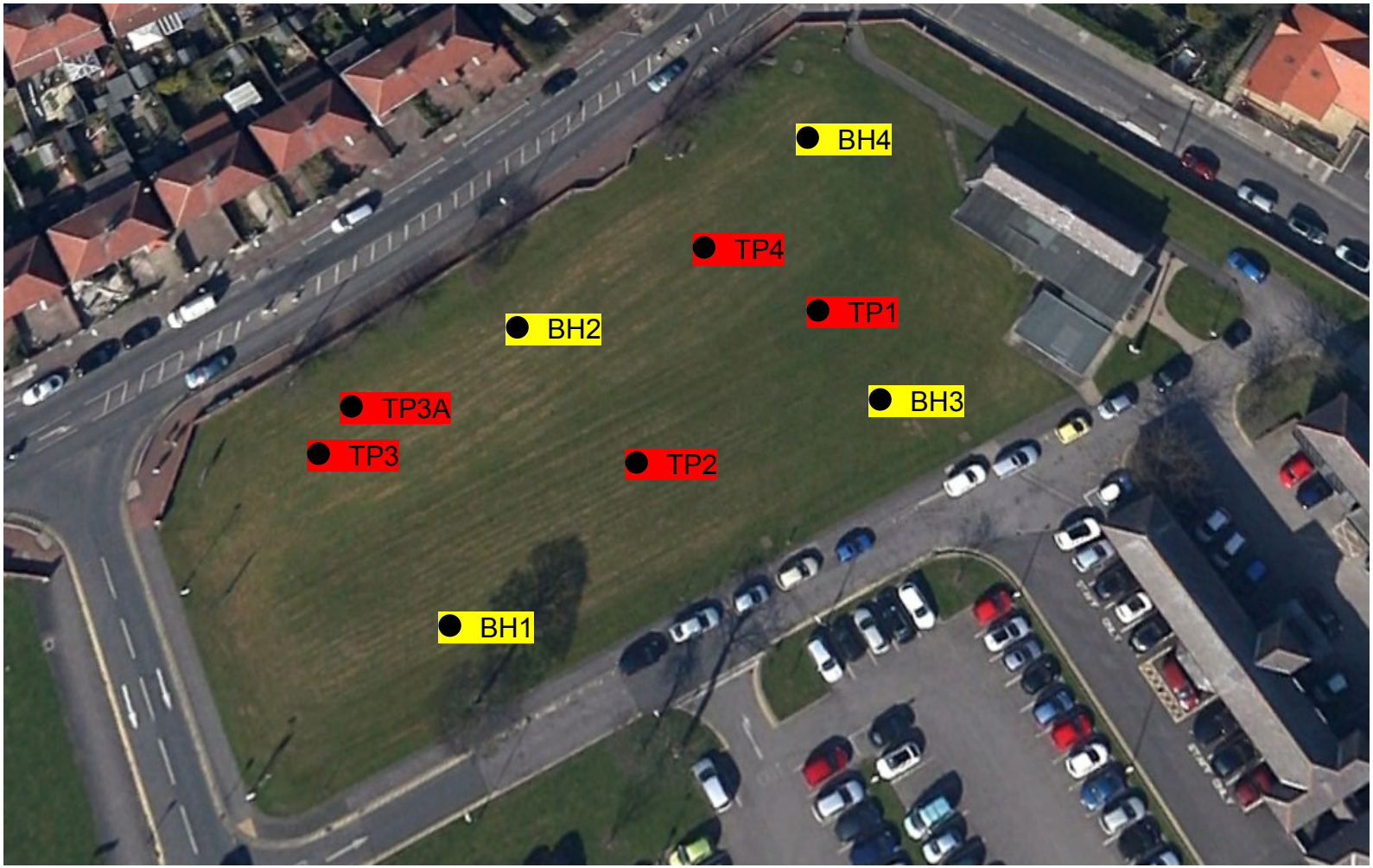

Title
Borehole and Trial Pit Location Plan

Project
South Tyneside Hospital

Client
South Tyneside District Hospital

Date
May 2014

Fig No
Figure 2

Scale
NTS

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APPENDIX B

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BOREHOLE LOG

Project				BOREHOLE No
South Tyneside Hospital				**BH01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.30-0.40	B					0.45	MADE GROUND: Grass over dark brown grey topsoil.		
0.70-0.80	B					0.80	MADE GROUND: Light brown grey clay fill.		
						1.10	Light brown slightly sandy CLAY.		
1.20-1.65	B						Firm brown slightly sandy CLAY. Occasional sandstone fragments noted.		
1.20-1.65	D	N=9							
2.00-2.45	U100	34 Blows							
2.45-2.55	B								
3.00-3.45	B								
3.00-3.45	D	N=6							
4.00-4.45	U100	37 Blows				(6.00)			
4.45-4.55	B								
5.00-5.45	B								
5.00-5.45	D	N=13							
6.00-6.45	U100	54 Blows							
6.45-6.55	B					7.10			
7.50-7.95	B						Stiff to very stiff grey brown sandy slightly gravelly CLAY. Gravel is angular to sub-angular, fine to coarse of sandstone and limestone.		
7.50-7.95	D	N=23							
						(2.90)			
9.00-9.45	B								
9.00-9.45	D	N=32							
						10.00			
10.00	B								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	No groundwater encountered.

All dimensions in metres Scale 1:65.625	Client South Tyneside District Hospital	Method/ Plant Used	Logged By AC

GRD_BOREHOLE_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

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BOREHOLE LOG

Project				BOREHOLE No
South Tyneside Hospital				**BH02**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.40	MADE GROUND: Grass over brown clayey sandy topsoil.		
0.30	B					0.70	MADE GROUND: Brown slightly sandy clay fill.		
0.70	B					(0.50) 1.20	Firm light brown slightly sandy CLAY.		
1.20-1.65	U100	14 Blows					Firm becoming stiff grey brown slightly sandy CLAY.		
1.65-1.75	B								
2.00-2.45	B								
2.00-2.45	D	N=12							
3.00-3.45	U100	52 Blows							
3.45-3.55	B								
4.00-4.50	B					(5.60)			
4.00-4.45	D	N=12							
5.00-5.45	U100	52 Blows							
5.45-5.55	B								
6.00-6.45	B								
6.00-6.45	D	N=16				6.80			
							Stiff grey brown sandy slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse of sandstone and limestone.		
7.50-7.95	U100	93 Blows							
7.95-8.05	B					(3.20)			
9.00-9.45	B								
9.00-9.45	D	N=29							
						10.00			
10.00	B								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	No groundwater encountered.

All dimensions in metres Scale 1:65.625	Client South Tyneside District Hospital	Method/ Plant Used	Logged By AC

GRD_BOREHOLE_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

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BOREHOLE LOG

Project				BOREHOLE No
South Tyneside Hospital				**BH03**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	07-05-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20-0.30	B					0.40	MADE GROUND: Grass over dark brown slightly sandy clayey topsoil.		
0.40-0.50	B					0.50	MADE GROUND: Brown clay fill.		
							Firm brown slightly sandy CLAY.		
1.20-1.65	U100	30 Blows							
1.65-1.70	D								
2.00-2.45	D	N=9							
3.00-3.45	U100	48 Blows							
3.45-3.50	D					(6.70)			
4.00-4.45	B								
4.00-4.45	D	N=11							
5.00-5.45	U100	39 Blows							
5.45-5.50	D								
6.00-6.45	B								
6.00-6.45	D	N=13							
						7.20			
7.50-7.95	U100	118 Blows					Stiff grey brown sandy slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse of sandstone and limestone.		
7.95-8.00	D								
						(2.80)			
9.00-9.45	B								
9.00-9.45	D	N=31							
						10.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	No groundwater encountered.

All dimensions in metres Scale 1:65.625	Client South Tyneside District Hospital	Method/ Plant Used	Logged By AC

GRD_BOREHOLE_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

BOREHOLE LOG

Project				BOREHOLE No
South Tyneside Hospital				**BH04**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	07-05-14			
Contractor				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20-0.30	B					0.30	MADE GROUND: Grass over sandy clayey topsoil.		
0.30-0.50	B					0.50	MADE GROUND: Brown slightly sandy clay fill.		
							Firm light brown slightly sandy CLAY.		
1.20-1.65	U100	31 Blows							
1.65-1.70	D								
2.00-2.45	D	N=9							
3.00-3.45	U100	47							
3.45-3.50	D								
						(6.80)			
4.00-4.45	B								
4.00-4.45	D	N=11							
5.00-5.45	U100	NR							
6.00-6.45	B								
6.00-6.45	D	N=12							
						7.30			
7.50-7.95	U100	123 Blows					Stiff brown to grey brown sandy slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse of sandstone, mudstone and limestone.		
7.95-8.00	D								
						(2.70)			
9.00-9.45	B								
9.00-9.45	D	N=29							
						10.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	No groundwater encountered.

All dimensions in metres Scale 1:65.625	Client South Tyneside District Hospital	Method/ Plant Used	Logged By AC

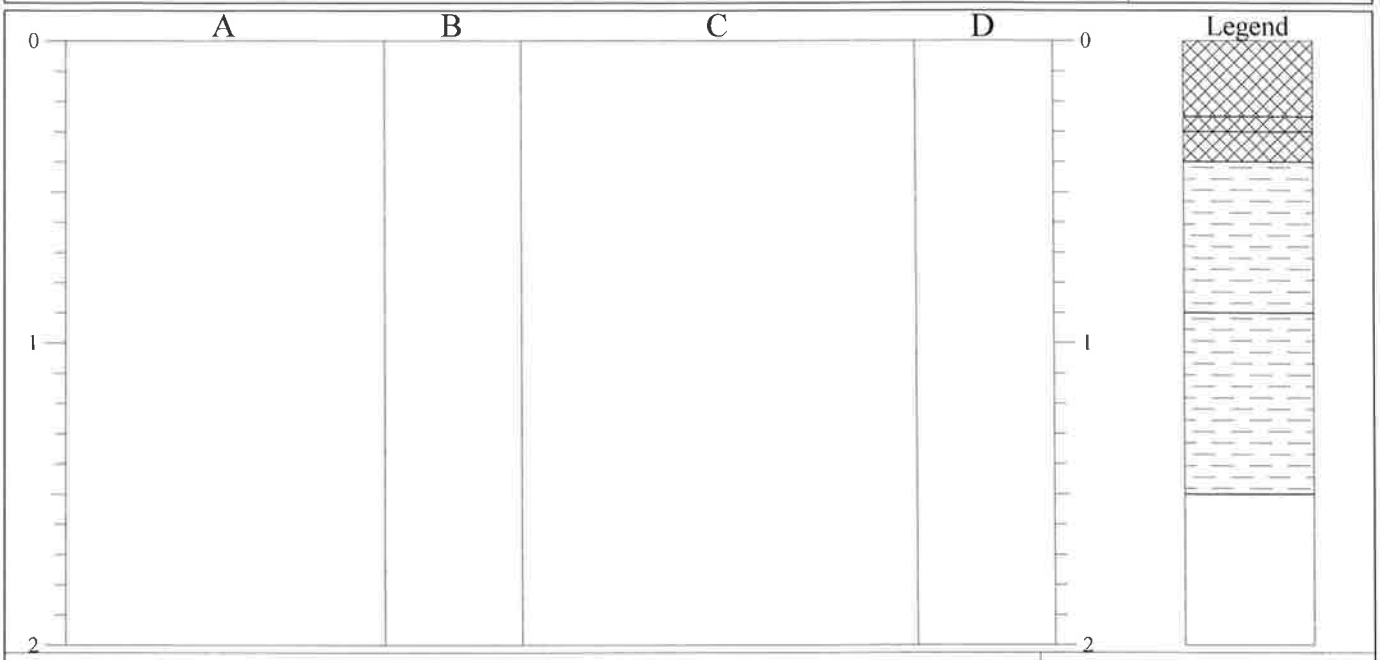
GRD_BOREHOLE_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

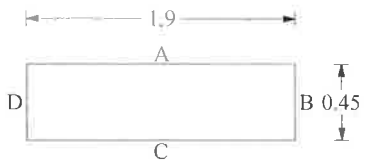
TRIAL PIT LOG

Project				TRIAL PIT No
South Tyneside Hospital				**TP1**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.25		MADE GROUND: Grass over grey slightly sandy slightly gravelly clay topsoil.			
0.25-0.30		MADE GROUND: Black sandy gravel fill.	0.25	B	
0.30-0.40		Sand is fine to coarse.			
0.40-0.90		Gravel is fine to coarse, angular of ash, clinker and slag.			
		MADE GROUND: Firm grey clay fill.	0.50	HV	=82kPa
		Firm to stiff light brown mottled grey slightly sandy CLAY.	0.60	B	
0.90-1.50		Stiff dark brown/grey weakly indistictly laminated slightly sandy CLAY.	0.90	B	
			0.90	HV	=96kPa
			1.30	B	
1.50		End of trial pit.	1.50	B	

Shoring/Support:
Stability:



GENERAL REMARKS

No groundwater encountered.
Percolation test undertaken in trial pit.

All dimensions in metres Scale 1:25	Client South Tyneside District Hospital	Method/ Plant Used Neuson Excavator	Logged By SJF

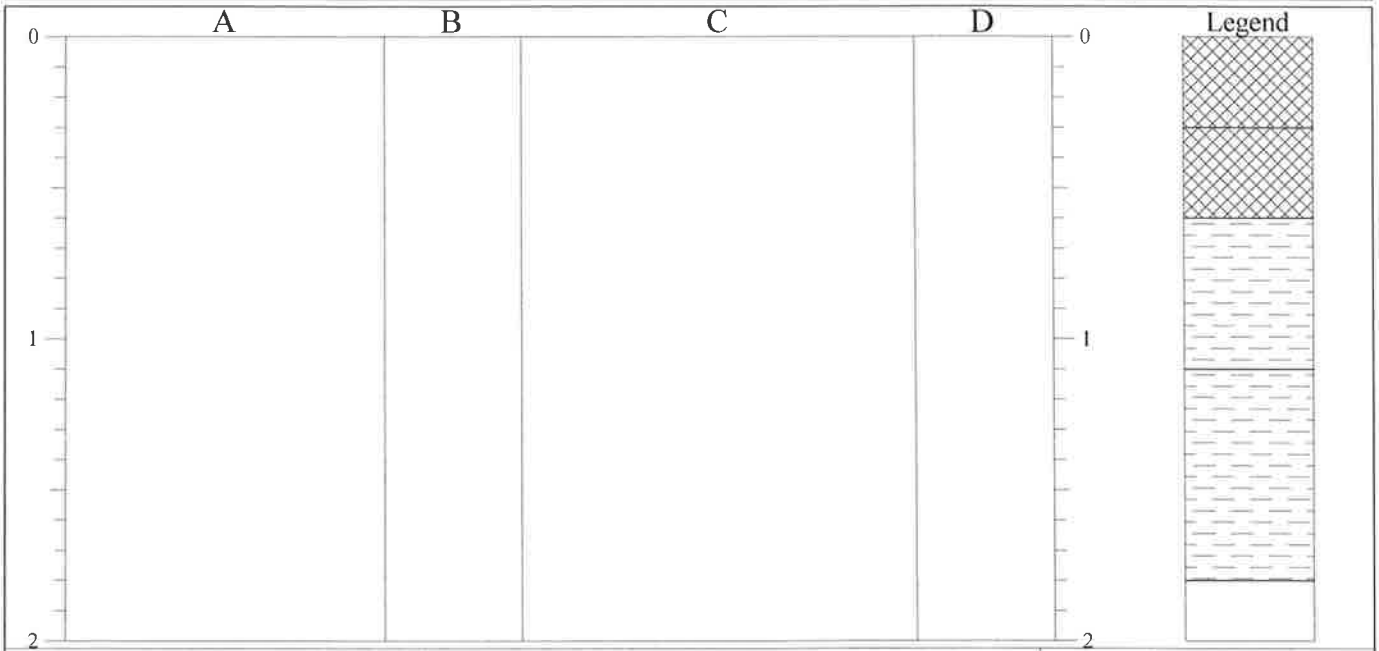
GRD_TRIAL_PIT_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

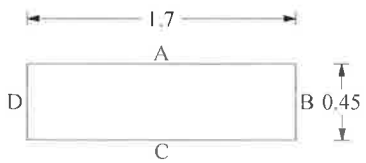
TRIAL PIT LOG

Project				TRIAL PIT No
South Tyneside Hospital				**TP2**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.30		MADE GROUND: Grass over grey clay topsoil.			
			0.20	B	
0.30-0.60		MADE GROUND: Firm grey clay fill.			
			0.40	B	
0.60-1.10		Firm light brown mottled grey weakly indistictly laminated slightly sandy CLAY.	0.65	HV	=70kPa
			1.00	B	
1.10-1.80		Stiff dark brown/grey weakly indistincly laminated slightly sandy CLAY.	1.10	HV	=106kPa
			1.70	B	
1.80		End of trial pit.			

Shoring/Support:
Stability:



GENERAL REMARKS

No groundwater encountered.
Percolation test undertaken in trial pit.

All dimensions in metres Scale 1:25	Client South Tyneside District Hospital	Method/ Plant Used Neuson Excavator	Logged By SJF

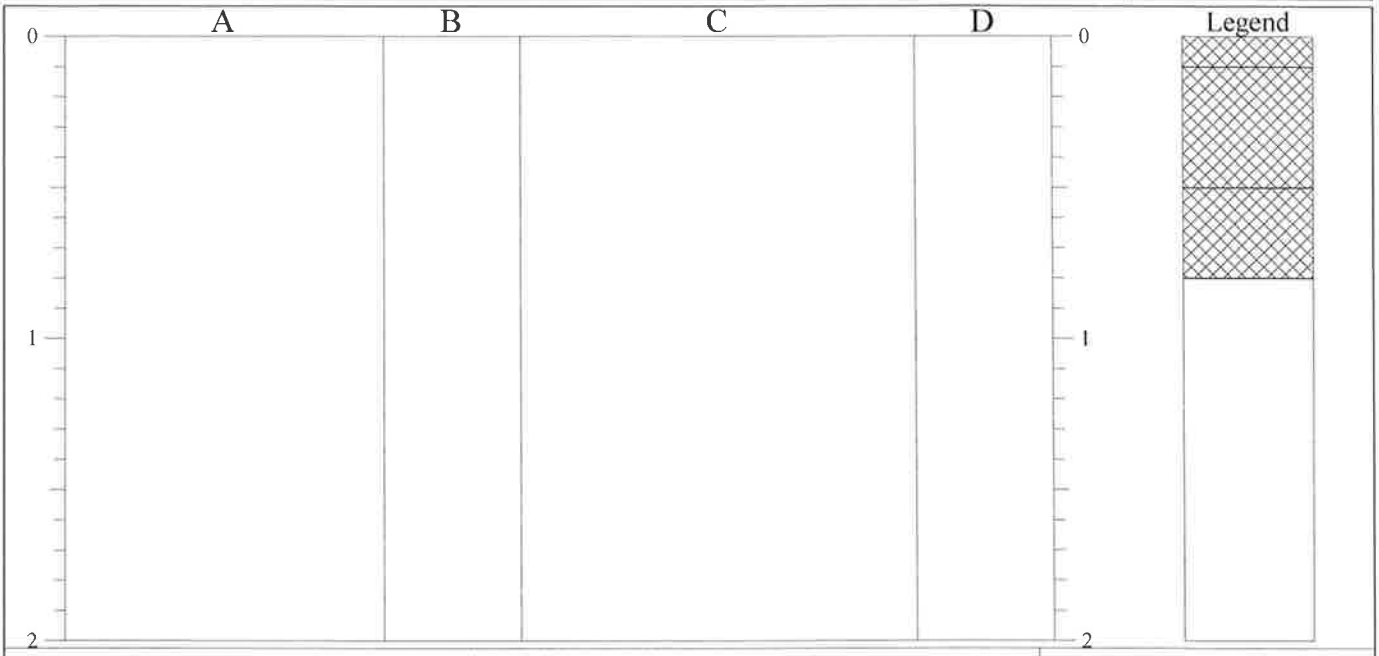
GRD_TRIAL_PIT_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

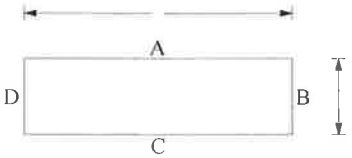
TRIAL PIT LOG

Project				TRIAL PIT No
South Tyneside Hospital				**TP3**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.10		MADE GROUND: Grass over grey clay topsoil.			
0.10-0.50		MADE GROUND: Firm grey slightly sandy slightly gravelly clay fill. Sand is fine to coarse. Gravel is fine to coarse, angular of pottery, brick, glass, concrete and coal.	0.30	B	
0.50-0.80		MADE GROUND: Firm light brown slightly sandy clay fill.			
0.80		Land drain noted at 0.80mbgl. Trial pit reloacted approximately 5m East.			

Shoring/Support:
Stability:



GENERAL REMARKS

No groundwater encountered.

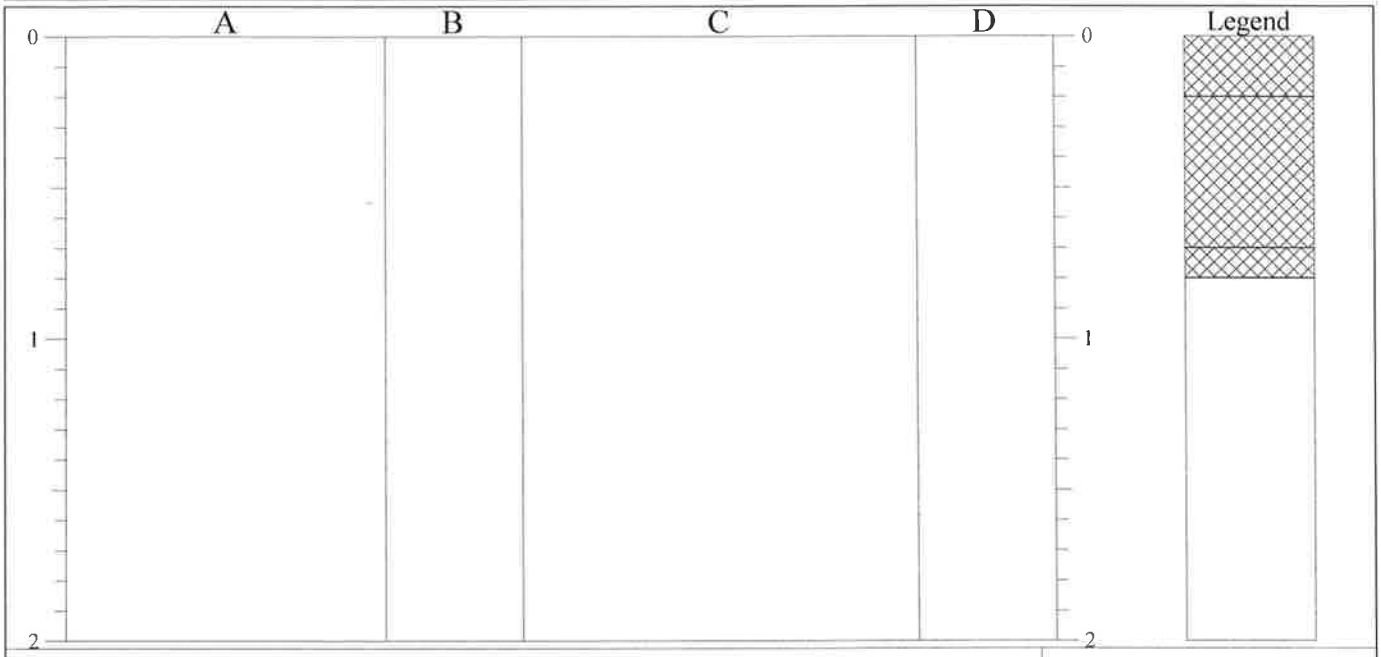
All dimensions in metres Scale 1:25	Client: South Tyneside District Hospital	Method/ Plant Used: Neuson Excavator	Logged By: SJF

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

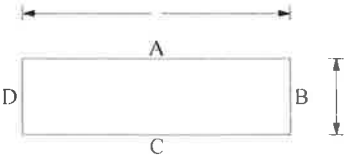
TRIAL PIT LOG

Project				TRIAL PIT No
South Tyneside Hospital				**TP3A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.20		MADE GROUND: Grass over grey clay topsoil.			
0.20-0.70		MADE GROUND: Firm grey slightly sandy slightly gravelly clay fill. Sand is fine to coarse. Gravel is fine to coarse, angular of brick, concrete, coal and ceramics.			
0.70-0.80		MADE GROUND: Firm light brown slightly sandy clay.	0.75	HV	=80kPa
0.80		Land drain at 0.80mbgl. Trial pit abandoned.			

Shoring/Support:
Stability:



GENERAL REMARKS

No groundwater encountered.

All dimensions in metres Scale 1:25	Client South Tyneside District Hospital	Method/ Plant Used Neuson Excavator	Logged By SJF

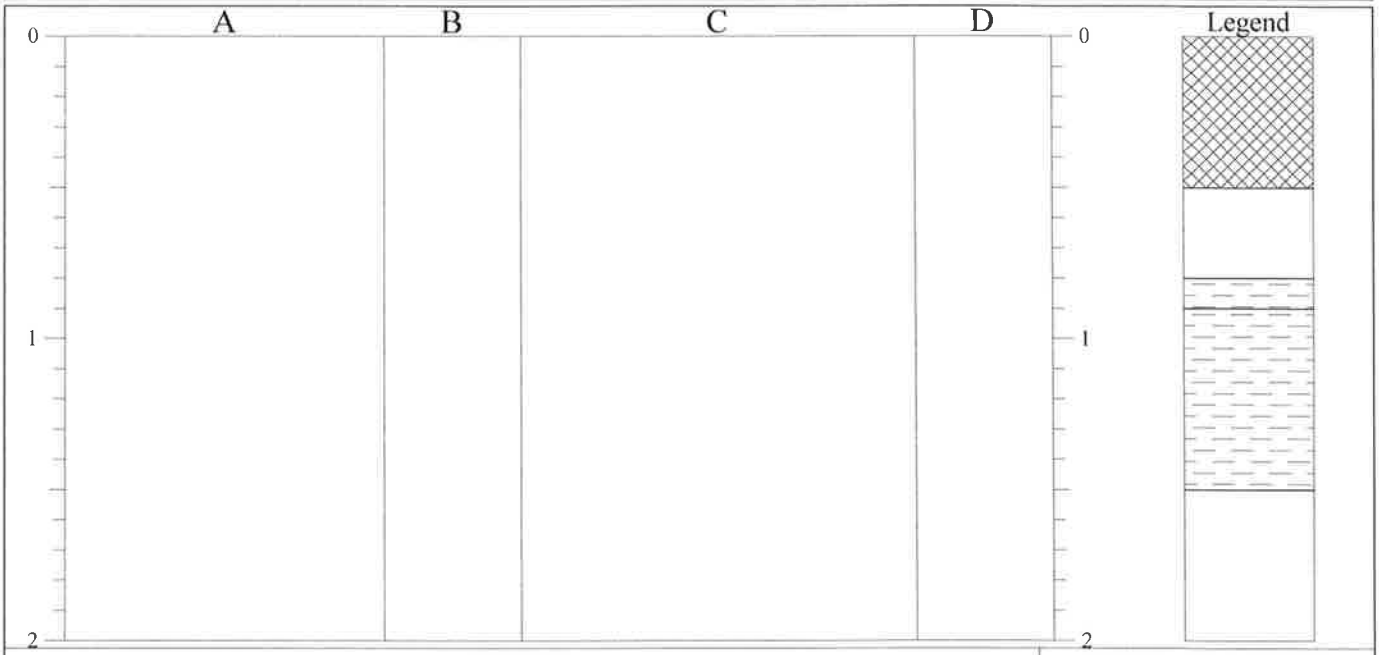
GRD_TRIAL_PIT_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

Solmek
12 Yarm Road
TS18 3NA

Tel 01642607083
Fax 01642612355

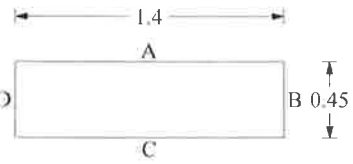
TRIAL PIT LOG

Project				TRIAL PIT No
South Tyneside Hospital				**TP4**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
S140408	06-05-14			
Contractor				Sheet
				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.50		MADE GROUND: Grass over grey slightly sandy slightly gravelly clay fill. Sand is fine to coarse. Gravel is fine to coarse angular of brick, concrete and coal.			
			0.40	B	
0.50-0.80		MADE GROUND: Brown slightly sandy clay fill. Land drain noted at 0.60mbgl. Trial pit extended to the West. Second land drain noted at 0.70mgbl.			
0.80-0.90		Firm light brown mottled grey slightly sandy CLAY.			
0.90-1.50		Stiff dark brown/grey weakly indistinctly laminated slightly sandy CLAY.			
			1.00	B	
			1.00	HV	=80kPa
1.50		End of trial pit.	1.50	B	

Shoring/Support:
Stability:



GENERAL REMARKS

No groundwater encountered.
Percolation test undertaken in trial pit.

All dimensions in metres Scale 1:25	Client South Tyneside District Hospital	Method/ Plant Used Neuson Excavator	Logged By SJF

GRD_TRIAL_PIT_LOG S140408.GPJ AGS3_ALL.GDT 30/5/14

APPENDIX C

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 14-05416

14-May-14

Client SOLMEK
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference 14-05416

Client Reference S140408

Contract Title Tyneside Hospital

Description 2 Soil samples.

Date Received 08-May-14

Date Started 08-May-14

Date Completed 14-May-14

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 14-05416
Client Ref S140408
Contract Title Tyneside Hospital

			Lab No	643261	643262
			Sample ID	TP1	TP3
			Depth	0.25	0.30
			Other ID	1	1
			Sample Type	B	B
			Sampling Date	06/05/14	06/05/14
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	14	30
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.4	1.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	1.0
Chromium	DETSC 2301#	0.15	mg/kg	31	39
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	84	240
Lead	DETSC 2301#	0.3	mg/kg	59	290
Mercury	DETSC 2325#	0.05	mg/kg	0.10	1.5
Nickel	DETSC 2301#	1	mg/kg	61	50
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.5
Zinc	DETSC 2301#	1	mg/kg	77	260
Inorganics					
pH	DETSC 2008#			7.5	7.6
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	0.3
Organic matter	DETSC 2002#	0.1	%	21	13
Carbonate (as CaCO3)	DETSC 2005*	1	%	1.0	5.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	57	27
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 14-05416
Client Ref S140408
Contract Title Tyneside Hospital

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
643261	TP1 1 0.25	SOIL	NAD	none	Jeff Cruddas
643262	TP3 1 0.30	SOIL	NAD	none	Jeff Cruddas

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 14-05416
Client Ref S140408
Contract Tyneside Hospital

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
643261	TP1 0.25 SOIL	06/05/14	PG		
643262	TP3 0.30 SOIL	06/05/14	PG		

Key: P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

CLEA Software Version 1.06

Report generated	29-May-14
Report title	South Tyneside Hospital
Created by	A Cutts at Solmek

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Cadmium	3.99E+02	3.87E+02	2.30E+02	0.41	0.59	1.00	NR	Yes	No
2	Chromium III	3.31E+05	3.34E+04	3.04E+04	0.09	0.91	1.00	NR	No	No
3	Chromium VI	NR	3.48E+01	NR	0.00	1.00	NR	NR	No	No
4	Copper	1.78E+05	9.60E+04	7.17E+04	0.25	0.75	1.00	NR	Yes	No
5	Mercury, inorganic	4.41E+03	2.09E+04	3.64E+03	0.83	0.17	1.00	NR	No	No
6	Nickel	2.22E+04	1.79E+03	NR	0.07	1.00	NR	NR	No	No
7	Zinc	6.62E+05	1.32E+06	5.06E+05	0.62	0.38	1.00	NR	Yes	No
8	Arsenic	6.35E+02	6.95E+02	NR	1.00	0.91	NR	NR	No	No
9	Boron	2.37E+05	6.39E+03	6.27E+03	0.02	0.98	1.00	NR	No	No
10	Selenium	1.30E+04	NR	NR	1.00	NR	NR	NR	No	No
11	Cyanide	1.46E+04	1.71E+03	1.58E+03	0.07	0.93	1.00	NR	No	No
12	Phenol	1.54E+06	4.05E+04	3.95E+04	0.03	0.97	1.00	3.62E+05 (vap)	No	No
13										
14										
15										
16										
17										
18										
19										
20										

Environment Agency

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Cadmium	99.7	0.3	0.0	100.0	2.30E+02	NR	1.15E+02	2.77E-06	1.57E-06	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2	Chromium III	100.0	0.0	0.0	100.0	3.04E+04	NR	1.52E+04	3.65E-04	2.07E-04	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
3	Chromium VI	98.3	1.7	0.0	100.0	3.48E+01	NR	1.74E+01	4.18E-07	2.37E-07	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
4	Copper	99.7	0.3	0.0	100.0	7.17E+04	NR	3.59E+04	8.62E-04	4.89E-04	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
5	Mercury, inorganic	99.9	0.1	0.0	100.0	3.64E+03	NR	1.82E+03	4.38E-05	2.48E-05	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
6	Nickel	99.9	0.1	0.0	100.0	1.79E+03	NR	8.94E+02	2.15E-05	1.22E-05	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
7	Zinc	99.2	0.8	0.0	100.0	5.06E+05	NR	2.53E+05	6.08E-03	3.44E-03	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
8	Arsenic	99.9	0.1	0.0	100.0	6.35E+02	NR	3.18E+02	7.63E-06	4.32E-06	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
9	Boron	96.9	3.1	0.0	100.0	6.27E+03	NR	3.14E+03	7.54E-05	4.27E-05	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
10	Selenium	99.4	0.6	0.0	100.0	1.30E+04	NR	6.51E+03	1.56E-04	8.87E-05	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
11	Cyanide	-208.3	308.3	0.0	100.0	1.58E+03	NR	7.89E+02	1.90E-05	1.07E-05	0.00E+00	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
12	Phenol	95.3	4.7	0.0	100.0	3.95E+04	5.01E+01	1.98E+04	4.75E-04	2.69E-04	3.43E-03	6.49E-02	3.68E-02	NA	NA	NA	NA	NA	NA
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
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Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Cadmium	1.04E-04	0.00E+00	1.71E-07	6.63E-07	0.00E+00	1.91E-04	2.86E-07	49.69	0.00	0.08	0.32	0.00	0.00	49.77	0.14
2	Chromium III	1.37E-02	0.00E+00	0.00E+00	8.73E-05	0.00E+00	8.60E-04	3.86E-06	93.49	0.00	0.00	0.60	0.00	0.00	5.88	0.03
3	Chromium VI	1.56E-05	0.00E+00	0.00E+00	1.00E-07	0.00E+00	9.57E-05	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
4	Copper	3.23E-02	0.00E+00	0.00E+00	2.06E-04	0.00E+00	1.00E-01	9.71E-06	49.83	0.00	0.00	0.32	0.00	0.00	49.83	0.01
5	Mercury, inorganic	1.64E-03	0.00E+00	0.00E+00	1.05E-05	0.00E+00	1.43E-05	0.00E+00	98.51	0.00	0.00	0.63	0.00	0.00	0.86	0.00
6	Nickel	8.05E-04	0.00E+00	6.64E-06	5.14E-06	0.00E+00	1.86E-03	8.57E-07	49.10	0.00	0.41	0.31	0.00	0.00	49.82	0.05
7	Zinc	2.28E-01	0.00E+00	0.00E+00	1.45E-03	0.00E+00	3.86E-01	3.43E-05	33.12	0.00	0.00	0.21	0.00	0.00	33.33	0.00
8	Arsenic	2.86E-04	0.00E+00	1.42E-05	1.83E-06	0.00E+00	0.00E+00	0.00E+00	94.70	0.00	4.69	0.61	0.00	0.00	0.00	0.00
9	Boron	2.82E-03	0.00E+00	0.00E+00	1.81E-05	0.00E+00	5.29E-02	5.69E-06	33.10	0.00	0.00	0.21	0.00	0.00	33.31	0.07
10	Selenium	5.86E-03	0.00E+00	0.00E+00	3.75E-05	0.00E+00	5.00E-04	8.57E-07	91.59	0.00	0.00	0.59	0.00	0.00	7.83	0.00
11	Cyanide	7.10E-04	0.00E+00	1.17E-04	4.54E-06	0.00E+00	4.29E-03	8.57E-07	28.44	0.00	4.70	0.18	0.00	0.00	33.32	0.03
12	Phenol	1.78E-02	0.00E+00	8.81E-03	1.14E-04	2.64E-04	5.00E-03	5.71E-04	54.65	0.00	27.07	0.35	0.48	0.32	15.37	1.76
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Environment Agency

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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		Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Cadmium	TDI	0.36	TDI	0.0014	13.4	0.02	NR	NR	NR	NR	NR	0.001	0.5	1	1	1
2	Chromium III	TDI	150	TDI	0.1	60.2	0.27	NR	NR	NR	NR	NR	0	0.5	1	1	1
3	Chromium VI	TDI	1	ID	0.0001	6.7	NR	NR	NR	NR	NR	NR	0	0.5	1	1	1
4	Copper	TDI	160	TDI	0.286	7000	0.68	NR	NR	NR	NR	NR	0	0.5	1	1	1
5	Mercury, inorganic	TDI	2	TDI	0.06	1	0	NR	NR	NR	NR	NR	0	0.5	1	1	1
6	Nickel	TDI	12	TDI	0.006	130	0.06	NR	NR	NR	NR	NR	0.005	0.5	1	1	1
7	Zinc	TDI	600	TDI	600	27000	2.4	NR	NR	NR	NR	NR	0	0.5	1	1	1
8	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	1	1
9	Boron	TDI	160	TDI	2.9	3700	0.398	NR	NR	NR	NR	NR	0	0.5	1	1	1
10	Selenium	TDI	6.4	NR	0	35	0.06	NR	NR	NR	NR	NR	0	0.5	1	1	1
11	Cyanide	TDI	12	TDI	0.9	300	0.06	NR	NR	NR	NR	NR	0.1	0.5	1	1	1
12	Phenol	TDI	700	TDI	10	350	40	8.35E-06	7.90E-06	6.36E-10	1.92	1.48	0.3	0.5	1	1	1
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Environment Agency

	Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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Environment Agency

		Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Cadmium	1.00E+02	NR	1.62E+06	0.052 fw	0.029 fw	0.031 fw	0.016 fw	0.0031 fw	0.0014 fw
2	Chromium III	4.80E+03	NR	5.85E+05	0.00003 fw	0.00003 fw	0.00003 fw	0.00003 fw	0.00003 fw	0.00003 fw
3	Chromium VI	1.80E+01	NR	2.30E+06	0.0002 fw	0.0001 fw	0.0001 fw	0.09 fw	0.0003 fw	0.09 fw
4	Copper	1.00E+02	NR	1.38E+06	0.0206 fw	0.0206 fw	0.0206 fw	0.0206 fw	0.0206 fw	0.0206 fw
5	Mercury, inorganic	5.00E+02	NR	7.40E+04	0.0038 fw	0.0069 fw	0.0043 fw	0.001 fw	0.0011 fw	0.001 fw
6	Nickel	5.00E+02	NR	2.50E+06	0.0038 fw	0.0043 fw	0.0019 fw	0.0025 fw	0.0025 fw	0.0034 fw
7	Zinc	3.80E+01	NR	4.32E+06	0.054 fw	0.054 fw	0.054 fw	0.143 fw	0.054 fw	0.054 fw
8	Arsenic	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
9	Boron	1.00E+01	NR	6.35E+04	0.4 fw	0.2 fw	0.2 fw	0.2 fw	0.2 fw	0.2 fw
10	Selenium	5.00E+01	NR	2.17E+06	0.0108 fw	0.00364 fw	0.00083 fw	0.00271 fw	0.003 fw	0.003 fw
11	Cyanide	1.00E-01	NR	1.00E+05	model	model	model	model	model	model
12	Phenol	6.27E+00	1.15E+01	8.41E+04	model	model	model	0.00E+00	0.00E+00	model
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Environment Agency

	Soil-to-water partition coefficient ($cm^3\ g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg\ L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
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APPENDIX D

SOLMEK Laboratory Report

Contract Number: S140408 **Report Date:** 28/05/2014

Client's Reference:

Client Name: Solmek
12 Yarm Road
Stockton on Tees
TS18 3NA

For the attention of: Adrian Cutts

Contract Title: South Tyneside Hospital

Date Received: 14/05/2014
Date Commenced: 14/05/2014
Date Complete: 23/05/2014

Notes:

Samples will be held at the laboratory for a period of 6 weeks after the report date. After the **09/07/2014** all samples will be disposed of. Should further testing be required then the office should be informed before the above date.

Checked and Approved Signitories:

I Nicholson
(Lab Manager)

H Merrick
(Assistant Lab Manager)

R Woods
(Office Manager)

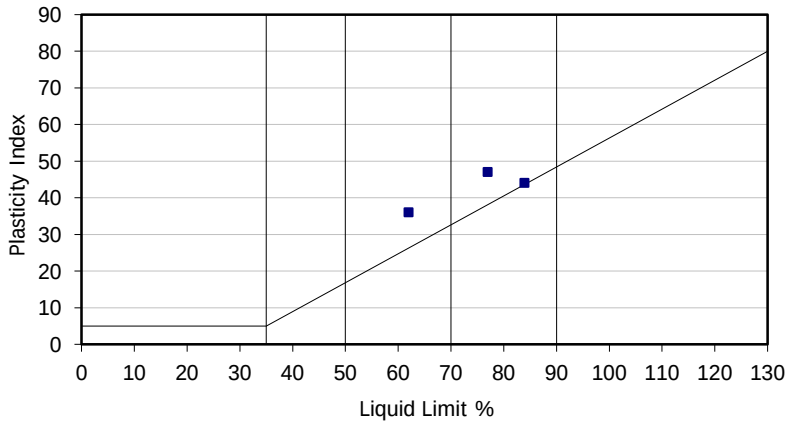
12 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Fax: 01642 612355
e-mail: lab@solmek.com

SUMMARY OF SOIL CLASSIFICATION TESTS
(BS1377-2:1990+A1:1996)

SOUTH TYNESIDE HOSPITAL
S140408

SOLMEK

Hole	Depth m	Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Plasticity	% Passing 425µm	pH	SO_4 Content mg/L	Chloride Content mg/L	Lab Shear Vane kPa
BH1	0.70	B	53	84	40	44	CV	97.8				
BH1	2.00	U	32						8.0	74		
BH2	0.70	B	34	77	30	47	CV	99.9				
BH2	1.20	U	31						7.6	95		
BH3	1.20	U	47									
BH4	1.20	U	36	62	26	36	CH	100				
BH4	3.00	U	35									



Liquid Limit

CE ME	Extremely high plasticity CLAY Extremely high plasticity SILT	>90%
CV MV	Very high plasticity CLAY Very high plasticity SILT	70 - 90%
CH MH	High plasticity CLAY High plasticity SILT	50 - 70%
CI MI	Intermediate plasticity CLAY Intermediate plasticity SILT	35 - 50%
CL ML	Low plasticity CLAY Low plasticity SILT	<35%

Comments

Prepared: Date: 28/05/2014

Checked: I. Nicholson Date: 28/05/2014

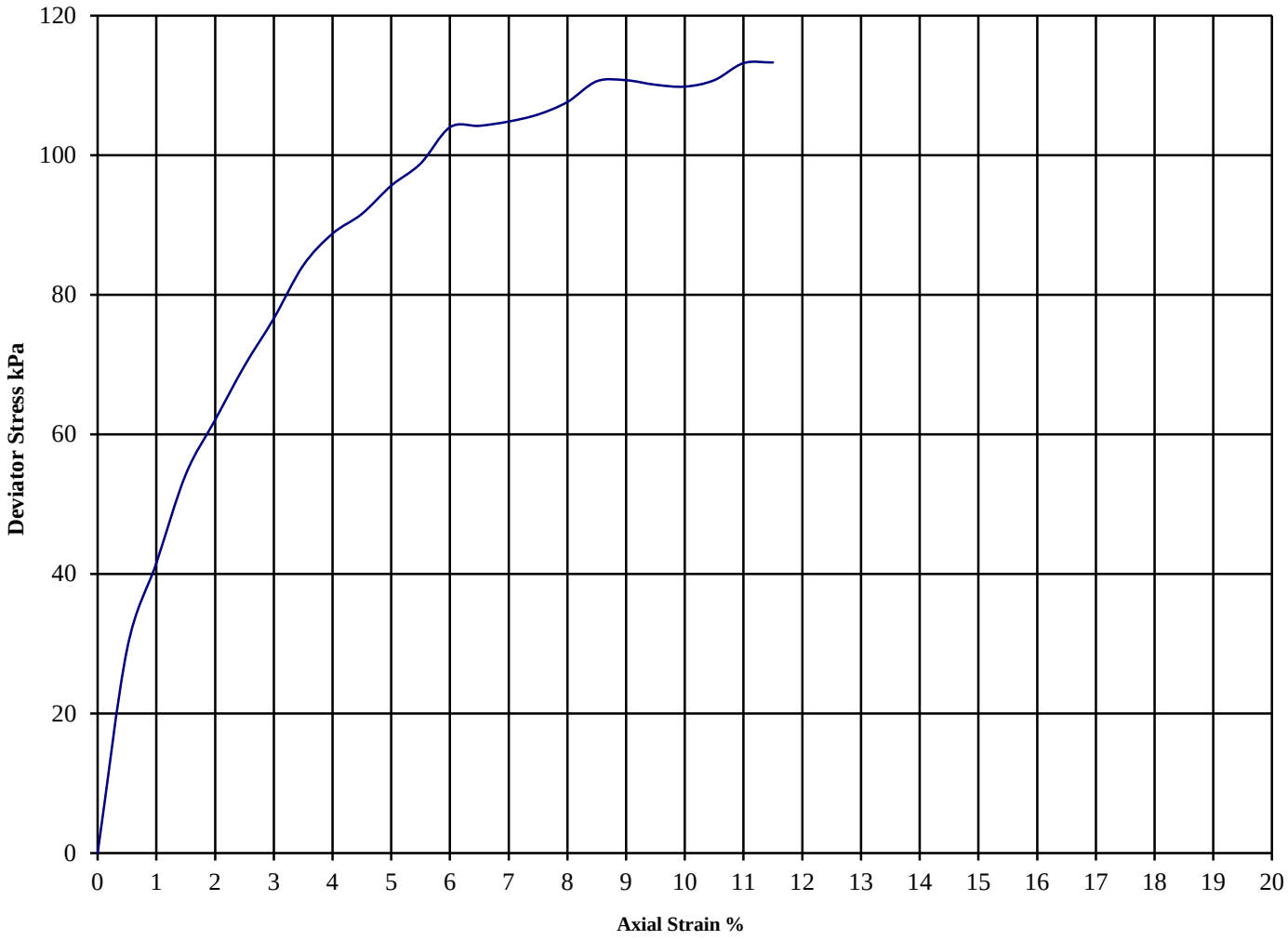
Approved: I. Nicholson Date: 28/05/2014

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

BS1377-7:1990+A1:1994 [Preparation Method BS1377-1:1990:Clause 8.3]

Hole Reference **BH 1** **Depth (m)** **2.00-2.45**



Diameter (mm):		100	Height (mm):		200	Test:	100 mm Single Stage.			Sketch of Failure Conditions:
Stage	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Shear Strength (kPa)	
1	32	2.09	1.59	40	113	57	11.5	Brittle	57	
Sample Description:		Dark brown mottled grey orange slightly silty CLAY								
Sample Condition:		Undisturbed		Rate of Strain %/min		2	Membrane Thickness		0.5mm	

Remarks:

Operator	Checked by	Date
UM	IN	28/05/14

SOLMEK

South Tyneside Hospital

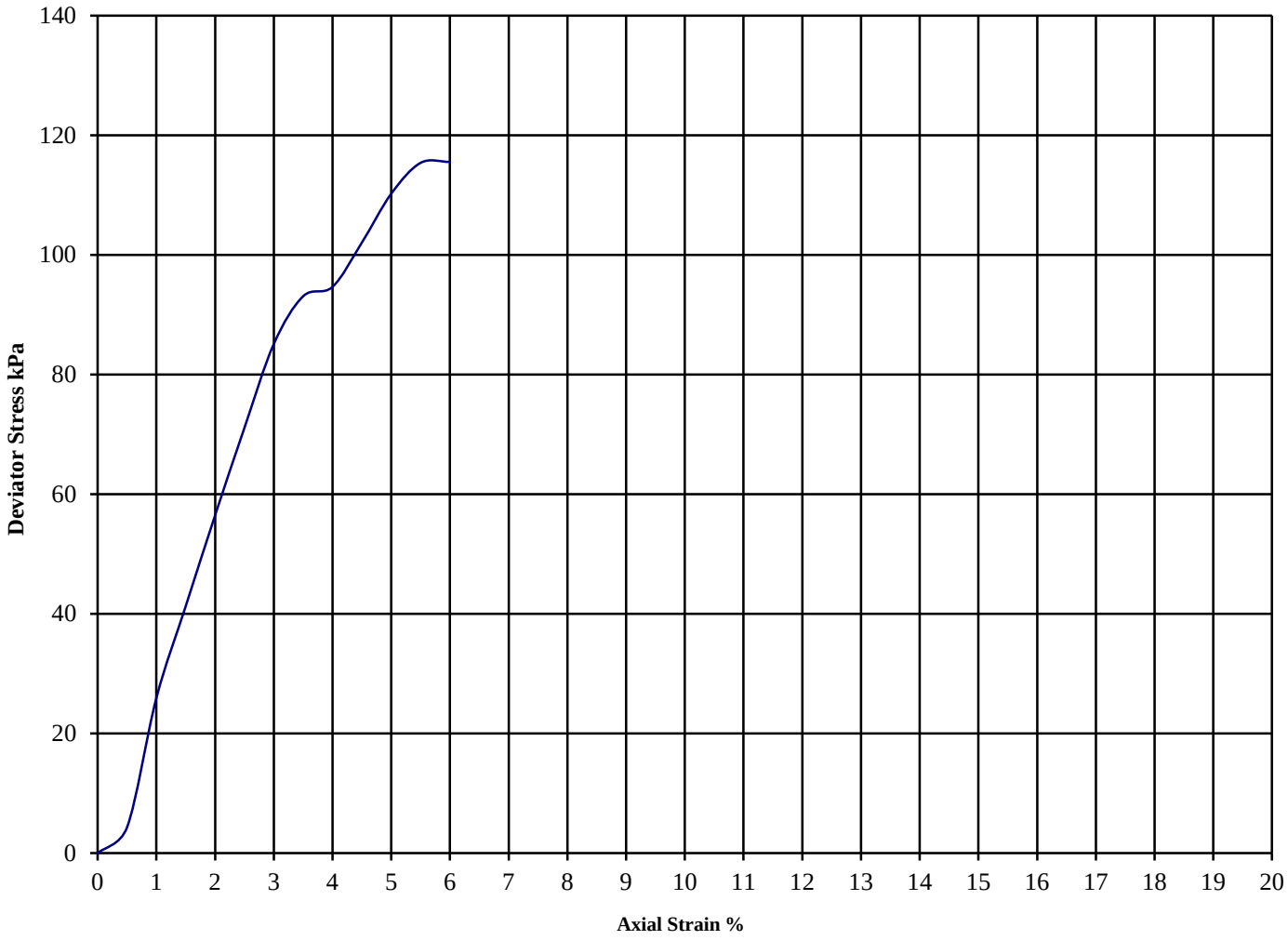
Contract No
S140408

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

BS1377-7:1990+A1:1994 [Preparation Method BS1377-1:1990:Clause 8.3]

Hole Reference **BH 2** **Depth (m)** **1.20-1.65**



Diameter (mm):		100	Height (mm):		200	Test:	100 mm Single Stage.			Sketch of Failure Conditions:
Stage	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Shear Strength (kPa)	
1	31	2.05	1.56	20	116	58	6.0	Brittle	58	
Sample Description:		Brown greyish CLAY								
Sample Condition:		Undisturbed		Rate of Strain %/min		2	Membrane Thickness		0.5mm	
Remarks:										

Operator	Checked by	Date
UM	IN	28/05/14

SOLMEK

South Tyneside Hospital

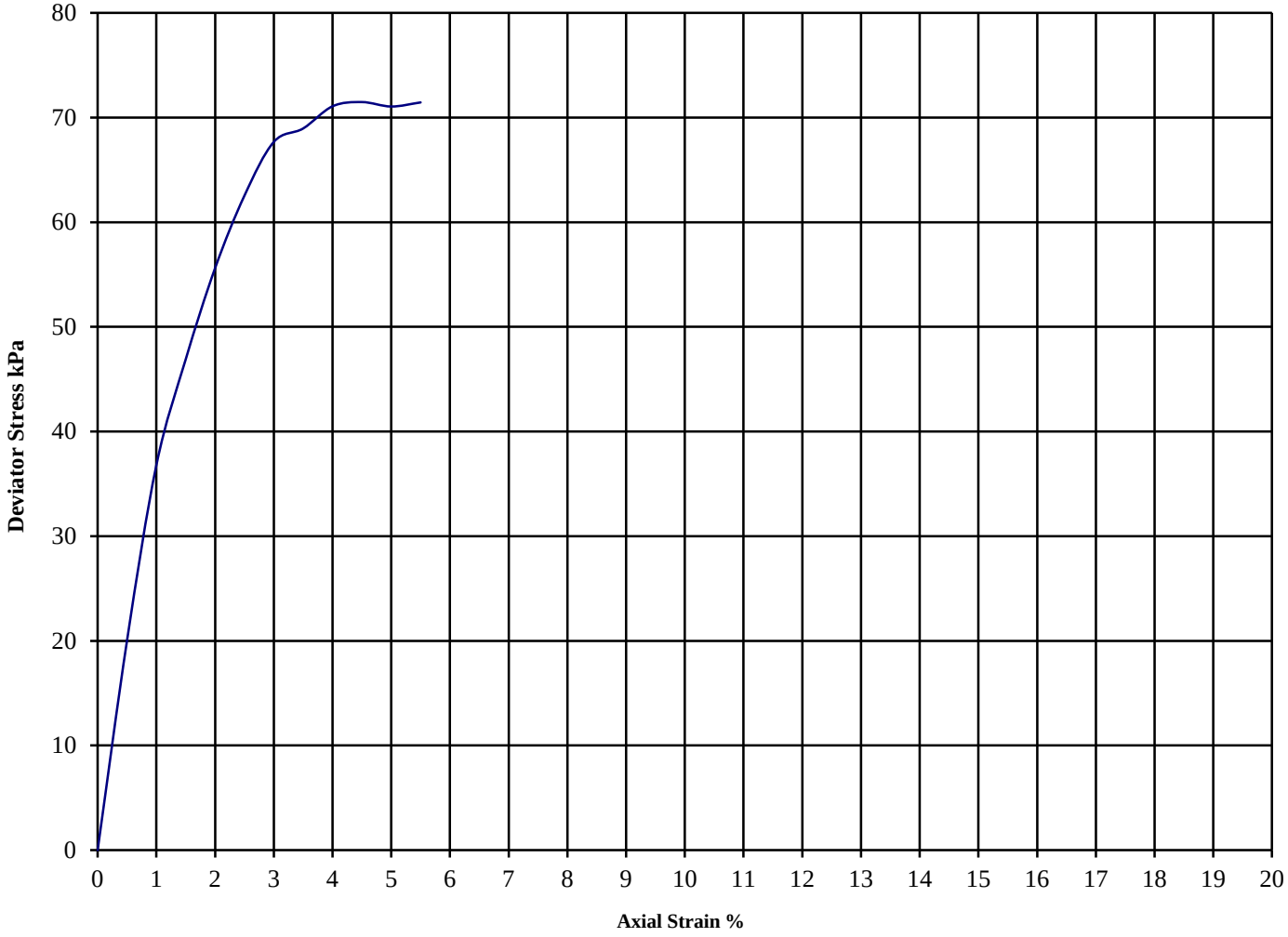
Contract No
S140408

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

BS1377-7:1990+A1:1994 [Preparation Method BS1377-1:1990:Clause 8.3]

Hole Reference **BH 3** **Depth (m)** **1.20-1.65**



Diameter (mm):		100	Height (mm):		200	Test:	100 mm Single Stage.			Sketch of Failure Conditions:
Stage	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Shear Strength (kPa)	
1	47	1.92	1.31	20	71	36	4.5	Brittle	36	
Sample Description:		Light brown greyish orangish CLAY								
Sample Condition:		Undisturbed		Rate of Strain %/min		2	Membrane Thickness		0.5mm	

Remarks:

Operator	Checked by	Date
UM	IN	28/05/14

SOLMEK

South Tyneside Hospital

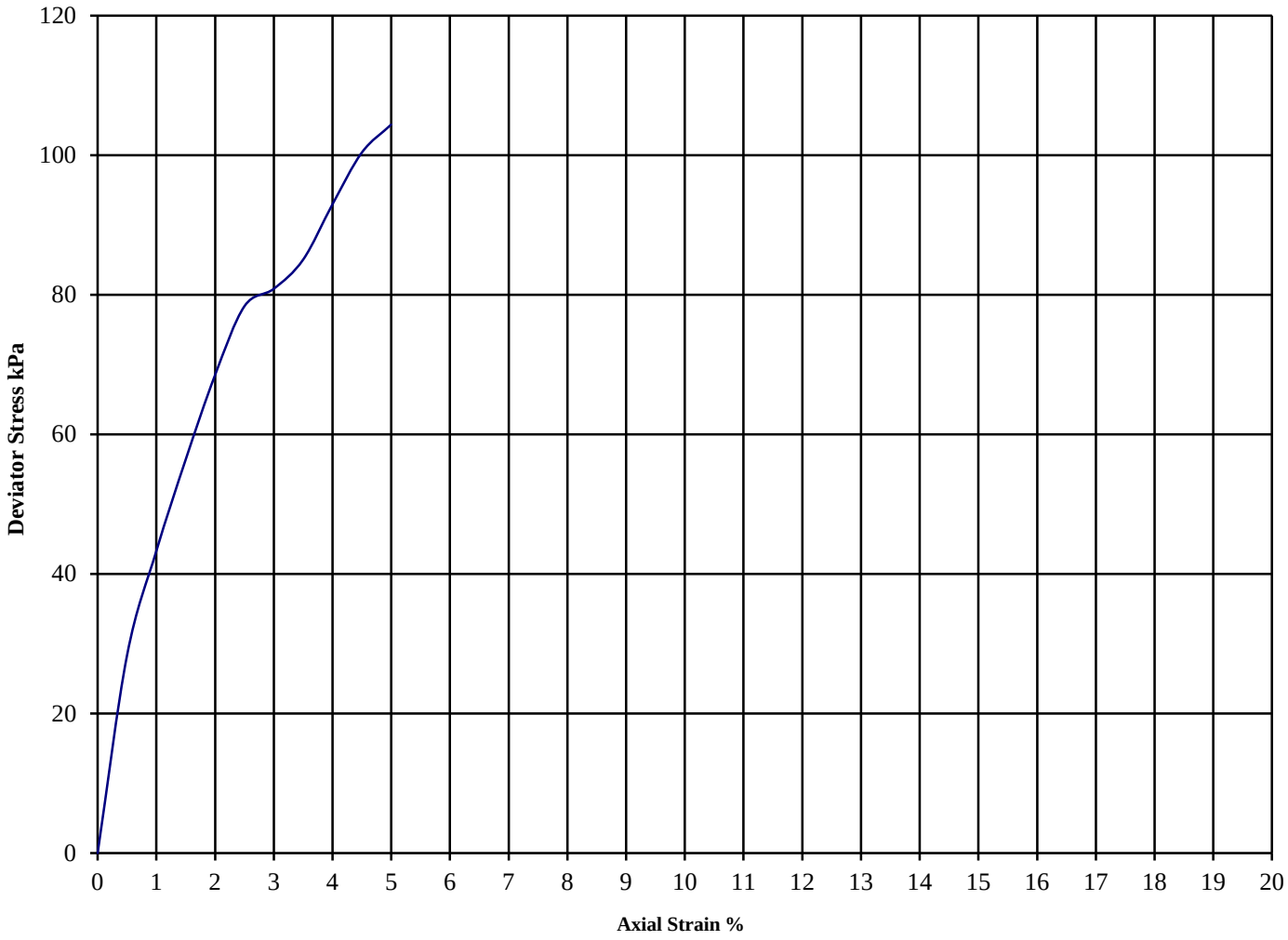
Contract No
S140408

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

BS1377-7:1990+A1:1994 [Preparation Method BS1377-1:1990:Clause 8.3]

Hole Reference **BH 4** **Depth (m)** **1.20-1.65**



Diameter (mm):		100	Height (mm):		200	Test:	100 mm Single Stage.			Sketch of Failure Conditions:
Stage	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Shear Strength (kPa)	
1	36	2.02	1.48	20	104	52	5.0	Brittle	52	
Sample Description:		Dark brown greyish orangish CLAY								
Sample Condition:		Undisturbed		Rate of Strain %/min		2	Membrane Thickness		0.5mm	

Remarks:

Operator	Checked by	Date
UM	IN	28/05/14

SOLMEK

South Tyneside Hospital

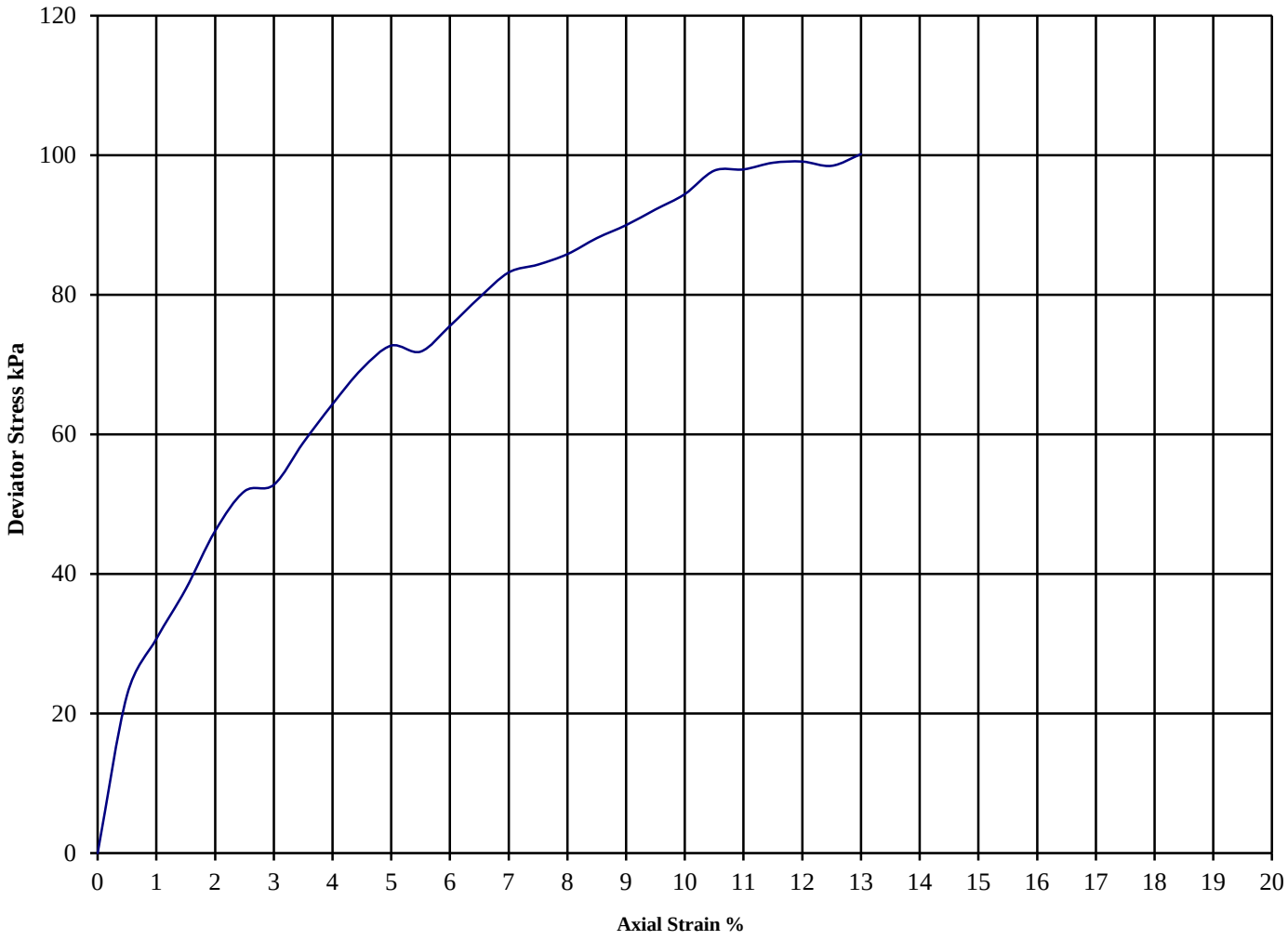
Contract No
S140408

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

BS1377-7:1990+A1:1994 [Preparation Method BS1377-1:1990:Clause 8.3]

Hole Reference **BH 4** **Depth (m)** **3.00-3.45**



Diameter (mm):		100	Height (mm):		200	Test:	100 mm Single Stage.			Sketch of Failure Conditions:
Stage	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Shear Strength (kPa)	
1	35	2.01	1.49	60	100	50	13.0	Brittle	50	
Sample Description:		Dark brown slightly silty CLAY								
Sample Condition:		Undisturbed		Rate of Strain %/min		2	Membrane Thickness		0.5mm	

Remarks:

Operator	Checked by	Date
UM	IN	28/05/14

SOLMEK

South Tyneside Hospital

Contract No
S140408

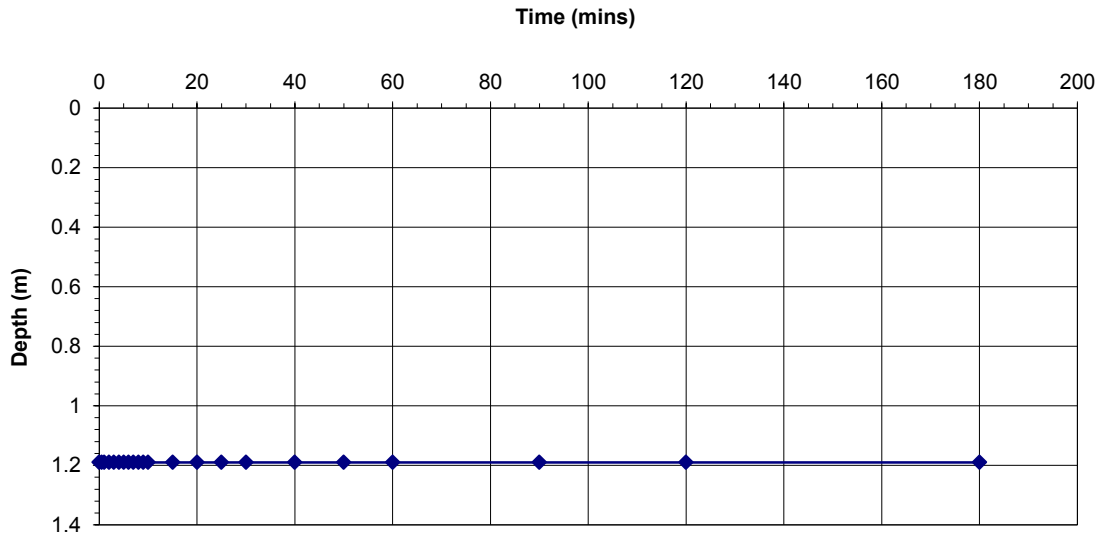
SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**South Tyneside**				
Site:	**South Tyneside Hospital**				
Job No:	**S140408**				
Pit No:	**TP1**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	1.19
0.5	1.19
1	1.19
2	1.19
3	1.19
4	1.19
5	1.19
6	1.19
7	1.19
8	1.19
9	1.19
10	1.19
15	1.19
20	1.19
25	1.19
30	1.19
40	1.19
50	1.19
60	1.19
90	1.19
120	1.19
180	1.19

Pit Dimensions	Length (m) =	1.90	
	Width (m) =	0.45	
	Depth (m) =	1.50	
	Depth at start of test (m) =	1.190	
	Depth at end of test (m)=	1.190	
	75% level (m)=	1.190	
	50% Effective Depth	0.000	
	25% level (m)=	1.190	
	Base area of pit (m^2) =	0.855	
	Vp_{75-25} (m^3) =	0.000	
	a_{p50} (m^2) =	0.855	
From the graph:			
	tp 75 (min) =	0	
	tp 25 (min) =	1	
Soil infiltration rate, f, (m/s) =	**0.00E+00**	**normal test**	
Input by:	**SJF**	**Date:**	**06/05/2014**
Checked by:	**AC**	**Date:**	**06/05/2014**



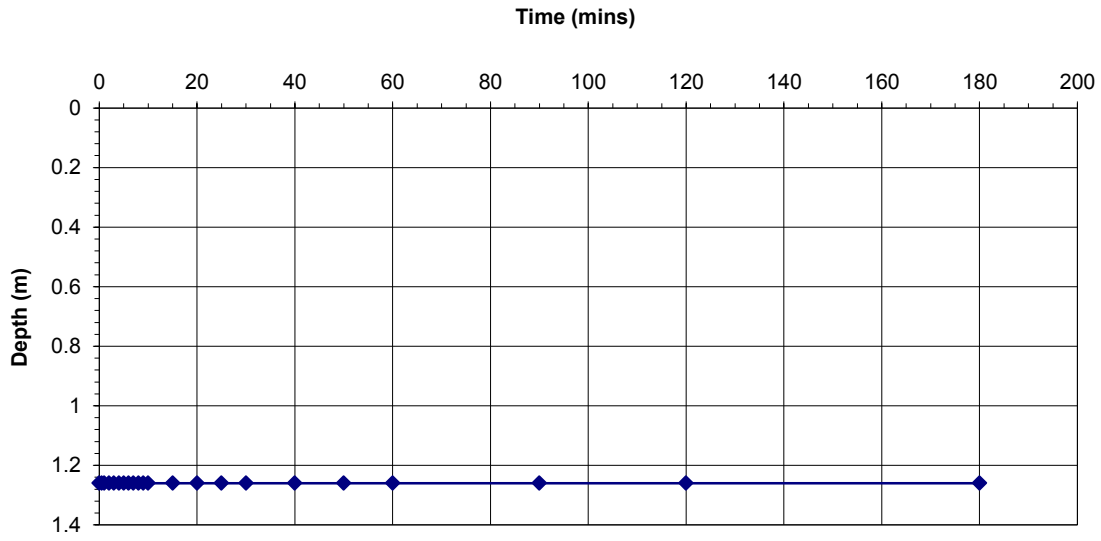
SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**South Tyneside**				
Site:	**South Tyneside Hospital**				
Job No:	**S140408**				
Pit No:	**TP4**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	1.26
0.5	1.26
1	1.26
2	1.26
3	1.26
4	1.26
5	1.26
6	1.26
7	1.26
8	1.26
9	1.26
10	1.26
15	1.26
20	1.26
25	1.26
30	1.26
40	1.26
50	1.26
60	1.26
90	1.26
120	1.26
180	1.26

Pit Dimensions	
Length (m) =	1.40
Width (m) =	0.45
Depth (m) =	1.80
Depth at start of test (m) =	1.260
Depth at end of test (m)=	1.260
75% level (m)=	1.260
50% Effective Depth	0.000
25% level (m)=	1.260
Base area of pit (m^2) =	0.630
Vp_{75-25} (m^3) =	0.000
a_{p50} (m^2) =	0.630
From the graph:	
tp 75 (min) =	0
tp 25 (min) =	1
Soil infiltration rate, f, (m/s) =	**0.00E+00** **normal test**
Input by:	**SJF** **Date:** **06/05/2014**
Checked by:	**AC** **Date:** **06/05/2014**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

Client:	**South Tyneside**				
Site:	**South Tyneside Hospital**				
Job No:	**S140408**				
Pit No:	**TP2**		**Test No:**	**1**	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	1.75
0.5	1.75
1	1.75
2	1.75
3	1.75
4	1.75
5	1.75
6	1.75
7	1.75
8	1.75
9	1.75
10	1.75
15	1.75
20	1.75
25	1.75
30	1.75
40	1.75
50	1.75
60	1.75
90	1.75
120	1.75
180	1.75

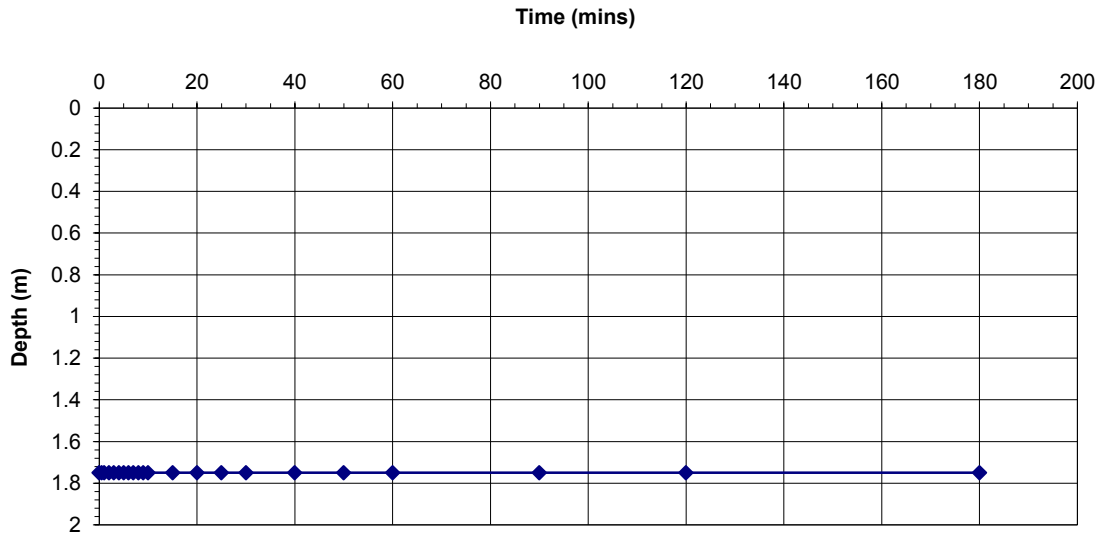
Pit Dimensions		
	Length (m) =	1.70
	Width (m) =	0.45
	Depth (m) =	1.80

Depth at start of test (m) =	1.750
Depth at end of test (m)=	1.750
75% level (m)=	1.750
50% Effective Depth	0.000
25% level (m)=	1.750
Base area of pit (m^2) =	0.765
Vp_{75-25} (m^3) =	0.000
a_{p50} (m^2) =	0.765

From the graph:	
tp 75 (min) =	0
tp 25 (min) =	1

Soil infiltration rate, f, (m/s) =	**0.00E+00**	**normal test**

Input by:	**SJF**	**Date:**	**06/05/2014**
Checked by:	**AC**	**Date:**	**06/05/2014**



APPENDIX E

♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2014)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek. Solmek was a trading name of Hymas Geoenvironmental Ltd.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.

SOLMEK NOTES ON CONTAMINATION GUIDANCE(REF: VERSION 1/2014)

UK BACKGROUND

A qualitative approach using the statutory definition of Contaminated land as defined with Section 78A (2) of Part 2A of the Environmental Protection Act has been adopted. This defines contaminated land (DEFRA 'Guidance on the Legal Definition of Contaminated Land', July 2008b) as:

"any land which appears to the local authority in whose area the land 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"

"Harm" is defined as *harm to the health of living organisms or other interference within the ecological systems of which they form part, and in the case of man, includes harm to his property.*

The concept of "significant harm" is dealt with via the Government guidance DEFRA Circular 02/2000 Contaminated Land: "*Implementation of Part IIA of the Environmental Protection Act 1990".* The statutory guidance uses the concept of pollutant linkages set out in Section 2.4 of the circular. Before the Local Authority can make a judgement on whether "*significant harm*" and the significant possibility of harm is being caused they are required to identify a "*significant pollution linkage".* This means effectively that three elements (a **source** of contamination, a relavent **receptor** and a **pathway**) must be present. In statutory terms:

- A **source** is a substance that is in, on or under the land and has the potential to cause harm.
- A **receptor** is in general terms, is something that could be adversely affected by a contaminant, such as people.
- A **pathway** is a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Without identification of all three elements together, land should not be regarded as "*Contaminated*" in the statutory sense. Solmek adopts the above measures in accordance with CLR 11 (2004) 'Model Procedures for the management of Land Contamination'.

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

DEFRA published the discussion paper 'Soil Guideline Values: the way forward' (2006). Following consultation, DEFRA released 'Improvements to Contaminated Land Guidance and Outcome of the Way Forward exercise on Soil Guideline Values' (2008b). From this review DEFRA and the Environment Agency had withdrawn documents CLR 7 to 10 since these no longer fully reflect the new UK approach, along with the associated Soil Guidelines Values (SGV). The Environment Agency have revised and updated information presented in CLR 7 to 10 within two recently published CLEA Framework Reports: Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2) and updated technical background to the CLEA model (Science Report Final SC050021/SR3).

The Environment Agency released the updated CLEA Software Version 1.06 in May 2011 which accompanies the two CLEA Framework Reports and reflects the updated approach. Solmek uses the CLEA Software Version 1.06 to derive a series of Generic Assessment Criteria (GAC) threshold values based on a number of site and soil parameters. Solmek GAC values represent a level at which a risk to human health may exist and are primarily intended as a guide to site redevelopment. Various factors used within the CLEA software by Solmek are summarised below:

<table>
<tr><th>Land Use</th><th>Receptor</th><th>Building</th><th>Soil Type</th><th>pH and SOM</th></tr>
<tr><td>Residential with Homegrown Produce</td><td>Female (Age Class 1-6: Young Child)</td><td rowspan="2">Bungalow
Small Terraced House
Medium/large Terraced House
Semi-detached House
Detached House</td><td rowspan="7">Clay
Silty Clay
Silty Clay Loam
Clay Loam
Sandy Lam
Loam
Silty Loam
Sandy Loam
Sandy Loam
Sand</td><td rowspan="7">pH and SOM content values as presented from testing.</td></tr>
<tr><td>Residential without Homegrown Produce</td><td>Female (Age Class 1-6: Young Child)</td></tr>
<tr><td>Allotments</td><td rowspan="3">Female (Age class 1-6: Young Child)</td><td rowspan="3">Assumes None</td></tr>
<tr><td>Parks</td></tr>
<tr><td>Open spaces</td></tr>
<tr><td>Playing fields</td><td>Female (Age class 4-11: Child)</td></tr>
<tr><td>Commercial</td><td>Female (Age Class 17-17: Working Adult)</td><td>Warehouse (pre 1970)
Warehouse (post 1970)
Office (pre 1970)
Office (post 1970)</td></tr>
<tr><td colspan="5">DERIVATION OF SOLMEK GAC THRESHOLD VALUES</td></tr>
</table>

A number of specific exposure pathways are considered in addition to the above table when considering the generated GAC values. In some instances, the GAC generated value may be presented at the soil saturation limit if this has been exceeded. The choice of receptor may differ from the table above based on professional judgment (with justification).

Solmek adopts a pH value of 7, Soil Organic Matter (SOM) content of 1% and a sandy loam soil where this information is not available. These figures accord with the generic units presented within the CLEA Software. Where Solmek cannot generate specific GAC values, the Environment Agency's SGVs (where available), released from March 2009, and Atkins SSV's (derived using CLEA Software Version 1.04, May 2011) are adopted for comparison.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness ($CaCO_3$) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with CLR 11- Model Procedures, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

WASTE ACCEPTANCE CRITERIA

Waste Acceptance Criteria (WAC) testing accords with the Landfill (England and Wales) 2002 Regulations and the subsequent amendments set out in Schedule 1 of the Landfill (England and Wales)(Amendment) Regulations 2004. WAC testing was introduced into UK Practise to supplement the revised changes to the Hazardous Waste and Landfill regulations outlined in 2005. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The WAC test categorises materials as either inert waste, non-reactive hazardous waste, and hazardous waste. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.