



TIM O'HARE ASSOCIATES  
SOIL & LANDSCAPE CONSULTANCY

Mr Simon Hedley  
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28<sup>th</sup> February 2012

Our Ref: TOHA/12/4287/RB  
Your Ref: as below

Dear Sirs

**Analysis Report – Boughton Urban Tree Soil**

We have completed the analysis and testing of the *Boughton Urban Tree Soil* sample.

The purpose of the analysis was to determine the suitability of the soil for use as urban tree soil for tree planting in hard landscape situations.

***SAMPLE EXAMINATION***

Dark yellowish brown (10YR 4/4), slightly moist, friable SAND with a single grain structure. The sample was stone free and contained frequent organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were recorded.

***ANALYTICAL SCHEDULE***

The samples were submitted to the laboratory for a range of physical and chemical analyses in accordance with the following schedule:

Geotechnical Properties

- permeability;
- total, air-filled and capillary porosity;
- bulk density;
- California Bearing Ratio (CBR).

Horticultural Properties

- detailed particle size distribution;
- stone content;
- moisture content;
- pH value;
- electrical conductivity value;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- carbon : nitrogen ratio.

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### Environmental Properties

- heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- soluble sulphate, elemental sulphur, acid volatile sulphide;
- total cyanide and total (mono) phenols;
- aromatic and aliphatic TPH (C5-C35 banding);
- speciated PAHs (US EPA16 suite);
- benzene, toluene, ethylbenzene, xylene.

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

### **RESULTS OF ANALYSIS**

#### ***Particle Size Distribution and Stone Content***

The sample fell into the *sand* texture class. The grading of the sand indicates a sufficiently narrow particle size distribution and a predominance of *medium sand* (0.25-0.50mm) and *fine sand* (0.15-0.25mm). This is ideal for 'structural soils' as sufficient porosity levels are maintained in a compacted state and the risk of particle interpacking is minimised.

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

#### ***Permeability and Porosity***

The permeability rate of the sample when in a compacted state (Standard Compaction) was moderate (28mm/hr), and indicates that the soil should demonstrate an adequate drainage performance for tree planting in hard landscape.

The sample displayed a reasonable total porosity value in a compacted state, comprising a combination of air-filled and capillary pores. This indicates that in its current condition, the soil contains sufficient large, air-filled pores to provide adequate aeration for root function. The high capillary porosity indicates that the soil has a good water-holding capacity, and given the particle size distribution of the soil, a significant proportion of the water is likely to be plant available.

The results support the interpretation of the particle size analysis result and confirm that this topsoil is suitable for use to a maximum depth of 600mm.

#### ***pH and Electrical Conductivity Values***

The sample was alkaline in reaction (pH 8.0), with a pH value that would be considered suitable for the majority of tree species used in commercial landscaping and in particular tree species with a wide pH tolerance or those known to prefer alkaline soils.

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

#### ***Organic Matter and Fertility Status***

The sample contained adequate levels of organic matter content, extractable potassium and extractable magnesium. The level of total nitrogen was a little low and this will need to be supplemented by the incorporation of a suitable slow-release compound fertiliser into the soil prior to it into a tree pit/trench.

#### ***Potential Contaminants***

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 (SGV) presented in the Contaminated Land Exposure Assessment (CLEA) (EA/DEFRA: 2009) and the CIEH/LQM Generic Assessment Criteria (2<sup>nd</sup> 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 soil.

## **CONCLUSION**

From the visual examination and laboratory analysis undertaken, the sample can be described as an alkaline, non-saline, stone-free SAND with a single grain structure. The material contains adequate levels of organic matter and mineral nutrients, and is a little low in nitrogen. No significant contamination was found with respect to the parameters determined.

The soil represented by this sample would be considered suitable for use as an Urban Tree Soil, provided the physical condition of the soil is maintained and the nitrogen deficiency is addressed.

The nitrogen deficiency should be remedied by the incorporation of a suitable slow-release compound fertiliser prior to placing the soil in a tree pit/trench (e.g. *Scotts Agroblen* (18%N:8%P<sub>2</sub>O<sub>5</sub>:16%K<sub>2</sub>O)).

Allowances should also be made for on-going fertiliser applications as part of a tree's long-term maintenance programme.

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I hope this report meets with your approval. Please call us if you wish to talk through the findings and recommendations.

Yours faithfully

**Ceri Spears**  
BSc MSc  
Soil Scientist

*For and on behalf of Tim O'Hare Associates LLP*

Client: **Boughton Loam & Turf Management Ltd**  
 Project: **Boughton Urban Tree Soil**  
 Testing: **Physical Parameters**  
 Date: **February 2012**  
 Job Ref No: **TOHA/12/4287/RB**



**Sample Reference** **Boughton Tree Soil**

Clay (<0.002mm)	%	3
Silt (0.002-0.063mm)	%	5
Very Fine Sand (0.05-0.15mm)	%	5
Fine Sand (0.15-0.25mm)	%	23
Medium Sand (0.25-0.50mm)	%	47
Coarse Sand (0.50-1.0mm)	%	15
Very Coarse Sand (1.0-2.0mm)	%	2
Texture Class (UK Classification)	--	SAND
Stones (2-20mm)	% DW	0
Stones (20-50mm)	% DW	0
Stones (>50mm)	% DW	0

**Determination of Permeability and Porosity (K H Volume 10.7 method)**

Initial Height	mm	130.0
Initial Diameter	mm	100.0
Particle Density	Mg/m3	2.50
Initial Bulk Density	Mg/m3	1.53
Final Bulk Density	Mg/m3	1.79
Initial Moisture Content	%	6.1
Final Moisture Content	%	27
Initial Dry Density	Mg/m3	1.44
Final Dry Density	Mg/m3	1.41
Permeability	mm/hr	28
Initial Total Porosity	%	42
Final Total Porosity	%	44
Initial Air-filled Porosity	%	34
Final Air-filled Porosity	%	6
Initial Capillary Porosity	%	9
Final Capillary Porosity	%	38

**Notes**

Material recompacted at the 'as-received' moisture with a 2.5kg rammer  
 Sample is assumed to be fully saturated when a rate of steady flow is achieved  
 Permeability is determined when sample achieved a state of steady flow

**Determination of California Bearing Ratio (BS 1377-4:1990:Method 7.4)**

Moisture Content (Initial)	%	6.1
Moisture Content (Top)	%	6.3
Moisture Content (Base)	%	6.3
Moisture Content (Mean)	%	6.3
Initial Bulk Density	Mg/m3	1.54
Initial Dry Density	Mg/m3	1.45
CBR Top	%	5.9
CBR Base	%	6.4

**Notes**

Material recompacted at the 'as-received' moisture with a 2.5kg rammer  
 Sample tested in an unsoaked condition  
 Applied Seating Load (top) : 10N  
 Applied Seating Load (base) : 53N  
 Applied Surcharge : 10.0kg

Client: **Boughton Loam & Turf Management Ltd**  
 Project: **Boughton Urban Tree Soil**  
 Testing: **Chemical Parameters**  
 Date: **February 2012**  
 Job Ref No: **TOHA/12/4287/RB**



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**Sample Reference**

**Boughton Tree Soil**

pH Value (1:2.5 water extract)	units	8.0
Electrical Conductivity (1:2.5 water extract)	uS/cm	721
Exchangeable Sodium Percentage	%	2.8
Organic Matter (Walkley Black)	%	2.4
Total Nitrogen (Dumas)	%	0.09
C:N Ratio		15
Extractable Phosphorus	mg/l	34
Extractable Potassium	mg/l	1057
Extractable Magnesium	mg/l	103
Total Arsenic (As)	mg/kg	29
Total Cadmium (Cd)	mg/kg	<0.2
Total Chromium (Cr)	mg/kg	57
Hexavalent Chromium	mg/kg	<4.0
Total Copper (Cu)	mg/kg	10
Total Lead (Pb)	mg/kg	27
Total Mercury (Hg)	mg/kg	<0.3
Total Nickel (Ni)	mg/kg	22
Total Selenium (Se)	mg/kg	<1
Total Zinc (Zn)	mg/kg	72
Water Soluble Boron (B)	mg/kg	<0.2
Total Cyanide (CN)	mg/kg	<1
Total (mono) Phenols	mg/kg	<2.0
Elemental Sulphur (S)	mg/kg	<20
Acid Volatile Sulphide (S)	mg/kg	19
Water Soluble Sulphate (SO4)	g/l	0.36
Naphthalene	mg/kg	<0.05
Acenaphthylene	mg/kg	<0.20
Acenaphthene	mg/kg	<0.10
Fluorene	mg/kg	<0.20
Phenanthrene	mg/kg	<0.20
Anthracene	mg/kg	<0.10
Fluoranthene	mg/kg	<0.20
Pyrene	mg/kg	<0.20
Benzo(a)anthracene	mg/kg	<0.20
Chrysene	mg/kg	<0.05
Benzo(b)fluoranthene	mg/kg	<0.10
Benzo(k)fluoranthene	mg/kg	<0.20
Benzo(a)pyrene	mg/kg	<0.10
Indeno(1,2,3-cd)pyrene	mg/kg	<0.20
Dibenzo(a,h)anthracene	mg/kg	<0.20
Benzo(g,h,i)perylene	mg/kg	<0.05
Total PAHs (sum USEPA16)	mg/kg	<1.6
Benzene	mg/kg	<0.001
Toluene	mg/kg	<0.001
Ethylbenzene	mg/kg	<0.001
p & m-xylene	mg/kg	<0.001
o-xylene	mg/kg	<0.001
Aliphatic TPH >C5-C6	mg/kg	< 0.1
Aliphatic TPH >C6-C8	mg/kg	< 0.1
Aliphatic TPH >C8-C10	mg/kg	< 0.1
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
Aromatic TPH >C5-C7	mg/kg	< 0.1
Aromatic TPH >C7-C8	mg/kg	< 0.1
Aromatic TPH >C8-C10	mg/kg	< 0.1
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
TPH [C5-C35]	mg/kg	< 10