ITEM 753.1 BIORETENTION SOIL CUBIC YARD

GENERAL

Work under this item shall be in accordance with the relevant provisions of Section 751 of the MassDOT Standard Specifications, Division II, and the following:

The Contractor shall furnish all material, accessories, labor, and equipment necessary to place bioretention soil for bioretention areas where indicated on the Plans.

Work shall include all soil media, aggregate media, soil blending, testing, grading, and backfill of the bioretention area. Work shall be completed and coordinated with connecting storm drainage improvements as required in other specification sections.

MATERIALS

The Bioretention Soil shall be a mixture of sand, compost, and topsoil to the following proportions by volume: 40% Sand, 20-30% topsoil, and 30-40% compost. Compost, sand, and topsoil materials shall be as specified herein.

1. Topsoil: The USDA textural classification of the Topsoil for the Bioretention Soil shall be LOAMY SAND or SANDY LOAM. The Topsoil shall be fertile, friable soil, uncontaminated by salt water, foreign matter, or substances harmful to plant growth. There should be no course fragments over 1-inch in size. The soil shall have at least 4 percent organic matter but not more than 8 percent on a dry weight basis, soil moisture content less than 8% by weight for installation, and a pH range between 5.5 to 6.5. The Topsoil shall be tested and meet the following criteria:

Sieve Size	Percent Passing by Weight
No. 10	85-100
No. 40	35-85
No. 200	10-35
<20µm	< 5

2. The sand component of the Bioretention Soil shall be coarse sand that meets ASTM C- 33 (Fine Aggregate) with a Fines Modulus Index of 2.75 or greater and shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
3/8-inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

3. The leaf compost shall be a homogeneous and friable mixture of partially

decomposed organic matter, with or without soil, resulting from the composting of yard waste in accordance with MassDEP Guidelines. The compost shall not contain biosolids. The compost shall contain less than 1% by dry weight debris including metal, glass, plastic, rubber, asphalt, concrete or masonry. The Carbon to Nitrogen Ratio shall be less than 30 to 1 and the pH shall be between 6.0 and 8.0.

The infiltration rate of the Bioretention Soil Layer within the bioretention areas after installation shall be between 4 inches per hour and 10 inches per hour.

4. The Bioretention Soil shall be a uniform mix, free of plant residue, stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth or prove a hindrance to the planting or maintenance operations. The Bioretention Soil shall be tested and meet the following criteria:

Item	Criteria	Test Method
Corrected pH	5.5-6.5	AASHTO D4972
Magnesium	Minimum 32 ppm	*
Phosphorus (Phosphate-P2O5)	Not to exceed 69 ppm	*
Potassium (K2O)	Minimum 78 ppm	*
Soluble Salts	Not to exceed 500 ppm	*

*Use soil test procedures authorized by the Engineer.

Should the pH fall outside of the acceptable range, the Bioretention Soil may be modified with lime (to raise) or iron sulfate plus sulfur (to lower). The lime or iron sulfate must be mixed uniformly into the Bioretention Soil prior to use in bioretention facilities.

Should the Bioretention Soil not meet the minimum requirement for magnesium, it may be modified with magnesium sulfate. Likewise, should the Bioretention Soil not meet the minimum requirement for potassium, it may be modified with potash. Magnesium sulfate and potash must be mixed uniformly into the Bioretention Soil prior to use in bioretention facilities.

Bioretention Soil that fails to meet the minimum requirements shall be replaced at no additional cost to the City. Mixing of the corrective additives to the Bioretention Soil is incidental and shall be at no additional cost to the City.

Mixing of the Bioretention Soil to a homogeneous consistency shall be done to the satisfaction of the Engineer. Upon approval of all requirements and testing, the Bioretention Soil shall be stockpiled, and no material shall be added to the Bioretention Soil in the stockpile or during transport to the bioretention basin. If the Bioretention Soil stockpiles are not placed in the bioretention basin within 30 days from the time of the testing, then the stockpile shall be retested. If the Bioretention Soil no longer meets the requirements indicated above, then the Contractor shall provide the necessary additives to bring the soil back into compliance.

SUBMITTALS:

The Contractor shall submit test results to the Engineer indicating the results and conformance of the characteristics of the materials used in the bioretention soils to be supplied to the project for review a maximum of 30 days prior to delivery of material to the site. No materials shall be purchased until the required submittals have been reviewed and approved by the Engineer. Approval of test results does not constitute final acceptance. The Engineer reserves the right to reject on or after delivery any material which does not meet the Specifications.

Bioretention Soil Mix: Submit manufacturer's product data.

Bioretention Soil infiltration test results.

Installation:

Where noted on the Plans and details, subgrade below the bioretention soil shall be decompacted to a minimum depth of 6” (or as directed by the Engineer) before installation of bioretention soil.

Bioretention soil shall be placed in six-inch lifts. Bioretention soil may need to be installed with hand equipment and should not disturb the underlying stone layers or compact the previously decompacted soil.

Do not work the soil when it is too moist or frozen. If the soil smears when worked, it is too moist.

The finished grade of the bioretention soil shall match the lines and grades as shown on the Plans to within 2 inches. The Contractor is responsible for maintaining the proposed grading until the area is planted and accepted. Any regrading or reshaping required prior to final acceptance shall be done by the Contractor at no additional cost to the City.

Infiltration testing shall be performed at a rate of one (1) test per bioretention soil area or one (1) test for every 5,000 square feet of bioretention soil area, whichever is greater. Test results shall be submitted to the Engineer.

METHOD OF MEASUREMENT

Bioretention Soil will be measured for payment by the cubic yard, complete in place, to the depth specified on the Plans or as directed by the Engineer. No additional compensation will be made to account for settlement, shrinkage, and penetration into the underlying material.

BASIS OF PAYMENT

Bioretention Soil will be paid for at the Contract unit price per cubic yard, which price shall include all labor, materials, equipment, and incidental costs required to complete work. No separate payment will be made for soil testing, infiltration testing, amending, grading, and decompaction, but all costs in connection therewith shall be included in the Contract unit price bid.