



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Peter Cullen
Tarmac Topscap
Manchester Road
Congleton
Cheshire, CW12 2LU

18th November 2020
Our Ref: TOHA/20/9725/SS
Your Ref: PO00449149

Dear Sirs

Topsoil Analysis Report: Topscap Topsoil (Cardiff)

We have completed the analysis of the soil sample referenced *Topscap Topsoil (Cardiff)*, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the 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 - Table 1, Multipurpose Topsoil*).

The sample represents a trial mix blended at the office of Tim O'Hare Associates using samples of the following materials submitted to us by Tarmac Topscap:

- Topsport CYG sandstone dust
- PAS100 green compost

It is understood that the blending is to be replicated at the Tarmac Topscap Cardiff site following this bench-scale trial. 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 resultant blended topsoil has left the Tarmac Topscap site.

SAMPLE EXAMINATION

The sample was described as a dark grey (Munsell Colour 10YR 4/1), slightly moist, friable, very slightly calcareous SANDY LOAM with a weakly developed, very fine to fine granular structure*. The sample was slightly stony (small 'grit' sized stones) and contained a moderate proportion of organic fines and very occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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

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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);
- pH and electrical conductivity values;
- 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

Detailed Particle Size Analysis and Stone Content

The sample fell into the *sandy loam* texture class. Further detailed particle size analysis revealed the sample to have a broad particle size distribution, with relatively equal proportions within each particle range and a significant amount of *very coarse sand* (1.0-2.0mm). This could increase the risk of particle interpacking once the material is placed. In this situation, finer particles fill the voids between the larger particles, thereby reducing drainage and aeration. To minimise the risk of self-compaction and anaerobism, placing this soil to a maximum depth of 300mm is recommended, which is in line with BS3882:2015, section A.3.

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 strongly alkaline in reaction (pH 8.2). This pH value would be considered suitable for general landscape purposes providing species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

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

The electrical conductivity value by CaSO₄ extract (BS3882 requirement) fell below 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 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 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. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil - Table 1, Multipurpose Topsoil*).

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, very slightly calcareous sandy loam with a weakly developed structure and low stone content. The sample was adequately supplied with organic matter and all major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

Based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes provided species tolerant of alkaline soil conditions are selected and the soil's physical condition is satisfactory.

To minimise the risk of self-compaction and anaerobism, we recommend that this soil is not placed thicker than a maximum depth of **300mm**.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*).

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, resspreading, 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



Aaron Cross
BSc MSc
Soil Scientist



Ceri Spears
BSc MSc MSoilSci
Senior Associate

For & on behalf of Tim O'Hare Associates LLP



Client:	Tarmac Topsoil
Project:	Topsoil Topsoil (Cardiff)
Job:	Topsoil Analysis - BS3882:2015
Date:	18/11/2020
Job Ref No:	TOHA/20/9725/SS

Sample Reference		Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.063mm)	%	UKAS
Very Fine Sand (0.063-0.15mm)	%	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 (0.063-2.0mm)	%	UKAS
Texture Class (UK Classification)	--	UKAS
Stones (2-20mm)	% DW	GLP
Stones (20-50mm)	% DW	GLP
Stones (>50mm)	% DW	GLP

pH Value (1:2.5 water extract)	units	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

Total Arsenic (As)	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 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	--	ISO 17025
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SL - SANDY LOAM

Visual Examination

The sample was described as a dark grey (Munsell Colour 10YR 4/1), slightly moist, friable, very slightly calcareous SANDY LOAM with a weakly developed, very fine to fine granular structure. The sample was slightly stony (small 'grit' sized stones) and contained a moderate proportion of organic fines and very 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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Topsoil Topsoil (Cardiff)

11
14
11
9
13
15
27
75
SL
12
0
0

8.2
787
2592
3.1
6.8
0.28
14
41
1208
168

10
< 0.2
21
6
18
17
< 0.3
31
< 1.0
72
1.8
< 1
< 1

< 0.05
< 0.05
< 0.05
< 0.05
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< 0.8

< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 8.0
< 8.0
< 10
< 0.001
< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 10
< 10
< 10

< 0.001
< 0.001
< 0.001
< 0.001
< 0.001
< 0.001

Not-detected

Aaron Cross

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