



Turf & Soil Diagnostics

December 5, 2018

Doug Meador
Turf Materials
PO Box 270149
Flower Mound, TX 75027

TSD File #18120004

Enclosed are the results of the Martin Marietta USGA Golf Sand sample received by our laboratory on 12/3/18. This sample was tested as received. Guidelines for topdressing sand selection and the USGA Recommendations for Putting Green Construction are included in the data table for your information and possible comparison.

The particle size results indicate that the sample is clean, uniformly graded sand. Most of the particles are in the medium and coarse sand size fractions. There is a small amount of silt and clay present. The gradation and uniformity coefficient meet USGA recommendations. The sand particle shape is mixed. The pH is high.

We recommend topdressing with a material that has similar or slightly coarser particle size than the existing greens to minimize the risk of layering. The particle size distribution suggests this sand should be acceptable for a variety topdress uses, though we recommend testing of the existing rootzone to confirm compatibility. The sand is clean in the coarsest fractions, so it should work cleanly into the greens canopy.

If you have any questions or need further assistance, please contact us. Samples are generally kept on the premises for 45 days after report date. Thank you for using Turf & Soil Diagnostics, Inc.

Sincerely,

Sam Ferro
President

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Date Received Dec-03-2018
 Date Reported Dec-05-2018
 Facility Product Development

Particle Size Evaluation*

| Lab ID# | Sample Name | % Sand 2.0 - 0.05 mm | % Silt 0.05-0.002mm | % Clay < 0.002mm | Gravel 4.0 (5) | Gravel 2.0 (10) | % Retained mm (US sieve) | | | | |
|---------------------------------|----------------|-------------------------|------------------------|---------------------|-------------------------------|--------------------|--------------------------|--------------------|---------------------|--------------------|-----------------------|
| | | | | | | | V. Coarse 1.0 (18) | Coarse 0.5 (35) | Medium 0.25 (60) | Fine 0.15 (100) | V. Fine 0.05 (270) |
| 18120004-2 | USGA Golf Sand | 98.8 | 1.1 | < 1.0 | 0.0 | 0.0 | 7.9 | 42.5 | 39.0 | 7.3 | 2.2 |
| USGA Recommendations for Greens | | ≥ 92% | ≤ 5% | ≤ 3% | ≤ 3% Gravel ≤ 10% Combined | | ≥ 60% Combined | | ≤ 20% | ≤ 5%*** | |
| Greens Topdress Guidelines† | | - | ≤ 3% | | 0% | 0% | ≤ 5% | ≥ 60% Combined | | ≤ 15% | ≤ 5% |

† Guidelines Developed by Hummel & Co.

| Lab ID# | Sample Name | Uniformity Coefficient Cu | D15 mm | D50 mm | D85 mm | Shape Angularity | Shape Sphericity | USDA Textural Classification | Acid Reaction | pH [‡] 1:1 |
|---------------------------------|----------------|---------------------------------|-----------|-----------|-----------|------------------------|---------------------|------------------------------------|------------------|------------------------|
| 18120004-2 | USGA Golf Sand | 2.5 | 0.27 | 0.50 | 0.89 | Sub-Angular to Rounded | Medium to High | Sand | Slight | 7.7 |
| USGA Recommendations for Greens | | See Below | - | - | - | - | - | - | - | - |

*ASTM F1632 Method A & Determination of Size Factors SOP

‡ASTM D4972 w/ CaCl₂

***Maximum of 10% combined on Very Fine Sand, Silt, and Clay fractions.

pH in water available upon request.

USGA Rootzone Coefficient of Uniformity Recommendations: 1.8 to 3.5 for Mixes with Peat; 2.0 to 3.5 for Mixes with Inorganic Amendment or Pure Sand.

Samples were tested as received and comments pertain only to the samples shown.

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Sample condition upon receipt was normal.

Samples were received without a transmittal letter.

Reviewed by Sam Fero