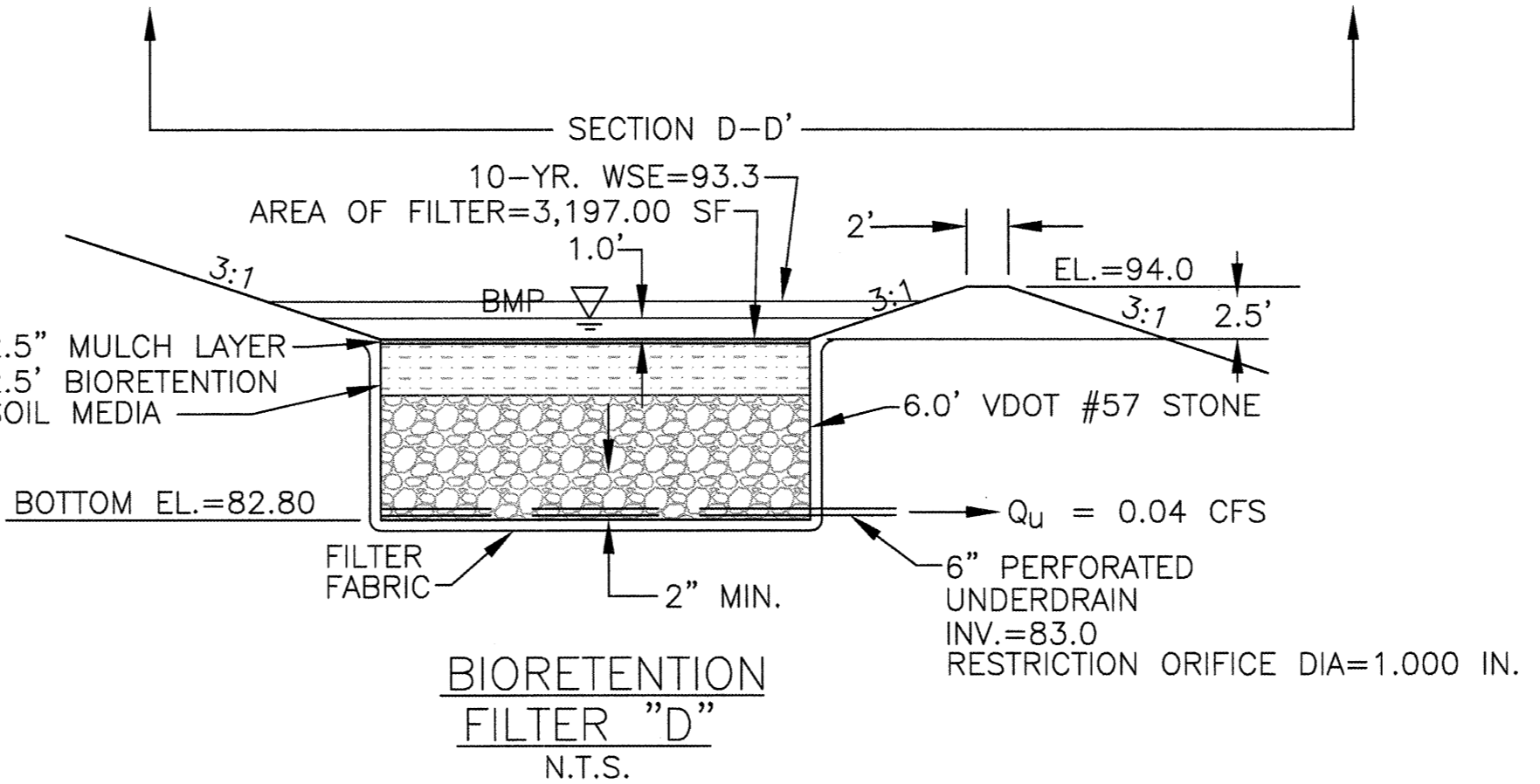
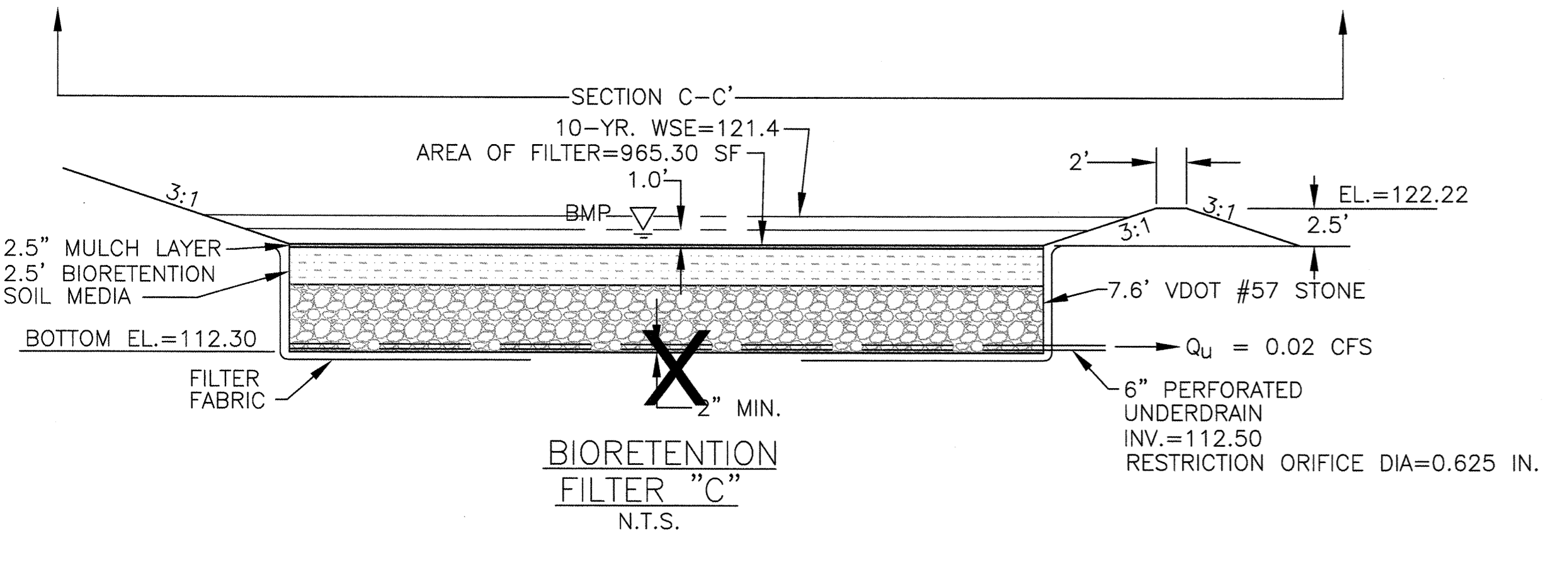
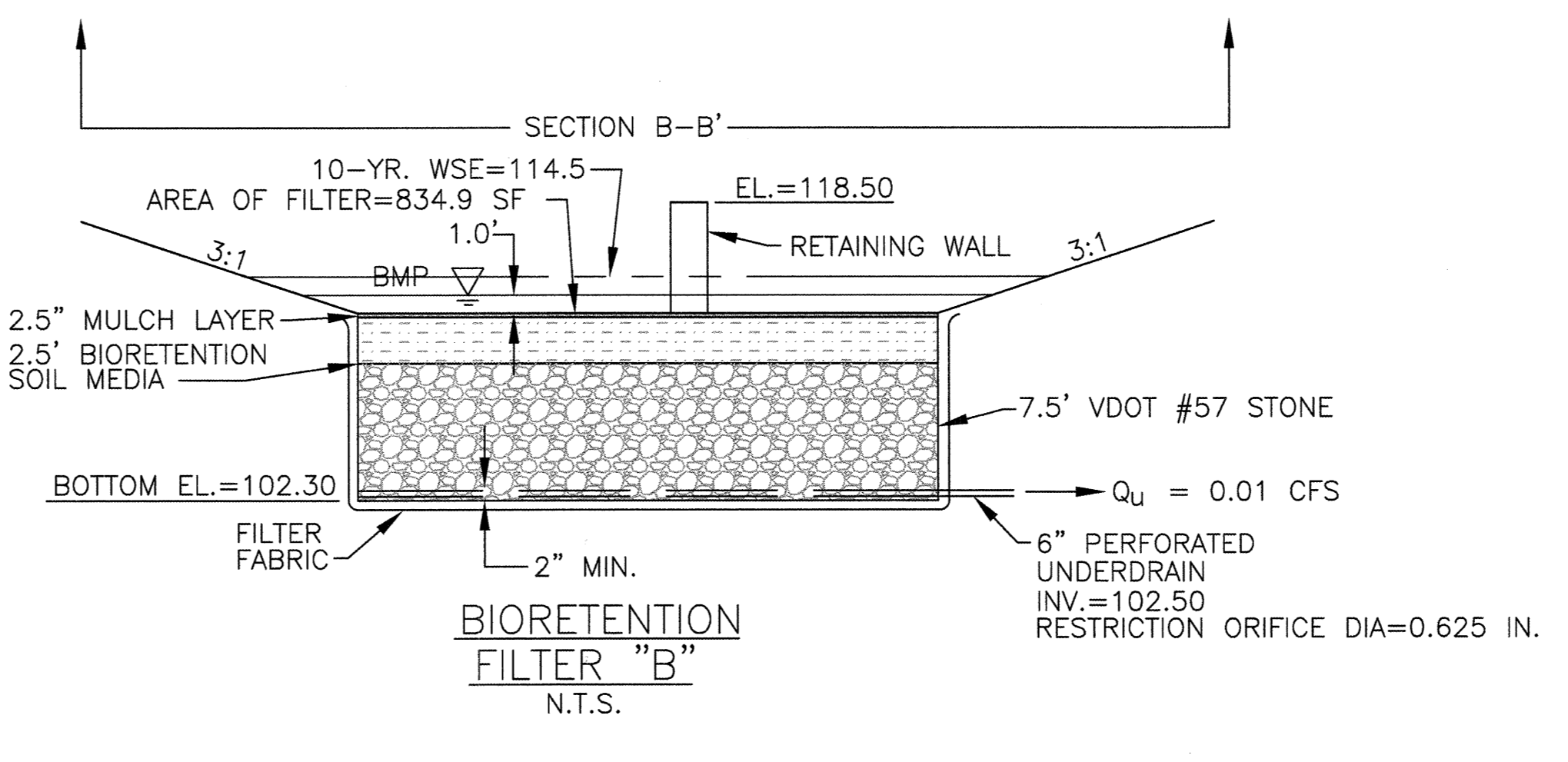
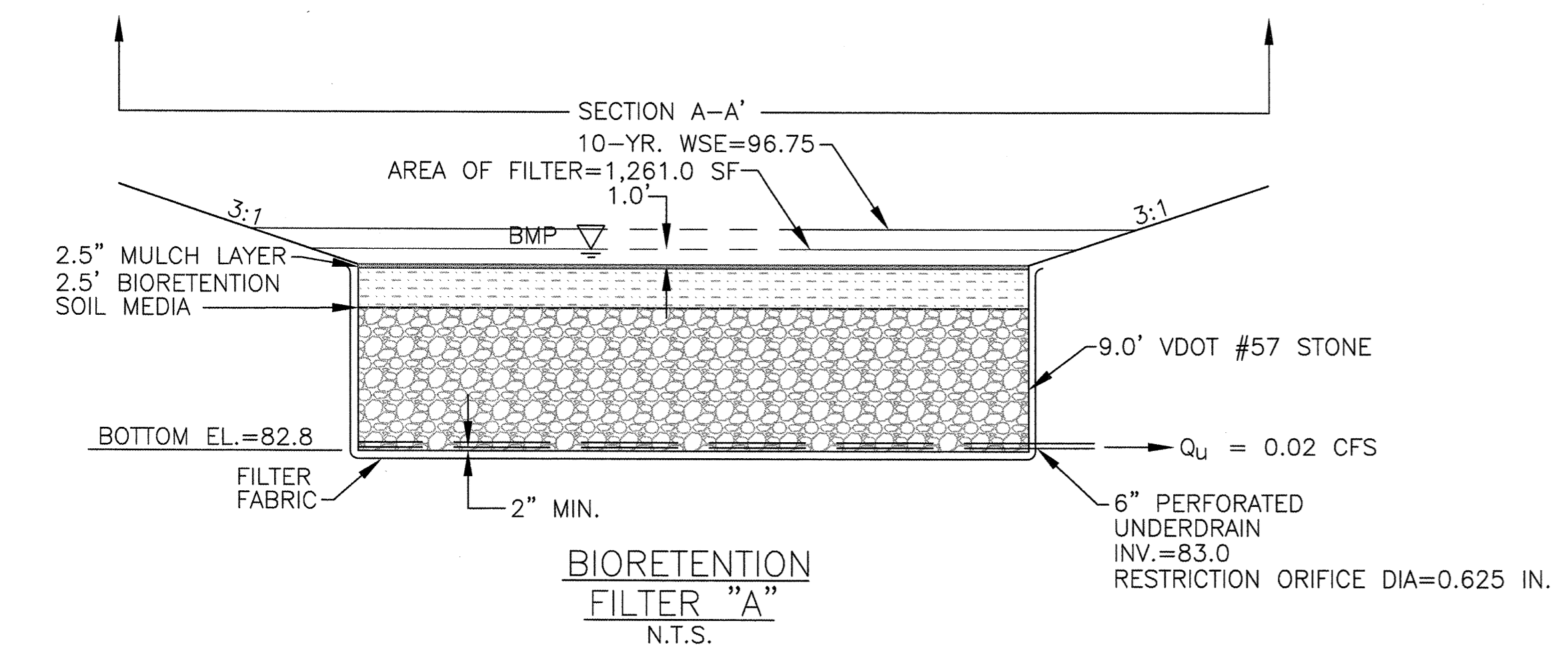


CROSS SECTIONS



SEE SHEET C5.10 "STORMWATER MANAGEMENT PLAN" FOR CROSS SECTION LOCATIONS. ALL CROSS SECTION LOCATIONS PLACED SUCH THAT TYPICAL FACILITY DETAIL SHOWN AND ADEQUACY OF PERFORMANCE DEMONSTRATED.

CONSTRUCTION SPECIFICATIONS

(Adapted from Fairfax County 2001 Public Facilities Manual (PFM).)

PFM 6-1307.11A - The owner shall provide for inspection during construction of the facility by a licensed design professional (In accordance with standard practice, the actual inspections may be performed by an individual under responsible charge of the licensed professional). The licensed professional shall certify that the facility was constructed in accordance with the approved plans. The licensed professional's certification along with any material delivery tickets and certifications from the material suppliers and results of the tests and inspections required under § 6-1307.9A, § 6-1307.11D, and § 6-1307.11K shall be submitted to the County prior to bond release. For projects requiring as-built plans, the required certification and supporting documents shall be submitted with or incorporated in the as-built plans. For projects that do not require as-built plans, the required certification and supporting documents shall be submitted with the RUP or non-RUP request.

PFM 6-1307.11B - Bioretention facilities shall be constructed after the drainage area to the facility is completely stabilized. Erosion and sediment controls for construction of the facility shall be installed as specified in the erosion and sediment control plan.

PFM 6-1307.11C - The components of the soil media shall be thoroughly mixed until a homogeneous mixture is obtained. It is preferable that the components of the soil media be mixed at a batch facility prior to delivery to the site. The soil media shall be moistened, as necessary, to prevent separation during installation.

PFM 6-1307.11D - The soil media shall be tested for pH, organic matter, and soluble salts prior to installation. If the results of the tests indicate that the required specifications are not met, the soil represented by such tests shall be amended or corrected as required and retested until the soil meets the required specifications. If the pH is low, it may be raised by adding lime. If the pH is too high, it may be lowered by adding iron sulfate plus sulfur.

PFM 6-1307.11E - For bioretention basins, the floor of the facility shall be scarified or tilled to reduce soil compaction and raked to level it before the filter fabric, stone, and soil media are placed.

PFM 6-1307.11F - The soil media may be placed by mechanical methods with minimal compaction in order to maintain the porosity of the media. Spreading shall be by hand. The soil media shall be placed in 8-12 inch (203-305 mm) lifts with no machinery allowed over the soil media during or after construction. The soil media should be overfilled above the proposed surface elevation as needed to allow for natural settlement. Lifts may be lightly watered to encourage settlement. After the final lift is placed, the soil media shall be raked to level it, saturated, and allowed to settle for at least one week prior to installation of plant materials.

PFM 6-1307.11G - Fill for the berm and overflow weir shall consist of clean material free of organic matter, rubbish, frozen soil, snow, ice, particles with sizes larger than 3 inches (76 mm), or other deleterious material. Fill shall be placed in 8-12 inch (203-305 mm) lifts and compacted to prevent settlement. Compaction equipment shall not be allowed within the facility on the soil bed. The top of the berm and the invert of the overflow weir shall be constructed level at the design elevation.

PFM 6-1307.11H - Plant material shall be installed per § 12-0805.

PFM 6-1307.11I - Planting shall take place after construction is completed and during the following periods: March 15 through June 15 and September 15 through November 15 unless otherwise approved by the Director.

PFM 6-1307.11J - All areas surrounding the facility that are graded or denuded during construction of the facility and are to be planted with turf grass shall be sodded.

PFM 6-1307.11K - The facility shall be inspected at 12-24 and 36-48 hours after a significant rainfall [0.5-1.0 inch (1.27-2.54 cm)] or artificial flooding to determine that the facility is draining properly. Results of the inspection shall be provided to DPWES prior to bond release.

MATERIALS SPECIFICATIONS

(Adapted from Fairfax County 2001 Public Facilities Manual (PFM).)

PFM 6-1307.9A - The bioretention soil media shall be composed of a mixture of 60-75% washed sand, 5-15% organic compost meeting the requirements of Table 6.32, and 10-35% topsoil. Topsoil shall be a sandy loam, loamy sand, silt loam or loam per USDA textural classification. The textural class of the topsoil shall be verified by a laboratory analysis. Topsoil shall be of uniform composition, containing no more than 8% clay, free of stones, stumps, brush, roots, or similar objects larger than 2 inches. Topsoil shall be free of Bermuda Grass, Quackgrass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearthumb, or other noxious weeds. Sand shall meet AASHTO M-6, ASTM C-33, or VDOT Section 202 Grade "A" Fine Aggregate specifications. Sand shall be clean and free of deleterious materials. The final soil mixture shall not contain any material or substance that may be harmful to plant growth, or a hindrance to plant growth or maintenance. The final soil mixture shall meet the requirements in Table 6.33. Each bioretention area shall have a minimum of one soil test performed on the final soil mixture. Test results and materials certifications shall be submitted to DPWES prior to bond release.

PFM 6-1307.9B - Mulch shall be double shredded aged hardwood bark with a particle size greater than 0.5 inches (1.27 cm). Mulch shall be well aged, uniform in color, and free of salts, harmful chemicals, and extraneous material including soil, stones, and plant 2001 PFM Page 6-87 material. Well aged mulch is mulch that has been stockpiled or stored for 6-12 months.

PFM 6-1307.9C - Underdrains shall be PVC pipe conforming to the requirements of ASTM F758, Type PS 28 or ASTM F949; HDPE pipe conforming to the requirements AASHTO M252 or M 294, Type S; or approved equivalent pipe. Underdrains shall be perforated with 4 rows of 3/8 inch (9.5 mm) holes with a hole spacing of 3.25 + 0.25 inches (82.5 + 6.4 mm) or a combination of hole size and spacing that provides a minimum inlet area > 1.76 square inches per linear foot (37.2 cm²/m) of pipe or be perforated with slots 0.125 inches (3.2 mm) in width that provides a minimum inlet area > 1.5 square inches per linear foot (31.8 cm²/m) of pipe.

PFM 6-1307.9D - Filter fabric shall be a needled, non-woven, polypropylene geotextile meeting the requirements listed in Table 6.34. Heat-set or heat-calendared fabrics are not permitted.

pH	6.0-8.0
Soluble Salts (electrical conductivity)	<5 dS/m (mmhos/cm)
Nutrient Content (dry weight basis)	Nitrogen - 1% or above Phosphorus -1% or above Potassium -1% or above
Organic Matter Content (dry weight basis)	50-60%
Moisture Content (wet weight basis)	40-50%
Particle Size (aggregate size)	Pass through a 0.5 inch screen or smaller
Maturity Indicator (percentage of control)	>80% of control
Stability (CO ₂ evolution)	0-4 mg CO ₂ /C per g OM per day
Trace Elements/Heavy Metals	Meet U.S. EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3
Pathogens	Meet U.S. EPA Class A standard, 40 CFR § 503.32(a)

pH	5.5 - 6.0
Total Organic Matter by Loss of Ignition (ASTM F1647, Method A)	10% (dry weight)
Topsoil	25%
Sand	65%
Clay Content	≤ 7.5%

Grab Tensile Strength (ASTM D4632)	≥ 120 lbs (534 N)
Mullen Burst Strength (ASTM D3786)	≥ 225 lbs/in ² (1550 kPa)
UV Resistance (ASTM D4355)	70% strength after 500 hours
Flow Rate (ASTM D4491)	≥ 125 gal/min/ft ² (5093 l/min/m ²)
Apparent Opening Size (AOS) (ASTM D4751)	US #70 or #80 sieve (0.212 or 0.180 mm)

Bioretention July 25

ATTACHMENT A
BIORETENTION BASIN (Rain Garden)
MAINTENANCE SPECIFICATIONS

- 1) Bioretention Basin(s) and appurtenances shall be maintained in good working condition acceptable to the County.
- 2) The Bioretention Basin(s) and appurtenances shall be privately owned and maintained.
- 3) Bioretention Basin(s) and appurtenances shall be inspected in accordance with the following schedule by a qualified individual to ensure that they operate in good working condition acceptable to the County. Items in need of repair shall be promptly addressed.
 - Embankment settling, woody growth, and signs of piping (annually)
 - Signs of seepage on the downstream face of the embankment (annually)
 - Condition of grass cover on the embankment and perimeter (annually)
 - Riprap displacement or failure (annually)
 - Outlet (annually)
 - Outlet channel conditions (annually)
 - Inlet pipe conditions (annually)
 - Safety features of the facility (annually)
 - Access for maintenance equipment (annually)
 - Observation well (annually)
 - Sediment accumulation (monthly)
 - Debris and trash accumulation (monthly)
 - Erosion in bioretention area and on the embankment (yearly or after major rain event)
 - Species removal/survival for plantings shown on the design plans essential to the pollutant removal capability of the facility (twice per year)
 - Condition of mulch (biannually)
 - Condition of grass buffer (biannually)
- 4) The pH of the soil shall be tested annually. The pH level of the soil shall be maintained as neutral (within a pH range of 6.5 to 7.5). Limestone shall be spread over the bioretention facility if the soil pH is less than 6.5.
- 5) The mulch layer and soils shall be examined for evidence of hydrocarbons or other deleterious materials if the plant community experiences unsatisfactory growth or mortality. Any contaminated mulch shall be removed and replaced with clean mulch. In the event of persistent unsatisfactory growth, the soils shall be tested as needed for hydrocarbons or other toxic substances. If excess levels of these toxic substances are encountered, then the soils, plants and mulch shall be replaced as needed in conformance with the approved construction plans. The mulch shall be raked and scarified on an annual basis.
- 6) Trees and shrubs shall be mulched to a minimum thickness of 3 inches. Mulch shall be raked and scarified annually. Mulch shall be removed and replaced every three years. Ground cover specified as plugs shall be installed after the area has been mulched. Ground cover established by seeding and/or consisting of grass shall not be covered with mulch.
- 7) Watering of plant material shall be performed as needed to ensure survival.
- 8) The basin's embankment and overflow spillway shall be mowed at least twice during the Spring, at least once during the Summer, and at least twice during the Fall to

Bioretention Filter	10-YR WSE (ft)	Mulch layer thickness (ft)	Soil media thickness (ft)	Stone layer thickness (ft)
A	97.5	0.2	2.5	4.5
B	113.5	0.2	2.5	6.5
C	121.5	0.2	2.5	4.5
D	103.4	0.2	2.5	4.5
E	119.5	0.2	2.5	6.0

- 9) discourage woody growth with the last cutting occurring at the end of the growing season. The grass should not be cut to less than 6 to 8 inches in height.
- 9) If necessary, the embankment shall be limed, fertilized and seeded in the fall, after the growing season. Lime and fertilizer application rates shall be based on soil test results. The type of seed should be consistent with that originally specified on the construction plans.
- 10) All erosion gullies noted during the growing season shall be backfilled with topsoil, reseeded and protected (mulched) until vegetation is established.
- 11) All bare areas and pathways on the embankment shall be promptly seeded and protected (mulched) or otherwise stabilized to eliminate the potential for erosion.
- 12) All animal burrows shall be backfilled and compacted and burrowing animals shall be removed from the area.
- 13) All trees, woody vegetation and other deep-rooted growth, including stumps and associated root systems, shall be removed from the embankment. The root systems shall be extracted and the excavated volume replaced and compacted with material similar to the surrounding area. All seedlings shall be removed at the first opportunity. Similarly, any vine cover and brush shall be removed from the embankment to allow for inspections.
- 14) Grass buffer strips shall be maintained at a height of 6 to 12 inches.
- 15) A reinforcement planting for the vegetation shown on the design plans, essential to the pollutant removal capability of the facility, shall be scheduled at the onset of the second growing season after construction. The size and species for the reinforcement plantings shall be based on an inspection of the growth and survival of the plantings at the end of the first growing season.
- 16) Water shall not be allowed to pond on the surface of the basin for more than 48 hours after a storm. Water ponding more than 48 hours after a storm is an indication that the underlying soil interface is clogged. Any evidence of clogging of the underlying soil interface shall be investigated and promptly addressed.
- 17) The owner shall provide an annual report of inspections and maintenance activities including a fiscal summary of budgeted and actual expenditures to the County (Maintenance and Stormwater Management Division) within 45 days of the end of the calendar year. The annual report shall include the names, addresses, telephone numbers, and other available means of contact (FAX numbers and email addresses) of the current owner(s) and the individual(s) responsible for maintenance of the facility. Inspection and maintenance records also shall be kept on-site or at a location that is readily accessible and shall be made available to County officials upon request.

PLAN REVISIONS -

SHEET C5.21
24 OF 80

SCALE N.T.S.

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MOUNT VERNON DISTRICT FAIRFAX COUNTY, VIRGINIA

BIORETENTION AND STORMWATER MANAGEMENT DETAILS

DATE: 01/14/11
ENGINEER: LCG
CAD: KAB
CHECKED: WBS
JOB#: 109-084

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