

A REPORT

ON A

GROUND INVESTIGATION

AT

**ST. STEPHENS
HAINE ROAD
RAMSGATE
KENT CT12 5ES**

FOR

JOHN BURKE ASSOCIATES

BY

SOILTEC LABORATORIES LIMITED

**Soiltec House
Langley Park
Sutton Road
Maidstone
Kent
ME17 3NQ**

Date: June 2016

Report No: 07045/22

**A REPORT ON A SITE INVESTIGATION AT ST. STEPHENS, HAINE ROAD,
RAMSGATE, KENT FOR JOHN BURKE ASSOCIATES BY
SOILTEC LABORATORIES LIMITED.**

Date : June 2016

Report No : 07045/22

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FOREWORD

General Conditions Relating to Site Investigation

The recommendations made and any opinions expressed in this report are based on the ground conditions revealed by the site works, an assessment of the site and laboratory test results together with other available information. The possibility of variations in ground conditions elsewhere on the site should not be overlooked. No liability can be accepted for such variations.

Unless otherwise stated in the report, drilling is undertaken using light percussive shell and auger equipment or continuous window sampler equipment. Whilst these methods are regarded as most reliable, some disturbance of the soils is inevitable.

The ground water conditions indicated on the borehole and/or trial pit records are those observed at the time of the investigation. The normal rate of excavation usually does not allow the recording of an equilibrium water level. Additionally, ground water levels are subject to seasonal variation or changes in local drainage conditions.

Boring and sampling methods are generally undertaken in accordance with B.S. 5930 : 1999, 'Code of practice for site investigations'. Laboratory testing is carried out in accordance with B. S. 1377 : 1990, 'Methods of Test for Soils for Civil Engineering Purposes', unless otherwise stated.

This report is produced for the benefit of the Client alone. It should be noted that the investigation was made for the form of development described and may be inappropriate to another form of development. No responsibility can be accepted for any consequences of this information being passed to a third party who may act upon its content.

1.0 INTRODUCTION

It is proposed to redevelop the property known as St. Stephens, Haine Road, Ramsgate, to provide a new housing development consisting of three pairs of semi-detached houses and associated garaging and access road. At the request of John Burke Associates, an investigation was carried out to provide information on ground conditions for foundation design.

Soiltec Laboratories Limited was instructed to complete the required investigation work by email dated 11th May 2016 in response to our quotation for the ground investigation.

At the time of this investigation details of the form of construction and foundation loads were not known.

The comments given and opinions expressed in this report are based on the ground conditions encountered during the site works, on the results of tests made in the field and in the laboratory together with other available information. The possibility of variations in ground conditions elsewhere on the site should not be overlooked.

2.0 DESCRIPTION AND GEOLOGY OF THE SITE

The property is located adjacent to the west of Haine Road, to the north of Manston Golf Centre and south of Sprattling Lane. The site forms rectangular plot consisting of a brick built house set in gardens of hedging and low walls. The site is generally level with a number of trees located on and close to the site, some of which may be significant in relation to foundation design.

From an examination of the online BGS geological map for the area the solid geological deposit appears as THANET formation. No drift deposits being recorded. However, it is likely that some superficial deposits will be located across the site.

Thanet Beds consist of pale yellow-brown fine glauconitic, marine sands and fossiliferous sandy clays.

3.0 FIELD WORK

The fieldwork undertaken comprised the excavation of boreholes using track mounted Terrier windowless sampler. Site works completed on the 25th May 2016. The table below indicates the number of boreholes and depths achieved.

Borehole	Depth (m bgl)
WS1	4.45
WS2	4.45
WS3	4.45

The borehole locations are shown on the block plan included with this report.

A note of the strata encountered in the boreholes together with a record of the ground water conditions are presented in the borehole records.

Disturbed soil samples were taken at the depths shown on the records and were returned to the laboratory for examination and testing.

Standard Penetration Tests (SPT/CPT) were carried out generally in accordance with BS EN ISO 22476-3:2005 + A1:2011 to determine relative density or hardness of the soils encountered. The results of penetration resistance are shown on the borehole records and the un-corrected N values are included in tabular form in this report.

Equivalent undrained shear strengths (c_u) derived from N values from cohesive soils are based on relationship suggested by Stroud, M. A. (1974) "The standard penetration test in insensitive clays and soft rock," Proceedings of the 1st European Symposium on Penetration Testing, Sweden: Stockholm, vol. 2(2), 367-375.

Plasticity Index	Equivalent C_u
<20	(6-7)N
>20 <30	(4-5)N
>30	4.2 N

The angle of shearing resistance (ϕ) of the coarse grained soils has been derived from the uncorrected standard penetration resistance N value using the relationship after Peck, Hanson and Thorburn (1967).

Where appropriate, shear strengths of the soils encountered was determined using in-situ shear vane equipment. The results are utilised to determine bearing capacities of the soil. The results are shown on the borehole records and the un-corrected values are included in tabular form in this report.

Soakage Tests

Preliminary falling head soakage test was undertaken in borehole WS1. The procedure outlined in BRE365 was used with the exception that the hole is filled only once. The area of ground exposed in a borehole is less than for a trial pit and so the results are indicative only, although reasonable correlation with the full sized tests is normally quite robust.

4.0 LABORATORY TESTING

A program of laboratory testing was carried out on selected soil samples as follows :

Test	No.
Natural moisture content	6
Liquid & Plastic Limits	6
Water soluble sulphate	2
pH	2
Waste Acceptance Criteria	1

Generally values of between 79% and 49% were recorded for Liquid Limits (LL) and 19% to 25% for Plastic Limits (PL). All results are summarised under Laboratory Test Results Table 1. Table 1 includes a classification of the soils in terms of B. S. 5930 plasticity and NHBC volume change potential. The latter utilises a modified Plasticity Index which takes into account the granular content of the clay where appropriate.

Low soluble sulphate concentrations together with near neutral pH were recorded for the site.

The tests, unless otherwise stated, were carried out in accordance with British Standard 1377 : 1990 “methods of Test for Soils for Civil Engineering Purposes”.

5.0 DISCUSSION

5.1 General

The investigation confirmed the anticipated solid deposit for the site. Below a mantle of made ground consisting of turf over sandy clay with some brick and ash each borehole revealed firm to stiff becoming stiff weathered silty CLAY. This clay being consistent with weathered Thanet Formation as indicated on the BGS data.

Depth of made ground/fill encountered is summaries below :

Borehole	Depth (m)
WS1	0.30
WS2	0.45
WS3	0.45

5.2 Roots

Roots were encountered during the site works as follows :

Borehole	Maximum Depth of Roots (m)	Diameter (mm)
WS1	1.05	<3
WS2	0.90	<3
WS3	1.55	<3

5.3 Ground Water

Ground water was not encountered during the site works.

5.4 Foundations

It is recommended that all foundations are extended through any made or disturbed ground, desiccated soil, roots and to terminate wholly in the natural silty CLAY. Foundations should also extend below any existing foundations that may be found on the site. They should also be designed such as not to impact any existing drainage or retaining walls.

The index properties of the soils show the site should be considered as high shrinkage potential. It is recommended that high volume change potential is assumed for the site. Therefore foundation depths should be calculated in accordance with guidance given in National House Building Councils Chapter 4.2 Building near Trees. Depths of foundations will vary across the site as the distances from existing trees varies. Roots

were encountered to a maximum depth of 1.55m and deepest foundations are likely to be within the east area of the site.

From an examination of the shear strength results an allowable bearing capacity of 100kN/m² may be given for conventional foundations founded at the depths indicated above. For the bearing capacity given, total settlements should remain within tolerable limits.

Foundations should terminate wholly in one soil type in order to minimise the potential for differential settlements.

Due to the nature of the soils encountered the sides of any excavation may become unstable during periods of wet weather. The bottoms of foundation trenches should be left above formation level and only bottomed out when concreting is imminent. Any rainwater entering open trenches is unlikely to drain naturally therefore some pumping may be required during periods of wet weather.

5.5 Ground floor slabs

N.H.B.C. Chapter 5.1 recommends suspended floor construction where modified Plasticity Index is greater than 10%. The results of the laboratory tests indicate the site to be classified as shrinkable with modified PI greater than 10%. Therefore all ground floors must be suspended.

Where depth of fill is greater than 0.60m suspended ground floors must be adopted.

It is also standard to adopt suspended ground floor slabs when foundations exceed 1.50m bgl.

5.6 Sulphates and Acidity

Low concentrations of soluble sulphate were found within the samples tested. It is therefore concluded that a Design Sulphate Class of DS-1 as indicated in Table C2 – Aggressive Chemical Environment for concrete (ACAC) Classification for Brownfield Locations may be taken for the site. The pH values were recorded as 6.7 to 7.7 and since ground water was not encountered it can be assumed to be static, therefore, the ACEC site classification is AC-1s.

5.7 Surface Water Disposal

Borehole	Depth of test (m)	BRE 365 Soil Infiltration Rate (<i>f</i>) m/s
WS1	0.00-4.00	No soakage recorded

The results of the soakage tests carried out on the site show a virtually no soakage potential.

Conventional chamber soakaways are unlikely to be effective on this site. Consideration should be given to dispose of surface water off site. It is likely that deep bored soakaways extended into the underlying chalk stratum would be effective but the advice of the Environment Agency should be sought in this respect.

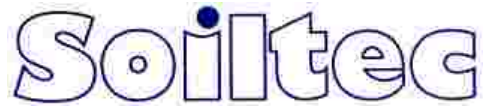


Martin King
Director

For and on behalf of

Soiltec Laboratories Limited

LABORATORY TEST RESULTS



SUMMARY OF LABORATORY TEST RESULTS

Date : June 2016

Report No: 07045/22

Client : John Burke Associates

Location :. St. Stephens, Haine Road, Ramsgate, Kent CT12 5ES

BH/TP	Depth (m)	INDEX PROPERTIES					Plasticity Classification (BS 5930 : 1999)	Modified Plasticity Index(NHBC Ch. 4.2)	Volume Change Potential (NHBC 4.2)
		Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing 425µm sieve			
WS1	2.00	33.3	79	25	54	100	CV	54	High
WS1	4.00	30.9	65	21	44	100	CH	44	High
WS2	1.00	30.0	69	21	48	100	CH	48	High
WS2	3.00	30.3	49	19	30	100	CI	30	Medium
WS3	1.00	35.2	64	21	43	100	CH	43	High
WS3	2.00	31.6	57	20	37	100	CH	37	Medium

Abbreviations:

C – Clays/silty clays

M – Silts

O – Organic

L – Low plasticity

I - Intermediate plasticity

H – High plasticity

V – Very high plasticity

E – Extremely high plasticity

NP – Non plastic

SOILTEC LABORATORIES LTD

CHEMICAL ANALYSIS REPORT

CLIENT: J Burke
SITE: St Stephens, Hain Road, Ramsgate
DATE SAMPLED: 25/05/16
SAMPLE REF: 07045/22
DATE SAMPLES RECEIVED: 25/05/16
SAMPLED BY: Soiltec
TESTED BY: Soiltec (AH/RJ)

REPORT No: 07045/22
REPORT DATE: 06/06/16
SPEC: BS1377 Part3:1990

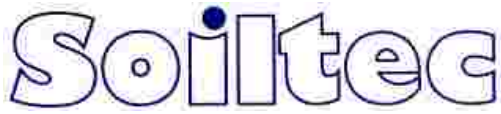
MATERIAL: Soil

RESULTS

Sample Location	Depth (m)	pH	Water Soluble Sulphate (mg/l) as SO_4^{2-}	Stone Content >2mm (% w/w)
BH1	0.75	6.7	15	<0.1
BH3	1.25	7.7	<10	<0.1

COMMENTS The analysis was carried out in accordance with BS1377 Part3:1990 i.e. the sulphate determination was carried out on the material passing a 2mm sieve.

IN-SITU TEST RESULTS



IN-SITU SHEAR VANE TESTS RESULTS

Date : June 2016

Report No: 07045/22

Client : John Burke Associates

Location : St. Stephens, Haine Road, Ramsgate. CT12 5ES

BH No.	Test Depth (m)	Cohesion (kPa)	Field Description
WS1	1.00	71	Firm silty CLAY
WS1	2.00	102	Stiff silty CLAY
WS2	1.00	99	Firm to stiff silty CLAY
WS2	2.00	100	Stiff silty CLAY
WS3	1.00	77	Firm to stiff silty CLAY
WS3	2.00	140	Stiff silty CLAY

Soiltec			RESULTS OF STANDARD PENETRATION TESTS					
			Date : June 2016			Report No: 07045/22		
Client : John Burke Associates			Location :. St. Stephens, Haine Rd, Ramsgate					
Borehole No.	Type of Test	Depth at start of Test (m)	Seating Drive	Test Drive				N-Value
			Blows for 150mm Penetration	Blows for 75mm penetration				
WS1	S	1.00	3	1	2	3	3	9
WS1	S	2.00	5	3	3	4	5	15
WS1	S	3.00	7	3	4	4	4	15
WS1	S	4.00	6	3	4	4	4	15
WS2	S	1.00	3	1	3	3	2	9
WS2	S	2.00	3	2	3	3	4	12
WS2	S	3.00	5	3	4	3	4	14
WS2	S	4.00	6	4	4	4	4	16
WS3	S	1.00	3	2	2	3	4	13
WS3	S	2.00	4	3	3	4	3	13
WS3	S	3.00	4	4	4	3	5	16
WS3	S	4.00	7	4	4	5	4	17

C denote Cone Penetration Test
S denotes Standard Penetration Test

BRE Digest 365 Soakage Test (Borehole Method)

Client : John Burke Associates	Date of Test : 25/05/16
Site : St. Stephens, Haine Road, Ramsgate	Report No: 07045/22

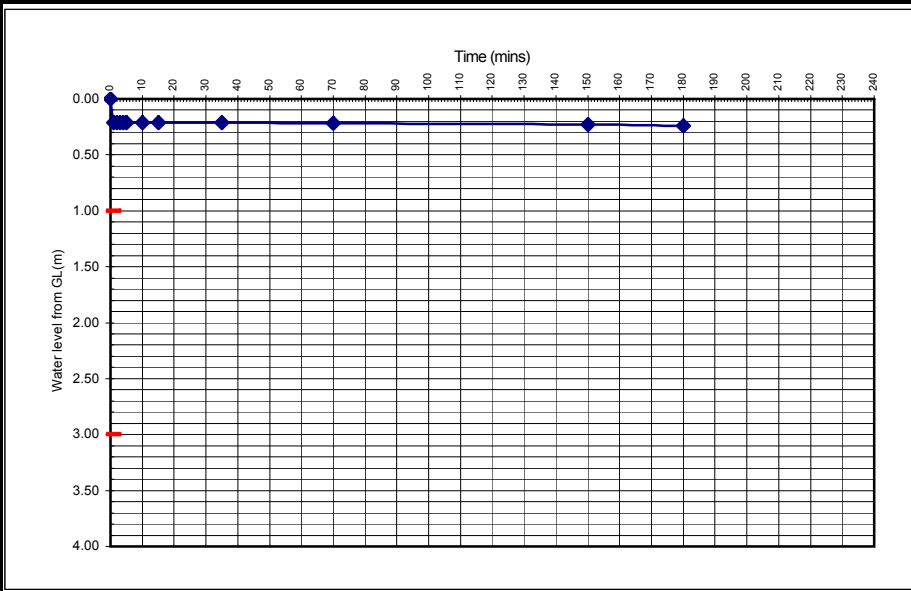
BH : **WS3**

Borehole:	
Diameter	0.15 m
Depth	4.00 m
Invert level	0.00 m
Assumed invert level*	0.00 m
Ground conditions	Silty CLAY

Results		
Water level at start of test	(bgl)	0 m
Depth of borehole	(bgl)	4 m
Effective storage depth		4 m
75% effective storage depth		3.00 m
depth below GL		3.00 m
25% effective storage depth		1.00 m
depth below GL		1.00 m
Effective volume of outflowing between 75% and 25%		0.9426 m ³
Effective storage depth 75%-25%		2.00 m
Mean surface area	(a _{p50})	0.4890 m ²
Out flow time to 75% effective depth from graph		N/A mins
Out flow time to 25% effective depth from graph		N/A mins
Outflow time	(Tp75%-Tp25%)	N/A mins

Soil Infiltration Rate (f) = N/A m/s

Time mins	Depth to water (m)
0	0.000
1	0.210
2	0.210
3	0.210
4	0.210
5	0.210
10	0.210
15	0.210
35	0.210
70	0.22
150	0.23
180	0.24



* or water level at start of test

Tested by	AH
Approved	MK

BOREHOLE LOGS

Client : **John Burke Associates**

Borehole No : **WS1**

Project : **St. Stephens, Haine Rd. Ramsgate**

Project No : **07045/22**

Date : **25/5/16**

SUB-SURFACE PROFILE			SAMPLE				STANDARD PENETRATION TEST				SHEAR VANE										
Depth (m)	Legend	Description	Elev/Depth (m)	Number	Type	Depth (m)	(SPT/CPT)				kPa										
							10	20	30	40	10	30	50	70	90	110	130				
1 2 3 4		<p>MADE GROUND Turf over dark brown sandy silty clay with occasional brick and ash fragments. Occasional fine roots.</p>	-0.3	1	U	0.00-1.00															
		<p>SILTY CLAY Firm light brown mottled orange weathered silty CLAY with some small ironstone deposits. Scattered roots.</p>	-0.9				●								■						
		<p>SILTY CLAY Firm to stiff weathered light brown mottled green grey silty CLAY with few roots to 1.05m depth. Below 1.90m, slightly fine sandy.</p>						●									■				
							3	U	2.00-3.00												
							4	U	3.00-4.00												
				5	SS	4.00-4.45															
		End of Log	-4.45																		
5																					
6																					

Water Strike : none

SOILTEC LABORATORIES LIMITED

Drill Method : Windowless Sampler

Water after 15mins : none


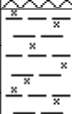
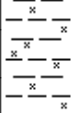

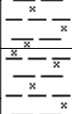
Client : John Burke Associates

Borehole No : WS2

Project : St. Stephens, Haine Rd. Ramsgate

Project No : 07045/22

Date : 25/5/16

SUB-SURFACE PROFILE			SAMPLE				STANDARD PENETRATION TEST				SHEAR VANE									
Depth (m)	Legend	Description	Elev/Depth (m)	Number	Type	Depth (m)	(SPT/CPT)				kPa									
							10	20	30	40	10	30	50	70	90	110	130			
		MADE GROUND Turf over dark brown sandy silty clay with occasional brick, chalk and ash fragments. Occasional fine roots.	-0.45	1	U	0.00-1.00														
1		SILTY CLAY Firm light brown mottled orange green weathered slightly sandy silty CLAY with some small chalk pellets. Scattered roots to 0.90m depth.		2	U	1.00-2.00		●												■
2		SILTY CLAY Firm to stiff weathered locally friable light brown mottled green grey slightly fine sandy silty CLAY	-2	3	U	2.00-3.00		●												■
3				4	U	3.00-4.00			●											
4				5	SS	4.00-4.45			●											
		End of Log	-4.45																	
5																				
6																				

Water Strike : none

SOILTEC LABORATORIES LIMITED

Drill Method : Windowless Sampler

Water after 15mins : none

Sheet : 1 of 1



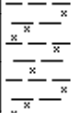
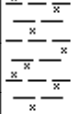
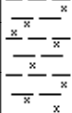
Client : John Burke Associates

Borehole No : WS3

Project : St. Stephens, Haine Rd. Ramsgate

Project No : 07045/22

Date : 25/5/16

SUB-SURFACE PROFILE			SAMPLE				STANDARD PENETRATION TEST				SHEAR VANE									
Depth (m)	Legend	Description	Elev/Depth (m)	Number	Type	Depth (m)	(SPT/CPT)				kPa									
							10	20	30	40	10	30	50	70	90	110	130			
		MADE GROUND Turf over dark brown sandy silty clay with much brick and ash fragments. Occasional fine roots.	-0.45	1	U	0.00-1.00														
1		SILTY CLAY Firm (stiff below 1.50m) light brown mottled orange grey weathered slightly sandy silty CLAY with some small chalk pellets. Scattered roots to 1.55m depth.		2	U	1.00-2.00		●											■	
2				3	U	2.00-3.00		●												■
3		SILTY CLAY Firm to stiff weathered locally friable light brown mottled green grey slightly fine sandy silty CLAY with occasional seams of fine sand and ironstone fragments.	-2.6	4	U	3.00-4.00		●												
4				5	SS	4.00-4.45		●												
		End of Log	-4.45																	
5																				
6																				

Water Strike : none

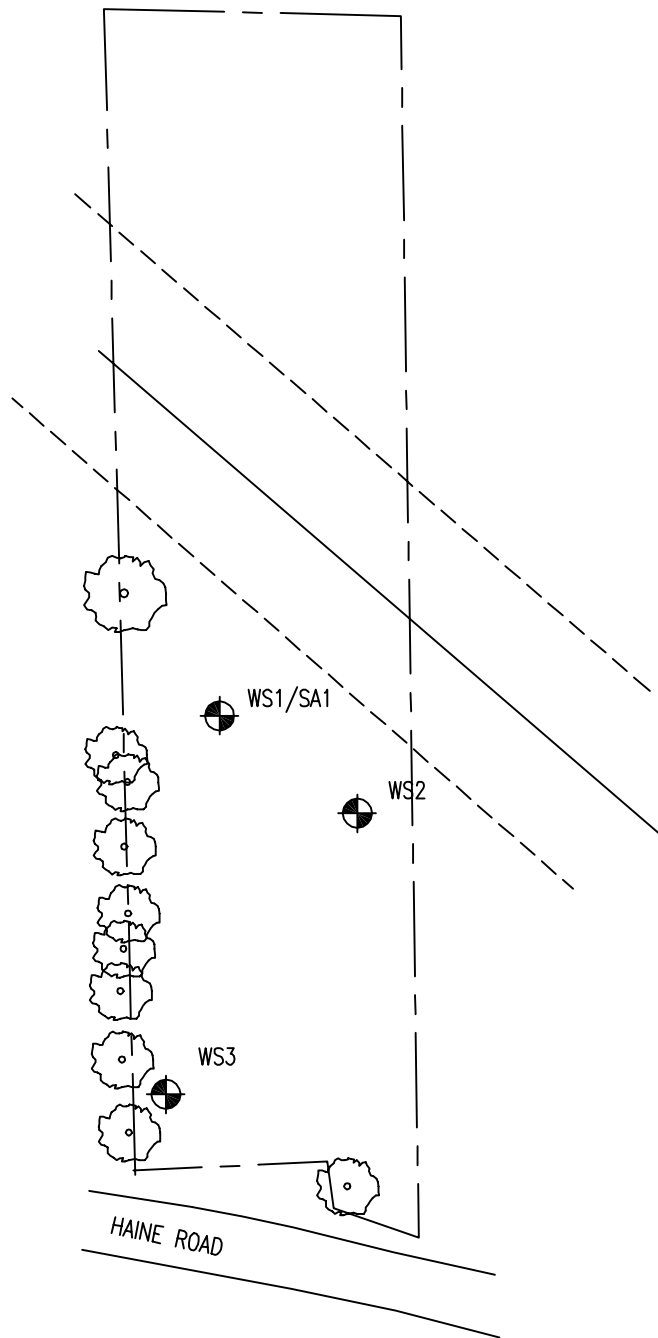
SOILTEC LABORATORIES LIMITED

Drill Method : Windowless Sampler

Water after 15mins : none

Sheet : 1 of 1

SITE PLAN



Scale: nts

Drawn : MRK

Location : St. Stephens, Haine Rd, Ramsgate.

Report: 07045/22

Title : SITE LOCATION PLAN

Fig. No.: 4

**Appendix A –
Waste Acceptance Criteria Certificate**



Soiltec Laboratories Limited
Soiltec House, Langley Park
Sutton Road, Langley,
Maidstone, Kent ME17 3NQ

Telephone: 01622 862138
(Two Lines) 01622 862904
E-mail: info@soiltec.net
Web: www.soiltec.net

LABORATORY REPORT

Date : 6th June 2016

Report No : 07045/22

Your Ref: JB

Client : J Burke

Site/Subject: St Stephens, Hain Road, Ramsgate, Kent

This report details the results of the chemical analysis carried out on the soil sample taken from the above site.

The sample was as follows:

A composite sample taken from the geotechnical site investigation borehole 2 from existing ground level to 2.0m. This material would be typical of the material to be removed from the site as part of the development works.

The EU Landfill Directive suite of Waste Acceptance Criteria (WAC) tests, two stage leachable and solid suite was carried out on the sample and the results show that the material could be disposed as inert waste at a landfill that is licensed to accept such waste.

The results of EU Landfill Directive suite of Waste Acceptance Criteria tests must not be used to assess any contamination issues on the site and must only be used for the classification for disposal at landfill.

Keith Huxley CSci CChem MRSC MIEnvSc
Encs: Chemical analysis results (2 pages)



SOILTEC LABORATORIES LTD

EU Landfill Directive Waste Acceptance Criteria (WAC) Leachable Determinands

CLIENT: J Burke
SITE: St Stephens, Hain Road, Ramsgate
DATE SAMPLED: 25/05/16
SAMPLE REF: Sample received on 25/05/16
SAMPLED BY: Soiltec
TESTED BY: QTS (UKAS/MCERTS 4480)

REPORT No: 07045/22
REPORT DATE: 06/06/16
SPEC: EULD

RESULTS

Sample ID	WAC	Inert	Limit	
			Values (mg/kg) at L/S 10 l/kg	
Sample Location	BH2		snrh (nhl)	Haz
Sample Depth (m)	GL-2.0			
Arsenic as As	<0.2	0.5	2	25
Barium as Ba	0.1	20	100	300
Cadmium as Cd	<0.02	0.04	0.1 (1)	1 (5)
Chromium as Cr	<0.2	0.5	10	70
Copper as Cu	<0.5	2	50	100
Mercury as Hg	<0.01	0.01	0.02 (0.2)	0.4 (2)
Molybdenum as Mo	<0.1	0.5	10	30
Nickel as Ni	<0.2	0.4	10	40
Lead as Pb	<0.2	0.5	10	50
Antimony as Sb	<0.06	0.06	0.7	5
Selenium as Se	<0.1	0.1	0.5	7
Zinc as Zn	<0.2	4	50	200
Chloride as Cl	<12	800	15000	25000
Fluoride as F	<1	10	150	500
Sulphate as SO ₄ ²⁻	<20	1000	20000	50000
Total Dissolved Solids (TDS)	523	4000	60000	100000
Phenol Index	<0.5	1		
Dissolved Organic Carbon	70	500	800	1000

COMMENTS

L/S = Leachate to Soils ratio

snrh (nhl) = Stable non-reactive hazardous waste in non-hazardous landfill

It must be noted that should the above limits are achieved for inert waste landfill, the additional analytical limits that are carried out on the waste direct must also be achieved.

The figures in parenthesis for cadmium and mercury are permitted if a site specific risk assessment determines that there is no acceptable discharge to groundwater.

Keith Huxley CSci CChem MRSC MEnvSc
Date: 06/06/16

Page 1 of 2

Soiltec House~Langley Park~Sutton Road~Langley~Maidstone~Kent ME17 3NQ

SOILTEC LABORATORIES LTD

EU Landfill Directive Waste Acceptance Criteria (WAC) Total Determinands

CLIENT: J Burke
SITE: St Stephens, Hain Road, Ramsgate
DATE SAMPLED: 25/05/16
SAMPLE REF: Sample received on 25/05/16
SAMPLED BY: Soiltec
TESTED BY: QTS (UKAS/MCERTS 4480)

REPORT No: 07045/22
REPORT DATE: 06/06/16
SPEC: EULD

RESULTS

Sample ID	WAC		Limit Values	
Sample Location	BH2	Inert	snrh (nhl)	Haz
Sample Depth (m)	GL-2.0			
Total Organic Carbon (%)	0.3	3	5	6
Total BTEX	<0.05	6		
PCB's (7 congeners)	<0.1	1		
Mineral Oils (C ₁₀ -C ₄₀)	<10	500		
Total PAH's	<1.7	100	tbe	tbe
pH	8.0		>6	
Acid Neutralisation Capacity (mol/kg)	<1	tbe	tbe	tbe

COMMENTS All the analysis was carried out on the soil or waste direct.

All values are mg/kg unless stated.

snrh (nhl) = Stable non-reactive hazardous waste in non-hazardous landfill

tbe = To be evaluated