



MATERIAL SALES COMPANY

HEDRICK INDUSTRIES

CRUSHED STONE

SAND

GRAVEL

Grove Stone & Sand

842 Old US Hwy 70, Black Mountain, NC 28711

Bioretention Media 2023

Blending & Testing Methods

Material Sales Company’s Bioretention Media is blended at Grove Stone & Sand, located in Black Mountain, NC. We determine the ratio of the blend based on a recommendation from Summit Laboratories located in Charlotte, NC. Manufactured sand, silt/clay fines, & aged mulch are bucket blended w/ a loader until the product is well blended and uniform. The mulch is sent to Clemson University to verify that the Phosphorus levels are sufficient and within the tolerance.

All Bioretention orders must be preapproved and accepted by the project before any material is blended and shipped to a jobsite. Attached is a lab report from Summit Laboratories with additional information regarding the gradation, the phosphorus index, and the Double Ring Test that reports the Infiltration Rate.

(By Volume)	NCDENR Bioretention Media Specs (2020)	Grove Stone & Sand’s WNC Blend Bioretention Media (2023)
Sand	75 – 85%	85%
Fines	8 – 15%	9%
Organics	5 – 15%	6%
P Index	Less than 30	4
Infiltration Rate	At least 1”/hour	4.63”/hour

* Grove Stone & Sand’s WNC Blend does not meet the washed sand spec due to the lack of clean natural sand in WNC. However, the blend does meet the overall ratio of sand/fines/organics.

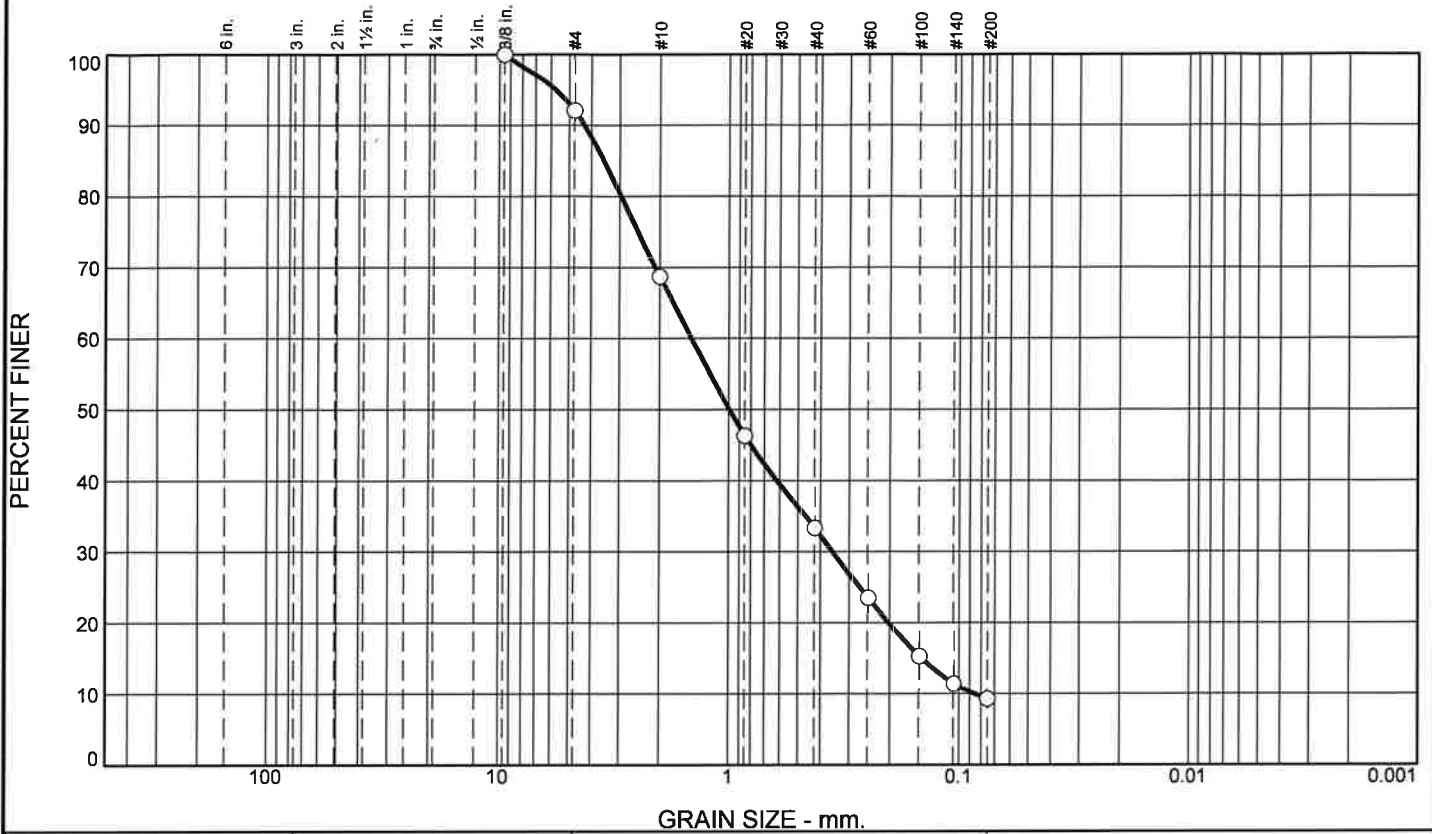
Bioretention Media should not be mechanically compacted or driven on as this may affect infiltration rates. Bioretention Media should only be installed if the construction site is stabilized from on-site silt/clay.

Please let me know if you need any additional information. Thank you,

Jon Neumann
Vice President
Material Sales Company

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	7.9	23.4	35.4	24.0	9.3

Test Results (ASTM D6913)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
0.375	100.0			
#4	92.1			
#10	68.7			
#20	46.3			
#40	33.3			
#60	23.5			
#100	15.3			
#140	11.4			
#200	9.3			

Material Description

Grove Stone and Sand Bio Mix

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 4.3001 D₈₅= 3.5265 D₆₀= 1.4539
D₅₀= 0.9944 D₃₀= 0.3559 D₁₅= 0.1466
D₁₀= 0.0853 C_u= 17.05 C_c= 1.02

Classification

USCS= AASHTO=

Test Remarks

85% Sand, 9% Fines, 6% Organics by Volume
PIndex: 4

* (no specification provided)

Sample Date: 12-20-22

<p style="font-size: 1.2em; font-weight: bold; margin: 0;">Summit Engineering</p> <p style="font-size: 1.2em; font-weight: bold; margin: 0;">Ft. Mill, South Carolina</p>	<p>Client: Materials Sales Company</p> <p>Project: Bio Retention Soil Mixes</p> <p>Project No: 6510.L0852</p> <p style="text-align: right;">Figure</p>
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Tested By: FG

Checked By: MH

Report No: 22-363-0532
 Account No: 06767



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Advisor: SUMMIT-COMPANIES
 MIMI S HOURANI
 POB 7384
 CHARLOTTE NC 28241

Client: Grove Stone Bio Mix

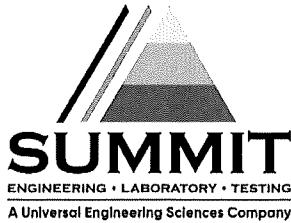
Farm:

Date Received: 12/29/2022

Date of Report: 12/30/2022

Lab No	Field ID	Sample ID	Soil Class	HM%	W/V	pH	Ac	P-I	K-I	S-I	Mn-I	Mn-AI1	Mn-AI2	Zn-I	Zn-AI	Cu-I	CEC	BS%	Ca%	Mg%	ESP	Na
23124		1-4 Blend	MIN	0.5		6.0	1.5	4	59	1631	175	0	0	53	53	145	9.9	85	74	7	0.5	0.1
23125		1-3 Blend	MIN	0.5		6.1	1.1	4	56	1385	144	0	0	53	53	130	8.0	86	74	9	0.7	0.1

Comment:



February 2, 2023

Jon Neumann
Material Sales Company
Phone Number: 828-230-2774
Email: jneumann@hedrickind.com

**Subject: Report of Infiltration Rate Testing
Grove Stone & Sand Double Ring Infiltration
842 Old US Hwy 70
Black Mountain, North Carolina 28711
SUMMIT Project Number: 9705.G0002**

Dear Mr. Neumann:

As requested, Summit Engineering, Laboratory & Testing, Inc. (**SUMMIT**) has performed infiltration testing for Grove Stone & Sand Quarry off Old US Hwy 70 in Black Mountain, North Carolina. A more detailed description of the site location and our test results can be found on the attached figures. The following paragraphs provide a brief summary of our observations and test results.

Observations and Testing

SUMMIT visited the project site and performed a double-ring infiltrometer test on the proposed bio-mix material. The test was performed at approximately 6 inches below the created bio mix mound. It should be noted that no testing depth was specified.

After preparing the ground and positioning the double-ring apparatus, water was added to a sufficient level to allow for a clear view and water level measurements. **SUMMIT** recorded the initial water level and then recorded water level measurement every 15 minutes for the following 120 minutes (2 hours) and every 30 minutes for the remaining 120 minutes (2 hours), until the rate of infiltration stabilized.

Infiltrometer Testing Results

The material was loosely placed as a 6' x 6' test pad approximately 3 feet above grade. The test pad material consisted of a Material Sales Company proprietary biomix designated as Grove Stone & Sand Blend. During the second hour of testing, the infiltration rate began to stabilize, which may indicate saturation of the subgrade soils. The measured infiltration rates then remained constant throughout the remaining duration of the test.

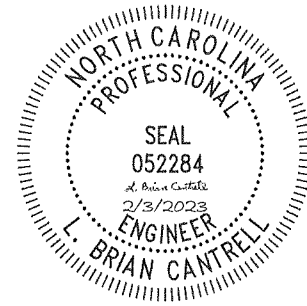
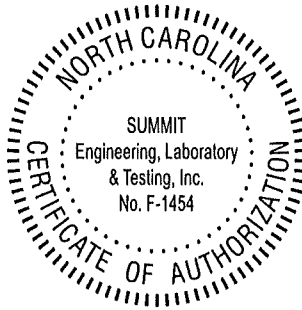
The double-ring infiltrometer test was performed in general accordance with ASTM D 3385. Results of the double-ring infiltrometer test indicates an average infiltration rate of 6.306 inches per hour and a stabilized infiltration rate of 4.625 inches per hour. Please see Figure 2 for a graphical presentation of our test results.

SUMMIT appreciates the opportunity to provide our professional services to you on this project. If you have any questions concerning the information in this report, or if we can be of further service, please contact us.

Sincerely,
SUMMIT



Noah Sacks
Geotechnical Staff Professional



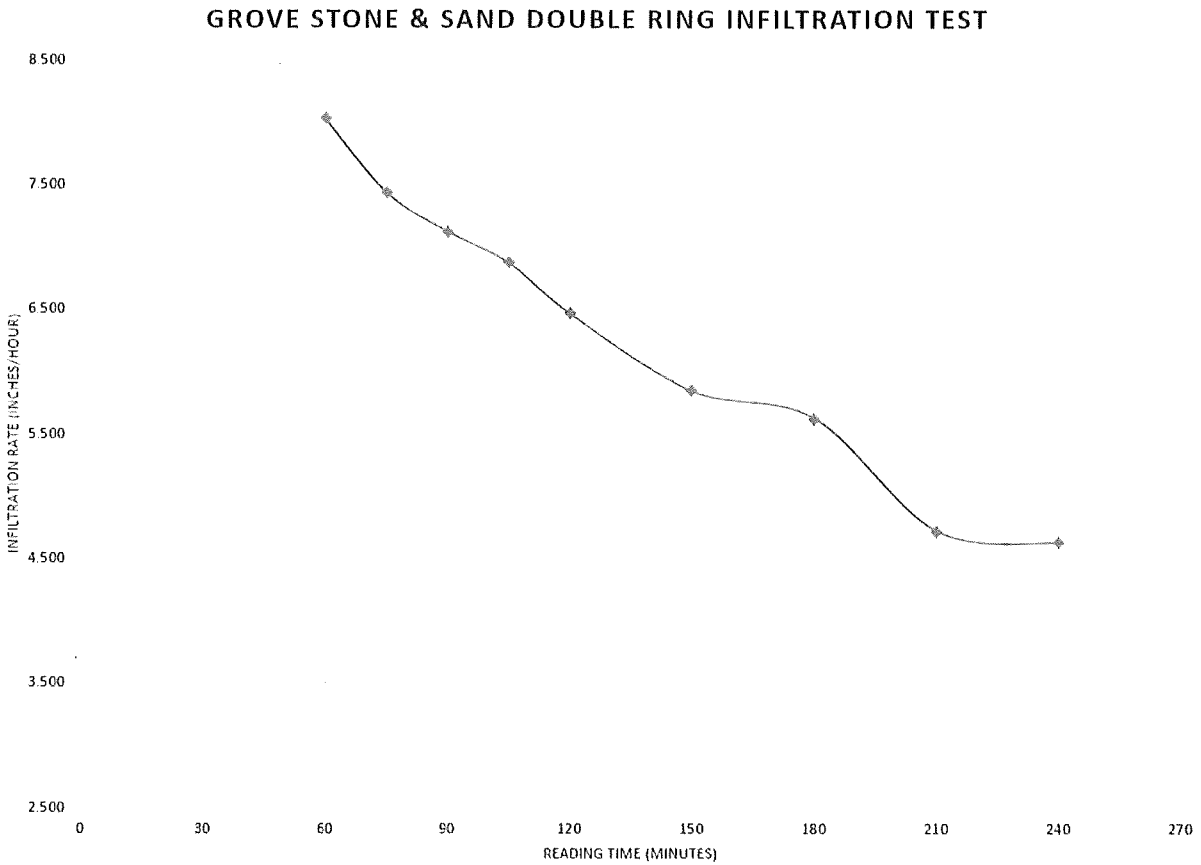
L. Brian Cantrell
L. Brian Cantrell
Geotechnical Dept. Manager

Attachments: Figure 1 - Test Location
Figure 2 - Double-Ring Infiltration Test Result

Figure 1- Test Location



Figure 2 - Infiltrometer Results



Average Infiltration Rate:	6.306 inches/hour
Stabilized Infiltration Rate:	4.625 inches/hour