



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr John Coles
Bury Hill Landscape Supplies Ltd
The Estate Office
Old Bury Hill
Westcott
Nr Dorking
Surrey, RH4 3JU

24th March 2023
Our Ref: TOHA/23/7856/SS
Your Ref: See below

Dear Sirs

Topsoil Analysis Report: Bury Hill Horsham Yard – pH Neutral Lightweight Topsoil

We have completed the analysis of the soil sample recently submitted, referenced *pH Neutral Lightweight Topsoil*, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the material for use as an intensive lightweight substrate in a rooftop or podium garden environment.

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, waste designation purposes or for any project-specific application, especially after the topsoil has left the Bury Hill Landscape Supplies Ltd site.

SAMPLE EXAMINATION

The sample can be described as a dark grey (Munsell Colour 10YR 4/1), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was virtually stone free with a moderate proportion of lightweight expanded clay aggregate 'leca' and a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Tim O'Hare Associates LLP
Howbery Park Wallingford Oxfordshire OX10 8BA
T:01491 822653 E:info@toha.co.uk
www.toha.co.uk



Plate 1: pH Neutral Lightweight Topsoil 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 and fertility of the soil, 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);
- bulk density (as received, field capacity);
- saturated hydraulic conductivity;
- pH and electrical conductivity values;
- calcium carbonate;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- visible contaminants;
- heavy metals (Sb, As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, 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 found the sample to have a narrow particle size distribution with a predominance of *medium sand* (0.25-0.50mm) and a smaller proportion of *coarse sand* (0.50-1.0mm). Such soils typically have good aeration and drainage properties but can possess reduced water and nutrient retention capacities. However, in this instance the soil's organic matter content (8.2%) is likely to offset these factors. Consideration should be given to provision of supplementary irrigation, particularly during drier periods.

With the exception of 'leca' particles, the sample contained a very low proportion of 'stone' sized material (>2mm).

Bulk Density and Saturated Hydraulic Conductivity

The sample displayed a bulk density at Field Capacity of 1.50 Mg/m³, which is reasonably low compared to that of standard topsoil. The suitability of the bulk density result should be confirmed by the project engineer for the recipient site.

The saturated hydraulic conductivity of the sample (53 mm/hour) indicates that the substrate is sufficiently permeable and should demonstrate adequate drainage performance for use in rooftop or podium garden environments. Soils used in these environments need to have satisfactory drainage performance to avoid stagnation (and therefore excess weight) and to enable efficient conveyance of water into the drainage system.

pH and Electrical Conductivity Values

The sample was slightly acid in reaction (pH 6.8), with a pH value that would be considered ideal for general landscape purposes.

The electrical conductivity values were moderate, indicating that soluble salts were not present at a level 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 was high (26:1) and exceeded the maximum recommended level (20:1). This could cause 'nitrogen lock up' and result in growth restriction in sensitive plants in particular. The C:N ratio can be addressed through an appropriate fertiliser application.

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations that affect human health have been compared with the *residential with home grown 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 remaining potential contaminants determined, none exceeded their respective 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 material for use as an intensive lightweight substrate in a roof garden or podium landscape environment.

From the soil examination and subsequent laboratory analysis, the sample was described as a slightly acid, non-saline, non-calcareous sand with a single grain structure and moderate proportion of 'leca' particles. The sample was adequately supplied with organic matter and all major plant nutrients. The C:N ratio of the sample was high. Of the potential contaminants determined, none exceeded their respective guideline values.

Based on our findings, the substrate represented by this sample would be considered suitable for use as a lightweight intensive substrate for landscaping purposes in a roof garden or podium environment provided the C:N ratio is addressed through a suitable fertiliser application.

The substrate should be underlain by a suitably graded subsoil product to interface with underlying structures and / or drainage infrastructure, as appropriate.

RECOMMENDATIONS

Fertiliser for Planting

To address the high C:N ratio and to help promote effective plant establishment, we recommend applying and incorporating the compound, controlled release fertiliser ICL Osmocote PrePlant (17%N:9%P₂O₅:10%K₂O:2%MgO+TE) at a rate of 70 g/m² to a depth of 200mm.

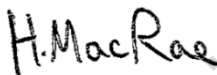
Soil Handling Recommendations

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. If the soil is compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction 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



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
Job:	Topsoil Analysis
Date:	24/03/2023
Job Ref No:	TOHA/23/7856/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

Bulk Density (As Received)	Mg/m3	UKAS
Bulk Density (Saturated @ Field Capacity)	Mg/m3	UKAS
Saturated Hydraulic Conductivity	mm/hr	A2LA

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

Visible Contaminants: Plastics >2.00mm	%	UKAS
Visible Contaminants: Sharps >2.00mm	%	UKAS

Total Antimony (Sb)	mg/kg	MCERTS
Total Arsenic (As)	mg/kg	MCERTS
Total Barium (Ba)	mg/kg	MCERTS
Total Beryllium (Be)	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 Vanadium (V)	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

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

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

Benzene	mg/kg	MCERTS
Toluene	mg/kg	MCERTS
Ethylbenzene	mg/kg	MCERTS
p & m-xylene	mg/kg	MCERTS
o-xylene	mg/kg	MCERTS

Asbestos	ND/D	ISO17025
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S = SAND

Visual Examination

The sample can be described as a dark grey (Munsell Colour 10YR 4/1), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was virtually stone free with a moderate proportion of lightweight expanded clay aggregate 'leca' and 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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pH Neutral Lightweight Topsoil

5
3
6
7
40
33
6
92
5
1
0
0

1.29
1.50
53

6.8
< 1.0
1117
3215
4.1

8.2
0.18
26
37
703
84

0
0

< 1.0
8
16
0.17
< 0.2
12
< 1.8
12
8.6
< 0.3
15
< 1.0
13
31
2.2
< 1.0
< 1.0

< 0.05
< 0.05
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< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.80

< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 8.0
17
21
< 0.001
< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 10
11
15

< 0.005
< 0.005
< 0.005
< 0.005
< 0.005

Not-detected

H.MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist