



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr John Coles
Bury Hill Landscape Supplies Ltd
The Estate Office
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9th December 2022
Our Ref: TOHA/22/7685/4/SS
Your Ref: see below

Dear Sirs

Soil Analysis Report: Bury Hill Horsham Yard – Rain Garden Soil (E)

We have completed the analysis of the sample recently submitted, referenced *Rain Garden Soil (E)* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample for use as a topsoil for rain gardens. Rain gardens are typically small features that are less engineered than full bioretention systems that use specialist, high permeability rootzones. For rain gardens, a sandy topsoil with normal levels of fertility is usually preferred.

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

SAMPLE EXAMINATION

The sample was described as a dark yellowish brown (Munsell Colour 10YR 3/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was very slightly stony and contained a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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Plate 1: Rain Garden Soil (E) Sample

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, drainage rate and fertility of the rootzone, and the concentration of selected potential contaminants. The following parameters were determined:

- detailed particle size analysis (5 sands, silt, clay);
- stone content (2-20mm, 20-50mm, >50mm);
- saturated hydraulic conductivity;
- pH and electrical conductivity values;
- calcium carbonate;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (Sb, As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn);
- total cyanide and total (mono) phenols;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX);
- asbestos screen.

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 *sand* texture class. Further detailed particle size analysis revealed the sample to have a narrow particle size distribution and a predominance of *medium sand* (0.25-0.50mm), followed by *coarse sand* (0.50-1.0mm). This particle size distribution would be considered suitable for topsoil in a rain garden environment.

The sample was very slightly stony, and as such stones will not restrict the use of the soil.

Saturated Hydraulic Conductivity

The saturated hydraulic conductivity rate (23mm/hr) recorded under a degree of consolidation would be described as moderate and would be considered suitable for a rain garden environment provided it meets the specific drainage performance for the respective scheme.

pH and Calcium Carbonate Values

The sample was strongly alkaline in reaction (pH 8.4) and non-calcareous ($\text{CaCO}_3 < 1\%$).

The main source of the 'alkalinity' is likely to be the potassium ions from the compost in the sample. As such, this pH value would be considered suitable for most plant species, including those that are intolerant of calcareous (chalky) soils.

Electrical Conductivity Values

The electrical conductivity (salinity) values (water and CaSO_4 extracts) were moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

Organic Matter and Fertility Status

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

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

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations that affect human health have been compared with the *residential with homegrown produce* land use in the Suitable For Use Levels (S4ULs) presented in *The LQM/CIEH S4ULs for Human Health Risk Assessment* (2015) and the DEFRA SP1010: *Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination – Policy Companion Document* (2014).

Of the potential contaminants determined, none was found at levels that exceeded their guideline values.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels.

CONCLUSION

The purpose of the analysis was to determine the suitability of the sample for use as a topsoil for rain gardens.

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, non-calcareous sand with an adequate structure and very low stone content. The sample was adequately supplied with organic matter and all major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

Based on these results, the soil represented by this sample would be considered suitable for use as topsoil within a 'rain garden' landscape provided the drainage rate meets the requirements of the respective scheme.

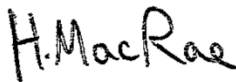
Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid compaction during all phases of soil handling (e.g. stockpiling, respreading, cultivating, seeding or turfing). As a consequence, soil handling operations should be carried out when soil and the underlying ground is sufficiently dry and stable.

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 ground has dried out. If the soil is compacted at any stage during the course of soiling or landscaping works, it should be decompacted appropriately.

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



Harriet MacRae
BSc MSc
Graduate Soil Scientist



Matthew Heins
BSc (Hons) MSoilSci
Senior Soil Scientist

For & on behalf of Tim O'Hare Associates LLP



Client:	Bury Hill landscape Supplies Ltd
Project:	Bury Hill Horsham Yard - Rain Garden Soil (E)
Job:	Soil Analysis
Date:	09/12/2022
Job Ref No:	TOHA/22/7685/4/SS

Sample Reference	%	Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.05mm)	%	UKAS
Very Fine Sand (0.05-0.15mm)	%	UKAS
Fine Sand (0.15-0.25mm)	%	UKAS
Medium Sand (0.25-0.50mm)	%	UKAS
Coarse Sand (0.50-1.0mm)	%	UKAS
Very Coarse Sand (1.0-2.0mm)	%	UKAS
Total Sand (0.05-2.0mm)	%	UKAS
Texture Class (UK Classification)	--	UKAS
Stones (2-20mm)	% DW	GLP
Stones (20-50mm)	% DW	GLP
Stones (>50mm)	% DW	GLP

Saturated Hydraulic Conductivity	mm/hr	A2LA
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Parameter	units	UKAS
pH Value (1:2.5 water extract)	units	UKAS
Calcium Carbonate	%	UKAS
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS
Electrical Conductivity (1:2 CaSO ₄ extract)	uS/cm	UKAS
Exchangeable Sodium Percentage	%	UKAS
Organic Matter (LOI)	%	UKAS
Total Nitrogen (Dumas)	%	UKAS
C : N Ratio	ratio	UKAS
Extractable Phosphorus	mg/l	UKAS
Extractable Potassium	mg/l	UKAS
Extractable Magnesium	mg/l	UKAS

Parameter	mg/kg	MCERTS
Total Arsenic (As)	mg/kg	MCERTS
Total Cadmium (Cd)	mg/kg	MCERTS
Total Chromium (Cr)	mg/kg	MCERTS
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS
Total Copper (Cu)	mg/kg	MCERTS
Total Lead (Pb)	mg/kg	MCERTS
Total Mercury (Hg)	mg/kg	MCERTS
Total Nickel (Ni)	mg/kg	MCERTS
Total Selenium (Se)	mg/kg	MCERTS
Total Zinc (Zn)	mg/kg	MCERTS
Water Soluble Boron (B)	mg/kg	MCERTS
Total Cyanide (CN)	mg/kg	MCERTS
Total (mono) Phenols	mg/kg	MCERTS

Parameter	mg/kg	MCERTS
Naphthalene	mg/kg	MCERTS
Acenaphthylene	mg/kg	MCERTS
Acenaphthene	mg/kg	MCERTS
Fluorene	mg/kg	MCERTS
Phenanthrene	mg/kg	MCERTS
Anthracene	mg/kg	MCERTS
Fluoranthene	mg/kg	MCERTS
Pyrene	mg/kg	MCERTS
Benzo(a)anthracene	mg/kg	MCERTS
Chrysene	mg/kg	MCERTS
Benzo(b)fluoranthene	mg/kg	MCERTS
Benzo(k)fluoranthene	mg/kg	MCERTS
Benzo(a)pyrene	mg/kg	MCERTS
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS
Dibenzo(a,h)anthracene	mg/kg	MCERTS
Benzo(g,h,i)perylene	mg/kg	MCERTS
Total PAHs (sum USEPA16)	mg/kg	MCERTS

Parameter	mg/kg	MCERTS
Aliphatic TPH >C5 - C6	mg/kg	MCERTS
Aliphatic TPH >C6 - C8	mg/kg	MCERTS
Aliphatic TPH >C8 - C10	mg/kg	MCERTS
Aliphatic TPH >C10 - C12	mg/kg	MCERTS
Aliphatic TPH >C12 - C16	mg/kg	MCERTS
Aliphatic TPH >C16 - C21	mg/kg	MCERTS
Aliphatic TPH >C21 - C35	mg/kg	MCERTS
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS
Aromatic TPH >C5 - C7	mg/kg	MCERTS
Aromatic TPH >C7 - C8	mg/kg	MCERTS
Aromatic TPH >C8 - C10	mg/kg	MCERTS
Aromatic TPH >C10 - C12	mg/kg	MCERTS
Aromatic TPH >C12 - C16	mg/kg	MCERTS
Aromatic TPH >C16 - C21	mg/kg	MCERTS
Aromatic TPH >C21 - C35	mg/kg	MCERTS
Aromatic TPH (C5 - C35)	mg/kg	MCERTS

Parameter	mg/kg	MCERTS
Benzene	mg/kg	MCERTS
Toluene	mg/kg	MCERTS
Ethylbenzene	mg/kg	MCERTS
p & m-xylene	mg/kg	MCERTS
o-xylene	mg/kg	MCERTS
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS

Asbestos	ND/D	ISO 17025
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S = SAND

Visual Examination

The sample was described as a dark yellowish brown (Munsell Colour 10YR 3/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was very slightly stony and contained a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Results of analysis should be read in conjunction with the report they were issued with

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Rain Garden Soil (E)

4
0
1
5
43
35
12
96
S
2
0
0

23

8.4
< 1.0
921
3128
4.7
6.3
0.21
17
55
915
99

3
< 0.2
6
< 1.8
12
10
< 0.3
4
< 1.0
27
1
< 1.0
< 1.0

< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
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< 0.001
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< 0.001
< 1.0
< 2.0
< 8.0
< 8.0
< 10
< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 10
< 10
< 10

< 0.001
< 0.001
< 0.001
< 0.001
< 0.001
< 0.001

Not-detected

H. MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist