

Site Investigations



Geologists



Environmental & Geotechnical  
Engineers



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Ipswich  
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16<sup>th</sup> September 2015  
Contract Ref: S150912

FAO Mr Richard Barker

**Permeability Testing at Smithy Wood Lane, Dodworth, Barnsley**

Solmek visited the above site on 11<sup>th</sup> September 2015 to carry out percolation trials as instructed. Please find attached a site location map, soakaway test location plan and the field test results. The testing was generally carried out in accordance with BRE Digest 365: Soakaway Design.

The trial pits were excavated, logged and then water was poured into the trial pits from a water bowser and depth measurements were taken at regular time intervals (see attached). Following completion of the percolation tests the trial pits were backfilled with arisings.

Below gives a summary of the related infiltration rate, where an advisory classification has been given.

TP	Infiltration Rate (m/sec*10 <sup>-6</sup> )	Description of base stratum	Suitability
1	8.9	Light brown mottled grey CLAY	Poor
2	156	Light brown weathered SANDSTONE	Moderately Good
3	2.66	Light grey weathered MUDSTONE	Not Acceptable

We would like to take this opportunity to thank you for using Solmek. An invoice for the works carried out is also enclosed.

Yours faithfully

Paul Finnimore  
**On behalf of Solmek**



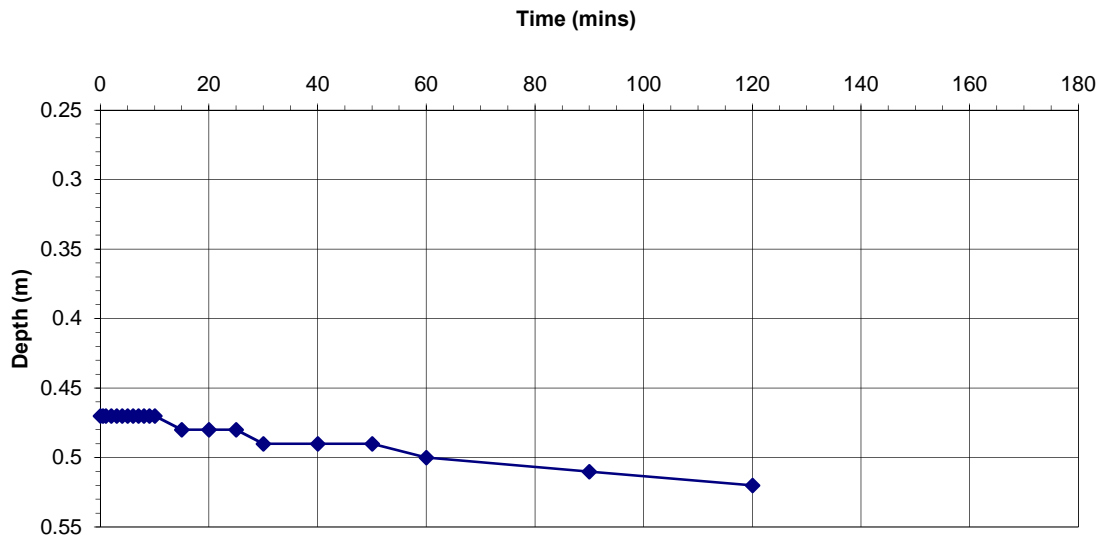
**Figure 1: Soakaway Location Plan**

<b>Client:</b>	Wentworth Trust	
<b>Project:</b>	Smithy Wood Lane, Dodworth, Barnsley	
<b>Title:</b>	Soakaway Location Plan	
<b>Drawing No:</b>	Figure 1	<b>Scale:</b> NTS
<b>Date</b>	September 2015	

**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991**

**BRE Digest 365, Figure 2, Page 5**

<b>Client: Wentworth Trust</b>					
<b>Site: Smithy Wood Lane, Dodworth, Barnsley</b>					
<b>Job No: S150912</b>					
<b>Pit No: TP1</b>		<b>Test No: 1</b>			
<b>CALCULATION OF SOIL INFILTRATION RATE</b>					
<b>Time (min)</b>	<b>Depth (m)</b>	<b>Pit Dimensions</b>		<b>Length (m) =</b>	<b>1.60</b>
0	0.47			<b>Width (m) =</b>	<b>0.60</b>
0.5	0.47			<b>Depth (m) =</b>	<b>1.50</b>
1	0.47				
2	0.47			<b>Depth at start of test (m) =</b>	<b>0.470</b>
3	0.47			<b>Depth at end of test (m) =</b>	<b>0.520</b>
4	0.47			<b>75% level (m) =</b>	<b>0.483</b>
5	0.47			<b>50% Effective Depth</b>	<b>0.025</b>
6	0.47			<b>25% level (m) =</b>	<b>0.508</b>
7	0.47				
8	0.47			<b>Base area of pit (m<sup>2</sup>) =</b>	<b>0.960</b>
9	0.47			<b>V<sub>p75-25</sub> (m<sup>3</sup>) =</b>	<b>0.024</b>
10	0.47			<b>a<sub>0.50</sub> (m<sup>2</sup>) =</b>	<b>1.070</b>
15	0.48				
20	0.48			<b>From the graph:</b>	
25	0.48			<b>tp 75 (min) =</b>	<b>20</b>
30	0.49			<b>tp 25 (min) =</b>	<b>62</b>
40	0.49				
50	0.49	<b>Soil infiltration rate, f, (m/s) =</b>		<b>8.90E-06</b>	<b>normal test</b>
60	0.5				
90	0.51				
120	0.52	<b>Input by:</b>	<b>PF</b>	<b>Date:</b>	<b>16/09/2015</b>
180		<b>Checked by:</b>	<b>RW</b>	<b>Date:</b>	<b>16/09/2015</b>



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

**Client:** Wentworth Trust

**Site:** Smithy Wood Lane, Dodworth, Barnsley

**Job No:** S150912

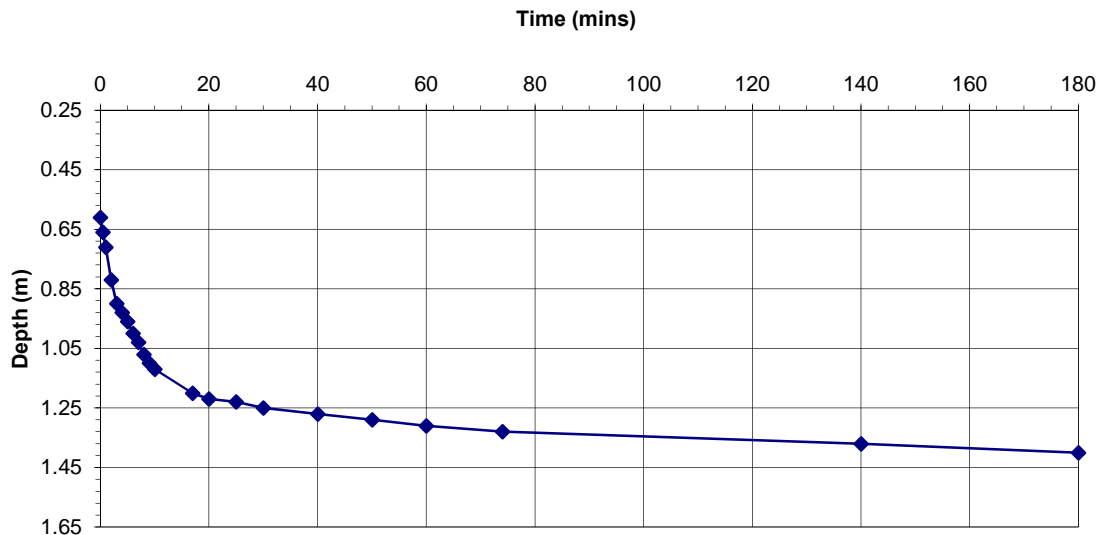
**Pit No:** TP2

**Test No:**

1

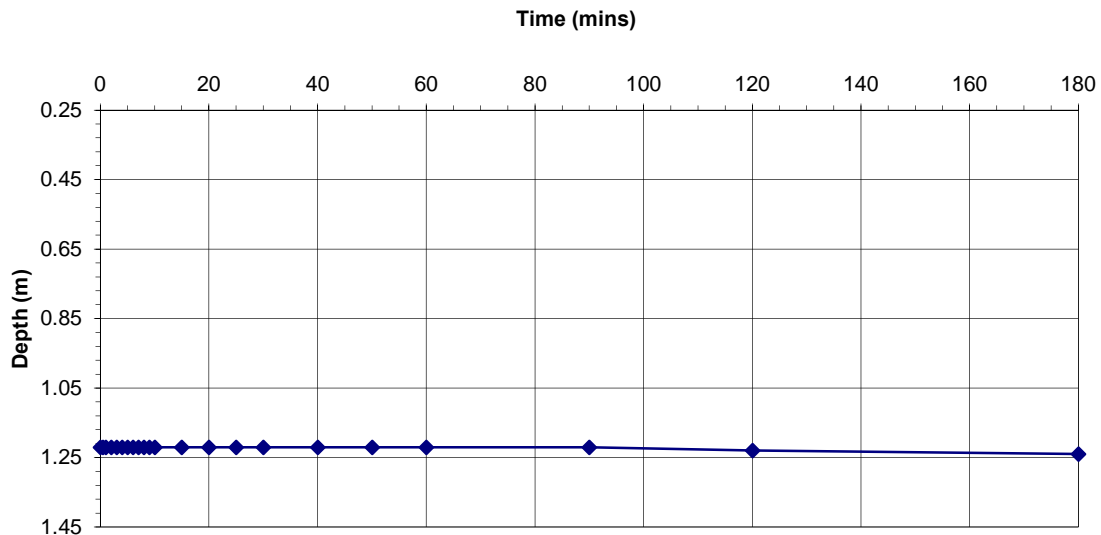
**CALCULATION OF SOIL INFILTRATION RATE**

Time (min)	Depth (m)	Pit Dimensions		Length (m) =	1.90
0	0.61	Pit Dimensions		Width (m) =	0.60
0.5	0.66			Depth (m) =	1.70
1	0.71				
2	0.82	Depth at start of test (m) = 0.610			
3	0.9	Depth at end of test (m) = 1.400			
4	0.93	75% level (m) = 0.808			
5	0.96	50% Effective Depth = 0.395			
6	1	25% level (m) = 1.203			
7	1.03				
8	1.07	Base area of pit (m <sup>2</sup> ) = 1.140			
9	1.1	V <sub>p75-25</sub> (m <sup>3</sup> ) = 0.450			
10	1.12	a <sub>0.50</sub> (m <sup>2</sup> ) = 3.115			
17	1.2				
20	1.22	From the graph:			
25	1.23	tp 75 (min) = 1.6			
30	1.25	tp 25 (min) = 17			
40	1.27				
50	1.29	Soil infiltration rate, f, (m/s) =	1.56E-04	normal test	
60	1.31				
74	1.33				
140	1.37	Input by:	PF	Date:	16/09/2015
180	1.4	Checked by:	RW	Date:	16/09/2015



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

<b>Client:</b> Wentworth Trust					
<b>Site:</b> Smithy Wood Lane, Dodworth, Barnsley					
<b>Job No:</b> S150912					
<b>Pit No:</b> TP3		<b>Test No:</b> 1			
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)	Pit Dimensions	Length (m) =	1.80	
0	1.22		Width (m) =	0.60	
0.5	1.22		Depth (m) =	1.80	
1	1.22				
2	1.22	Depth at start of test (m) =		1.220	
3	1.22	Depth at end of test (m) =		1.240	
4	1.22	75% level (m) =		1.225	
5	1.22	50% Effective Depth		0.010	
6	1.22	25% level (m) =		1.235	
7	1.22				
8	1.22	Base area of pit (m <sup>2</sup> ) =		1.080	
9	1.22	V <sub>p75-25</sub> (m <sup>3</sup> ) =		0.011	
10	1.22	a <sub>0.50</sub> (m <sup>2</sup> ) =		1.128	
15	1.22				
20	1.22	From the graph:			
25	1.22	tp 75 (min) =		30	
30	1.22	tp 25 (min) =		90	
40	1.22				
50	1.22	Soil infiltration rate, f, (m/s) =		2.66E-06 normal test	
60	1.22				
90	1.22				
120	1.23	Input by:	PF	Date:	16/09/2015
180	1.24	Checked by:	RW	Date:	16/09/2015



## UK BACKGROUND

### **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”*.

## 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 volatized 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.

## 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<sub>3</sub>) 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

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 (3<sup>rd</sup> 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.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

Parameter group	Pipe Material (Threshold concentrations in mg/kg)					
	PE	PVC	Barrier pipe (PE-AL-PE)	Wrapped Steel	Wrapped Ductile Iron	Copper
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
<b>Specific suite identified as relevant following site investigation</b>						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

## 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.