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SOIL & LANDSCAPE CONSULTANCY

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23rd January 2020
Our Ref: TOHA/20/9367/SS
Your Ref: as below

Dear Sirs

Topsoil Analysis Report – G1 Topsoil

We have completed the analysis of the topsoil sample recently submitted, referenced *G1 Topsoil,* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil *(BS3882:2015 Specification for Topsoil – Multipurpose Topsoil)*.

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 R Draper Ltd site.

SAMPLE EXAMINATION

The sample was described as a very dark grey (Munsell Colour 10YR 3/1) slightly moist, slightly plastic, very slightly calcareous LOAMY SAND with a weakly developed, fine to occasionally coarse granular structure*. The sample was slightly stony and contained very common organic fines. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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:

- particle size analysis (sand, silt, clay);
- stone content (2-20mm, 20-50mm, >50mm);
- pH and electrical conductivity values;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- 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 *loamy sand* texture class, which is usually considered suitable for general landscape applications provided the soil's physical condition is satisfactory.

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

pH and Electrical Conductivity Values

The sample was slightly acid in reaction (pH 6.5), with a pH value that would be considered ideal for general landscape purposes.

The electrical conductivity (salinity) value (water extract) was moderately high. Although the growth of many plant species (including amenity turf) are unlikely to be affected by this level of salinity, it is possible that salt sensitive species, including emergent seedlings, could show reduced growth potential.

The electrical conductivity value by $CaSO_4$ extract (3530 µS/cm - *BS3882* requirement) slightly exceeded the maximum specified value (3300 µS/cm) given in *BS3882:2015 – Table 1*.

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

With reference to *BS3882:2015 - Table 1*: Notes 3 and 4, there is a recommendation to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. 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 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 specified in *BS3882:2015 – Table 1*.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine compliance with the requirements of the British Standard for Topsoil *(BS3882:2015 Specification for Topsoil – Multipurpose Topsoil)*.

From the soil examination and laboratory analysis, the sample was described as a slightly acid, moderately saline, very slightly calcareous loamy sand with a weakly developed structure and low stone content. The sample contained sufficient reserves of organic matter and major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

The electrical conductivity (salinity) value (water extract) was moderately high. In this instance, the proportion of soluble salts should not be significant for more hardy plants or grass cultivars. However, the soil represented by this sample may not be suitable for salt-sensitive species or young seedlings.

To conclude, based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes (hardy trees, shrubs and amenity grass), provided the physical condition of the soil is satisfactory.

The sample was largely compliant with the requirements of the British Standard for Topsoil *(BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil)* with the exception of the slightly elevated electrical conductivity ($CaSO_4$ extract). On this occasion, this non-compliance is considered minor when reviewed in the context of all the other results and given the proposed end-use of the soil.

RECOMMENDATIONS

Soil Handling Recommendations

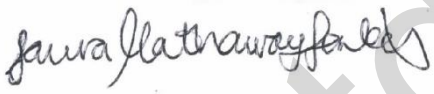
It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, respreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is reasonably dry and non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

Further details on soil handling are provided in Annex A of *BS3882:2015.*

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



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For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**R Draper Ltd**
Project	**G1 Topsoil**
Job:	**Topsoil Analysis - BS3882:2015**
Date:	**23/01/2020**
Job Ref No:	**TOHA/20/9367/SS**

Sample Reference			**G1 Topsoil**
		Acreditation	
Clay (<0.002mm)	%	UKAS	7
Silt (0.002-0.063mm)	%	UKAS	8
Sand (0.063-2.0mm)	%	UKAS	85
Texture Class (UK Classification)	--	UKAS	LS
Stones (2-20mm)	% DW	GLP	6
Stones (20-50mm)	% DW	GLP	6
Stones (>50mm)	% DW	GLP	0
pH Value (1:2.5 water extract)	units	UKAS	6.5
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	1640
Electrical Conductivity (1:2 $CaSO_4$ extract)	uS/cm	UKAS	3530
Exchangeable Sodium Percentage	%	UKAS	5.2
Organic Matter (LOI)	%	UKAS	5.4
Total Nitrogen (Dumas)	%	UKAS	0.22
C : N Ratio	ratio	UKAS	14
Extractable Phosphorus	mg/l	UKAS	65
Extractable Potassium	mg/l	UKAS	1450
Extractable Magnesium	mg/l	UKAS	141
Total Arsenic (As)	mg/kg	MCERTS	7
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2
Total Chromium (Cr)	mg/kg	MCERTS	13
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS	< 4.0
Total Copper (Cu)	mg/kg	MCERTS	26
Total Lead (Pb)	mg/kg	MCERTS	33
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3
Total Nickel (Ni)	mg/kg	MCERTS	10
Total Selenium (Se)	mg/kg	MCERTS	< 1.0
Total Zinc (Zn)	mg/kg	MCERTS	48
Water Soluble Boron (B)	mg/kg	MCERTS	1.5
Total Cyanide (CN)	mg/kg	MCERTS	< 1
Total (mono) Phenols	mg/kg	MCERTS	< 1.0
Naphthalene	mg/kg	MCERTS	< 0.05
Acenaphthylene	mg/kg	MCERTS	< 0.05
Acenaphthene	mg/kg	MCERTS	< 0.05
Fluorene	mg/kg	MCERTS	< 0.05
Phenanthrene	mg/kg	MCERTS	0.4
Anthracene	mg/kg	MCERTS	< 0.05
Fluoranthene	mg/kg	MCERTS	0.36
Pyrene	mg/kg	MCERTS	0.33
Benzo(a)anthracene	mg/kg	MCERTS	< 0.05
Chrysene	mg/kg	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	MCERTS	< 0.05
Benzo(k)fluoranthene	mg/kg	MCERTS	< 0.05
Benzo(a)pyrene	mg/kg	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS	< 0.05
Dibenzo(a,h)anthracene	mg/kg	MCERTS	< 0.05
Benzo(g,h,i)perylene	mg/kg	MCERTS	< 0.05
Total PAHs (sum USEPA16)	mg/kg	MCERTS	1.1
Aliphatic TPH >C5 - C6	mg/kg	MCERTS	< 0.001
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.001
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.001
Aliphatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0
Aliphatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0
Aliphatic TPH >C16 - C21	mg/kg	MCERTS	< 8.0
Aliphatic TPH >C21 - C35	mg/kg	MCERTS	< 8.0
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	< 10
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.001
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.001
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.001
Aromatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0
Aromatic TPH >C12 - C16	mg/kg	MCERTS	< 2.0
Aromatic TPH >C16 - C21	mg/kg	MCERTS	< 10
Aromatic TPH >C21 - C35	mg/kg	MCERTS	< 10
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10
Benzene	mg/kg	MCERTS	< 0.001
Toluene	mg/kg	MCERTS	< 0.001
Ethylbenzene	mg/kg	MCERTS	< 0.001
p & m-xylene	mg/kg	MCERTS	< 0.001
Xylene	mg/kg	MCERTS	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001
Asbestos Screen	N/ND	ISO 17025	Not-detected

LS = LOAMY SAND

Visual Examination

The sample was described as a very dark grey (Munsell Colour 10YR 3/1) slightly moist, slightly plastic, very slightly calcareous LOAMY SAND with a weakly developed, fine to occasionally coarse granular structure. The sample was slightly stony and contained very common organic fines. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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