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

9th December 2022
Our Ref: TOHA/22/7685/3/SS
Your Ref: see below

Dear Sirs

Topsoil Analysis: Bury Hill Horsham Yard - Lawn Topsoil (S)

We have completed the analysis of the soil sample recently submitted, referenced *Lawn Topsoil (S)* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample specifically for use as a 'lawn topsoil' for general amenity grass areas where high compaction resistance and wear tolerance are not required and where supplementary irrigation may not be available.

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 or waste designation purposes, especially after the topsoil has left the Bury Hill Landscape Supplies Ltd site.

SAMPLE EXAMINATION

The sample was described as a dark yellowish brown (Munsell Colour 10YR 4/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was virtually stone free 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.

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

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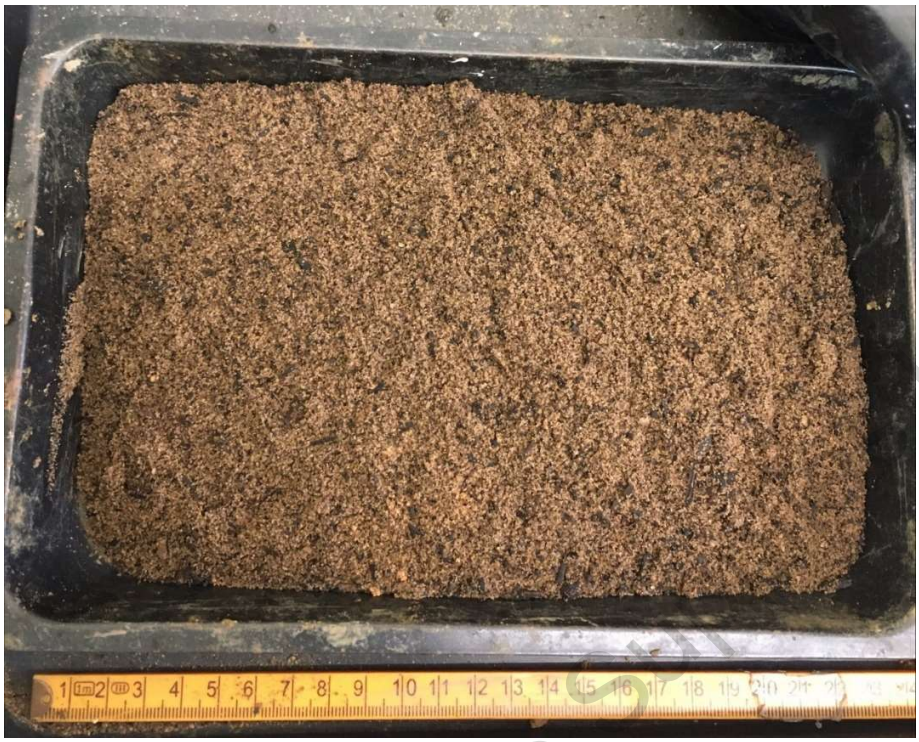

Plate 1: Lawn Topsoil (S) Sample

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);
- 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 (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 sized distribution found the sample to have a narrow particle size distribution, with a predominance of *medium sand* (0.25-0.50mm) and *coarse sand* (0.50-1.0mm). This grading should provide sufficient porosity levels in a consolidated state, with a reduced risk of particle interpacking and surface smearing. However, high sand content soils typically have good aeration, drainage and compaction-resistance properties, but can possess reduced water and nutrient retention capacities. In this instance, this is compensated for by the higher organic matter content of the sample. Bulky organic matter derived from green compost acts like a sponge and improves water holding capacity.

The sample was virtually stone-free and as such, stones should not restrict the use of the soil as a lawn topsoil.

Saturated Hydraulic Conductivity.

The saturated hydraulic conductivity rate (12 mm/hr) recorded under a degree of consolidation was moderate and acceptable for many applications, including amenity lawns areas where a 'fast-draining' topsoil is not required.

The combination of this drainage rate and the soil's particle size distribution should offer a good balance of water retention for plant uptake and drainage of surplus water over a period of time.

pH and Calcium Carbonate Values

The sample was strongly alkaline in reaction (pH 8.0) and non-calcareous ($CaCO_3$ <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 grass cultivars.

Electrical Conductivity Values

The electrical conductivity (salinity) values (water and $CaSO_4$ extract) were moderate, which indicates that soluble salts were not 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 landscape applications.

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations of potential contaminants 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 potential contaminants determined, none was found at levels that exceed 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 lawn topsoil.

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

To conclude, based on our findings, the topsoil represented by this sample would be considered suitable for use as a *lawn topsoil* in amenity lawn areas where a 'high-performance' soil is not required.

The total sand content of the soil and its grading may result in a growing medium which is prone to droughty conditions without supplementary irrigation. However, the organic matter content of the topsoil (>5%) should aid in mitigating these risks and help improve the water and nutrient retention of the topsoil. Supplementary irrigation may still need to be considered, particularly in drier months. The incorporation of an appropriate soil conditioner should aid in water and nutrient retention.

A suitable maintenance regime should be implemented to support the establishment and continued growth of the grass sward (e.g. decompaction, aeration, fertiliser applications, etc.).

RECOMMENDATIONS

Soil Conditioner

To improve the water and nutrient retention capacities of this soil, we recommend application and incorporation of a suitable soil conditioner, e.g. *TerraCottem "Universal"*, at the manufacturer's recommended rate.

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

H.MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist

Matthew Heins
BSc (Hons) MISoilSci
Senior Soil Scientist

For and on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Bury Hill Landscape Supplies Ltd**
Project:	**Bury Hill Horsham Yard - Lawn Topsoil (S)**
Job:	**Topsoil Analysis**
Date:	**09/12/2022**
Job Ref No:	**TOHA/22/7685/3/SS**

Sample Reference		**Lawn Topsoil (S)**
Clay (<0.002mm)	%	5
Silt (0.002-0.05mm)	%	2
Very Fine Sand (0.05-0.15mm)	%	2
Fine Sand (0.15-0.25mm)	%	4
Medium Sand (0.25-0.50mm)	%	48
Coarse Sand (0.50-1.0mm)	%	34
Very Coarse Sand (1.0-2.0mm)	%	5
Total Sand (0.05-2.0mm)	%	93
Texture Class (UK Classification)	--	S
Stones (>2mm)	% DW	0
Stones (>20mm)	% DW	0
Stones (>50mm)	% DW	0
Saturated Hydraulic Conductivity	mm/hr	12
pH Value (1:2.5 water extract)	units	8.0
Calcium Carbonate	%	< 1.0
Electrical Conductivity (1:2.5 water extract)	uS/cm	747
Electrical Conductivity (1:2 $CaSO_4$ extract)	uS/cm	2887
Exchangeable Sodium Percentage	%	4.9
Organic Matter (LOI)	%	5.2
Total Nitrogen (Dumas)	%	0.20
C : N Ratio	ratio	15
Extractable Phosphorus	mg/l	49
Extractable Potassium	mg/l	913
Extractable Magnesium	mg/l	97
Total Arsenic (As)	mg/kg	5
Total Cadmium (Cd)	mg/kg	< 0.2
Total Chromium (Cr)	mg/kg	7
Hexavalent Chromium (Cr VI)	mg/kg	< 1.8
Total Copper (Cu)	mg/kg	9
Total Lead (Pb)	mg/kg	7
Total Mercury (Hg)	mg/kg	< 0.3
Total Nickel (Ni)	mg/kg	2
Total Selenium (Se)	mg/kg	< 1.0
Total Zinc (Zn)	mg/kg	14
Water Soluble Boron (B)	mg/kg	0.9
Total Cyanide	mg/kg	< 1.0
Total (mono) Phenols	mg/kg	< 1.0
Naphthalene	mg/kg	< 0.05
Acenaphthylene	mg/kg	< 0.05
Acenaphthene	mg/kg	< 0.05
Fluorene	mg/kg	< 0.05
Phenanthrene	mg/kg	< 0.05
Anthracene	mg/kg	< 0.05
Fluoranthene	mg/kg	< 0.05
Pyrene	mg/kg	< 0.05
Benz(a)anthracene	mg/kg	< 0.05
Chrysene	mg/kg	< 0.05
Benzo(b)fluoranthene	mg/kg	< 0.05
Benzo(k)fluoranthene	mg/kg	< 0.05
Benzo(a)pyrene	mg/kg	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.05
Dibenzo(a,h)anthracene	mg/kg	< 0.05
Benzo(g,h,i)perylene	mg/kg	< 0.05
Total PAHs (sum USEPA16)	mg/kg	< 0.80
Aliphatic TPH >C5 - C6	mg/kg	< 0.001
Aliphatic TPH >C6 - C8	mg/kg	< 0.001
Aliphatic TPH >C8 - C10	mg/kg	< 0.001
Aliphatic TPH >C10 - C12	mg/kg	< 1.0
Aliphatic TPH >C12 - C16	mg/kg	< 2.0
Aliphatic TPH >C16 - C21	mg/kg	< 8.0
Aliphatic TPH >C21 - C35	mg/kg	< 8.0
Aliphatic TPH (C5 - C35)	mg/kg	< 10
Aromatic TPH >C5 - C7	mg/kg	< 0.001
Aromatic TPH >C7 - C8	mg/kg	< 0.001
Aromatic TPH >C8 - C10	mg/kg	< 0.001
Aromatic TPH >C10 - C12	mg/kg	< 1.0
Aromatic TPH >C12 - C16	mg/kg	< 2.0
Aromatic TPH >C16 - C21	mg/kg	< 10
Aromatic TPH >C21 - C35	mg/kg	< 10
Aromatic TPH (C5 - C35)	mg/kg	< 10
Benzene	mg/kg	< 0.001
Toluene	mg/kg	< 0.001
Ethylbenzene	mg/kg	< 0.001
m-xylene	mg/kg	< 0.001
o-xylene	mg/kg	< 0.001
p-xylene	mg/kg	< 0.001
Asbestos	ND/D	Not-detected

S = SAND

Visual Examination

The sample was described as a dark yellowish brown (Munsell Colour 10YR 4/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was virtually stone free 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.

H.MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist

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