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Your Ref: see below

Soil Analysis Report: Bury Hill Horsham Yard – Lawn Rootzone (T)

We have completed the analysis of the soil sample recently submitted, referenced *Lawn Rootzone (T)* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample specifically for use as a lawn rootzone for high-performance amenity grass areas with good compaction resistance, a higher drainage rate is required and where automatic irrigation and on-going maintenance are provisioned.

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 dark yellowish brown (Munsell Colour 10YR 4/6), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was stone-free and no unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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Plate 1: Lawn Rootzone (T) 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, drainage rate and fertility of the rootzone, 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);
- 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.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *sand* texture class. Further detailed particle sized distribution found the sample to have a predominance of *medium sand* (0.25-0.50mm), with lower proportions of *fine sand* (0.15-0.25mm) and *coarse sand* (0.50-1.0mm). This should be suitable for high-use grass areas as sufficient porosity levels are maintained in a consolidated state and the risk of particle interpacking and surface smearing is minimised.

High sand content soils typically have good aeration, drainage and compaction-resistance properties, but can possess reduced water and nutrient retention capacities. As such, it will be important that the lawn be suitably maintained (seasonal fertiliser applications, irrigation, decompaction etc.) as part of an ongoing maintenance regime.

The sample was stone-free and as such, stones will not restrict the use of the soil.

Saturated Hydraulic Conductivity

The saturated hydraulic conductivity rate (325 mm/hr) recorded under a degree of consolidation was very high and would be considered 'very free-draining'. This rate is at the upper end of what would be considered acceptable and so the soil may be prone to droughty soil condition. Therefore, to mitigate this, the sward should be supported by a fully automatic irrigation system.

pH and Calcium Carbonate Values

The sample was strongly alkaline in reaction (pH 8.5) and non-calcareous ($\text{CaCO}_3 < 1\%$).

The main source of the 'alkalinity' is likely to be the potassium ions from the compost in the sample. As such, this pH value would be considered suitable for most grass cultivars.

Electrical Conductivity Values

The electrical conductivity (salinity) values (water and CaSO_4 extract) were low, which indicates that soluble salts should not be present at levels that would be harmful to plants.

Organic Matter and Fertility Status

The sample was adequately supplied with organic matter and most major plant nutrients but was slightly deficient in total nitrogen. This deficiency can be remedied by a routine fertiliser application.

The C:N ratio of the sample was acceptable for landscape applications.

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations of potential contaminants 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 our maximum permissible levels.

CONCLUSION

The purpose of the analysis was to determine the suitability of the sample for use as a rootzone for high-performance amenity grass / lawn areas.

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, non-calcareous sand with a single grain structure. The sample was stone-free and contained sufficient reserves of organic matter and most major plant nutrients but was slightly deficient in total nitrogen. The saturated hydraulic conductivity of the sample was high. Of the potential contaminants determined, none exceeded their respective guideline values.

To conclude, based on our findings, the soil represented by this sample would be considered suitable for high-use lawn areas provided they are supported by fully automatic irrigation systems and provided the total nitrogen deficiency is addressed through a routine fertiliser application.

The drainage rate should be reviewed to confirm its acceptability for the project specific requirements.

A suitable maintenance regime should also be implemented to support the establishment and continued growth of the grass sward (e.g. decompaction, aeration, fertiliser applications, etc.).

RECOMMENDATIONS

Fertiliser for Amenity Grass Establishment

To address the total nitrogen deficiency and to help promote effective grass establishment, we recommend applying and incorporating the pre-seeding grass fertiliser *ICL Sportsmaster Pre-seeder* (8%N:12%P₂O₅:8%K₂O+3%MgO) prior to seeding or turfing at a rate of 35 g/m² and to a depth of 100mm.

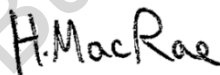
Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid compaction during all phases of soil handling (e.g. stockpiling, resspreading, 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.

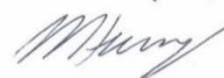
It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the ground has dried out. If the soil is compacted at any stage during the course of soiling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

