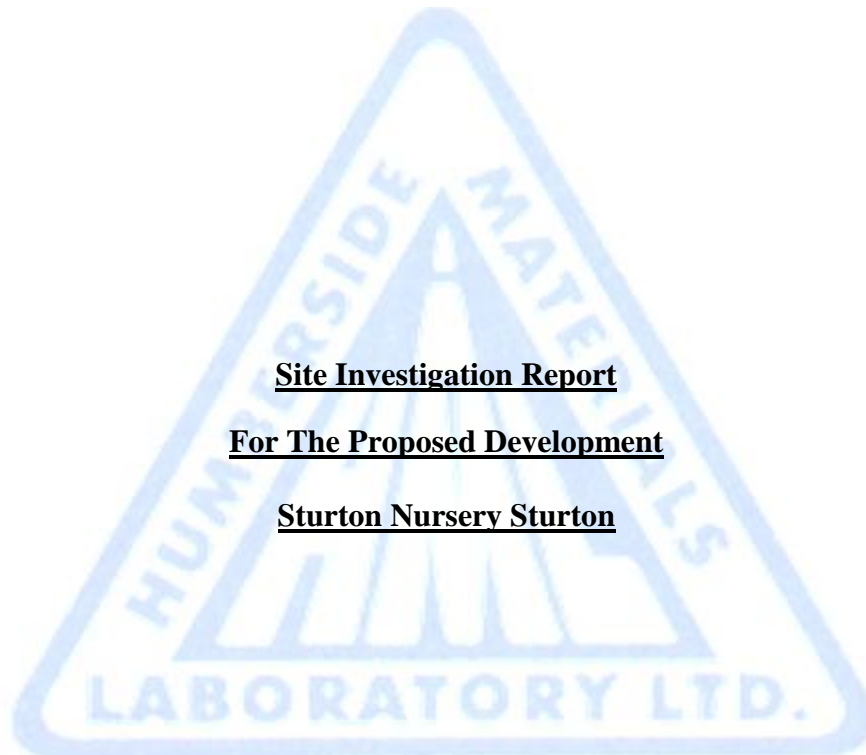


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Site Investigation Report
For The Proposed Development
Sturton Nursery Sturton

Client: M Smalley

Date: January 2019
Report: 001/4720/P

SITE INVESTIGATION REPORT FOR
PROPOSED DEVELOPMENT
STURTON NURSERY STURTON

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1.0 Introduction

At the request of the Mr M Smalley, Humberside Materials Laboratory Limited (HML) were engaged to undertake a contaminated land ground investigation for the proposed development on land at Sturton Nursery, in Sturton near Scawby, North Lincolnshire.

The aim of the investigation is to assess potential contamination at the site with respect to proposed development works. The scope of the investigation includes a review of desk top information, excavation of three number trial pits, soil sampling and geochemical laboratory testing with an assessment of the findings. In addition, two trial pits were excavated to determine an infiltration rate.

This report is produced solely for Mr M Smalley and should only be copied in full. When transmitted electronically, the definitive copy of the report is held by Humberside Materials Laboratory Ltd.

The comments given in this report and the opinions expressed assume that ground conditions do not vary beyond the range revealed by the investigation.

2.0 Desk Study Information

Various desk top sources of information have been reviewed as part of this investigation into the current site. This includes the HML report 001/4720 dated November 20018, which contains site data and historical maps included within an Envirocheck Report (Order Number: 186695217_1_1) supplied by Landmark Information Group.

Other reviewed sources include local Ordnance Survey (OS) maps and geological map (BGS, 1983). In addition, a site walkover was carried out, allowing further information to be collected.

A summary of the relevant findings of the desk top information is presented below. For further details, reference should be made directly to the Phase 1 (desk study) report.

2.1 Site description and topography

The site is situated on the southern outskirts of Sturton, Scawby off Main Street. It occupies land used for Sturton Nursey, a wholesale producer. The land is irregular in shape with a total area of 0.39 Ha, it measures approximately 50m by 75m.

The site is centred around national grid reference (NGR) 496890 404520. The proposed site will be accessed from Main Street along the current access to the nursery.

The site Comprises of a barn and several greenhouses. The rear section is open grass land which was historically used as a vegetable garden. Views of the site are presented in appendix A.

The site has been in operation by the family since 1945 when it was started with a single greenhouse. The main operations have been growing bedding plants from seeds for wholesale. Within the green houses there are thin concrete footpaths, the soils to the sides of these are covered by a weed inhibiting geotextile, with raised growing tables.

The site is in an area with a level of 23m above ordinance datum. The land is on a gradual slope to the east. The A15 is circa 40m OD (1km west) and the B1206 is 10m OD (0.2km East).

2.2 Proposed works

It is proposed to develop the site by constructing 3 or 4 plots which will be west facing. The existing barn will be converted. An access road will run along the western boundary. No detailed plan is available at this stage.

Much of the site is expected to contain private gardens, predominantly to the eastern side. It is assumed that the residential gardens may be used to cultivate homegrown produce for human consumption. Therefore, the contamination assessment of the site will predominantly be based on residential with home grown produce.

2.3 Site History

The site history has been reviewed using historical maps and photographs which were presented previously. These include land survey maps dated from as early as 1887 to as recently as 2018.

The site has been a nursey since at least 1945. Historically there have been various green houses on the site. The barn present was built prior to 1987. The surrounding area has been farms and housing with other open fields.

Due to the fact that old buildings have been on site, there is potential that this may have contained asbestos and as such may have impacted the soils.

Pesticides and herbicide other than as treatment on seeds has not be used within the past 50 years.

An above ground heating oil tank has been on site that could give rise to petroleum hydrocarbon contamination. This was inspected and no contamination noted at or around the base.

2.4 Site Geology

Inspection of a local geological map (BGS, 1983) shows the site does not contain any drift deposits. However the solid geology could give rise to weathered limestone as sand or clay. The bedrock is anticipated to be shallow and consist of Santon Oolite and Kirton Cementstone.

2.5 Hydrology

The nearest reported surface water feature is located about 1171m northwest of the site. These are minimal and flow to the east.

BGS data indicates the site is at risk to flooding to occur below ground. It is not at risk from flooding or extreme flooding from rivers and seas.

2.6 Hydrogeology

In terms of groundwater vulnerability the soils are classed as high leaching potential. The bedrock aquifer is designated as a principal aquifer.

2.7 Environmental setting

No record has been found of any significant pollution incident near the site. There have been no reported pollution incidents to Controlled Waters within 500m of the site. Within 500m of the site, there is no record of any Prosecution Relating to Controlled Waters, Integrated Pollution Control (IPC), Integrated Pollution Prevention and Control (IPPC) or Local Authority (LA) IPC, PPC or IPPC enforcement.

There are no reported sites containing especially hazardous substances nearby. There are no reported Registered Radioactive Substances, Control of Major Accident Hazards Sites (COMAH) or Explosive Sites within a kilometre.

There is generally no reported evidence of potential contamination near the site. Within 500m, there are no recorded IPC Registered Waste Sites, Licensed Waste Management Facilities, (Registered, Historical, BGS Recorded or LA Recorded) Landfill Sites, Potentially Infilled Land or Registered Waste (Transfer or Treatment and Disposal) Sites. Similarly, there are no nearby fuel stations.

The site is in a *Lower* probability radon area where no radon protective measures are considered necessary for the construction of new housing properties.

BGS data provides estimations of concentrations of contaminants in rural soil at the location of the site. These include estimated levels for arsenic, cadmium, chromium, lead and nickel, as shown below (in Table 2).

Table 2: BGS Estimated Soil Chemistry (rural soil)	
<i>Contaminant</i>	<i>Concentration (mg/kg)</i>
Arsenic	15 - 25
Cadmium	< 1.8
Chromium	40 - 60
Lead	<100
Nickel	15 - 30

3.0 Initial Contaminated Land Assessment

3.1 Assessment principles

Current legislation and best practice, such as Part IIA of the Environmental Protection Act and CLR 11 (EA/Defra, 2004), recommend that potentially contaminated land is best managed using a risk-based approach. Model procedures to assess the risks from contaminated land involve the development of a conceptual site model (CSM) and the identification of relevant contamination linkages (RCLs).

A relevant contamination linkage (RCL) comprises a *source* (i.e. a contaminant capable of causing pollution or harm), a *receptor* and a viable *pathway* by which one can be transmitted to the other. If one of these three elements are missing, there is no significant risk.

Any risk from potential contamination can be assessed as a product of the severity of the consequences of the hazard from the contamination and the probability of the hazard occurring, as outlined in CIRIA C552 written by Rudland and co-workers (2001). The definitions used to perform the risk assessment for the subject site are shown below (in Tables 3 and 4).

Classification	Category/Definition			
	Human	Controlled waters	Property	Eco system
Severe	Short term acute risk	Short term risk	Catastrophic damage	Short term risk
Medium	Chronic damage	Pollution to sensitive water resources		Significant change
Mild		Pollution to non-sensitive water resources	Significant damage	Significant damage
Minor	Non-permanent health effects		Repairable damage	

Table 4: Probability of hazard being realised	
Classification	Definition
Highly likely	There is a pollution linkage and an event that appears very likely in the short term and or almost inevitable over a long term, or evidence at the receptor of harm or pollution
Likely	There is a pollution linkage and all elements are present which means that it is probable that an event will occur.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event will occur. However, it is not certain that even over a long period such an event would occur and is less likely in the short term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the long term.

The largest risks are where the severity of the contaminant is great and the probability of the contaminant linkage occurring is highly likely. A matrix can be used to determine a suitable risk classification, as shown below (in Table 5). The definitions of the different classifications used in this assessment based on CIRIA C552 (Rudland *et al.*, 2001) are also shown below (in Table 6).

Table 5: Risk classification matrix					
		Consequence			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Medium	Medium/low
	Likely	High	Medium	Medium/low	Low
	Low likelihood	Medium	Medium/low	Low	Very low
	Unlikely	Medium/low	Low	Very low	Very low

Table 6: Risk classification definition	
Classification	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm to a designated receptor is currently occurring. This risk if realised is likely to result in a substantial liability. Investigation and or remediation is required.
High	Harm is likely to a designated receptor from an identified hazard or there is evidence that severe harm to a designated receptor is currently occurring. This risk if realised is likely to result in a substantial liability. Investigation and or remediation may be necessary in the short term and likely over the long term.
Medium	It is possible that harm could arise to a designated receptor from the identified hazard. However, it is relatively unlikely that such a hazard would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify and determine the potential risk. Some remedial works may be required in the long term.
Low	It is possible that harm could arise to a designated receptor from the hazard identified, but is likely that this hazard if realised would at worst normally be mild.
Very low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe

3.2 Potential contamination linkages

3.2.1 *Sources of contamination*

The *sources* of contamination at the site are as shown below (in Table 7).

Table 7: Potential sources of contamination		
	<i>Potential contaminants</i>	
<i>Contamination group</i>	<i>Category name</i>	<i>Notes</i>
Natural soils	PAH	General contamination
	Metals	General contamination
	Asbestos	Residual from buildings
	Pesticides & herbicides	Minimal usage due to growth in pots
	TPH	Area around fuel tank

Therefore with the exception of pesticides and herbicides the above have been considered in this initial investigation.

3.2.2 *Pathways*

There are many potential pathways to receptors. These may include:

- Inhalation (i.e. indoor or outdoor dust or vapour)
- Ingestion (i.e. swallowing soil, dust or homegrown produce)
- Absorption (i.e. dermal contact with soil)
- Migration (i.e. vertical/lateral movement through soil, groundwater, voids and along services)

3.2.3 *Receptors*

Receptors comprise those things or beings that may be impacted by contaminants. These include:

- human site users (i.e. future occupants and construction workers),
- controlled waters (i.e. groundwater and surface water features),
- building materials and services (e.g. clean water pipework and buried concrete) and
- ecological systems (e.g. local wildlife).

3.3

Initial risk assessment (of potential contamination linkages)

As discussed, the risk associated with each identified potential contamination linkage can be assessed as a product of the severity of the potential consequence and probability of the associated hazard occurring as outlined in CIRIA C522 (Rudland et al., 2001). On this basis, the risk assessment of potential contamination linkages is presented below (in Table 8).

Table 8: Conceptual site model and Preliminary risk assessment						
Potential source	Potential pathway	Potential receptor	Probability	Severity	Risk rating	Comments
Metals and PAH – general contamination	inhalation, ingestion, absorption	Future occupants	Low likelihood	Mild	Low	
	Inhalation, ingestion, absorption	Construction workers	Unlikely	Minor	Very low	
	Aggressive attack	Building materials	Unlikely	Minor	Very low	
	Migration	Bedrock aquifer	Unlikely	Minor	Very low	
	Migration	Surface waters	Unlikely	Minor	Very low	
Asbestos from the previous building	Inhalation	Future occupants and construction workers	likely	medium	medium	Limited amount (mainly glass houses)
TPH	inhalation, ingestion, absorption	Future occupants	Low likelihood	Mild	Low	Area of above ground fuel tank
	Inhalation, ingestion, absorption	Construction workers	Unlikely	Minor	Very low	
	Aggressive attack	Building materials	Likely	Mild	Medium / low	
	Migration	Bedrock aquifer	Unlikely	Minor	Very low	
	Migration	Surface waters	Unlikely	Minor	Very low	

Table 8: Conceptual site model and Preliminary risk assessment						
Potential source	Potential pathway	Potential receptor	Probability	Severity	Risk rating	Comments
Oregano Pesticides and herbicides	inhalation, ingestion, absorption	Future occupants	Unlikely	Minor	Very low	Very low use, growth from seeds in pots with compost
	Inhalation, ingestion, absorption	Construction workers	Unlikely	Minor	Very low	

3.4 Initial Conceptual Site Model (CSM)

The risk assessment of potential contamination linkages above (in Table 8) shows that there are some relevant contamination linkages (RCLs), i.e. contamination linkages that pose more than a *low* or *very low* risk to receptors. These RCLs are related to the asbestos and TPH near the tank. As some investigation was considered appropriate it is considered that testing for general contaminants of metals and PAH should be undertaken to prove the hypothesis of the conceptual model and its robustness.

3.5 Investigation proposals (based on Phase 1 desk study information)

A preliminary investigation seems necessary to more closely examine the above RCLs. This should allow the identified risks to be more accurately assessed and the conceptual site model to be revised appropriately.

Accordingly, any investigation should explore the nature and extent of potential PAH and metals.

4.0 Site Investigation Works

Two trial pits were excavated by the rear hoe of a JCB on the 3rd December 2018 under the supervision of an HML engineer. Water was added to each trial pit so the level could be monitored against time. The test procedure was undertaken twice. Due to the speed at which the infiltration occurred (soaking away at the speed of entry) the rate of water being pump was calculated. This was 100 l/min. Based on the time and rate the instantaneous volume was used to calculate the infiltration rate.

On the 18th of December, three trial pits were excavated by hand dig. These were used to sample the soils for contamination testing. Samples were taken in amber coloured glass jars and transported in a cool box.

The procedures adopted for this site investigation were based on BS 5930 (2015) *Code of Practice for Site Investigations* and BS 10175 (2013) *Investigation of potentially contaminated sites, code of practice*. The soils and rocks encountered have been described in accordance with BS5930 (2015), BS EN ISO 14688-1 (2002) and BS EN ISO 14689-1 (2003).

Trial pit locations were positioned with regard to the oil tank, with a further two in the rear gardens of the proposed houses. The soakaways were determined in trial pits to both the front and rear of the proposed houses. Positions of exploratory holes were established relative to existing site features.

The approximate locations of all five trial pits are shown in the plan in Appendix A.

The encountered strata are presented on the trial pit logs (in Appendix B).

No ground levels were measured during site works. However, since the site is flat, the ground level at all trial pit locations is assumed to be similar.

5.0 Laboratory Testing

The scope of the laboratory testing reflected the findings of the initial CSM and the results of the site work (i.e. the trial pit logs). PAH (i.e. polyaromatic hydrocarbon), metals, asbestos and TPH (i.e. petroleum hydrocarbon) analyses were carried out. Tests were carried out on a total of three soil samples, as shown below (in Table 9).

Table 10: Schedule of Laboratory Testing						
<i>Sample ref.</i>	<i>Sample location</i>	<i>Depth (m bgl)</i>	<i>Asbestos</i>	<i>Metals</i>	<i>PAH</i>	<i>TPH</i>
M/51177	Tp1	0.1-0.4	ü	ü	ü	ü
M/51178	Tp2	0.1-0.4	ü	ü	ü	
M/51179	Tp3	0.1-0.4	ü	ü	ü	

All the laboratory testing was undertaken by an MCERTS and UKAS accredited laboratory. Samples were stored and transported in sealed amber-coloured glass jars.

Results for all the testing undertaken are included in Appendix C.

6.0 Encountered Ground Conditions

6.1 Ground conditions

The encountered ground conditions agreed quite closely with the anticipated site geology (see Section 2). Exploratory hole log records (in Appendix B) indicate the following general sequence of sub-strata at the site (in descending order).

- Topsoil (0.2m to 0.4m in thickness)
- Sand (0.16m to 0.5m in thickness)
- Limestone

There was a minimal layer of topsoil and sand. This was followed by limestone which existed in cobble to fine fragments of limestone becoming coarser with depth.

At no stage during the investigation was any visual or olfactory evidence noted.

6.2 Infiltration rate

Calculated infiltration rate based on 300l being added instantaneously was 1.41×10^{-3} m/s. This rate should be used for the design of any soakaways within the development.

6.3 Groundwater observations

Groundwater was not recorded in any of the trial pits.

6.4 Contamination tests

The results of all chemical analyses are contained in Appendix C.

7.0 Contamination Assessment

7.1 Assessment principles

The proposed works outlined (see Section 2) are for residential homes, which will include scope for garden-grown vegetables. Therefore, the risk assessment to human health (presented herein) is considered in the context of a development that is *residential with homegrown produce land-use*. This context is intended to reflect the proposed site use and tends to produce the most onerous assessment criteria (compared with a *commercial* context, say).

The assessment criteria (in mg/kg) are presented below (in Tables 11, 12 and 13). These have been taken from the *generic assessment criteria* (GAC) published in the *Land Quality Management Ltd/Chartered Institute of Environmental Health suitable for use levels* (LQM/CIEH S4ULs) report (LQM/CIEH, 2015), which are based on tolerable/minimal risk from contaminants. The exception to this is for lead which is taken from the Category 4 Screening Level (C4SL) data published in a report by Defra. The GAC for organic contaminants takes into account the soil organic matter (SOM) content.

7.2 Metals

Table 11 (below) gives the GAC for metal contaminants considered for the assessment of the site.

Table 11: Generic assessment criteria for metals	
Element	Residential with homegrown produce land-use* (mg/kg)
Arsenic	37
Cadmium	11
Chromium III	910
Chromium VI	6
Copper	2400
Lead**	200
Mercury element	1.2
Mercury inorganic	40
Mercury methyl	11
Nickel	130
Selenium	250
Vanadium	410
Zinc	3700
*	Taken from LQM/CIEH (2015) except lead
**	Taken from Defra C4SL

Test data for metals is included in Appendix C.

The analysis in the first instance has included *total chromium*, which can exist in nine oxidation states.

Typically, in natural soils, the most common is chromium III. Chromium VI (hexavalent chromium) is typically only present in soils in the vicinity of industrial processes and waste deposition, which is not the case on this site. The highest measured *total chromium* concentration (of 140mg/kg) is far below the GAC threshold value for Chromium III (of 910mg/kg). The GAC for Chromium VI is only 6mg/kg, but it is considered implausible that Chromium VI as a percentage of total chromium could be significantly high. Therefore, it is considered that there is minimal risk on site from chromium pollution.

Analysis indicates all metals are well below the GAC limits applied to the site.

7.3 Polyaromatic hydrocarbons (PAHs)

Table 12 (below) gives the GAC (from LQM/CIEH, 2015) for speciated PAH contaminants considered for an initial assessment of the site.

Table 13 - Assessment criteria for PAH			
Element	Residential with homegrown produce land-use		
	SOM of 1%	SOM of 2.5%	SOM of 6%
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Anthracene	2400	5400	11000
Benzo(a)anthracene	7.2	11	13
Benzo(a)pyrene	2.2	2.7	3.0
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(k)fluoranthene	77	93	100
Benzo(ghi)perylene	320	340	350
Chrysene	15	22	27
Dibenzo(ah)anthracene	0.24	0.28	0.3
Fluoranthene	280	560	890
Fluorene	170	400	860
Indeno(123-cd) pyrene	27	36	41
Naphthalene	2.3	5.6	13
Phenanthrene	95	220	440
Pyrene	620	1200	2000

The complete results are presented in Appendix C.

Results show that all data is below the above GAC based on a 1% SOM, being the most onerous. Notably, both the samples from the rear garden areas are well below the GAC.

7.4 Petroleum hydrocarbons

Hydrocarbon analyses were carried out on one sample, that being Tp1, adjacent to the oil tank. These included tests for fractions of volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH) in aromatic and aliphatic equivalent carbon (EC) chain banding. The generic assessment criteria based on LQM/CIEH (2015) values are shown below (in Table 14). Assessment is based on a 1% soil organic matter content (SOM), being the most onerous category.

Table 14: Assessment criteria for TPH			
TPH	Residential with homegrown produce land-use (mg/kg)		
	SOM of 1%	SOM of 2.5%	SOM of 6%
Aliphatic EC5-6	42	78	160
Aliphatic >EC6-8	100	230	530
Aliphatic >EC8-10	27	65	150
Aliphatic >EC10-12	130	330	760
Aliphatic >EC12-16	1100	2400	4300
Aliphatic >EC16-35	65000	92000	110000
Aromatic EC5-7	70	140	300
Aromatic >EC7-8	130	290	660
Aromatic >EC8-10	34	83	190
Aromatic >EC10-12	74	180	380
Aromatic >EC12-16	140	330	660
Aromatic >EC16-21	260	540	930
Aromatic >EC21-35	1100	1500	1700

Test data presented in Appendix C indicates values from adjacent to the tank were well below the above assessment. The data also confirmed the visual and olfactory evidence from the excavation of the two trial pits in this area.

7.5 Asbestos

All three samples were tested for the presence of asbestos. Non-was found.

7.6 Revised Conceptual Site Model

A revised risk assessment of potential contamination linkages that incorporates the findings of the investigation is presented below.

- Metals – proven not to exist above the GAC. Metals would normally be elevated by general contamination including fires, building waste etc. and may also be present if herbicides/pesticides are present.
- PAH – proven not to be present above the GAC. PAH would be present from fires and general contamination.
- TPH – proven not to be present adjacent to the fuel tank.
- Asbestos – proven not to be present. Asbestos was the general contaminants and hence tested for in each trial pit as a result of any previous buildings within the site.

The revised risk assessment incorporating the findings of the investigation indicate a very low risk.

7.7 Remediation proposals

As shown in the revised conceptual model above, there are no relevant contamination linkages (RCLs) that have the potential to cause harm to receptors relating to the proposed works. Therefore remedial works are not required.

Any unforeseen contamination encountered during the development of the site should be reported to the local authority. Work should be halted in that area and the contamination investigated/assessed to the satisfaction of the local authority.

8.0 Conclusion

8.1 Encountered ground conditions

The following general sequence of sub-strata at the site (in descending order) was encountered.

- Topsoil
- Sand
- Limestone

8.2 Groundwater and soakaways

Groundwater was not recorded in any of the trial pits.

The infiltration rate was determined to be 1.4×10^{-3} m/s. This value should be used to design and evaluate any soakaways within the site.

8.3 Contamination

The results of all chemical analyses are contained in Appendix C. The data indicates that the applicable GAC levels have not been exceeded.

Contamination by testing has proven the site conceptual model and revised the risk rating to very low.

Remediation is not required.

Radon protection measures are not required. The conceptual site model does not indicate a potential risk from hazardous ground gas. Therefore, gas monitoring and gas protection measures are not required.

Any unforeseen contamination encountered during the development of the site should be reported to the local authority. Work should be halted in that area and the contamination investigated/assessed to the satisfaction of the local authority.

This report is prepared on the assumption that all facts have been disclosed. The comments given in this report and the opinions expressed assume that conditions do not vary beyond the range revealed by this study and the information provided in the production of this report is complete and reliable.

M.J. Green I.Eng. F.I.H.I.E

9.0

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APPENDIX A



Site location



Schematic overview of scheme



SITE PLAN - BOREHOLE / TRIAL PIT LOCATIONS



Humberside Materials Laboratory Ltd
Atherton Way, Brigg
North Lincs, DN20 8AR
Tel Fax 01652 652753

CLIENT :- M Smalley

SITE :- Sturton Nursery

APPENDIX B



HUMBERSIDE MATERIALS LABATORY Ltd.

Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

TRIAL PIT LOG

**Trial pit
No
1**

Client :- M Smalley
Site :- Sturton Nursery
Project No :- 4720

Location :- see site plan
Date :- 18-Dec-18

Coordinates E: N:
Elevation :-
Excavated by :- Hand dig

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe					Notes
					0	5	10	15	20	
0	Brown TOPSOIL	0								
0.2	Orange coarse to fine SAND with occasional limestone gravels	(0.3)	1	D						
0.4		(0.5)								
0.6	Cobble to fine LIMESTONE	0.8	2	D						
0.8		(0.2)								
1		1								
1.2		1.2								
1.4		1.4								
1.6		1.6								
1.8		1.8								
2		2								
2.2		2.2								
2.4		2.4								
2.6		2.6								
2.8		2.8								
3		3								
3.2		3.2								
3.4		3.4								
3.6		3.6								
3.8		3.8								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1 / 4720

Logged by :- M Green



HUMBERSIDE MATERIALS LABATORY Ltd.

Atherton Way, Brigg
North Lincs DN20 8AR
Tel & Fax 01652 652753

email info@humbersidematerialslab.co.uk

TRIAL PIT LOG

**Trial pit
No
2**

Client :- M Smalley
Site :- Sturton Nursery
Project No :- 4720

Location :- see site plan
Date :- 18-Dec-18

Coordinates E: N:
Elevation :-
Excavated by :- Hand dig

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe					Notes
					0	5	10	15	20	
0	Brown TOPSOIL	0								
0.2		(0.3)	1	D						
0.3	Orange coarse to fine SAND with occasional limestone gravels									
0.4		(0.35)								
0.65	Cobble to fine LIMESTONE		2	D						
0.8		(0.35)								
1		1								
1.2		1.2								
1.4		1.4								
1.6		1.6								
1.8		1.8								
2		2								
2.2		2.2								
2.4		2.4								
2.6		2.6								
2.8		2.8								
3		3								
3.2		3.2								
3.4		3.4								
3.6		3.6								
3.8		3.8								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1 / 4720

Logged by :- M Green



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TRIAL PIT LOG

Trial pit
No
3

Client :- M Smalley
Site :- Sturton Nursery
Project No :- 4720

Location :- see site plan
Date :- 18-Dec-18

Coordinates E: N:
Elevation :-
Excavated by :- Hand dig

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe					Notes
					0	5	10	15	20	
0	Brown TOPSOIL	0.4	1	D						
0.2										
0.4	Orange coarse to fine SAND with occasional limestone gravels	0.16								
0.6										
0.6	Cobble to fine LIMESTONE	0.45	2	D						
0.8										
1.0										
1.2										
1.4										
1.6										
1.8										
2.0										
2.2										
2.4										
2.6										
2.8										
3.0										
3.2										
3.4										
3.6										
3.8										

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1 / 4720

Logged by :- M Green



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TRIAL PIT LOG

**Trial pit
No
SA1**

Client :- M Smalley
Site :- Sturton Nursery
Project No :- 4720

Location :- see site plan
Date :- 03-Dec-18

Coordinates E: N:
Elevation :-
Excavated by :- JCB

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe					Notes
					0	5	10	15	20	
0	Brown TOPSOIL	0								
0.2		(0.4)								
0.4	Orange coarse to fine SAND with occasional limestone gravels	0.4								
0.6		(0.4)								
0.8	Cobble to fine LIMESTONE	0.8								
1										
1.2		(0.8)								
1.4										
1.6	1.6	1.6								
1.8		1.8								
2		2								
2.2		2.2								
2.4		2.4								
2.6		2.6								
2.8		2.8								
3		3								
3.2		3.2								
3.4		3.4								
3.6		3.6								
3.8		3.8								

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1 / 4720

Logged by :- M Green



HUMBERSIDE MATERIALS LABATORY Ltd.

Atherton Way, Brigg
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TRIAL PIT LOG

Trial pit
No
SA2

Client :- M Smalley
Site :- Sturton Nursery
Project No :- 4720

Location :- see site plan
Date :- 03-Dec-18

Coordinates E: N:
Elevation :-
Excavated by :- JCB

Depth (m)	Lithology / Description / Depth / (thickness)	Elevation	Samples	Water level	Mackintosh Probe					Notes
					0	5	10	15	20	
0	Brown TOPSOIL	(0.2)								
0.2	Orange coarse to fine SAND with occasional limestone gravels	(0.36)								
0.4										
0.6	Cobble to fine LIMESTONE	(0.84)								
0.8										
1										
1.2										
1.4										
1.6										
1.8										
2										
2.2										
2.4										
2.6										
2.8										
3										
3.2										
3.4										
3.6										
3.8										

Sample Key
B Bulk
D Disturbed
W Water
SS Split spoon
C Cone

Notes :-

File Ref :- 1 / 4720

Logged by :- M Green

APPENDIX C

HUMBERSIDE MATERIALS LABORATORY LTD

Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel & Fax 01652 652753

DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/50982/01

Client M Smalley

Site	Sturton Nursery
Location	Tp1
Date tested	03/12/2018
Determined by	M Green
Soil type	Cobble to fine limestone

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	Tp1		
Anticipated invert level	Not known		
Pit Dimensions (l x w x d) (m)	1.60	0.60	1.8
Effective Depth (75% - 25%)	Determination 1	0.155	m
	Determination 2	0.155	m
Effective volume (75% - 25%)	Determination 1	0.149	m ³
	Determination 2	0.149	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.162	m ²
	Determination 2	1.162	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	90.6	Sec.
	Determination 2	90.6	Sec.
Soil Infiltration Rate (m/s)	Determination 1	1.41E-03	m/s
	Determination 2	1.41E-03	m/s

Comments

File ref 001/4720/P

Signed M.J. Green C. Driver
Director

HUMBERSIDE MATERIALS LABORATORY LTD

Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel & Fax 01652 652753

DETERMINATION OF SOIL INFILTRATION RATE

Sample Ref S/50982/02

Client M Smalley

Site	Sturton Nursery
Location	Tp2
Date tested	03/12/2018
Determined by	M Green
Soil type	Cobble to fine limestone

Calculation of Soil Infiltration Rate :- BRE Digest No. 365

Calculation Data			
Soakaway pit No	Tp2		
Anticipated invert level	Not known		
Pit Dimensions (l x w x d) (m)	1.60	0.60	1.4
Effective Depth (75% - 25%)	Determination 1	0.155	m
	Determination 2	0.155	m
Effective volume (75% - 25%)	Determination 1	0.149	m ³
	Determination 2	0.149	m ³
Effective Surface Area (75% - 25%)	Determination 1	1.162	m ²
	Determination 2	1.162	m ²
Time for soakaway (75%-25% effective depth)	Determination 1	90.6	Sec.
	Determination 2	90.6	Sec.
Soil Infiltration Rate (m/s)	Determination 1	1.41E-03	m/s
	Determination 2	1.41E-03	m/s

Comments

File ref 001/4720/P

Signed M.J. Green C. Driver
Director



2531



ANALYTICAL TEST REPORT

Contract no: 75863
Contract name: Sturton
Client reference: 001/4720
Clients name: Humberside Materials Laboratory
Clients address: Atherton Way
Brigg
North Lincolnshire
DN20 8AR
Samples received: 20 December 2018
Analysis started: 20 December 2018
Analysis completed: 08 January 2019
Report issued: 08 January 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:



Dave Bowerbank
Customer Services Co-ordinator

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
75863-1	M/51177 TP1	0.10-0.40	Sandy Loam	-	-	19.6
75863-2	M/51178 TP2	0.10-0.40	Loam	-	-	15.9
75863-3	M/51179 TP3	0.10-0.40	Loam & Sand	-	-	19.5

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SOILS

Lab number			75863-1	75863-2	75863-3
Sample id			M/51177 TP1	M/51178 TP2	M/51179 TP3
Depth (m)			0.10-0.40	0.10-0.40	0.10-0.40
Date sampled			18/12/2018	18/12/2018	18/12/2018
Test	Method	Units			
Arsenic (total)	CE127 ^M	mg/kg As	15	17	17
Beryllium (total)	CE127 ^U	mg/kg Be	1.1	<1	<1
Boron (water soluble)	CE063 ^M	mg/kg B	1.6	1.4	1.1
Cadmium (total)	CE127 ^M	mg/kg Cd	0.2	0.6	0.4
Chromium (total)	CE127 ^M	mg/kg Cr	112	129	140
Copper (total)	CE127 ^M	mg/kg Cu	19	23	23
Lead (total)	CE127 ^M	mg/kg Pb	57	174	111
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	15	16	16
Selenium (total)	CE127 ^M	mg/kg Se	1.0	0.8	0.8
Vanadium (total)	CE127 ^M	mg/kg V	55	50	48
PAH					
Naphthalene	CE087 ^M	mg/kg	0.02	<0.02	0.03
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02
Acenaphthene	CE087 ^M	mg/kg	0.04	<0.02	<0.02
Fluorene	CE087 ^U	mg/kg	0.03	<0.02	<0.02
Phenanthrene	CE087 ^M	mg/kg	0.58	0.11	0.20
Anthracene	CE087 ^U	mg/kg	0.27	0.04	0.06
Fluoranthene	CE087 ^M	mg/kg	2.48	0.34	0.76
Pyrene	CE087 ^M	mg/kg	2.10	0.30	0.69
Benzo(a)anthracene	CE087 ^U	mg/kg	1.10	0.17	0.37
Chrysene	CE087 ^M	mg/kg	1.23	0.17	0.39
Benzo(b)fluoranthene	CE087 ^M	mg/kg	1.33	0.23	0.53
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.65	0.11	0.27
Benzo(a)pyrene	CE087 ^U	mg/kg	1.14	0.20	0.47
Indeno(123cd)pyrene	CE087 ^M	mg/kg	0.69	0.12	0.28
Dibenz(ah)anthracene	CE087 ^M	mg/kg	0.16	<0.02	0.05
Benzo(ghi)perylene	CE087 ^M	mg/kg	0.65	0.11	0.27
PAH (total of USEPA 16)	CE087	mg/kg	12.5	1.91	4.38
TPH					
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	5	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	6	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	-	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-

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SOILS

Lab number			75863-1	75863-2	75863-3
Sample id			M/51177	M/51178	M/51179
Depth (m)			TP1	TP2	TP3
Date sampled			0.10-0.40	0.10-0.40	0.10-0.40
			18/12/2018	18/12/2018	18/12/2018
Test	Method	Units			
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	20	-	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	-	-
Subcontracted analysis					
Asbestos (qualitative)	\$	-	NAD	NAD	NAD

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Beryllium (total)	Aqua regia digest, ICP-MS	Dry	U	1	mg/kg Be
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Vanadium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg V
CE087	Naphthalene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	Wet	U	0.01	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	Wet	M	0.01	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	Wet	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	Wet	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	Wet		0.27	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	Wet		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	Wet		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	Wet		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	Wet		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	Wet		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	Wet		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	Wet		10	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
75863-1	M/51177 TP1	0.10-0.40	N	
75863-2	M/51178 TP2	0.10-0.40	N	
75863-3	M/51179 TP3	0.10-0.40	N	