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VA DEQ STORMWATER DESIGN SPECIFICATION NO. 9

BIORETENTION

Table 9.B. Bioretention Material Specifications

Material	Specification	Notes
BIORETENTION SOIL MEDIA Composition	Filter Media to contain: <ul style="list-style-type: none">85%-88% sand8%-12% soil fines3%-5% organic matter in the form of leaf compost	The volume of SOIL MEDIA based on 110% of the plan volume, to account for settling or compaction.
BIORETENTION SOIL MEDIA Testing	P-Index range = 10-30, OR Between 7 and 21 mg/kg of P in the soil media. CECs greater than 10	The media must be procured from approved filter media vendors.
Mulch Layer	Use aged, shredded hardwood bark mulch	Lay a 2 to 3 inch layer on the surface of the filter bed
Alternative Surface Cover	Use river stone or pea gravel, coir and jute matting, or turf cover	Lay a 2 to 3 inch layer of to suppress weed growth
Top Soil For Turf Cover	Loamy sand or sandy loam texture, with less than 5% clay content, pH corrected to between 6 and 7, and an organic matter content of at least 2%	3 inch surface depth.
Geotextile/Liner	Use a non-woven geotextile fabric with a flow rate of > 110 gal/min/sq. ft. (e.g., Geotex 351 or equivalent)	Apply only to the sides and above the underdrain. For hotspots and certain karst sites only, use an appropriate liner on bottom.
Stone Jacket for Underdrain and/or Storage Layer	1 inch stone should be double-washed and clean and free of all fines (e.g., VDOT #57 stone).	12 inches for the underdrain; 12 to 18 inches for the stone storage layer, if needed
Underdrains, Cleanouts, and Observation Wells	Use 6 inch rigid schedule 40 PVC pipe (or equivalent) corrugated HDPE for (micro-bioretention), with 3/8-inch perforations at 6 inches on center; position each underdrain on a 1% or 2% slope located no more than 10 feet from the next pipe.	Lay the perforated pipe under the length of the bioretention cell, and install non-perforated pipe as needed to connect with the storm drain system. Install T's and Y's as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with vented caps at the T's and Y's. Establish plant materials as specified in the landscaping plan and the recommended plant list. In general, plant spacing must be sufficient to ensure the plant material achieves 80% cover in the proposed planting areas within a 3-year period. If seed mixes are used, they should be from a qualified supplier, should be appropriate for stormwater basin applications, and should consist of native species (unless the seeding is to establish maintained turf).
Plant Materials	Plant one tree per 250 square feet (15 feet on-center, minimum 1 inch caliper). Shrubs a minimum of 30 inches high planted a minimum of 10 feet on-center. Plant ground cover plugs at 12 to 18 inches on-center. Plant container-grown plants at 18 to 24 inches on-center, depending on the initial plant size and how large it will grow.	

FIGURE 9-B.2 TYPICAL BIORETENTION BASIN BERM

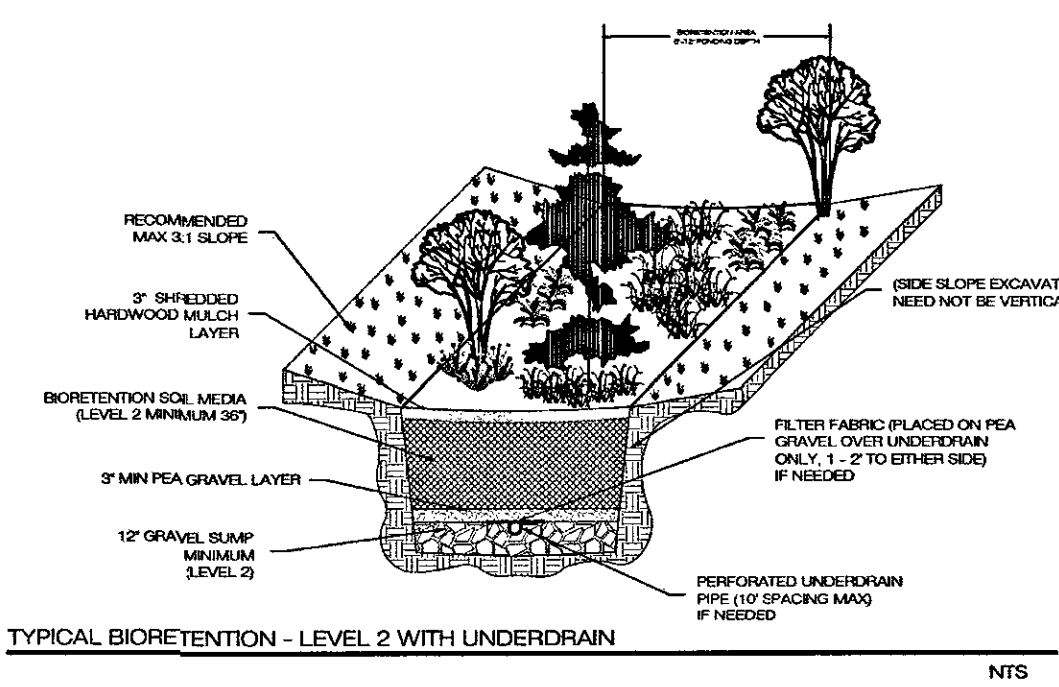
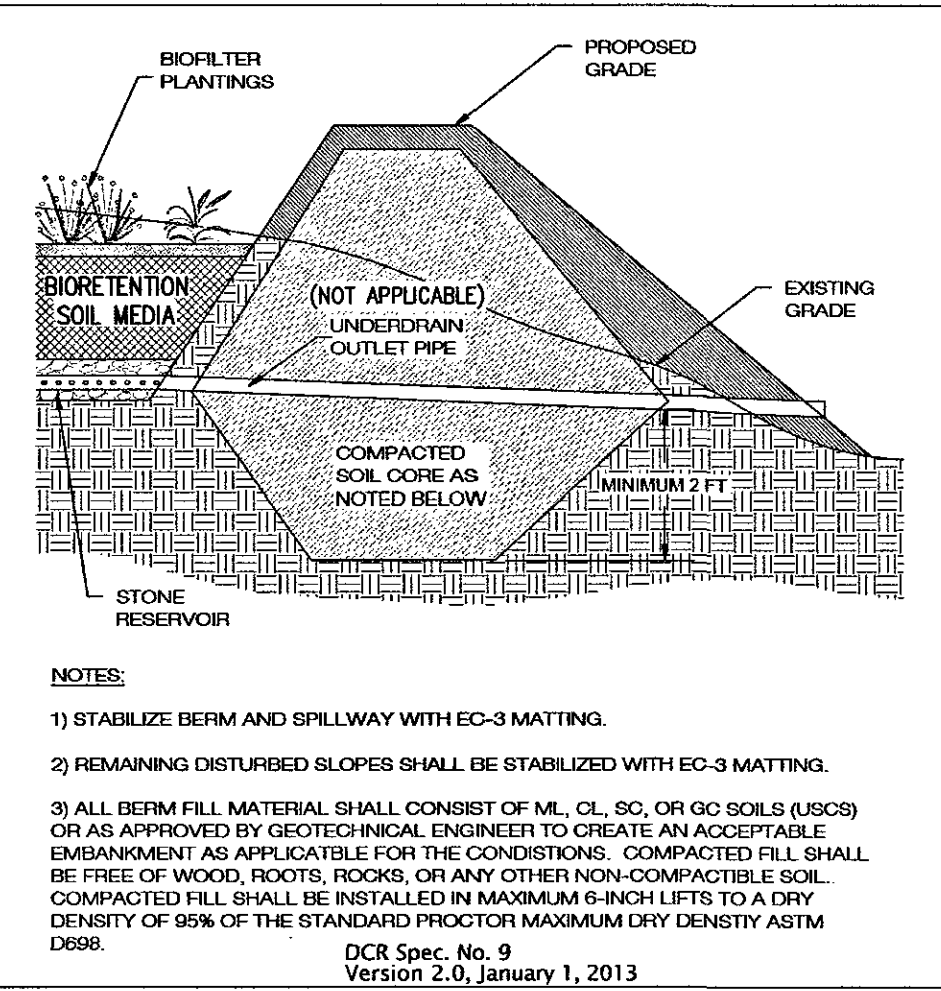


Figure 9-B.2: Typical Detail of Bioretention Basin Level 2 Design

- NOTES:
- 1) STABILIZE BERM AND SPILLWAY WITH EC-3 MATTING.
 - 2) REMAINING DISTURBED SLOPES SHALL BE STABILIZED WITH EC-3 MATTING.
 - 3) ALL BERM FILL MATERIAL SHALL CONSIST OF ML, CL, SC, OR GC SOILS (USCS) OR AS APPROVED BY GEOTECHNICAL ENGINEER TO CREATE AN ACCEPTABLE COMPACTED FILL. THE FILL SHALL BE FREE OF WOOD, ROCKS, OR ANY OTHER NON-COMPACTIBLE SOIL. COMPACTED FILL SHALL BE INSTALLED IN MAXIMUM 6-INCH LIFTS TO A DRY DENSITY OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY ASTM D698.
- DCR Spec. No. 9
Version 2.0, January 1, 2013

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BIORETENTION

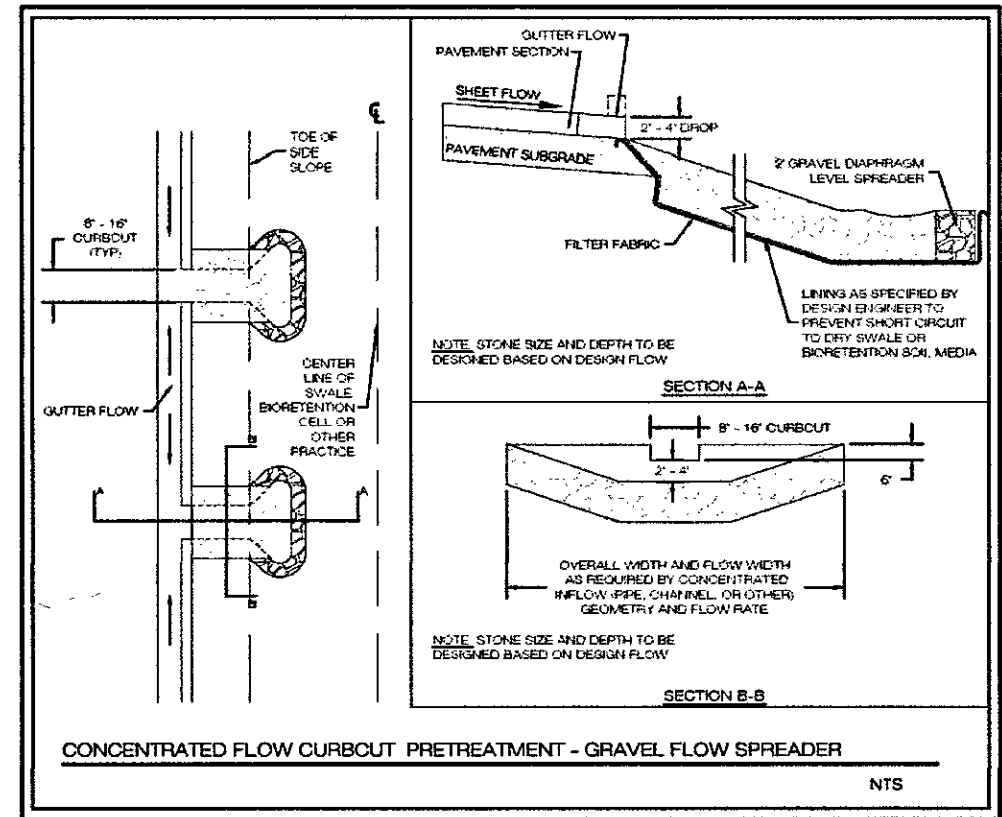
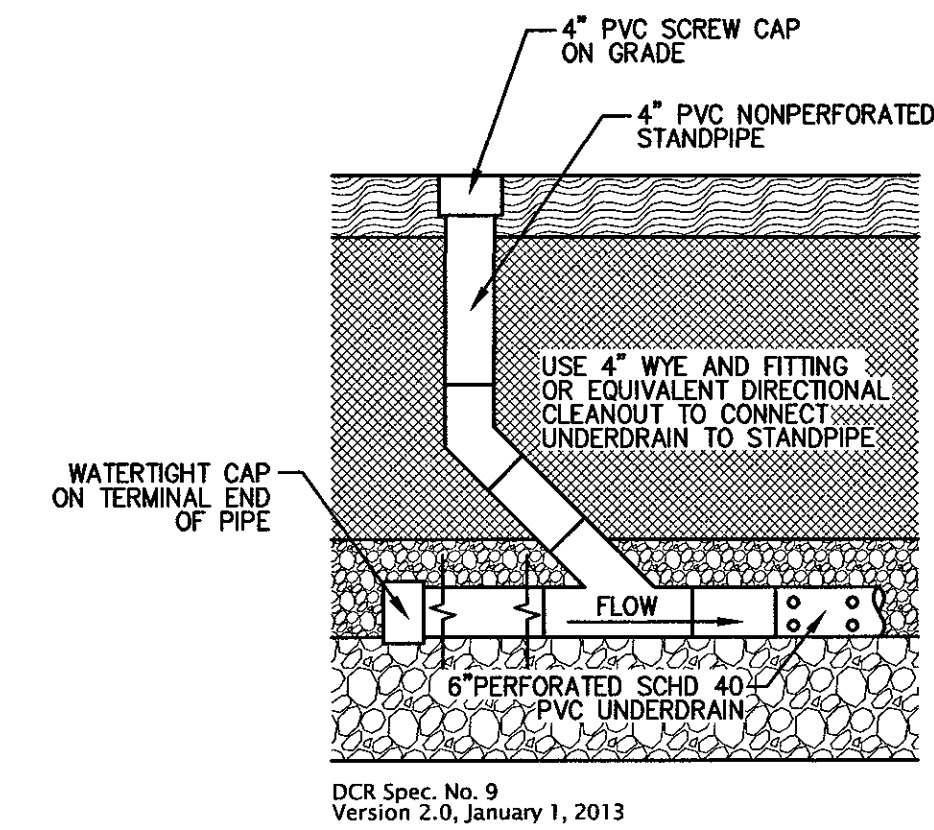


Figure 9.9: Pre-Treatment - Gravel Flow Spreader for Concentrated Flow

BIORETENTION STORMWATER MANAGEMENT NOTES:

1. SHOULD ROCK BE ENCOUNTERED DURING THE EXCAVATION FOR BIORETENTION BASINS, THE CONTRACTOR SHALL GRADE TO A MINIMUM OF 2 FEET BELOW THE DESIGN BASIN GRAVEL SUMP LAYER AND BACKFILL NORMAL EARTH FILL MATERIAL BEFORE CONTINUING BIORETENTION LAYER SCHEME.
2. SHOULD KARST AREAS BE ENCOUNTERED DURING THE EXCAVATION FOR THE BIORETENTION BASINS, THE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER IMMEDIATELY.
3. SEE DETAILED GRADING SHEETS FOR FURTHER BIORETENTION DETAILS.
4. ROANOKE CITY WILL REQUIRE SEALED AS-BUILT DRAWINGS OF THE STORM DRAIN AND STORMWATER MANAGEMENT SYSTEMS AFTER CONSTRUCTION. IN ADDITION TO THE POST CONSTRUCTION AS-BUILT DRAWINGS, THE CONTRACTOR SHOULD, AT A MINIMUM, CONTRACT WITH A LICENSED SURVEYOR AND ENGINEER TO AS-BUILT THE FOLLOWING DURING CONSTRUCTION:
 - UNDERGROUND DETENTION SYSTEM PRIOR TO BACKFILL
 - BIORETENTION FACILITIES PRIOR TO INSTALLATION OF GRAVEL SUMP AREA



- MONITORING WELL NOTES:
1. MONITORING WELL SHALL CONNECT TO 6" UNDERDRAIN BY TIE FITTING AND CONSIST OF A 4" PERFORATED PIPE WRAPPED IN FILTER FABRIC.
 2. EACH BIORETENTION BASIN SHALL HAVE A MINIMUM OF 1 MONITORING WELL.

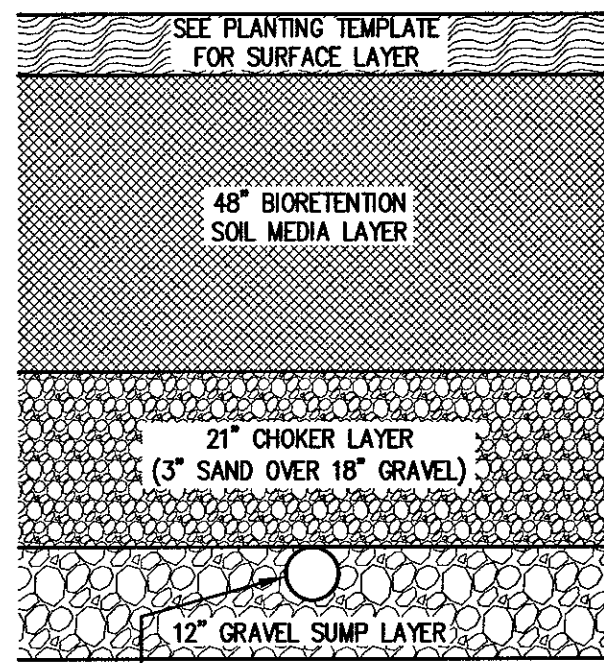
FIGURE 9-B.1 P.V.C. CLEANOUT/MONITORING WELL DETAIL

HERBACEOUS MEADOW SEEDING: (BIORETENTION AREAS "A" & "C")

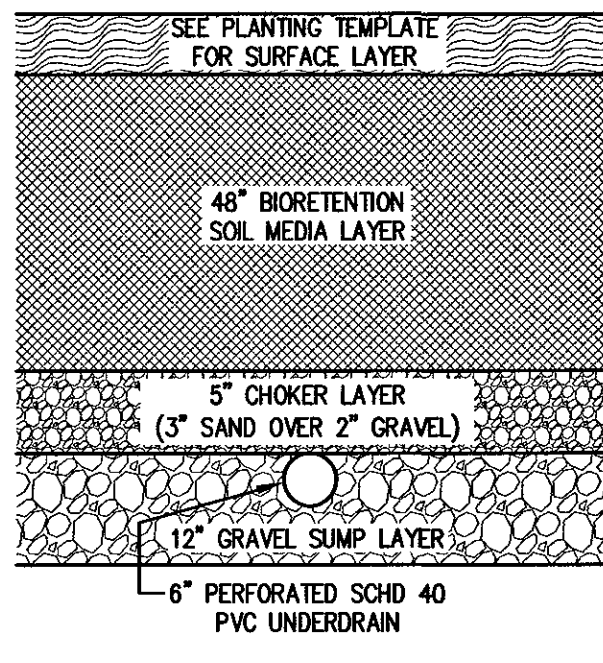
THE DELINEATED AREA SHALL BE SEEDING WITH "WETLAND SEED MIX" BY ERNST SEEDS, OR APPROVED EQUIVALENT, APPLIED AT A RATE OF 1/2 LB PER 1,000 SF.

EC-3 EROSION CONTROL MATTING SHALL BE USED IN LIEU OF THE CONVENTIONAL MULCH LAYER.

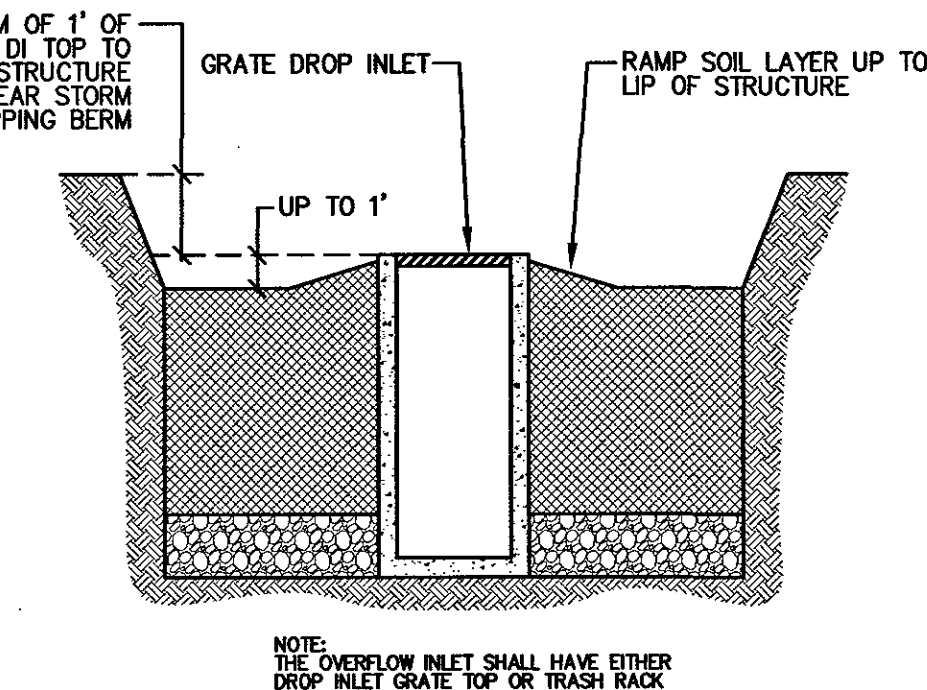
THE SEEDING AREA SHOULD ONLY BE MOWED DURING THE DORMANT SEASON.



BIORETENTION AREA "A" & "C" LAYER SCHEME



BIORETENTION AREA "B" LAYER SCHEME



- NOTE:
1. THE OVERFLOW INLET SHALL HAVE EITHER DROP INLET GRATE TOP OR TRASH RACK

FIGURE 9.13 TYPICAL DETAIL BIORETENTION OVERFLOW INLET

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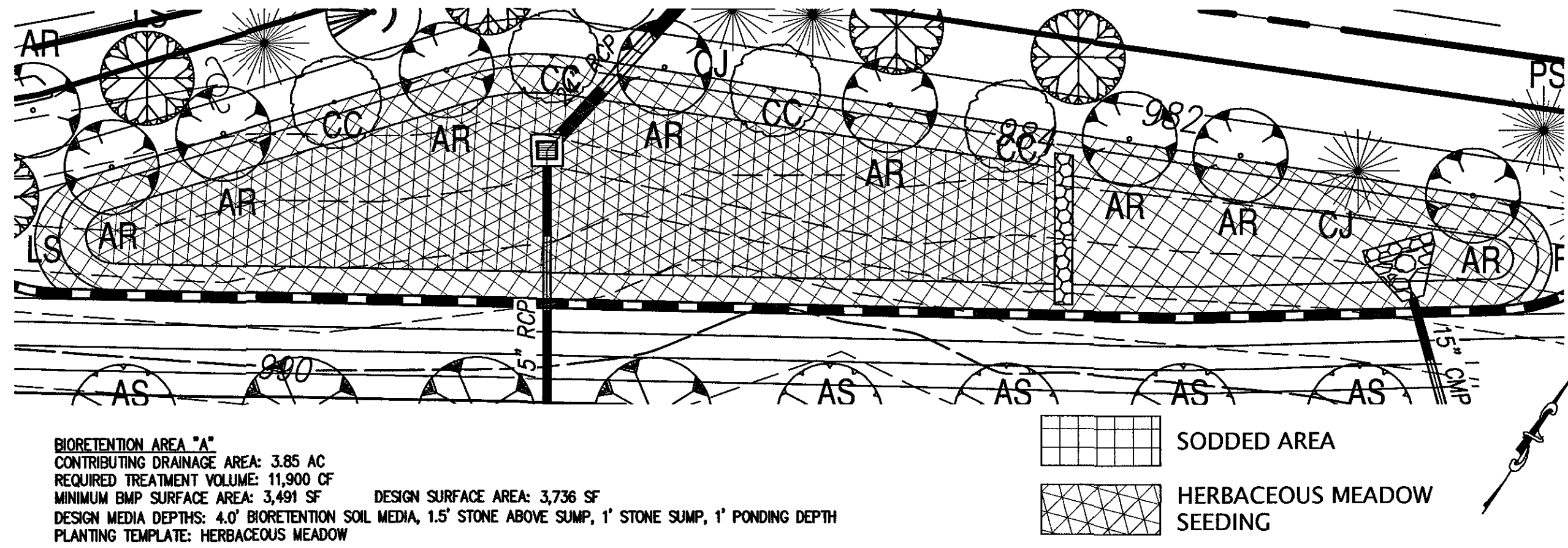
8.2 Bioretention Installation

The following is a typical construction sequence to properly install a bioretention basin. The installation of a bioretention basin will include intermediate inspections at critical stages of construction with inspector sign-off that the particular elements of the bioretention are constructed according to the approved plans and specifications. As an alternative, if allowed by the VSMP Authority, the contractor may rely on the engineer of record or other qualified individual to conduct the intermediate inspections and certifications of compliance. The construction sequence for micro-bioretention is more simplified. These steps may be modified to reflect different bioretention applications or expected site conditions:

- Step 1. Construction of the bioretention area may only begin after the entire contributing drainage area has been stabilized with vegetation. It may be necessary to block certain curb or other inlets while the bioretention area is being constructed. The proposed site should be checked for existing utilities prior to any excavation.
- Step 2. The designer and the installer should have a preconstruction meeting, checking the boundaries of the contributing drainage area and the actual inlet elevations to ensure they conform to original design. Since other contractors may be responsible for constructing portions of the site, it is quite common to find subtle differences in site grading, drainage and paving elevations that can produce hydraulically important differences for the proposed bioretention area. The designer should clearly communicate, in writing, any project changes determined during the preconstruction meeting to the installer and the plan review/inspection authority.
- Step 3. Temporary E&S controls are needed during construction of the bioretention area to divert stormwater away from the bioretention area until it is completed. Special protection measures such as erosion control fabrics may be needed to protect vulnerable side slopes from erosion during the construction process.
- Step 4. Any pre-treatment cells should be excavated first and then sealed to trap sediments.
- Step 5. Excavators or backhoes should work from the sides to excavate the bioretention area to its appropriate design depth and dimensions. Excavating equipment should have scoops with adequate reach so they do not have to sit inside the footprint of the bioretention area. Contractors should use a cell construction approach in larger bioretention basins, whereby the basin is split into 500 to 1,000 sq. ft. temporary cells with a 10-15 foot earth bridge in between, so that cells can be excavated from the side.
- Step 6. It may be necessary to rip the bottom soils to a depth of 6 to 12 inches to promote greater infiltration.
- Step 7. Place geotextile fabric on the sides of the bioretention area with a 6-inch overlap on the sides. If a stone storage layer will be used, place the appropriate depth of #57 stone on the bottom, install the perforated underdrain pipe, pack #57 stone to 3 inches above the underdrain pipe, and add approximately 3 inches of choker stone/pea gravel as a filter between the underdrain and the soil media layer. If no stone storage layer is used, start with 6 inches of #57 stone on the bottom, and proceed with the layering as described above.
- Step 8. Obtain soil the media from a qualified vendor, and store it on an adjacent impervious area or plastic sheeting. After verifying that the media meets the specifications, apply the media by hand in 12-inch lifts until the desired top elevation of the bioretention area is achieved. Saturate with water, wait a few days to check for settlement, and add additional media, as needed, to achieve the design elevation.
 - No machinery allowed on soil media during or after placement. Rake level by hand.
- Step 9. Prepare planting holes for any trees and shrubs, install the vegetation, and water accordingly. Install any temporary irrigation.
- Step 10. Place the surface cover in both cells (mulch, river stone or turf), depending on the design. If coir or jute matting will be used in lieu of mulch, the matting will need to be installed prior to planting (Step 9), and holes or slits will have to be cut in the matting to install the plants.
- Step 11. Install the plant materials as shown in the landscaping plan, and water them during weeks of no rain for the first two months.

20' 0 20'
SCALE: 1" = 20'

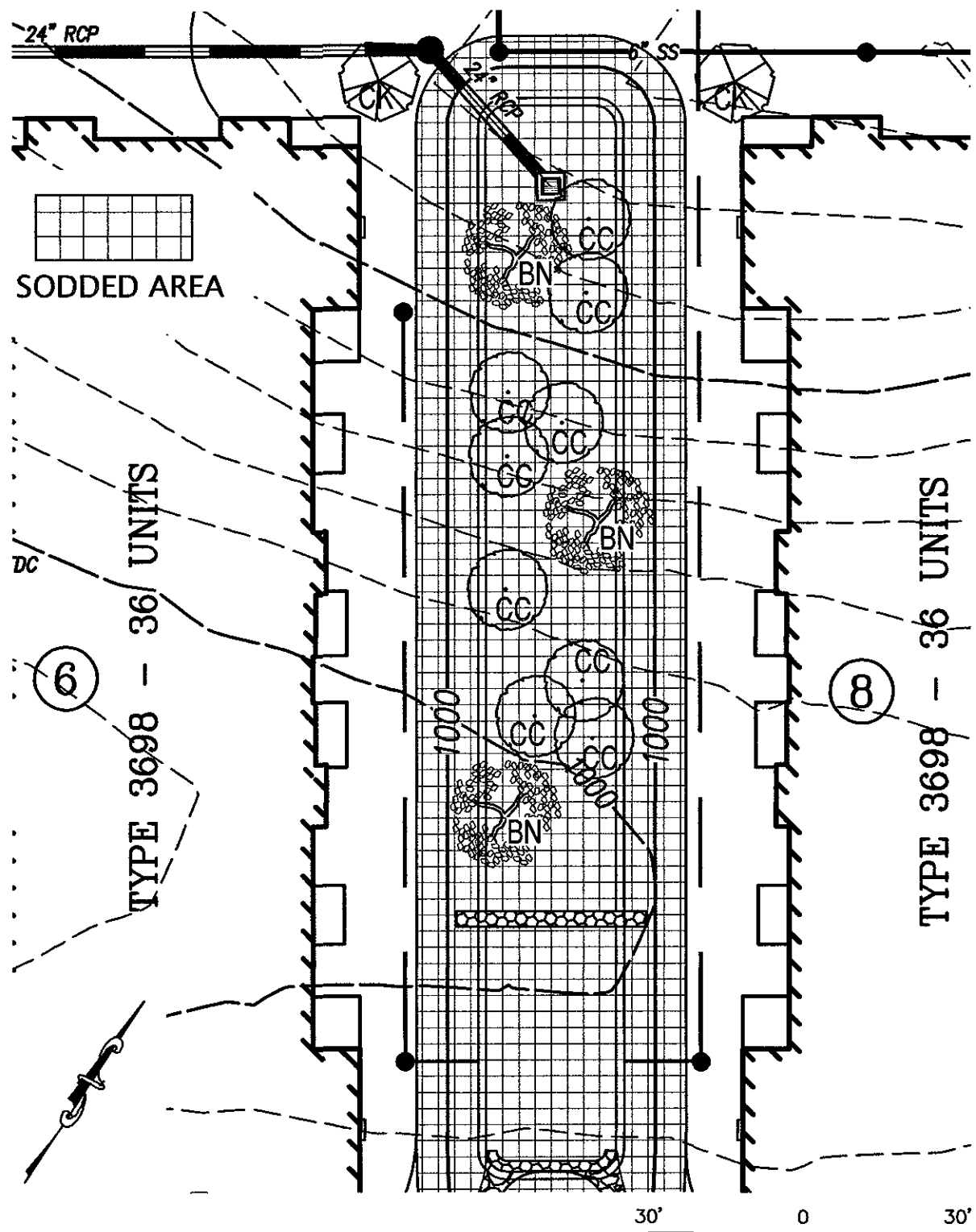
BIORETENTION AREA "A"



BIORETENTION AREA "A"
CONTRIBUTING DRAINAGE AREA: 3.85 AC
REQUIRED TREATMENT VOLUME: 11,500 CF
MINIMUM BMP SURFACE AREA: 3,491 SF
DESIGN SURFACE AREA: 3,736 SF
DESIGN MEDIA DEPTHS: 4.0' BIORETENTION SOIL MEDIA, 1.5' STONE ABOVE SUMP, 1' STONE SUMP, 1' PONDING DEPTH
PLANTING TEMPLATE: HERBACEOUS MEADOW

SODDED AREA
HERBACEOUS MEADOW SEEDING

BIORETENTION AREA "B"



BIORETENTION AREA "B"
CONTRIBUTING DRAINAGE AREA: 2.95 AC
REQUIRED TREATMENT VOLUME: 9,699 CF
MINIMUM BMP SURFACE AREA: 3,556 SF
DESIGN SURFACE AREA: 3,906 SF
DESIGN MEDIA DEPTHS: 4.0' BIORETENTION SOIL MEDIA, 0' STONE ABOVE SUMP, 1' STONE SUMP, 1' PONDING DEPTH
PLANTING TEMPLATE: TURF AND TREE

BIORETENTION TREES NOTE: ALL PROPOSED TREES SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY, AND ARE ACCOUNTED FOR ON THE LANDSCAPING PLAN, SHEET 20, THIS SET.

City of Roanoke
Planning, Building, & Development
COMPREHENSIVE DEVELOPMENT PLAN
APPROVED
by Adrian Gilbert 05/16/2017

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BIORETENTION
DETAILS

COMPREHENSIVE DEVELOPMENT PLAN
FOR
DISTRICT VUE APARTMENTS
PREPARED FOR
SOUTHEASTERN SITE ACQUISITIONS
SITUATED ALONG ORANGE AVENUE
THE CITY OF ROANOKE, VIRGINIA

REVISIONS	DESCRIPTION
NO.	DATE
1	
2	
3	
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DATE: April 6, 2017	
SCALE: AS SHOWN	
COMMISSION NO: 15-005	
SHEET 13 OF 22	