2011

Final Report: Appendix G. LID Driveway Retrofit and Teaching Tool at Bristol County Agricultural High School, Dighton - Supporting Information

Horsley Witten Group, Inc.

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APPENDIX G. LID DRIVEWAY RETROFIT AND TEACHING TOOL AT BRISTOL COUNTY AGRICULTURAL HIGH SCHOOL, DIGHTON - SUPPORTING INFORMATION
MEMORANDUM

TO: Krista Paynton, Superintendent/Director
    Bristol County Agricultural High School
    135 Center Street
    Dighton, MA 02715

FROM: Richard A. Claytor, Jr., P.E., Principal Engineer
      Ellie Baker, Project Manager

DATE: December 4, 2009

RE: Demonstration Projects at Bristol County Agricultural High School
    Taunton River Watershed Management Plan

As you know, Ellie Baker and I visited the Bristol County Agricultural High School on November 3, 2009 and met with you, the Principal, several teachers and a group of students to identify potential project sites for low impact development (LID) measures on campus. As you may recall, we spoke with the teachers and students about the potential to use the project as a teaching tool, and the potential for students to monitor the plantings and possibly become a supplier to others for native plants that are appropriate for these systems, but not necessarily currently commercially available.

We identified five separate potential LID locations on campus with a variety of drainage characteristics (see attached figure). Sites were identified based on current drainage patterns and the potential to offer an improved stormwater management option. The LID stormwater management approach is designed to capture and manage runoff from relatively small areas and uses a natural approach to treat, and where feasible, infiltrate stormwater into the underlying soils. Each of the five identified locations employs a similar basic strategy, which is to collect runoff from the surface in a vegetated channel and then drain to a bioretention system (or rain garden). Bioretention is an alternative stormwater management practice that uses a soil matrix and landscaping to filter stormwater pollutants and, where possible, infiltrate into the underlying soils (see photo). The proposed design concept, approximate size of the project and approximate construction costs for each of the five sites are as follows:
Site 1: This area drains rooftop from the main campus building (Gilbert Hall) and the adjacent parking area to the rear. We propose to design a bioretention area with an overflow to the lower parking area.
   - Drainage area to be managed: 0.22 acres.
   - Bioretention surface area: 290 square feet.
   - Planning level cost estimate: $8,700

Site 2: This area drains a portion of the access road, buildings and farm equipment repair building. We propose to design a vegetated swale that leads to a bioretention facility, which would then overflow to the field below.
   - Drainage area to be managed: 1.89 acres.
   - Swale Length: 140 feet;
   - Bioretention surface area: 1,360 square feet.
   - Planning level cost estimate: $44,500

Site 3: This area drains runoff from the parking lot and rooftop from the greenhouse. We propose to design a vegetated swale that leads to a bioretention facility, which would then overflow to the field below.
   - Drainage area to be managed: 0.48 acres.
   - Swale Length: 35 feet;
   - Bioretention surface area: 320 square feet.
   - Planning level cost estimate: $11,500

Site 4: This area drains runoff from the large animal facility and the driveway in front of the small animal facility. We propose to design a swale that leads to a bioretention facility, which would then overflow back into the drainage gutter along the driveway edge.
   - Drainage area to be managed: 0.48 acres.
   - Swale Length: 25 feet;
   - Bioretention surface area: 330 square feet.
   - Planning level construction cost estimate: $11,000

Site 5: This area drains runoff from the driveway, the riding arena and the adjacent areas. We propose to design a swale that leads to a bioretention facility, which would then overflow into the existing drainage system.
   - Drainage area to be managed: 0.96 acres.
   - Swale Length: 80 feet;
   - Bioretention surface area: 500 square feet.
   - Planning level construction cost estimate: $20,500

Based on our initial assessment of the relative costs versus the size of the area treated for each location, as well as our project budget, we believe it makes the most economic sense to pursue sites 2 and 3. However, if you and the other school officials believe that any of the other sites would be a better selection (and are feasible and might offer different educational opportunities) please let us know and we would be happy to discuss this with you.
Please review the attached map and this memo and let us know if you agree with our recommendation to pursue these 2 preferred locations, or if you would like us to concentrate our efforts on another location. If you have any questions, please do not hesitate to contact me at 508-833-6600 or Ellie Baker at 978-499-0601. We look forward to hearing from you. We hope to reach a final selection by the New Year, or sooner if possible, so that we can move forward with any necessary survey and test pits as soon as possible.
SITEWIDE FACILITY OPERATIONAL NOTES

STORMWATER FACILITY OPERATIONAL NOTES

1. The contractor shall be responsible for the proper operation and maintenance of all stormwater facilities. The contractor shall ensure that the facilities are operated in accordance with the approved construction plan.

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A

LOAMY SAND

B

LOAMY SAND

C

MEDIUM SAND

C 1

91.0

TP-1

WEEPING OBSERVED AT 84"

ESHGW EL. 85.5

A

LOAMY SAND

B

LOAMY SAND

C 1

MEDIUM SAND

C 2

FINE SAND

TP-2

WEEPING OBSERVED AT 100"

ESHGW EL. 86.7

BRISTOL COUNTY AGRICULTURAL HIGH SCHOOL

135 CENTER ST

DIGTTON, MA

GRAPHIC SCALE

0 100' = 1" PENCIL

BENCHMARK

MAG NAIL SET

ELEV. = 106.00" ASSUMED

BENCHMARK

MAG NAIL SET

ELEV. = 106.00" ASSUMED

INSPECTOR: J. HENDERSON

DATE: 3/2/2010

10 YR 4/4 91.0

10 YR 5/6 90.5

10 YR 5/4

10 YR 6/6

10 YR 8/3
**Bioretention Material Specifications**

**Material**

- **Soil**
  - Filter Media to contain:
    - 85-88% sand
    - 8-12% soil fines (< 2% clay)
    - 3-5% organic matter
  - USDA soil types loamy sand or sandy loam.
  - Volume of filter media based on 110% of plan volume to account for settling or compaction. Organic matter shall be well aged (6-12 months), well aerated, leaf compost or approved equivalent.

- **Mulch Layer**
  - Fine shredded hardwood mulch. Well aged (6 months minimum).
  - A 2 to 3 inch layer on the surface of the filter bed. Mix half into soil filter media.

- **Filter Fabric**
  - For use over underdrains (extend 1 foot - 1.5 feet each side) and side walls of bioretention excavation.

- **Pea Gravel 3/8" washed stone**
  - For use between the Bioretention Soil and the approved subgrade/underdrain gravel.

- **Gravel Underdrain Jacket**
  - AASHTO M-43 Washed, clean and free of all fines.
  - Underdrain 4" rigid schedule 40 PVC pipe, with 3/8" perforations @ 6" o.c. meeting ASTMD 1785 or AASHTO M-278 (Or equivalent corrugated HDPE if shown in drawings).
  - Perforated pipe for length of bioretention cell, and non-perforated pipe as needed to connect with storm drain system. T's and Y's as needed depending on underdrain configuration.

- **Underdrain Cleanouts**
  - Non perforated schedule 40 PVC pipe, PVC elbow, cap, and all associated fittings.
  - Extend cleanout pipes to surface with vented caps at T's and Y's.

- **Erosion Control Blanket**
  - Woven, 100% biodegradable jute fiber 7.70 lbs/1000 sqft. Bionet S150BN or approved equivalent.
  - To be used on 3:1 side slopes of bioretention area.

**Plant Material**

- All plant material shall conform, in all respects, to the guidelines of the "American Standard for Nursery Stock", latest edition.
- Plant species and quantities as specified in the Drawings.
- New England Conservation/Wildlife/Mix or approved equivalent.
- Application rate 25 lbs/ acres or per seed manufacturer's requirements.

**Bioretention Construction Sequence and Required Inspections**

1. Check and mark the final grade elevations on the inside of each turn and weir structure.
2. Check that the filter media is free of all debris and is acceptable for use.
3. Check that the filter media is free of all debris and is acceptable for use.
4. Check that the filter fabric is free of all debris and is acceptable for use.
5. Check that the pea gravel is free of all debris and is acceptable for use.
6. Check that the gravel underdrain jacket is free of all debris and is acceptable for use.
7. Check that the underdrain cleanouts are free of all debris and are acceptable for use.
8. Check that the erosion control blanket is free of all debris and is acceptable for use.
9. Check that the plant material is free of all debris and is acceptable for use.
10. Check that the bottom elevation = surface of shredded organic layer (see detail).
11. See pipe schedule for outlet pipe size.
## TAUNTON RIVER WATERSHED PLAN - BRISTOL COUNTY AGRICULTURAL HIGH SCHOOL
### DIGHTON, MA

### 75% DESIGN PLANS
#### CONSTRUCTION COST ESTIMATE
8/6/2010

<table>
<thead>
<tr>
<th>ITEM NUMBER</th>
<th>DESCRIPTION</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>TOTAL AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>STRAWBALES &amp; SILT FENCE FOR EROSION CONTROL</td>
<td>610</td>
<td>LINEAR FOOT</td>
<td>$10.00</td>
<td>$6,100</td>
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<td>2.0</td>
<td>BIORETENTION FACILITY</td>
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<td>$63,250</td>
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<td>3.0</td>
<td>EROSION CONTROL MAT FOR REINFORCED SWALES</td>
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<td>SQUARE YARD</td>
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<td>$5,600</td>
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<tr>
<td>4.0</td>
<td>PAVED DRAINAGE FLUME</td>
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<td>$1,200</td>
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<tr>
<td>5.0</td>
<td>RIPRAP OUTFALLS</td>
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<td>EACH</td>
<td>$2,000.00</td>
<td>$4,000</td>
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<tr>
<td>6.0</td>
<td>SEDIMENT FOREBAY W/ TIMBER CHECK DAM</td>
<td>300</td>
<td>SQUARE FOOT</td>
<td>$15.00</td>
<td>$4,500</td>
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<td>7.0</td>
<td>SWALE EXCAVATION</td>
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<td>CUBIC YARD</td>
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<td>$4,550</td>
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<tr>
<td>8.0</td>
<td>LOAM &amp; SEED FOR SWALES</td>
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<td>SQUARE YARD</td>
<td>$9.00</td>
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<tr>
<td>9.0</td>
<td>GRADING AROUND STORMWATER FACILITIES</td>
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<td>EACH</td>
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<td>10.0</td>
<td>REMOVAL OF EXISTING UNDERGROUND STRUCTURE</td>
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<td>EACH</td>
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<tr>
<td>11.0</td>
<td>EROSION/SEDIMENT CONTROL</td>
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<td>LUMP SUM</td>
<td>$2,500.00</td>
<td>$2,500</td>
</tr>
</tbody>
</table>

**SUB TOTAL** $100,350

**ESTIMATED BID PRICE** $101,000

Owner Contingency 30% $31,000

**ESTIMATED CONSTRUCTION BUDGET** $132,000

### NOTES:

CONTINGENCY IS PROVIDED BASED ON 75% DESIGN PLANS REFLECTING THE FACT THAT UNCERTAINTY EXISTS BETWEEN THIS STAGE AND CONSTRUCTION STAGE DRAWINGS. FINAL CONSTRUCTION ESTIMATES WILL BE DEPENDANT ON FACTORS RESOLVED AT THE CONSTRUCTION BIDDING STAGE.