Document Control

Project title	30a Highgate Road, London, NW5 1NS	**Project ref**	J12041C
Report prepared by	Matthew Elcock BEng FGS		
Report checked and approved for issue by	Steve Branch BSc MSc CGeol FGS FRGS MIEnvSc		

Issue No	Status	Date	Approved for Issue
1	Final	16 July 2014	

This report has been issued by the GEA office indicated below. Any enquiries regarding the report should be directed to the office indicated or to Steve Branch in our Herts office.

✓	Hertfordshire	tel 01727 824666	mail@gea-ltd.co.uk
	Nottinghamshire	tel 01509 674888	midlands@gea-ltd.co.uk

CONTENTS

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Mr Colin Serlin to provide advice for the remediation of the soils at 30a Highgate Road, London, NW5 1NS. GEA has previously carried out a number of phases of work at the site, as detailed below:

- Desk Study and Ground Investigation Report (ref J12041, dated 24 April 2012);
- Supplementary Contamination Report (ref J12041A, dated 6 December 2012);
- Letter Report (ref J12041A/JF/3, dated 8 May 2013); and
- Interim Verification Report (ref J12041B, dated 21 January 3014).

The previous investigations generally encountered a moderate thickness of made ground overlying the London Clay Formation. Contamination testing indicated elevated concentrations of sulphide, total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) in samples of made ground. A single fuel tank was discovered during groundworks and removed from site as described in the May 2013 letter report, and the Interim Verification Report confirmed that soil remaining in the tank excavation does not pose a risk to end users. However, further work was required to provide confirmation that imported soil in soft landscaped areas was suitable for use.

Since the above reports were produced the further remediation work has been carried out in the areas of soft landscaping. This report provides a summary of the previous work reported in our Interim Verification Report, and describes the further work that has now been undertaken in the soft landscaping areas.

1.1 Proposed Development

The previous buildings have been demolished and the site has been redeveloped through the construction of two-storey and three-storey mews houses and apartment blocks. There is a communal central courtyard with some soft landscaping; the layout is similar to previous although the level of the entire site has been lowered by approximately 300 mm.

This report is specific to the proposed development and the advice herein should be reviewed if the development proposals are amended.

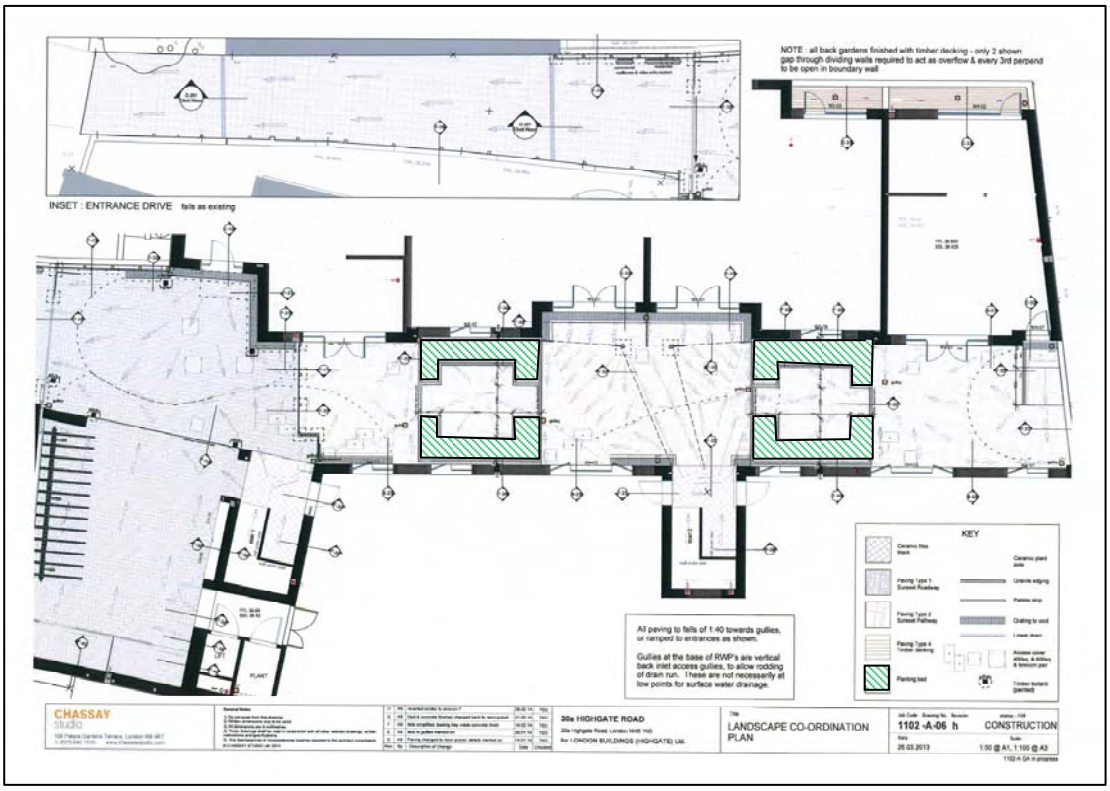
1.2 Summary of Previous Remediation Work

The site was the subject of a site strip which removed the majority of made ground, an underground tank was also located and removed by a specialist contractor. Retrospective validation indicated that the soil within the former tank excavation did not pose a risk to end users or the site environs, including a vapour risk. Validation boreholes drilled across the site indicated the previous made ground to have been removed and a layer of crush had been placed above the London Clay. The exception of this was towards the south of the site where made ground was deeper in Validation Borehole Nos 7, 8 and 9.

Chemical testing generally confirmed that the made ground had been removed and no elevated concentrations of contaminants were encountered, with the exception of the tank excavation, but there were no pathways considered to be present to end users or the site environs. Further work was proposed in soft landscaped areas.

1.3 Further Work and Validation of Soft Landscaping Areas

There are four areas of proposed soft landscaping, as indicated on the plan below. GEA visited site to inspect the formation layer of the proposed soft landscaping areas on 13 February 2014. No visual or olfactory signs of contamination were noted in the three areas that were ready for inspection at that time and samples of the formation layer were collected to confirm this view. A photoionisation dectector (PID) was used on site to screen for vapours and none were detected. The contamination results of the formation layer are presented in the appendix and show no elevated concentrations of contaminations when compared to the generic soil screening values, also in the appendix.



A geotextile (Terram Hi-Vis) was placed at the formation layer to act as a marker and to also prevent any mixing of imported soil and the underlying formation level.

Clean imported topsoil was sourced from Rolawn and chemical test data of the soil was provided to GEA prior to importation to site and is provided in the appendix. A review of these results indicates concentrations of contaminants below the generic soil screening values. The soil was subsequently delivered to the site and delivery dockets are provided in the appendix.

GEA visited site on 9 May 2014 to inspect the marker membrane, thickness of topsoil and collect samples of the imported topsoil. Importation of topsoil was still ongoing, the geotextile was confirmed to be present in all four beds and the topsoil was noted to be at depths of between 200 mm and 300 mm. The site inspection sheet in the appendix provides information on the specific depths and the soil was generally brown very clayey sand with occasional fine gravel and rare fragments of brick and decomposed roots. Discussions with the site manager suggested that it was not possible to deepen the areas of soft landscaping due

to the presence of numerous services crossing the planting beds.

Three samples of the topsoil were collected and scheduled for contamination testing and the results show no elevated concentrations of contaminants when compared to the generic risk based soil screening values. The results are presented within the appendix.

2.0 DISCUSSION

Two-storey and three-storey mews houses and apartment blocks have been constructed in roughly the same locations as the previous buildings. The majority of the site area is covered in hardstanding, apart from four small areas of planting within the communal central courtyard. The previous remediation and validation work at the site has indicated that the majority of the made ground that previously contained contamination had been removed by the site strip process.

The removal of soil in the areas of soft landscaping has effectively removed the source of the contamination and chemical testing in these areas has shown no elevated concentrations of contaminants to remain.

The incorporation of a geotextile will limit mixing of clean imported soil and potentially contaminated soil below. Chemical test information prior and after the topsoil was delivered to site has shown no elevated concentrations of contaminants when compared to the generic risk based soil screening values. Site constraints meant that it was not possible to achieve a thickness of clean imported soil of 600 mm, however given that there is not considered to be any contamination below the soft landscaped areas then there is no potential source of contamination, thus no requirement for a set thickness of topsoil.

Although some further topsoil will be delivered to site to complete all the soft landscaped areas, it is considered that, on the assumption that the same topsoil is used, there will be no risk to end users.

The table below provides a summary of the risk assessment following the validation work.

SOURCE	RECEPTOR	PATHWAY	COMMENTS
Inorganic and organic contamination within near surface soils, petrol and diesel tanks	end users	vapours	The source of potential vapours has been removed by the site strip and tank removed. Chemical validation testing has shown no TPH above assessment criteria and no vapours were detected during sampling or monitoring. Nuisance vapours may be present and vent bricks may prove useful.
		direct contact	The majority of the made ground has been removed across the site and in areas of proposed soft landscaping. The majority of the site is covered by the new buildings and hard surfaces. Chemical testing of the formation layer in areas of soft landscaping has not indicated any elevated concentrations of contaminants. A geotextile has been used to separate the formation layer and clean imported soil which has also been tested; no contaminants were recorded in topsoil samples tested.

SOURCE	RECEPTOR	PATHWAY	COMMENTS
	groundwater	percolation	The presence of buildings and hardstanding will prevent percolation of surface run-off. The proposals will introduce areas of soft landscaping, however the majority of the made ground has been removed. Any contamination remaining on site is not considered to present a risk to groundwater.
		groundwater	The London Clay will inhibit downward percolation to the groundwater at depth within the chalk principal aquifer.
	site workers during construction	ingestion of contaminated soil or dust, skin contact, inhalation	Ongoing - appropriate protective equipment and working practices required during ground work.
	adjacent sites	migration of mobile contamination, along sewer that crosses the site	The risk of lateral migration of contamination has been minimised, removal of tank and made ground has removed the source of contamination.
	plastic services	direct contact	It is understood that plastic pipes were protected, as per our previous guidance.
	vegetation	uptake via soil, ground water or vapour	The validation work has indicated about 300 mm of imported topsoil is present in soft landscaping areas.

3.0 CONCLUSION

Remediation at this site has primarily been completed by the removal of sources of contamination, by a site strip and a tank removal process. Validation testing and vapour monitoring indicates there are no elevated concentrations of contaminants where previously encountered and no vapours were detected.

Imported topsoil has been used in soft landscaping areas to protect end users and allow successful plant growth.

On the basis of the above there is thus considered to be no further risk to end users or the site environs.

APPENDIX

Site Inspection Sheet (13 February 2014)

Topsoil Information

Delivery Dockets

Site Inspection Sheet (9 May 2014)

Chemical Test Results

Soil Screening Values

GEA Geotechnical & Environmental Associates

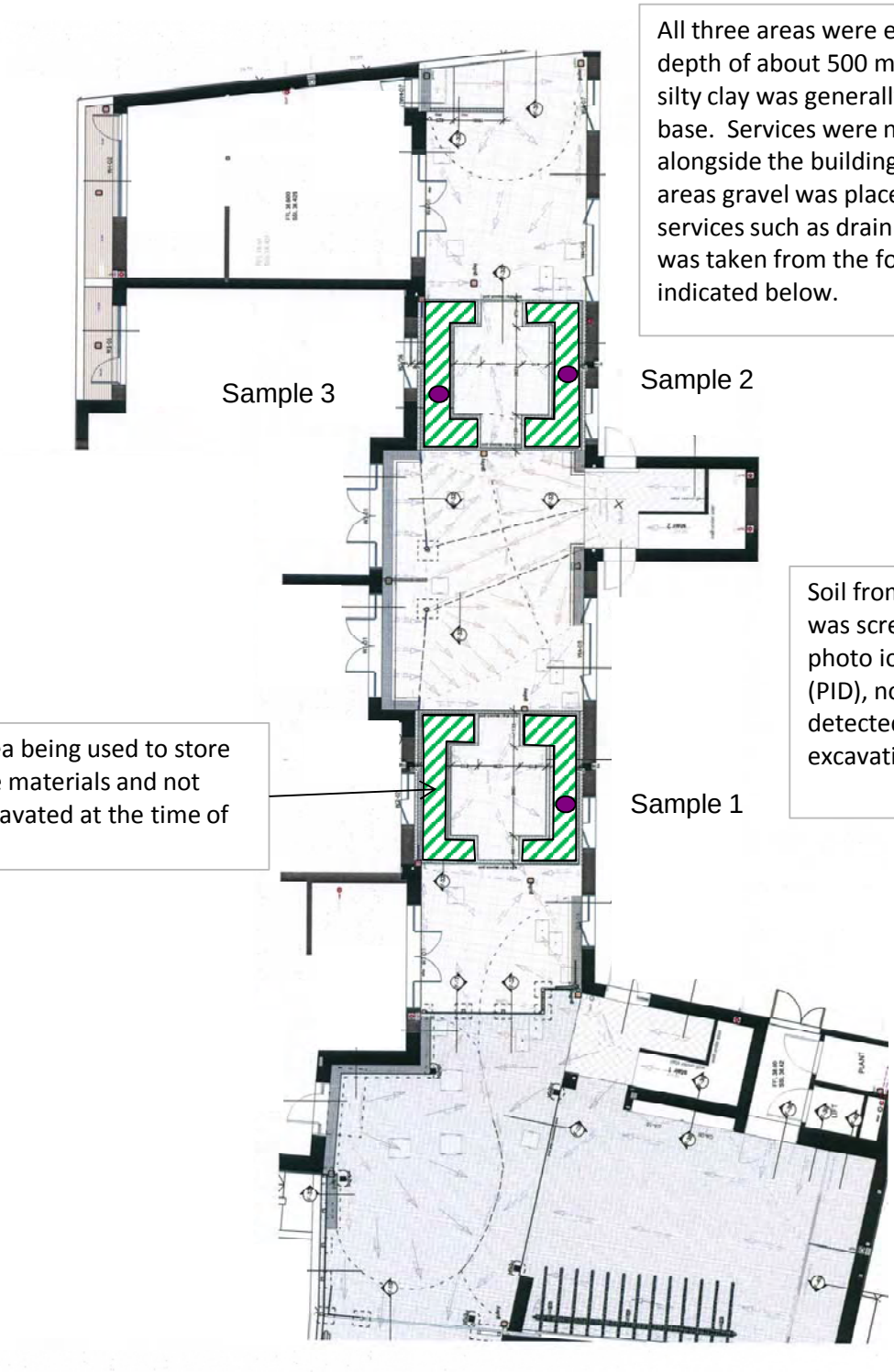
Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site Inspection Record

Site	30a Highgate Road, London, NW5 1NS
Client	Colin Serlin
Engineer	

Date of Inspection	Job Number
13/02/2014	J12041C
GEA Engineer	**Sheet**
ME	1 / 1

All three areas were excavated to a depth of about 500 mm and firm brown silty clay was generally noted at the base. Services were noted to run alongside the buildings and in some areas gravel was placed around the services such as drain runs. A sample was taken from the formation level as indicated below.



Soil from each excavation was screened with a photo ionising detector (PID), no vapours were detected in any of the excavations.

Plan showing external areas of the site

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

GEA
Tyttenhanger House
Coursers Road
St Albans Herts
AL4 0PG

FAO Matthew Elcock
26 February 2014

Dear Matthew Elcock

Test Report Number **251588**
Your Project Reference **J12041 - 30a Highgate Road, London**

Please find enclosed the results of analysis for the samples received 18 February 2014.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Keith Jones, Technical Manager

UKAS TESTING
2183

MCERTS

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are outside of the scope of UKAS accreditation*
- *The results relate only to the items tested*
- *Stones represent the quantity of material removed prior to analysis*
- *All results are expressed on a dry weight basis*
- *The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols*
- *For all other tests the samples were dried at < 37°C prior to analysis*
- *Uncertainties of measurement for the determinands tested are available upon request*
- *Soil descriptions, including colour and texture, are beyond the scope of MCertS accreditation*
- *None of the test results included in this report have been recovery corrected*

GEA
Tyttenhanger House
Coursers Road
St Albans Herts
AL4 0PG

FAO Matthew Elcock

LABORATORY TEST REPORT

Results of analysis of 3 samples
received 18 February 2014

J12041 - 30a Highgate Road, London

Chemtest
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Report Date
26 February 2014

Login Batch No						**251588**		
Chemtest LIMS ID						AJ84637	AJ84638	AJ84639
Sample ID						1	2	3
Sample No								
Sampling Date						13/2/2014	13/2/2014	13/2/2014
Depth								
Matrix						*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓		CAS No↓	Units↓	*			
2030	Moisture			%	M	21.2	20.4	20.2
	Stones content (>50mm)			%	M	<0.02	<0.02	<0.02
2040	Soil colour				M	brown	brown	brown
	Soil texture				M	clay	clay	clay
	Other material				M	stones	stones	stones
2010	pH				M	8.4	8.4	8.7
2300	Cyanide (total)		57125	mg kg-¹	M	<0.50	<0.50	<0.50
2325	Sulfide (Easily Liberatable)		18496258	mg kg-¹	M	2.2	0.81	2.7
2625	Total Organic Carbon			%	M	0.48	0.27	0.37
2220	Chloride (extractable)		16887006	g l-¹	M	0.014	<0.010	0.011
2430	Sulfate (total) as SO4			mg kg-¹	M	1200	300	400
2450	Arsenic		7440382	mg kg-¹	M	11	8.8	10
	Cadmium		7440439	mg kg-¹	M	0.16	0.11	<0.10
	Chromium		7440473	mg kg-¹	M	51	58	58
	Copper		7440508	mg kg-¹	M	22	23	25
	Mercury		7439976	mg kg-¹	M	<0.10	<0.10	<0.10
	Nickel		7440020	mg kg-¹	M	40	47	47
	Lead		7439921	mg kg-¹	M	27	15	18
	Selenium		7782492	mg kg-¹	M	0.20	0.32	0.48
	Zinc		7440666	mg kg-¹	M	74	74	79
2670	TPH >C5-C6			mg kg-¹	U	< 0.1	< 0.1	< 0.1
	TPH >C6-C7			mg kg-¹	U	< 0.1	< 0.1	< 0.1
	TPH >C7-C8			mg kg-¹	M	< 0.1	< 0.1	< 0.1
	TPH >C8-C10			mg kg-¹	M	< 0.1	< 0.1	< 0.1

All tests undertaken between 18/02/2014 and 24/02/2014

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

GEA
Tyttenhanger House
Coursers Road
St Albans Herts
AL4 0PG

FAO Matthew Elcock

LABORATORY TEST REPORT

Results of analysis of 3 samples
received 18 February 2014

J12041 - 30a Highgate Road, London

Chemtest
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Report Date
26 February 2014

					251588		
					AJ84637	AJ84638	AJ84639
					1	2	3
					13/2/2014	13/2/2014	13/2/2014
					SOIL	*SOIL*	*SOIL*
2670	TPH >C10-C12		mg kg-¹	M	< 0.1	< 0.1	< 0.1
	TPH >C12-C16		mg kg-¹	M	< 0.1	< 0.1	< 0.1
	TPH >C16-C21		mg kg-¹	M	< 0.1	< 0.1	< 0.1
	TPH >C21-C35		mg kg-¹	M	< 0.1	< 0.1	< 0.1
	Total Petroleum Hydrocarbons		mg kg-¹	U	< 10	< 10	< 10
2700	Naphthalene	91203	mg kg-¹	M	0.51	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-¹	M	< 0.1	< 0.1	< 0.1
	Acenaphthene	83329	mg kg-¹	M	0.17	< 0.1	< 0.1
	Fluorene	86737	mg kg-¹	M	0.18	< 0.1	< 0.1
	Phenanthrene	85018	mg kg-¹	M	0.54	< 0.1	< 0.1
	Anthracene	120127	mg kg-¹	M	0.23	< 0.1	< 0.1
	Fluoranthene	206440	mg kg-¹	M	0.7	< 0.1	< 0.1
	Pyrene	129000	mg kg-¹	M	0.54	< 0.1	< 0.1
	Benzo[a]anthracene	56553	mg kg-¹	M	0.33	< 0.1	< 0.1
	Chrysene	218019	mg kg-¹	M	0.33	< 0.1	< 0.1
	Benzo[b]fluoranthene	205992	mg kg-¹	N	0.44	< 0.1	< 0.1
	Benzo[k]fluoranthene	207089	mg kg-¹	N	0.18	< 0.1	< 0.1
	Benzo[a]pyrene	50328	mg kg-¹	M	0.28	< 0.1	< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	0.25	< 0.1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	0.27	< 0.1	< 0.1
	Total (of 16) PAHs		mg kg-¹	M	5	< 2	< 2
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3

All tests undertaken between 18/02/2014 and 24/02/2014

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

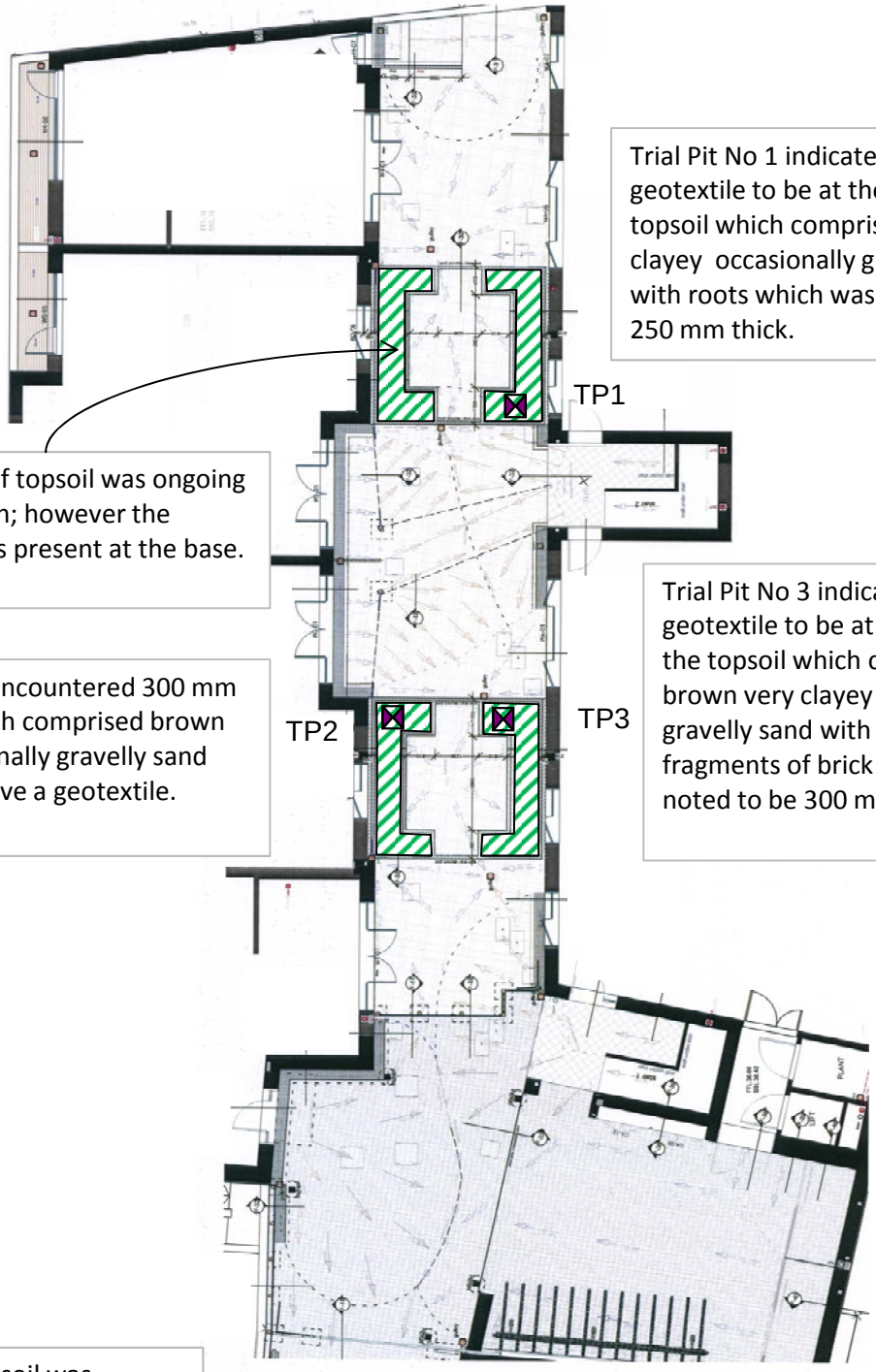
GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site Inspection Record

Site	30a Highgate Road, London, NW5 1NS
Client	Colin Serlin
Engineer	

Date of Inspection	Job Number
09/05/2014	J12041C
GEA Engineer	**Sheet**
ME	1 / 1



Trial Pit No 1 indicated the geotextile to be at the base of the topsoil which comprised brown very clayey occasionally gravelly sand with roots which was noted to be 250 mm thick.

Importation of topsoil was ongoing in this location; however the geotextile was present at the base.

Trial Pit No 2 encountered 300 mm of topsoil which comprised brown clayey occasionally gravelly sand with roots above a geotextile.

Trial Pit No 3 indicated the geotextile to be at the base of the topsoil which comprised brown very clayey occasionally gravelly sand with roots and rare fragments of brick which was noted to be 300 mm deep.

A sample of soil was collected from each trial pit and scheduled for contamination testing.

soft landscaped areas

Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Test Report Number:	14-01774
Issue:	1
Date of Issue:	23/05/2014
Contact:	Matthew Elcock
Customer Details:	GEA Unit 1 Church Farm Gotham Road Kingston On Soar Nottinghamshire
Quotation No:	
Order No:	
Customer Reference:	J12041A - 30a Highgate RA
Date Received:	16/05/2014
Date Approved:	23/05/2014
Details:	J12041A - 30a Highgate RA
Approved by:	 Keith Jones, Technical Manager

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Results Summary - Soil

Report No.: 14-01774_1

Project: J12041A - 30a Highgate RA

				Customer Sample ID	**TS1**	**TS2**	**TS3**
				Chemtest Sample ID	9236	9237	9238
				Sample Type	**SOIL**	**SOIL**	**SOIL**
				Sampling Date	09/05/2014	09/05/2014	09/05/2014
Determinand	**Accred**	**SOP**	**Units**	**LOD**			
Moisture	N	2030	%	0.02	34	30	30
Stones	N	2030	%	0.02	< 0.020	< 0.020	< 0.020
Soil Colour	N			0	brown	brown	brown
Other Material	N			0	none	none	none
Soil Texture	N			0	clay	clay	clay
pH	M	2010		0	7.6	7.6	7.5
Chloride (Extractable)	U	2220	g/l	0.01	0.18	0.26	0.054
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	2.1	2.9	1.8
Sulphate (Total)	M	2430	mg/kg	100	1800	1700	1600
Arsenic	M	2450	mg/kg	2	5.9	5.5	5.8
Cadmium	M	2450	mg/kg	0.1	0.26	0.24	0.28
Chromium	M	2450	mg/kg	5	9.7	9.1	9.8
Copper	M	2450	mg/kg	5	18	9.5	13
Mercury	M	2450	mg/kg	0.1	1.3	< 0.10	< 0.10
Nickel	M	2450	mg/kg	5	13	12	14
Lead	M	2450	mg/kg	5	24	22	25
Selenium	M	2450	mg/kg	0.2	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	5	80	59	68
Total Organic Carbon	M	2625	%	0.2	2.7	2.0	2.4
TPH >C5-C6	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C6-C7	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C7-C8	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C12-C16	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C16-C21	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
TPH >C21-C35	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0
Total TPH >C5-C35	N	2670	mg/kg	10	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10

Results Summary - Soil

Report No.: 14-01774_1

Project: J12041A - 30a Highgate RA

				Customer Sample ID	**TS1**	**TS2**	**TS3**
				Chemtest Sample ID	9236	9237	9238
				Sample Type	**SOIL**	**SOIL**	**SOIL**
				Sampling Date	09/05/2014	09/05/2014	09/05/2014
Determinand	**Accred**	**SOP**	**Units**	**LOD**			
Benzo[a]pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30

Report Information

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SM	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable sample
N/E	not evaluated
<	means "less than"
>	means "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected

Sample Deviation Codes

a - No date of sampling supplied
b - Sample age exceeds stability time (sampling to extraction)
c - Sample not received in appropriate containers

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Ian Elwick
Hallstone Developments Ltd
Elvington
York YO41 4XR

1st October 2013
Our Ref: TOHA/13/4732/4/JU
Your Ref: O/N IE0086

Dear Sirs

Topsoil Analysis Report: Hallstone Topsoil (September 2013)

We have completed the analysis of the soil sample recently submitted, referenced *Hallstone Topsoil (13/09/2013),* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

This report presents the results of analysis for the sample submitted to our office, and it should be considered **'indicative' of the topsoil source. The report and results should therefore not be used by** third parties as a means of verification or validation testing, especially after the topsoil has left the Hallstone Developments Ltd site.

SAMPLE EXAMINATION

The sample was described as a dark brown, dry, friable SANDY LOAM with a weakly developed, fine to medium granular structure*. The sample was virtually stone-free and contained frequent small woody fibres. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of a disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

Tim O'Hare Associates LLP
Howbery Park Wallingford Oxfordshire OX10 8BA
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ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the absence of potential contaminants. The following parameters were determined:

- particle size analysis and stone content;
- pH and electrical conductivity values ($CaSO_4$ and water extracts);
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- soluble sulphate, elemental sulphur, acid volatile sulphide;
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX).

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *sandy loam* texture class, which is usually considered suitable for general landscape applications, provided the soil's physical condition is satisfactory.

The sample was virtually stone-free and, as such, stones should not restrict the use of the soil for general landscape purposes.

pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.0). This pH value would be considered suitable for general landscape purposes providing species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

The electrical conductivity (salinity) value (water extract) was moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

The electrical conductivity value by $CaSO_4$ extract (*BS3882* requirement) fell below the maximum specified value (2800 µS/cm) given in *BS3882:2007 – Table 1*.

Organic Matter and Fertility Status

The sample was well supplied with organic matter and adequately supplied with all major plant nutrients.

The C:N ratio of the sample was acceptable for general landscape purposes.

Potential Contaminants

With reference to *BS3882:2007 - Table 1*: Notes 2, 3 and 4, there is a requirement to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations of selected potential contaminants that affect human health have been assessed for *residential* end-use against the Soil Guideline Values presented in the Contaminated Land Exposure Assessment (CLEA) (EA/DEFRA: 2009) and the CIEH/LQM Generic Assessment Criteria (2nd Edition, 2009).

Of the potential contaminants determined, none was found at levels that would indicate significant contamination with respect to the proposed end use of this topsoil.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in *BS3882:2007 – Table 1.*

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, virtually stone-free sandy loam with an adequate structure. The organic matter content and fertility status were moderate. No potential contamination was found with respect to the parameters determined.

Based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes provided species with a broad pH tolerance are selected for planting and the soil's physical condition is satisfactory.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

RECOMMENDATIONS

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, respreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully

Joanna Uglow
BSc MSc
Junior Soil Scientist

Laura Hathaway-Jenkins
BSc MSc EngD MISoilSci
Soil Scientist

For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Hallstone Developments Ltd**
Project	**Topsoil Analysis - Hallstone Topsoil (13/09/2013)**
Date:	**October 2013**
Job Ref No:	**TOHA/13/4732/4/JU**

Sample Reference			**Hallstone Topsoil**	
		Acreditation		
Clay (<0.002mm)	%	UKAS	10	✓
Silt (0.002-0.063mm)	%	UKAS	11	✓
Sand (0.063-2.0mm)	%	UKAS	79	✓
Texture Class (UK Classification)	--	UKAS	SL	✓
Stones (2-20mm)	% DW	GLP	1	✓
Stones (20-50mm)	% DW	GLP	0	✓
Stones (>50mm)	% DW	GLP	0	✓
pH Value (1:2.5 water extract)	units	UKAS	8.0	✓
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	743	✓
Electrical Conductivity (1:2 CaSO4 extract)	uS/cm	UKAS	2541	✓
Exchangeable Sodium Percentage	%	UKAS	4.2	✓
Organic Matter (LOI)	%	UKAS	8.5	✓
Total Nitrogen (Dumas)	%	UKAS	0.37	✓
C : N Ratio	ratio	UKAS	13	✓
Extractable Phosphorus	mg/l	UKAS	38	✓
Extractable Potassium	mg/l	UKAS	442	✓
Extractable Magnesium	mg/l	UKAS	88	✓
Total Arsenic (As)	mg/kg	MCERTS	6	✓
Total Barium (Ba)	mg/kg	MCERTS	52	✓
Total Beryllium (Be)	mg/kg	MCERTS	0.3	✓
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2	✓
Total Chromium (Cr)	mg/kg	MCERTS	8	✓
Chromium (VI) (Cr)	mg/kg	MCERTS	< 4.0	✓
Total Copper (Cu)	mg/kg	MCERTS	14	✓
Total Lead (Pb)	mg/kg	MCERTS	21	✓
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3	✓
Total Nickel (Ni)	mg/kg	MCERTS	11	✓
Total Selenium (Se)	mg/kg	MCERTS	< 1.0	✓
Total Vanadium (V)	mg/kg	MCERTS	11	✓
Total Zinc (Zn)	mg/kg	MCERTS	50	✓
Water Soluble Boron (B)	mg/kg	MCERTS	0.7	✓
Total Cyanide (CN)	mg/kg	MCERTS	< 1	✓
Total (mono) Phenols	mg/kg	MCERTS	< 2.0	✓
Elemental Sulphur (S)	mg/kg	MCERTS	< 20	✓
Acid Volatile Sulphide (S)	mg/kg	MCERTS	< 1.0	✓
Water Soluble Sulphate (SO4)	g/l	MCERTS	0.36	✓
Naphthalene	mg/kg	MCERTS	< 0.05	✓
Acenaphthylene	mg/kg	MCERTS	< 0.20	✓
Acenaphthene	mg/kg	MCERTS	< 0.10	✓
Fluorene	mg/kg	MCERTS	< 0.20	✓
Phenanthrene	mg/kg	MCERTS	< 0.20	✓
Anthracene	mg/kg	MCERTS	< 0.10	✓
Fluoranthene	mg/kg	MCERTS	< 0.20	✓
Pyrene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)anthracene	mg/kg	MCERTS	< 0.20	✓
Chrysene	mg/kg	MCERTS	< 0.05	✓
Benzo(b)fluoranthene	mg/kg	MCERTS	< 0.10	✓
Benzo(k)fluoranthene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)pyrene	mg/kg	MCERTS	< 0.10	✓
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS	< 0.20	✓
Dibenzo(a,h)anthracene	mg/kg	MCERTS	< 0.20	✓
Benzo(g,h,i)perylene	mg/kg	MCERTS	< 0.05	✓
Total PAHs (sum USEPA16)	mg/kg	MCERTS	< 1.6	✓
Aliphatic TPH >C5 - C6	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aliphatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aliphatic TPH >C16 - C21	mg/kg	MCERTS	< 8.0	✓
Aliphatic TPH >C21 - C35	mg/kg	MCERTS	11	✓
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	11	✓
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aromatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aromatic TPH >C16 - C21	mg/kg	MCERTS	< 10	✓
Aromatic TPH >C21 - C35	mg/kg	MCERTS	< 10	✓
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10	✓
Benzene	mg/kg	MCERTS	< 0.001	✓
Toluene	mg/kg	MCERTS	< 0.001	✓
Ethylbenzene	mg/kg	MCERTS	< 0.001	✓
o-xylene	mg/kg	MCERTS	< 0.001	✓
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001	✓

Visual Examination

The sample was described as a dark brown, dry, friable SANDY LOAM with a weakly developed, fine to medium granular structure. The sample was virtually stone-free and contained frequent small woody fibres. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

✓	Meets General Landscape Specification
X	Fails General Landscape Specification
SL	Sandy Loam Texture Class
PAH	Polyaromatic Hydrocarbons

TIM O'HARE ASSOCIATES

SOIL & LANDSCAPE CONSULTANCY

Mr Ian Elwick
Rolawn Ltd
York Road
Elvington
York YO41 4XR

1st October 2013
Our Ref: TOHA/13/4732/2/JU
Your Ref: O/N IE0086

Dear Sirs

Topsoil Analysis Report: Rolawn Blended Loam (September 2013)

We have completed the analysis of the soil sample recently submitted, referenced *Rolawn Blended Loam (b) (16/09/2013),* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the topsoil source. The report and results should therefore not be used by third parties as a means of verification or validation testing, especially after the topsoil has left the Rolawn Ltd site.

SAMPLE EXAMINATION

The sample was described as a brown, dry, friable SANDY LOAM with a weakly developed, fine granular structure*. The sample was virtually stone-free, contained frequent organic fines and was not intimately mixed. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of a disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the absence of potential contaminants. The following parameters were determined:

- particle size analysis and stone content;
- pH and electrical conductivity values ($CaSO_4$ and water extracts);
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- soluble sulphate, elemental sulphur, acid volatile sulphide;
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX).

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *loamy sand* texture class, which is usually considered suitable for general landscape applications, provided the soil's physical condition is satisfactory.

The sample was stone-free and, as such, stones should not restrict the use of the soil for general landscape purposes.

pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.0). This pH value would be considered suitable for general landscape purposes providing species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

The electrical conductivity (salinity) value (water extract) was moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

The electrical conductivity value by $CaSO_4$ extract (*BS3882* requirement) fell below the maximum specified value (2800 µS/cm) given in *BS3882:2007 – Table 1*.

Organic Matter and Fertility Status

The sample was well supplied with organic matter and all major plant nutrients.

The C:N ratio of the sample was acceptable for general landscape purposes.

Potential Contaminants

With reference to *BS3882:2007 - Table 1*: Notes 2, 3 and 4, there is a requirement to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations of selected potential contaminants that affect human health have been assessed for *residential* end-use against the Soil Guideline Values presented in the Contaminated Land Exposure Assessment (CLEA) (EA/DEFRA: 2009) and the CIEH/LQM Generic Assessment Criteria (2nd Edition, 2009).

Of the potential contaminants determined, none was found at levels that would indicate significant contamination with respect to the proposed end use of this topsoil.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in *BS3882:2007 – Table 1.*

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, stone-free loamy sand with an adequate structure. The organic matter content and fertility status were moderate. No potential contamination was found with respect to the parameters determined.

Based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes provided species with a broad pH tolerance are selected for planting and the soil's physical condition is satisfactory.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

RECOMMENDATIONS

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, respreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully

Joanna Uglow
BSc MSc
Junior Soil Scientist

Laura Hathaway-Jenkins
BSc MSc EngD MISoilSci
Soil Scientist

For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Rolawn Ltd**
Project	**Topsoil Analysis - Blended Loam Topsoil (16/09/13)**
Date:	**September 2013**
Job Ref No:	**TOHA/13/4732/2/JU**

Sample Reference			**Blended Loam Topsoil (b)**	
		Acreditation		
Clay (<0.002mm)	%	UKAS	10	✓
Silt (0.002-0.063mm)	%	UKAS	10	✓
Sand (0.063-2.0mm)	%	UKAS	80	✓
Texture Class (UK Classification)	--	UKAS	LS	✓
Stones (2-20mm)	% DW	GLP	0.4	✓
Stones (20-50mm)	% DW	GLP	0	✓
Stones (>50mm)	% DW	GLP	0	✓
pH Value (1:2.5 water extract)	units	UKAS	8	✓
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	656	✓
Electrical Conductivity (1:2 CaSO4 extract)	uS/cm	UKAS	2493	✓
Exchangeable Sodium Percentage	%	UKAS	4	✓
Organic Matter (LOI)	%	UKAS	7.3	✓
Total Nitrogen (Dumas)	%	UKAS	0.4	✓
C : N Ratio	ratio	UKAS	11	✓
Extractable Phosphorus	mg/l	UKAS	30	✓
Extractable Potassium	mg/l	UKAS	334	✓
Extractable Magnesium	mg/l	UKAS	76	✓
Total Arsenic (As)	mg/kg	MCERTS	5	✓
Total Barium (Ba)	mg/kg	MCERTS	47	✓
Total Beryllium (Be)	mg/kg	MCERTS	0.3	✓
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2	✓
Total Chromium (Cr)	mg/kg	MCERTS	7	✓
Chromium (VI) (Cr)	mg/kg	MCERTS	< 4.0	✓
Total Copper (Cu)	mg/kg	MCERTS	13	✓
Total Lead (Pb)	mg/kg	MCERTS	20	✓
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3	✓
Total Nickel (Ni)	mg/kg	MCERTS	10	✓
Total Selenium (Se)	mg/kg	MCERTS	< 1.0	✓
Total Vanadium (V)	mg/kg	MCERTS	10	✓
Total Zinc (Zn)	mg/kg	MCERTS	89	✓
Water Soluble Boron (B)	mg/kg	MCERTS	0.4	✓
Total Cyanide (CN)	mg/kg	MCERTS	< 1	✓
Total (mono) Phenols	mg/kg	MCERTS	< 2.0	✓
Elemental Sulphur (S)	mg/kg	MCERTS	< 20	✓
Acid Volatile Sulphide (S)	mg/kg	MCERTS	4	✓
Water Soluble Sulphate (SO4)	g/l	MCERTS	0.34	✓
Naphthalene	mg/kg	MCERTS	< 0.05	✓
Acenaphthylene	mg/kg	MCERTS	< 0.20	✓
Acenaphthene	mg/kg	MCERTS	< 0.10	✓
Fluorene	mg/kg	MCERTS	< 0.20	✓
Phenanthrene	mg/kg	MCERTS	< 0.20	✓
Anthracene	mg/kg	MCERTS	< 0.10	✓
Fluoranthene	mg/kg	MCERTS	< 0.20	✓
Pyrene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)anthracene	mg/kg	MCERTS	< 0.20	✓
Chrysene	mg/kg	MCERTS	< 0.05	✓
Benzo(b)fluoranthene	mg/kg	MCERTS	< 0.10	✓
Benzo(k)fluoranthene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)pyrene	mg/kg	MCERTS	< 0.10	✓
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS	< 0.20	✓
Dibenzo(a,h)anthracene	mg/kg	MCERTS	< 0.20	✓
Benzo(g,h,i)perylene	mg/kg	MCERTS	< 0.05	✓
Total PAHs (sum USEPA16)	mg/kg	MCERTS	< 1.6	✓
Aliphatic TPH >C5 - C6	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aliphatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aliphatic TPH >C16 - C21	mg/kg	MCERTS	< 8.0	✓
Aliphatic TPH >C21 - C35	mg/kg	MCERTS	13	✓
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	13	✓
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aromatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aromatic TPH >C16 - C21	mg/kg	MCERTS	< 10	✓
Aromatic TPH >C21 - C35	mg/kg	MCERTS	< 10	✓
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10	✓
Benzene	mg/kg	MCERTS	< 0.001	✓
Toluene	mg/kg	MCERTS	< 0.001	✓
Ethylbenzene	mg/kg	MCERTS	< 0.001	✓
o-xylene	mg/kg	MCERTS	< 0.001	✓
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001	✓

Visual Examination

The sample was described as a brown, dry, friable LOAMY SAND with a weakly developed, fine granular structure. The sample was virtually stone-free, contained frequent organic fines and was not intimately mixed. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

✓	Meets General Landscape Specification
X	Fails General Landscape Specification
*	See Report Comments
LS	Loamy Sand Texture Class
PAH	Polyaromatic Hydrocarbons

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Ian Elwick
Rolawn Ltd
York Road
Elvington
York YO41 4XR

1st October 2013
Our Ref: TOHA/13/4732/1/JU
Your Ref: O/N IE0086

Dear Sirs

Topsoil Analysis Report: Rolawn Blended Loam (September 2013)

We have completed the analysis of the soil sample recently submitted, referenced *Rolawn Blended Loam (a) (16/09/2013),* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the topsoil source. The report and results should therefore not be used by third parties as a means of verification or validation testing, especially after the topsoil has left the Rolawn Ltd site.

SAMPLE EXAMINATION

The sample was described as a brown, dry, friable SANDY LOAM with a weakly developed, fine granular structure*. The sample was virtually stone-free and contained frequent organic fines. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of a disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the absence of potential contaminants. The following parameters were determined:

- particle size analysis and stone content;
- pH and electrical conductivity values ($CaSO_4$ and water extracts);
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- soluble sulphate, elemental sulphur, acid volatile sulphide;
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX).

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *sandy loam* texture class, which is usually considered suitable for general landscape applications, provided the soil's physical condition is satisfactory.

The sample was stone-free and, as such, stones should not restrict the use of the soil for general landscape purposes.

pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.1). This pH value would be considered suitable for general landscape purposes providing species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

The electrical conductivity (salinity) value (water extract) was moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

The electrical conductivity value by $CaSO_4$ extract (*BS3882* requirement) fell below the maximum specified value (2800 µS/cm) given in *BS3882:2007 – Table 1.*

Organic Matter and Fertility Status

The sample was well supplied with organic matter and all major plant nutrients.

The C:N ratio of the sample was acceptable for general landscape purposes.

Potential Contaminants

With reference to *BS3882:2007 - Table 1*: Notes 2, 3 and 4, there is a requirement to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations of selected potential contaminants that affect human health have been assessed for *residential* end-use against the Soil Guideline Values presented in the Contaminated Land Exposure Assessment (CLEA) (EA/DEFRA: 2009) and the CIEH/LQM Generic Assessment Criteria (2nd Edition, 2009).

Of the potential contaminants determined, none was found at levels that would indicate significant contamination with respect to the proposed end use of this topsoil.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in *BS3882:2007 – Table 1.*

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, stone-free sandy loam with an adequate structure. The organic matter content and fertility status were moderate. No potential contamination was found with respect to the parameters determined.

Based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes provided species with a broad pH tolerance are selected for planting and the soil's physical condition is satisfactory.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil *(BS3882:2007 – Specification for topsoil and requirements for use – Table 1, Multipurpose Topsoil).*

RECOMMENDATIONS

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, respreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully

Joanna Uglow
BSc MSc
Junior Soil Scientist

Laura Hathaway-Jenkins
BSc MSc EngD MISoilSci
Soil Scientist

For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Rolawn Ltd**
Project	**Topsoil Analysis - Blended Loam Topsoil (16/09/13)**
Date:	**October 2013**
Job Ref No:	**TOHA/13/4732/1/JU**

Sample Reference			**Blended Loam Topsoil (a)**	
		Acreditation		
Clay (<0.002mm)	%	UKAS	10	✓
Silt (0.002-0.063mm)	%	UKAS	11	✓
Sand (0.063-2.0mm)	%	UKAS	79	✓
Texture Class (UK Classification)	--	UKAS	SL	✓
Stones (2-20mm)	% DW	GLP	0.1	✓
Stones (20-50mm)	% DW	GLP	0.2	✓
Stones (>50mm)	% DW	GLP	0	✓
pH Value (1:2.5 water extract)	units	UKAS	8.1	✓
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	773	✓
Electrical Conductivity (1:2 CaSO4 extract)	uS/cm	UKAS	2541	✓
Exchangeable Sodium Percentage	%	UKAS	4.9	✓
Organic Matter (LOI)	%	UKAS	6.1	✓
Total Nitrogen (Dumas)	%	UKAS	0.26	✓
C : N Ratio	ratio	UKAS	14	✓
Extractable Phosphorus	mg/l	UKAS	34	✓
Extractable Potassium	mg/l	UKAS	508	✓
Extractable Magnesium	mg/l	UKAS	88	✓
Total Arsenic (As)	mg/kg	MCERTS	4	✓
Total Barium (Ba)	mg/kg	MCERTS	50	✓
Total Beryllium (Be)	mg/kg	MCERTS	0.3	✓
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2	✓
Total Chromium (Cr)	mg/kg	MCERTS	8	✓
Chromium (VI) (Cr)	mg/kg	MCERTS	< 4.0	✓
Total Copper (Cu)	mg/kg	MCERTS	15	✓
Total Lead (Pb)	mg/kg	MCERTS	21	✓
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3	✓
Total Nickel (Ni)	mg/kg	MCERTS	10	✓
Total Selenium (Se)	mg/kg	MCERTS	< 1.0	✓
Total Vanadium (V)	mg/kg	MCERTS	11	✓
Total Zinc (Zn)	mg/kg	MCERTS	50	✓
Water Soluble Boron (B)	mg/kg	MCERTS	0.6	✓
Total Cyanide (CN)	mg/kg	MCERTS	< 1	✓
Total (mono) Phenols	mg/kg	MCERTS	< 2.0	✓
Elemental Sulphur (S)	mg/kg	MCERTS	< 20	✓
Acid Volatile Sulphide (S)	mg/kg	MCERTS	2	✓
Water Soluble Sulphate (SO4)	g/l	MCERTS	0.25	✓
Naphthalene	mg/kg	MCERTS	< 0.05	✓
Acenaphthylene	mg/kg	MCERTS	< 0.20	✓
Acenaphthene	mg/kg	MCERTS	< 0.10	✓
Fluorene	mg/kg	MCERTS	< 0.20	✓
Phenanthrene	mg/kg	MCERTS	< 0.20	✓
Anthracene	mg/kg	MCERTS	< 0.10	✓
Fluoranthene	mg/kg	MCERTS	< 0.20	✓
Pyrene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)anthracene	mg/kg	MCERTS	< 0.20	✓
Chrysene	mg/kg	MCERTS	< 0.05	✓
Benzo(b)fluoranthene	mg/kg	MCERTS	< 0.10	✓
Benzo(k)fluoranthene	mg/kg	MCERTS	< 0.20	✓
Benzo(a)pyrene	mg/kg	MCERTS	< 0.10	✓
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS	< 0.20	✓
Dibenzo(a,h)anthracene	mg/kg	MCERTS	< 0.20	✓
Benzo(g,h,i)perylene	mg/kg	MCERTS	< 0.05	✓
Total PAHs (sum USEPA16)	mg/kg	MCERTS	< 1.6	✓
Aliphatic TPH >C5 - C6	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aliphatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aliphatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aliphatic TPH >C16 - C21	mg/kg	MCERTS	< 8.0	✓
Aliphatic TPH >C21 - C35	mg/kg	MCERTS	11	✓
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	11	✓
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.1	✓
Aromatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	✓
Aromatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0	✓
Aromatic TPH >C16 - C21	mg/kg	MCERTS	< 10	✓
Aromatic TPH >C21 - C35	mg/kg	MCERTS	< 10	✓
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10	✓
Benzene	mg/kg	MCERTS	< 0.001	✓
Toluene	mg/kg	MCERTS	< 0.001	✓
Ethylbenzene	mg/kg	MCERTS	< 0.001	✓
o-xylene	mg/kg	MCERTS	< 0.001	✓
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001	✓

Visual Examination

The sample was described as a brown, dry, friable SANDY LOAM with a weakly developed, fine granular structure. The sample was virtually stone-free and contained frequent organic fines. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

✓	Meets General Landscape Specification
X	Fails General Landscape Specification
*	See Report Comments
SL	Sandy Loam Texture Class
PAH	Polyaromatic Hydrocarbons

Declaration of Compliance BS3882:2007

Soil source: Rolawn Ltd, Seaton Ross site - Blended Loam

This declaration confirms that the topsoil represented by the attached Topsoil Analysis Report conforms to the requirements of the British Standard for Topsoil (BS3882:2007).

The sample was sampled and tested in accordance with the requirements of BS3882:2007.

- Samples are taken for analysis every 8000 tonnes (5000m^3) of product.
- Samples are taken from all topsoil/loam ready for dispatch.
- Rolawn Blended Loam is sampled after screening.
- Analysis certificates are retained for a period of 5 years.
- Laboratory analysis is undertaken at a **UKAS** and **MCERTS** accredited laboratory.
- All laboratory methods are in accordance with BS3882:2007.

Signed

Ian Elwick
Production Manager (Other Products)
Rolawn Limited
Elvington
York
YO41 4XR
Tel: 01904 608661

Rolawn Limited

Product information sheet

Hallstone Value Topsoil

Issue date:
December 2010

Pack size:	Product Code:	EAN/Bar Code:	Material Safety Data Sheet:
0.6m^3 bulk bag 850 x 850 x 850 mm	HTOPSO6000	5060254400211	H/S Topsoil

Description

Hallstone Value Topsoil is a multi-purpose topsoil, using a blend of recycled natural topsoil derived from prime arable land and recycled green waste compost material produced to BSI PAS100:2005. Ideal for general purpose landscaping work, including year-round planting.

Specification

- Screened to 20mm
- Recycled topsoil tested to BS3882:2007 derived from prime arable land
- Recycled green waste compost produced to BSI PAS100:2005
- Safe
- Sustainable
- Peat free
- Consistent
- pH typically 7.5
- Weight to volume ratio (bulk density) is typically 900-1100kg/m^3

Properties

- Versatile
- Fully traceable content
- High in organic matter
- Consistently fertile
- Consistent appearance

Availability: UK mainland

Delivery Options: 0.6m^3 bulk bag

Coverage: Up to 24m^2 at a depth of 25mm

Volumetrics		
Unit of measure:		Bulk Bag
Units per SKU item:		1
Item dimensions in mm's	Height:	850
	Width:	850
	Depth:	850
Item average weight in kilos:		600
Items per outer:		N/A
Items per pallet:		2
Items per pallet layer:		1
Pallet design		2 way
Empty pallet dimensions in mm's	Height:	75
	Width:	900
	Depth:	900
Pallet dimensions with product in mm's (inc pallet)	Height:	1320
	Width:	1030
	Depth:	1060

Technical Support

Further information on Hallstone Value products and the complete Rolawn range can be obtained as below.

Further information

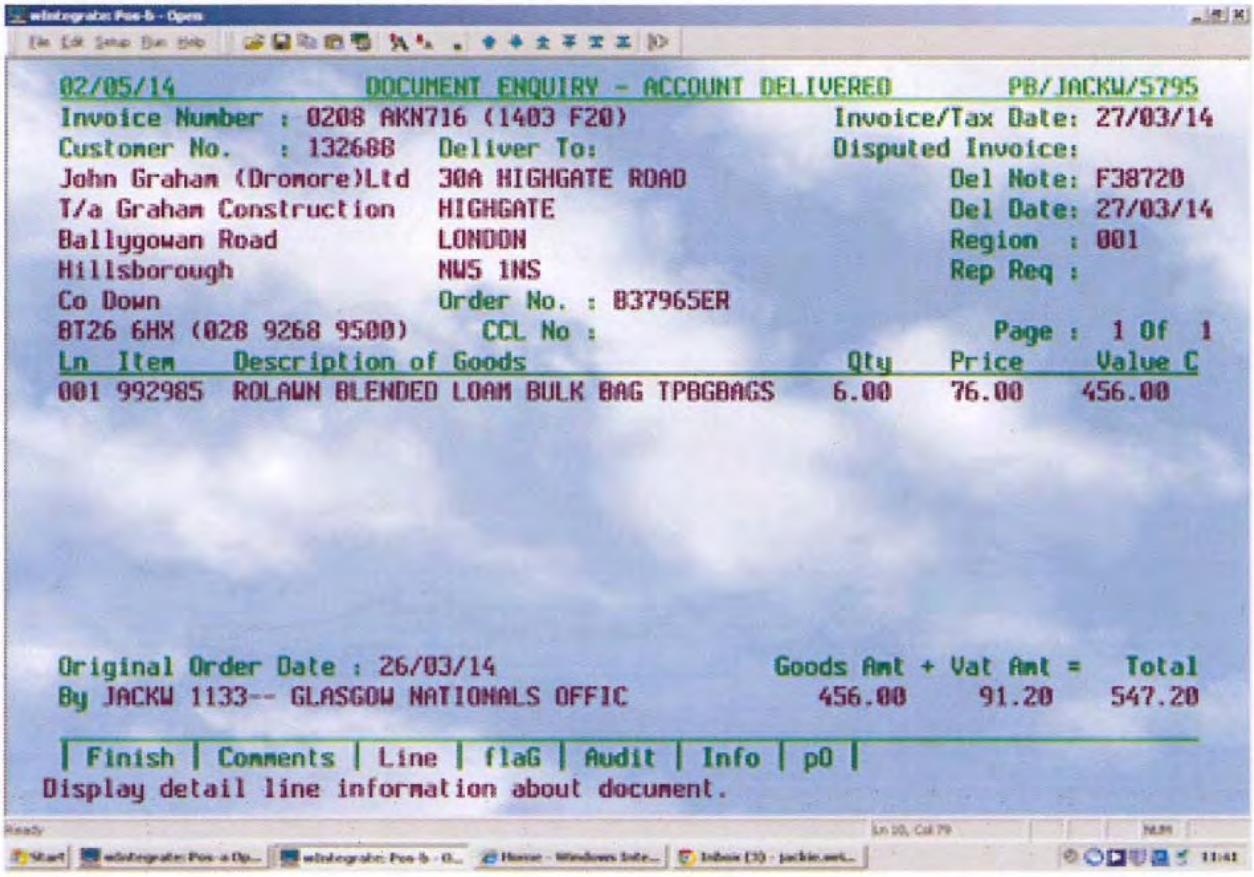
Customer services: Tel: 0845 604 6050

The information in this product information sheet is accurate at the time of printing, however Hallstone reserve the right to amend details as part of their product development programme.

Hallstone Value Topsoil is a natural product and we therefore reserve the right to change the specification.

Rolawn Limited
Elvington
York
YO41 4XR
Tel: 0845 604 6050
Fax: 01904 757342
Email: info@rolawn.co.uk
www.rolawn.co.uk

GEA Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG		**Topsoil Invoice**
Site 30a Highgate Road, London, NW5 1NS		**Job Number** J12041C
Client Colin Serlin		**Sheet** 1 / 1
Engineer		



GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Generic Risk-Based Soil Guideline Values

Site	30a Highgate Road, London, NW5 1NS	**Job Number** J12041C
Client	Mr Colin Serlin	**Sheet** 1 / 1
Engineer	Elliott Wood Partnership	

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 6.0

Contaminant	Guideline Value mg/kg	Data Source
Metals		
Arsenic	32	SGV
Cadmium	10	SGV
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	4.3	LQM/CIEH
Copper	2,330	LQM/CIEH
Lead	450	withdrawn SGV
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	130	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.33	SGV
Toluene	610	SGV
Ethyl Benzene	350	SGV
Xylene	230	SGV
Aliphatic C5-C6	110	LQM/CIEH
Aliphatic C6-C8	370	LQM/CIEH
Aliphatic C8-C10	110	LQM/CIEH
Aliphatic C10-C12	540	LQM/CIEH
Aliphatic C12-C16	3000	LQM/CIEH
Aliphatic C16-C35	76,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	151	LQM/CIEH
Aromatic C10-C12	346	LQM/CIEH
Aromatic C12-C16	593	LQM/CIEH
Aromatic C16-C21	770	LQM/CIEH
Aromatic C21-C35	1230	LQM/CIEH
PRO (C_5 –C_{10})	1351	Calc
DRO (C_{12} –C_{28})	80,363	Calc
Lube Oil (C_{28} –C_{44})	77,230	Calc
TPH	**500**	Trigger for speciated testing

Contaminant	Guideline Value mg/kg	Data Source
Anions		
Soluble Sulphate	0.5 g/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	420	SGV
PAH		
Naphthalene	8.70	LQM/CIEH
Acenaphthylene	850	LQM/CIEH
Acenaphthene	1,000	LQM/CIEH
Fluorene	780	LQM/CIEH
Phenanthrene	380	LQM/CIEH
Anthracene	9,200	LQM/CIEH
Fluoranthene	670	LQM/CIEH
Pyrene	1,600	LQM/CIEH
Benzo(a) Anthracene	5.9	LQM/CIEH
Chrysene	9	LQM/CIEH
Benzo(b) Fluoranthene	7.0	LQM/CIEH
Benzo(k) Fluoranthene	10.0	LQM/CIEH
Benzo(a) pyrene	1.00	LQM/CIEH
Indeno(1 2 3 cd) Pyrene	4.2	LQM/CIEH
Dibenzo(a h) Anthracene	0.90	LQM/CIEH
Benzo (g h i) Perylene	47	LQM/CIEH
Total PAH	**6.7**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	28	LQM/CIEH
tetrachloroethane (PCA)	4.8	LQM/CIEH
tetrachloroethene (PCE)	4.8	LQM/CIEH
trichloroethene (TCE)	0.49	LQM/CIEH
1,2-dichloroethane (DCA)	0.014	LQM/CIEH
vinyl chloride (Chloroethene)	0.00099	LQM/CIEH
tetrachloromethane (Carbon tetra	0.089	LQM/CIEH
trichloromethane (Chloroform)	2.7	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these valuesindicate a potential risk, and thus require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

withdrawn SGV - Former SGV, derived from the CLEA 2000 model and published by DEFRA pending confirmation of new approach to modeling lead

LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative