	3.9 Open Channel Systems	Sheet #	Yes/No	Comments
General				
1	What type of open channel system is utilized? ☐ Grass channels- preferable stormwater conveyance system alterative to curb and gutter and storm drains ☐ Dry swales- soil filter system that temporarily stores and then filters the desired design storm volume ☐ Bioswales- bioretention cell that is shallower, configured as linear channels, and covered with turf or other surface material (other than mulch and ornamental plants) ☐ Wet swales- linear wetland cells that intercept shallow groundwater to maintain a wetland plant community [3.9 Open Channel Systems, page 165]			
Siting				
2	Is there a minimum setback of 10 feet from a structure and waterproofing protection for foundation and basement? If setback not achieved, is an impermeable liner used along the sides of the practice? [3.9.1 Open Channel Feasibility Criteria- Setbacks, page 170]			
3	Is there a minimum 25-foot horizontal clearance between the residential structure and the 100-year floodplain? [Appendix F F.8 Open Channels, page F-4 & F-5]			
4	Is the seasonal high groundwater table at least 2 feet from the bottom of the open channel and the open channel located to avoid dry weather flow? [3.9.1 Open Channel Feasibility Criteria- Soils, page 170]			
Conveyance				
5	Does the open channel convey the capacity for the 2-year and 15-year design storms at non-erosive velocities for the soil and vegetative cover provided? [3.9.2 Open Channel Conveyance Criteria, page 171]			
6	Does the open channel contain the 15-year flow within the banks of the swale and provide a 1-foot minimum freeboard above the designated water surface profile? [3.9.2 Open Channel Conveyance Criteria, page 171]			

7	Does the analysis evaluate the flow profile through the channel at normal depth and flow depth over the top of the check dams? [3.9.2 Open Channel Conveyance Criteria, page 171]			
8	Is the bottom width and slope of a grass channel designed such that the velocity of the flow from the design storm provides a minimum hydraulic residence time of 9 minutes for peak flows from the SWRv or design storm? [3.9.2 Open Channel Conveyance Criteria, page 171]			
9	Are the channel invert and tops of bank shown on the plan and profile views? Is a cross-sectional view of each configuration? [3.9.6 Open Channel Construction Sequence, page 181]			
10	Is the transition at the entrance and outfall clearly shown on the plan and profile? [3.9.6 Open Channel Construction Sequence, page 181]			
Design				
11	Is pretreatment provided to dissipate energy, trap sediments, and slow down the runoff velocity? [3.9.3 Open Channel Pretreatment Criteria, page 171]			
12	If check dams are used for pretreatment, is the pretreatment volume stored at least 15 percent of the design volume? [3.9.3 Open Channel Pretreatment Criteria, page 171]			
13	If a gravel or stone diaphragm is used for pretreatment: ☐ Is there a 2 to 4-inch elevation drop from a hard-edged surface into a gravel or stone diaphragm? ☐ Is the stone sized according to the expected rate of discharge? [3.9.3 Open Channel Pretreatment Criteria, page 172]			
14	If a sediment forebay is used for pretreatment, does the forebay de-water between storm events? [3.9.3 Open Channel Pretreatment Criteria, page 172]			
15	If the open channel is wider than 8 feet, does the channel incorporate benches, check dams, level spreaders, etc. to prevent braiding and erosion? [3.9.4 Open Channel Design Criteria- Channel Geometry, page 172]			

16	Do open channels provide the following criteria? ☐ 6-inch minimum freeboard above the channel designated water surface profile? ☐ Gabion or rip-rap protection provided at the intersection of the channel inverts and side slopes unless it is demonstrated that the final bank and vegetation are sufficiently erosion resistant to withstand design flow and the channel will stay within the floodplain easement ☐ Channel inverts and top of bank on plan and profile ☐ Cross-section view of and transition entrance and outfall for a designed channel ☐ Final grading plan for a proposed channel ☐ Limits of recorded 100-year floodplain easement or surface water easement sufficient to convey the 100-year flow [Appendix F F.8 Open Channels, page F-4 & F-5]			
17	Do the check dams meet the following criteria? ☐ Firmly anchored into side slopes and channel bottom ☐ Designed with a center weir to pass the channel design storm peak flow ☐ Check dams in grass channels have a weep hole to dewater after storms ☐ Spaced to reduce effective slope to less than 2% (see Table 3.35 *Typical Check Dam Spacing to Achieve Effective Channel Slope*) [3.9.4 Open Channel Design Criteria- Check Dams, pages 172-173]			
18	Is the open channel stabilized to prevent erosion? Ensure the maximum flow velocities do not exceed the values listed in *Table 3.38 Recommended Vegetation for Open Channels*. [3.9.5 Open Channel Landscaping Criteria, page 180]			
	Dry Swale Design			
19	If the open channel is a dry swale, are check dams provided to create the necessary ponding volume? [3.9.1 Open Channel Feasibility Criteria- Site Topography, page 169]			
20	Is the dry swale ponding depth 3-18 inches? [3.9.4 Open Channel Design Criteria- Ponding Depth, page 174]			
21	Does the dry swale design incorporate an 18-inch to 6-foot layer of filter media above the choker stone layer? (An alternative design is 18 inches of sand topped with 4			

	inches of topsoil and compost) [3.9.4 Open Channel Design Criteria- Dry Swale Filter Media, page 174]			
22	Does the filter media meet the following requirements? ☐ 80-90% sand (at least 75% coarse or very coarse sand) ☐ 10-20% soil fines (silt and clay) ☐ 10% maximum clay ☐ 3-5% organic matter ☐ Plant available soil phosphorus (P) within the range of low to medium (Virginia Nutrient Management Standards and Criteria), 5-15 mg/kg P Mehlich I extraction procedure, or 18-40 mg/kg P Mehlich III procedure ☐ Minimum CEC of 5.0 (meq/100g or cmol+/kg) ☐ Initial permeability will exceed the desired long term permeability of 1-2 inches/hour [3.9.4 Open Channel Design Criteria- Dry Swale Filter Media, page 174]			
23	Does the plan contain a note stating the batch receipt confirming the source of the filter media must be submitted to the DDOE inspector? [3.9.4 Open Channel Design Criteria- Dry Swale Filter Media, page 174]			
24	Does the design include a choker stone layer of No. 8 or No. 78 stone at least 3-inches deep below the filter media? [3.9.4 Open Channel Design Criteria- Dry Swale Underdrain, page 174]			
25	When necessary, is the underdrain installed with a minimum of 2 inches of clean, double washed ASTM D448 No. 57 or smaller stone above and below the underdrain? [3.9.4 Open Channel Design Criteria- Dry Swale Underdrain, page 174]			
26	Does the design storm volume filter within 72 hours? [3.9.4 Open Channel Design Criteria- Dry Swale Drawdown, page 174]			
27	If the system utilizes an impermeable liner, does it meet the following requirements? ☐ Minimum 30-mil PVC geomembrane liner ☐ Field seams sealed with a minimum 6-inch overlap of material at all seams [3.9.4 Open Channel Design Criteria- Impermeable Liner, page 174]			
28	Does the dry swale include an observation well with cleanout pipes? [3.9.4 Open Channel Design Criteria- Dry Swale Observation Well, page 174]			
29	If a dry swale relies on infiltration, is it fully protected by the silt fence or construction fencing to prevent compaction by heavy equipment during construction? [3.9.6 Open Channel Construction Sequence, page 181]			

30	Is the dry swale sized using Equation 3.21 Dry Swale Storage Volume? [3.9.4 Open Channel Design Criteria- Dry Swale Sizing, page 179]			
Wet Swale				
31	Is the average wet swale pool depth throughout the swale 6 inches are less? [3.9.4 Open Channel Design Criteria- Wet Swale Design Issues, page 176]			
32	Is the maximum depth of any single cell no more than 18 inches at the most downstream point? [3.9.4 Open Channel Design Criteria- Wet Swale Design Issues, page 176]			
33	Is the wet swale sized using Equation 3.22 Wet Swale Storage Volume? [3.9.4 Open Channel Design Criteria- Wet Swale Sizing, page 175]			
Grass Channel				
34	If the grass channel is enhanced with compost, does the compost-amended strip extend over the length and width of the channel bottom and the compost incorporated to the depth specified in Appendix J? [3.9.4 Open Channel Design Criteria- Grass Channel Enhancements, pages 176]			
35	Is the hydraulic capacity of the grass channel verified using all of the following: ☐ Equation 3.15 Manning's Equation ☐ Equation 3.16 Continuity Equation ☐ Equation 3.17 Minimum Width ☐ Equation 3.18 Corresponding Velocity [3.9.4 Open Channel Design Criteria- Grass Channel Sizing, pages 177-178]			
36	Do calculations for peak flow rates reflect any increase in the flow along the length of the channel? If a single flow is used, is the follow at the outlet used? [3.9.4 Open Channel Design Criteria- Grass Channel Sizing, page 177]			
37	Is the flow depth for the SWRv peak flow 4 inches are less? [3.9.4 Open Channel Design Criteria- Grass Channel Sizing, page 177]			
38	Is Equation 3.19 Grass Channel Length used to ensure adequate hydraulic residence time? [3.9.4 Open Channel Design Criteria- Grass Channel Sizing, page 178]			
39	Is Equation 3.20 Grass Channel Storage Volume used to calculate the storage volume? [3.9.4 Open Channel Design Criteria- Grass Channel Sizing, page 177]			
40	Does the grass swale include soil amendments? If yes, complete questions 41 through 43.			
41	Was a soil test performed to ascertain preconstruction soil properties to a depth 1 foot below the proposed amendment area with respect to bulk density, pH, salts, and soil			

	nutrients? [Appendix J Soil Compost Amendment Requirements, page J-2]			
42	Does the plan specify that a soil test is taken at least one week after the compost has been incorporated into the soils to determine whether any further nutritional requirements, pH adjustment, and organic matter adjustments are necessary for plant growth? [Appendix J Soil Compost Amendment Requirements, page J-2]			
43	Do the compost specifications meet the following criteria? ☐ Derived from plant material ☐ Provided by member of US Composting Seal of Testing Assurance (STA) program (alternative specifications and/or certifications may be substituted, as authorized by DDOE) ☐ 100% of material passes the 0.5-inch screen ☐ pH between 6 and 8 ☐ Manufactured inert material less than 1.0% by weight ☐ Organic matter content between 35% and 65% ☐ Maturity greater than 80% ☐ Stability 7 or less ☐ Carbon/nitrogen ratio less than 25:1 ☐ Passing metal test ☐ Dry bulk density ranging from 40-50 pounds/cubic feet [Appendix J Soil Compost Amendment Requirements, page J-3]			
Construction				
44	Does the plan include the following construction notes? ☐ Protection during site construction with temporary soil erosion and sediment controls shown, such as barriers at key check dam locations, silt fence around the channel, and erosion control fabric within the channel. Any accumulation of sediments that occurs within the channel must be removed during the final stages of grading to achieve the design cross-section. ☐ Stormwater flows must not be permitted into the channel bottom until the bottom and side slopes are fully stabilized. [3.9.6 Open Channel Construction Sequence, pages 181-182]			

45	If the plan includes a compost amendment exceeding 2,500 square feet, does the plan include erosion and sediment control measures to secure the area until the surface is stabilized by vegetation? [Appendix J Soil Compost Amendment Requirements, page J-3]			
46	Does the plan contain the Open Channel Construction and Maintenance Inspection Checklists (Appendix K Construction Inspection Checklists and Appendix L Maintenance Inspection Checklists) or incorporate the checklists by reference? [Appendix K and Appendix L]			
Maintenance				
47	Does the SWMP include a maintenance schedule similar to Table 3.39 Typical Maintenance Activities and Schedule for Open Channels in the Stormwater Management Guidebook? [3.9.7 Open Channel Maintenance Criteria, page 183]			
48	If the plan contains a compost amendment, are the following tasks incorporated into the soil amendment maintenance plan? ☐ For the first six months following the incorporation of soil amendments, the site should be inspected by a qualified professional at least once after each storm event that exceeds ½-inch of rainfall. ☐ Inspectors should look for bare or eroding areas in the contributing drainage area or around the soil restoration area and make sure they are immediately stabilized with grass cover. ☐ Water once every three days for the first month aand then weekly during the first year (April-October) depending on the rainfall. [Appendix J Soil Compost Amendment Requirements, page J-4]			
49	Is the open channel included in the Declaration of Covenant? ☐ Is the location and extent of the open channel a part of Exhibit B Site Plan? ☐ Is the maintenance of the open channel a part of Exhibit C Maintenance Plan? [3.9.7 Open Channel Maintenance Criteria, page 183]			