



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

27th January 2023
Our Ref: TOHA/22/7793/2/SS/Rev.1
Your Ref: see below

Dear Sirs

Sand Analysis Report: Bury Hill Horsham Yard – Kent Medium Sand

We have completed the analysis of the sand sample recently submitted, referenced *Kent Medium Sand*, and have pleasure reporting our findings.

The purpose of the analysis was to assess selected physical and chemical properties of the sand in order to determine its potential for use in a range of landscape applications. The ultimate suitability of the sand for any use case should be reviewed and assessed prior to use, however this report indicates some possible cases where the sand may be appropriate.

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the sand source. The report and results should therefore not be relied upon by any third parties.

SAMPLE EXAMINATION

The sample can be described as a yellowish brown (Munsell Colour, 10YR 5/8), slightly moist, friable, non-calcareous, SAND with a single grained structure. The sample was stone free, and 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: Kent Medium Sand 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 of the sand. The following parameters were determined:

- detailed particle size analysis (5 sands, silt, clay);
- stone content (2-20mm, 20-75mm, >75mm);
- saturated hydraulic conductivity;
- pH and electrical conductivity (1:2.5 water extract);
- exchangeable sodium percentage
- calcium carbonate.
- 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 Saturated Hydraulic Conductivity

The sample had a total sand content of 96%. Further detailed particle size analysis revealed the sample to have a narrow particle size distribution, with a predominance of *medium sand* (0.25-0.50mm) and lower proportions of *coarse sand* (0.5-1.0mm) and *fine sand* (0.15-0.25mm).

If used as a subsoil for landscaping applications, it could be described as 'free-draining' which is confirmed by the high saturated hydraulic conductivity result (151 mm/hr).

Stone Content

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

pH and Electrical Conductivity Values

The sample was slightly acid in reaction (pH 6.1), with a low calcium carbonate (lime) content. This pH value should not restrict the use of the soil for most landscape purposes.

The electrical conductivity (salinity) values (water and CaSO₄ extract) were low, which indicates that soluble salts were not present at elevated levels.

Organic Matter Content

The organic matter content of the sand was very low (<0.5%).

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations of selected potential contaminants that affect human health have been assessed for the concentrations that affect human health have been assessed for *residential* end-use against the Suitable For Use Levels (S4ULs) presented in the LQM/CIH S4ULs for Human Health Risk Assessment (2015) and the DEFRA SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document (2014).

Of the 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 recommended levels.

COMMENTS

The sand represented by this sample has the following properties:

- Narrow particle size distribution
- Low fines content
- High drainage rate
- Low pH value and lime content
- Non-saline
- Inorganic

Based on these characteristics, the sand represented by this sample may have potential for use in a number of landscape application, examples of which could include:

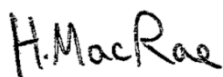
- 1) A free-draining, compaction resistant subsoil for landscape environments where a higher level of permeability and porosity in the subsoil layer is required, e.g. when planting larger rootballed trees, for podium landscapes, or formal / high-use grass lawns;
- 2) For use as a filter medium for bioretention systems and rain gardens that may be included within Sustainable Drainage Systems (SuDS).
- 3) For use as a surface ameliorant / topdressing to improve amenity grass / sports pitch surfaces;

- 4) For use in sports pitch drainage where a free-draining sand may be required (e.g. sand grooves);
- 5) For blending with suitable ameliorants to produce high-permeability rootzones;

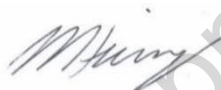
The suitability of this sand for any specific project or product should be carefully checked by further testing as necessary and should be approved by any project's designer / manager before use.

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) MSc SoilSci
Senior Soil Scientist

For & on behalf of Tim O'Hare Associates LLP



Client:	Bury Hill Landscape Supplies Ltd
Project:	Bury Hill Horsham Yard
Job:	Sand Analysis
Date:	27/01/2023
Job Ref No:	TOHA/23/7793/2/SS/Rev.1

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 (0.05-2mm)	%	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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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
Organic Matter (LOI)	%	UKAS
Exchangeable Sodium Percentage	%	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
Benz(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
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS

Asbestos	D/ND	ISO 17025
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S = SAND

Visual Examination

The sample can be described as a yellowish brown (Munsell Colour, 10YR 5/8), slightly moist, friable, non-calcareous, SAND with a single grained structure. The sample was stone free and 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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Kent Medium Sand

Clay (<0.002mm)	3
Silt (0.002-0.05mm)	1
Very Fine Sand (0.05-0.15mm)	5
Fine Sand (0.15-0.25mm)	15
Medium Sand (0.25-0.50mm)	53
Coarse Sand (0.50-1.0mm)	19
Very Coarse Sand (1.0-2.0mm)	4
Total Sand (0.05-2mm)	96
Texture Class (UK Classification)	S
Stones (2-20mm)	0
Stones (20-50mm)	0
Stones (>50mm)	0

Saturated Hydraulic Conductivity	151
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pH Value (1:2.5 water extract)	6.1
Calcium Carbonate	< 1.0
Electrical Conductivity (1:2.5 water extract)	45
Electrical Conductivity (1:2 CaSO ₄ extract)	2059
Organic Matter (LOI)	<0.5
Exchangeable Sodium Percentage	1.4

Visible Contaminants: Plastics >2.00mm	0
Visible Contaminants: Sharps >2.00mm	0

Total Antimony (Sb)	< 0.1
Total Arsenic (As)	7.8
Total Barium (Ba)	9.5
Total Beryllium (Be)	0.25
Total Cadmium (Cd)	< 0.2
Total Chromium (Cr)	12.0
Hexavalent Chromium (Cr VI)	< 1.8
Total Copper (Cu)	3.5
Total Lead (Pb)	1.7
Total Mercury (Hg)	< 0.3
Total Nickel (Ni)	9
Total Selenium (Se)	< 1.0
Total Vanadium (V)	23
Total Zinc (Zn)	13
Water Soluble Boron (B)	< 0.2
Total Cyanide (CN)	< 1.0
Total (mono) Phenols	< 1.0

Naphthalene	< 0.05
Acenaphthylene	< 0.05
Acenaphthene	< 0.05
Fluorene	< 0.05
Phenanthrene	< 0.05
Anthracene	< 0.05
Fluoranthene	< 0.05
Pyrene	< 0.05
Benz(a)anthracene	< 0.05
Chrysene	< 0.05
Benzo(b)fluoranthene	< 0.05
Benzo(k)fluoranthene	< 0.05
Benzo(a)pyrene	< 0.05
Indeno(1,2,3-cd)pyrene	< 0.05
Dibenzo(a,h)anthracene	< 0.05
Benzo(g,h,i)perylene	< 0.05
Total PAHs (sum USEPA16)	< 0.80

Aliphatic TPH >C5 - C6	< 0.001
Aliphatic TPH >C6 - C8	< 0.001
Aliphatic TPH >C8 - C10	< 0.001
Aliphatic TPH >C10 - C12	< 1.0
Aliphatic TPH >C12 - C16	< 2.0
Aliphatic TPH >C16 - C21	< 8.0
Aliphatic TPH >C21 - C35	< 8.0
Aliphatic TPH (C5 - C35)	< 10
Aromatic TPH >C5 - C7	< 0.001
Aromatic TPH >C7 - C8	< 0.001
Aromatic TPH >C8 - C10	< 0.001
Aromatic TPH >C10 - C12	< 1.0
Aromatic TPH >C12 - C16	< 2.0
Aromatic TPH >C16 - C21	< 10
Aromatic TPH >C21 - C35	< 10
Aromatic TPH (C5 - C35)	< 10

Benzene	< 0.005
Toluene	< 0.005
Ethylbenzene	< 0.005
p & m-xylene	< 0.005
o-xylene	< 0.005
MTBE (Methyl Tertiary Butyl Ether)	< 0.005

Asbestos	Not-detected
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H. MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist