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SOIL & LANDSCAPE CONSULTANCY

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Our Ref: TOHA/23/1184/2/SS
Your Ref: see below

Dear Sirs

Soil Analysis Report: Bury Hill Horsham Yard – Moderate Permeability Bio Retention (S)

We have completed the analysis of the *Moderate Permeability Bio Retention (S)* blend sample recently submitted and have pleasure reporting our findings.

INTRODUCTION

The purpose of the analysis was to determine the suitability of the sample for use as a bioretention soil where a lower permeability rate is desired. "Bioretention systems", including raingardens and swales, are shallow landscaped depressions that reduce run-off and treat pollution through the use of engineered soils and the vegetation that the soils support. In doing so they are a key element of many Sustainable Drainage Systems (SuDS).

A bioretention system usually has several components including a vegetation layer, a filter medium, a transition layer and a drainage layer, together with inlets, outlets and pipework. The *bioretention soil* represented by this sample is to be used as the "Filter Medium" of a bioretention system. The purpose of this analysis was therefore to determine the suitability of the sample for this use.

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the soil 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 soil has left the Bury Hill Landscape Supplies Ltd site.

SAMPLE EXAMINATION

The topsoil sample was described as a yellowish brown (Munsell Colour 10YR 5/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was virtually stone-free and contained a low proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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Plate 1: Moderate Permeability Bio Retention (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, performance and fertility of the soil. The following parameters were determined:

- detailed particle size analysis (5 sands, silt, clay);
- 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 (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.

In the absence of site-specific assessment criteria, the concentrations of potential contaminants that affect human health have been compared with the *residential with homegrown 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)*. Levels of phytotoxic metals determined (Cu, Ni, Zn) have also been compared against threshold values indicated in *BS3882:2015 Specification for Topsoil*.

Of the potential contaminants determined, none was found at levels that exceeded their guideline values.

COMMENTS

A bioretention filter medium is normally sand-based with some source of organic matter and slow-release plant nutrients to maintain healthy plant growth, filter out pollutants and control the rate at which water filters through the system, which is a key influence on the effectiveness. The material should be sufficiently permeable and porous to allow water to be infiltrated, attenuated and drained through it so that the surface does not become waterlogged. It also needs to contain sufficient organic matter and plant nutrients to support the vegetation layer.

From the examination and laboratory analysis, the sample was described as a strongly alkaline, non-saline, non-calcareous sand with a very low stone content. The sample contained low reserves of organic matter and most major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

A bioretention soil usually requires a high-water attenuation capacity and a good drainage rate in order to absorb run-off. The grading of this sample is largely within the desirable range. The saturated hydraulic conductivity result is slightly lower than would be expected from a bioretention soil. The organic matter and most nutrient levels are acceptable for this specific end-use.

The suitability of the soil for any proposed schemes should be reviewed against any project specific requirements.

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.

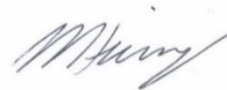
It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the ground has dried out. If the soil is compacted at any stage during the course of soiling 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



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Graduate Soil Scientist



Matthew Heins
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Senior Soil Scientist

For and on behalf of Tim O'Hare Associates LLP

