

A REPORT

ON A

SITE INVESTIGATION

AT

**HERNE HOUSE
MORRIS AVENUE
HERNE BAY
CT6 8BB**

FOR

IMPRESSIVE ERECTIONS LIMITED

BY

SOILTEC LABORATORIES LIMITED

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

Date: August 2018

Report No: 08184/24

**A REPORT ON A SITE INVESTIGATION AT HERNE HOUE, MORRIS AVENUE,
HERNE BAY, CT6 8BB FOR IMPRESSIVE ERECTIONS LIMITED
BY SOILTEC LABORATORIES LIMITED.**

Date : August 2018

Report No : 08184/24

Table of Contents

1. INTRODUCTION
2. DESCRIPTION AND GEOLOGY OF THE SITE
3. FIELD WORK
4. LABORATORY TESTING
5. DISCUSSION
6. DATA PRESENTATION

Laboratory Test Results
In-Situ Test Results
Borehole Logs
Site Plan

Appendix A – Waste Acceptance Criteria Certificate

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 re-develop the property known as Herne House located to the northwest of Morris Avenue, Herne Bay, Kent. The development is to comprise a three storey block of flats with associated hard standings landscaping. At the request of Impressive Erections Limited an investigation was carried out to provide information on ground conditions for foundation design.

At the time of the investigation the form of construction and foundation loads were not known to Soiltec Laboratories Limited.

Soiltec Laboratories Limited was instructed to complete the required investigation work by email dated 9th July 2018 in response to our quotation for a ground investigation.

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 site is located adjacent to the northern end of Morris Avenue and comprises the original Herne House set in open gardens. The site is bounded by dwelling houses to the east, south and west with the northern boundary exposed to the sea. A number of trees are located on these boundaries, some of which may be significant in relation to foundation design.

From an examination of data supplied by British Geological Survey the solid geological deposit for the site is London CLAY. No superficial deposits are recorded for the site.

London Clay

London Clay is lithologically very uniform and consists principally of marine clay, blue when fresh but weathering to brown. At the base of the formation a thin pebble bed containing dark flints commonly occurs and at various horizons calcareous concretions, either in bands or as large nodules also occur.

3.0 FIELD WORK

The fieldwork undertaken comprised the excavation of light cable percussion boreholes during the period 26th to 30th July 2018. The boreholes were located as close as possible to the foot print of the proposed development.

The table below indicates the number of boreholes and depths achieved.

Borehole	Depth (m bgl)
SA1	18.50
SA2	18.50

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 and undisturbed U100 soil samples were taken at the depths shown on the records and were returned to the laboratory for examination and testing.

A single water monitoring point was installed in SA2 after completion as shown on the borehole records.

Where Standard Penetration Tests (SPT/CPT) are carried out they conform to BS EN ISO 22476-3:2005 + A1:2011. 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 any coarse grained soils has been derived from the uncorrected standard penetration resistance N value using the relationship after Peck, Hanson and Thorburn (1967).

4.0 LABORATORY TESTING

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

Test	No.
Natural moisture content	4
Liquid & Plastic Limits	4
Undrained Triaxial Compression	9
BRE SD-1 Suite	2
WAC test	1

Values of between 62% and 83% were recorded for Liquid Limits (LL) and 21% to 27% 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.

Moderate to high concentrations of soluble sulphate together with near neutral pH were found within the samples tested

Shear strengths (cohesion) derived from the U100 samples ranged from 38kPa to 244kPa with average value of 123kPa.

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. The site is shown to be overlain with a thin mantle of made ground/topsoil between 0.45m to 0.60m. From these depths, soft or soft to firm brown weathered silty clay was encountered to between 7.80m to 9.50m. Stiff grey fissured silty clay was then encountered to the full depths of both boreholes at 18.45m. Full descriptions of the strata encountered are shown on the borehole records.

5.2 Ground Water

Ground water was not encountered during the site works.

5.3 Foundations

The foundation design must be suitable for the conditions present at the site. It is recommended that all foundations are extended through any made or disturbed ground, desiccated soil, roots and to terminate wholly in the natural soils. 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 results of the geotechnical laboratory testing conducted on samples indicate the soils to be of high shrinkage potential, as defined by NHBC Chapter 4.2. Therefore, the foundation depths should be determined in relation to the high shrinkage potential of the soils and location of any significant vegetation that is either to remain or be removed.

Traditional spread foundations :

The shallow soils encountered will be suitable for traditional strip or pad foundations. Taking into account comments made above, a minimum foundation depth of 1.00m may be taken for preliminary design purposes. At that depth it is considered that a net allowable bearing capacity of 65kPa would be suitable for strip, trench fill or pad foundations.

From details supplied by the Client, in the form of elevation and plan drawings, it is likely that this bearing capacity will not be sufficient to carry the likely foundation loads.

Therefore it is recommended that a pile solution is adopted for this development.

Pile Foundation :

It is outside the scope of this report to give specific pile design data. This will depend on the type of pile solution selected and the loads required to be carried. The advice of specialist piling contractors should be sought. However, the following table has been

produced using CADS Bearing Pile Designer software to give an indication of theoretical pile load that may be achieved on the site.

In preparing this table a number of assumptions are made in relation to the design characteristics of bored piles. The ultimate skin friction is taken as 45% the average cohesion down the length of the pile and the ultimate end bearing is taken as nine times the cohesion value at the base of the pile.

Pile Diameter (m)	Pile Length (m)	Total Ultimate Load (kN)
0.35	10	466
	12	633
	14	744
	16	1078
0.45	10	628
	12	853
	14	992
	16	1463

A factor of safety should be added to the above values of between 2.50 and 3.00 depending on pile type and spacing.

5.4 Ground Floors

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.

5.5 Sulphates

Sulphates and Acidity

Moderate to high concentrations of soluble sulphate were found within the samples tested. It is therefore concluded that a Design Sulphate Class of DS-4 as indicated in Table C2 – Aggressive Chemical Environment for concrete (ACAC) Classification for Brownfield Locations may be taken for the site. The recorded pH value is 8.0 and since ground water was not encountered it can be assumed to be static, therefore, the ACEC site classification is AC-3s.

A handwritten signature in black ink, appearing to read 'M King', is written over a faint circular stamp or watermark.

Martin King
Director

For and on behalf of

Soiltec Laboratories Limited

LABORATORY TEST RESULTS



SUMMARY OF LABORATORY TEST RESULTS

Date : August 2018

Client : Impressive Erections Limited

Report Number : 08184/24

Location :. Herne House, Morris Avenue, Herne Bay, Kent. CT6 8BB

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			
SA1	1.00	23.8	62	21	41	100	CH	41	High
SA1	2.00	32.7	83	27	56	100	CV	56	High
SA2	2.00	24.4	81	22	59	100	CV	59	High
SA2	3.00	33.9	82	23	59	100	CV	59	High

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



UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Date : August 2018

Client : : Impressive Erections Limited

Report No : 08184/24

Location : Herne House, Morris Avenue, Herne Bay, Kent. CT6 8BB

BH/TP	Sample Depth (m)	TEST RESULTS							Sample Description
		Moisture Content (%)	Bulk Density (Mg/m ³)	Cell Pressure (kPa)	Comp. Stress (kPa)	Strain (%)	Cohesion (kPa)	Ø°	
SA1	2.00	28.8	1.62	40	76	15.5	38	-	Soft brown silty CLAY
SA1	4.00	28.6	1.88	80	140	5.5	70	-	Firm brown silty CLAY
SA1	6.00	28.7	1.94	120	196	6.6	98	-	Firm to stiff grey silty CLAY
SA1	8.00	37.4	1.92	160	185	7.7	93	-	Firm to stiff grey silty CLAY
SA1	10.00	26.4	1.97	200	252	7.4	126	-	Stiff grey silty CLAY
SA1	12.00	27.2	1.97	240	224	5.7	112	-	Stiff grey silty CLAY
SA1	14.00	26.4	2.00	280	488	5.4	244	-	Stiff grey silty CLAY
SA1	16.00	30.3	1.91	320	295	13.6	147	-	Stiff grey silty CLAY
SA2	18.00	30.3	1.92	360	364	6.5	182	-	Stiff grey silty CLAY

Test method : 100mm single stage

SOILTEC LABORATORIES LTD

CHEMICAL ANALYSIS REPORT

CLIENT: Impressive Erections
SITE: Herne House, Morris Avenue, Herne Bay
DATE SAMPLED: 27/07/18
SAMPLE REF: 08184/24
DATE SAMPLES RECEIVED: 27/07/18
SAMPLED BY: Soiltec
TESTED BY: Soiltec (AH/RJ)

REPORT No: 08184/24
REPORT DATE: 08/08/18

RESULTS

Sample Location	BH1	BH2
Depth (m)	2.5	1.0
Stone Content >2mm (% w/w)	<0.1	<0.1
pH	8.0	8.0
Water Soluble Sulphate (mg/l) as SO ₄ ²⁻	3940	1400
Water Soluble Chloride (mg/l) as Cl ⁻	331	37
Water Soluble Nitrate (mg/l) as NO ₃ ⁻	<1.5	2.8
Water Soluble Magnesium (mg/l) as Mg ²⁺	150	20

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.

BOREHOLE RECORDS

Carried out for : Impressive Erections Ltd

BH NO : SA1






















Location : Herne House, Morris Av. Herne Bay

Report No : 08184/24

Elevation :

Date : 26/7/18

Coordinates : 614697,167717

Depth (m)	Legend	Description	Depth (m)	Sample Depth (m)	Sample No.	Type	N - Value	SPT/CPT				Installation	Remarks
								10	20	30	40		
0		Ground Surface	0										
		MADE GROUND Turf over dark brown sandy loam topsoil with scattered flints and few roots.	-0.6										
1		SILTY CLAY Soft light orange brown mottled grey weathered silty CLAY		1.00	1	D							
2				2.00-2.45	2	U						27 Blows	
				2.5	3	D							
3				3.0	4	D							
			-3.8										
4		SILTY CLAY Firm becoming firm to stiff light brown mottled orange and grey weathered silty CLAY [LONDON CLAY].		4.00-4.45	5	U						38 Blows	
				4.50	6	D							
5				5.00	7	D							
				6.00-6.45	8	U						45 Blows	
6				6.50	9	D							
7				7.00	10	D							
				8.00-8.45	11	U						51 Blows	
8				8.50	12	D							
9				9.00	13	D							
			-9.5										
10		SILTY CLAY Stiff grey fissured silty CLAY with random claystone fragments. [LONDON CLAY]		10.0-10.45	14	U						57 Blows	
				10.5	15	D							
11				11.00	16	D							
													
12												59 Blows	

Excavation Method : Shell & Auger

Soiltec Laboratories Limited

FIG : 1

Borehole Diam : 150mm

Logged By : SM/AB

Casing Depth : 1.50m

Ground Water : dry

Sheet : 1 of 2

Carried out for : Impressive Erections Ltd
 Location : Herne House, Morris Av. Herne Bay
 Elevation :
 Coordinates : 614697,167717

BH NO : SA1
 Report No : 08184/24
 Date : 26/7/18

Depth (m)	Legend	Description	Depth (m)	Sample Depth (m)	Sample No.	Type	N - Value	SPT/CPT				Installation	Remarks
								10	20	30	40		
13		SILTY CLAY Stiff grey fissured silty CLAY with random claystone fragments. [LONDON CLAY]		12.0-12.45	17	U							
				12.50	18	D							
				13.00	19	D							
14				14.0-14.45	20	U							64 Blows
				14.00	21	D							
15				15.00	22	D							
16				16.0-16.45	23	U							71 Blows
				16.50	24	D							
17				17.00	25	D							
18				18.0-18.45	26	U							76 Blows
			-18.5	18.5	27	D							
19		End of Log											
20													
21													
22													
23													
24													

Excavation Method : Shell & Auger

Soiltec Laboratories Limited

FIG : 1

Borehole Diam : 150mm

Logged By : SM/AB

Casing Depth : 1.50m

Ground Water : dry

Sheet : 2 of 2

Carried out for : Impressive Erections Ltd
 Location : Herne House, Morris Av. Herne Bay
 Elevation :
 Coordinates : 614696,167693

BH NO : SA2
 Report No : 08184/24
 Date : 30/7/18

Depth (m)	Legend	Description	Depth (m)	Sample Depth (m)	Sample No.	Type	N - Value	SPT/CPT				Installation	Remarks
								10	20	30	40		
0		Ground Surface	0										
		MADE GROUND Turf over dark brown sandy loam topsoil with scattered flints and few roots.	-0.45										
1		SILTY CLAY Firm light orange brown mottled grey weathered silty CLAY		1.00	1	D							
2				2.00-2.45	2	U							19 Blows
		SILTY CLAY Firm to stiff light brown mottled orange and grey weathered silty CLAY [LONDON CLAY].	-2.7	2.5	3	D							
3				3.0	4	D							
4				4.00-4.45	5	U							31 Blows
				4.50	6	D							
5				5.00	7	D							
6				6.00-6.45	8	U							44 Blows
				6.50	9	D							
7				7.00	10	D							
8			-7.8	8.00-8.45	11	U							51 Blows
		SILTY CLAY Stiff grey fissured silty CLAY with random claystone fragments. [LONDON CLAY]		8.50	12	D							
9				9.00	13	D							
10				10.0-10.45	14	U							59 Blows
				10.5	15	D							
11				11.00	16	D							
12													63 Blows

Excavation Method : Shell & Auger

Soiltec Laboratories Limited

FIG : 2

Borehole Diam : 150mm

Logged By : SM/AB

Casing Depth : 1.50m

Ground Water : dry

Sheet : 1 of 2

Carried out for : Impressive Erections Ltd
 Location : Herne House, Morris Av. Herne Bay
 Elevation :
 Coordinates : 614696,167693

BH NO : SA2
 Report No : 08184/24
 Date : 30/7/18

Depth (m)	Legend	Description	Depth (m)	Sample Depth (m)	Sample No.	Type	N - Value	SPT/CPT				Installation	Remarks
								10	20	30	40		
13 14 15 16 17 18		SILTY CLAY Stiff grey fissured silty CLAY with random claystone fragments. [LONDON CLAY]		12.0-12.45	17	U							66 Blows
				12.50	18	D							
				13.00	19	D							
				14.0-14.45	20	U							
				14.00	21	D							
				15.00	22	D							
				16.0-16.45	23	U							
				16.50	24	D							
				17.00	25	D							
				18.0-18.45	26	U							
				-18.5	18.5	27		D					
19		End of Log											
20													
21													
22													
23													
24													

Excavation Method : Shell & Auger

Soiltec Laboratories Limited

FIG : 2

Borehole Diam : 150mm

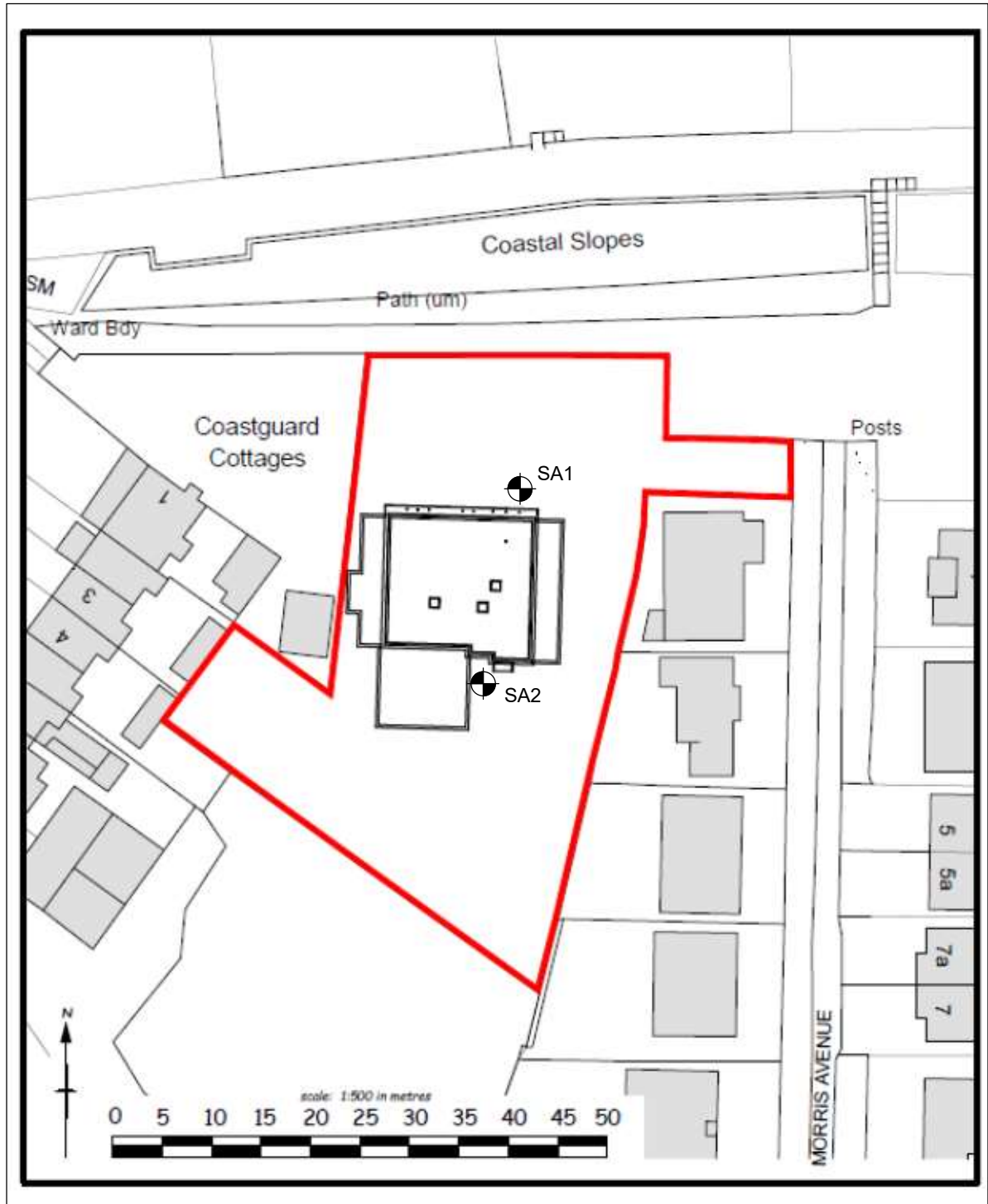
Logged By : SM/AB

Casing Depth : 1.50m

Ground Water : dry

Sheet : 2 of 2

SITE PLAN



Scale: nts

Drawn : MRK

Location : Herne House, Morris Ave. Herne Bay

Report: 08184/24

Title : BOREHOLE LOCATION PLAN

Fig. No.: 3

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 : 8th August 2018

Report No : 08184/24

Your Ref: RB

Client : Impressive Erections

Site/Subject: Herne House, Morris Avenue, Herne Bay, 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 1 from existing ground level to 4.0m. This material would be typical of the material to likely 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 stable non reactive hazardous waste in a non hazardous landfill at a landfill that is licensed to accept such waste. This is due the sulphate and total dissolved solids levels.

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 RSoBRA
Encs: Chemical analysis results (2 pages)



SOILTEC LABORATORIES LTD

EU Landfill Directive Waste Acceptance Criteria (WAC) Leachable Determinands

CLIENT: Impressive Erections
SITE: Herne House, Morris Avenue, Herne Bay
DATE SAMPLED: 27/07/18
SAMPLE REF: Sample received on 27/07/18
SAMPLED BY: Soiltec
TESTED BY: QTSE (UKAS/MCERTS 4480)

REPORT No: 08184/24
REPORT DATE: 08/08/18
SPEC: EULD

RESULTS

Sample ID	HH1	Inert	Limit	
			Values (mg/kg) at L/S 10 l/kg	
Sample Location	BH1		snrh (nhl)	Haz
Sample Depth (m)	GL-4.0			
Arsenic as As	<0.2	0.5	2	25
Barium as Ba	0.5	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	226	800	15000	25000
Fluoride as F	5.1	10	150	500
Sulphate as SO ₄ ²⁻	15746	1000	20000	50000
Total Dissolved Solids (TDS)	17818	4000	60000	100000
Phenol Index	<0.5	1		
Dissolved Organic Carbon	31	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 MIEEnvSc RSoBRA
Date: 08/08/18

Page 1 of 2

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SOILTEC LABORATORIES LTD

EU Landfill Directive Waste Acceptance Criteria (WAC) Total Determinands

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RESULTS

Sample ID	HH1		Limit Values	
Sample Location	BH1	Inert	snrh (nhl)	Haz
Sample Depth (m)	GL-4.0			
Total Organic Carbon (%)	0.1	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	7.4		>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