

# **Engineers' Toolkit**

## **Virginia Stormwater Management Program (VSMP) Permit Regulations Effective January 29, 2005**

### **Contents**

1. Introduction
  - A. Act
  - B. Applicability
  - C. Exemptions
  - D. Regulations
2. Technical Criteria for Stormwater Management Plans
  - A. 4VAC50-60-40. Applicability.
  - B. 4VAC50-60-50. General.
  - C. 4VAC50-60-60. Water quality.
  - D. 4VAC50-60-70. Stream channel erosion.
  - E. 4VAC50-60-80. Flooding.
3. References
  - A. Water Quality
  - B. Stream Channel Erosion
  - C. Flooding
4. Technical Criteria Checklist For Stormwater Management Plans

# 1. Introduction

## **A. Act (Virginia Stormwater Management Act) can be viewed at:**

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/vaswmlaw.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/vaswmlaw.pdf)

Enacted in 2004, the Virginia Stormwater Management Act, Code of Virginia (§ 10.1-603 et seq.), states that the Virginia Soil and Water Conservation Board “is authorized to adopt regulations that specify minimum technical criteria and administrative procedures for stormwater management programs in Virginia” (§ 10.1-603.4).

## **B. Applicability**

According to the Act (§ 10.1-603.4.6), the regulations shall “Establish statewide standards for stormwater management from land disturbing activities of one acre or greater, except as specified otherwise within this article, and allow for the consolidation in the permit of a comprehensive approach to addressing stormwater management and erosion and sediment control, consistent with the provisions of the Erosion and Sediment Control Law (§ 10.1-560 et seq.) and this article. However, such standards shall also apply to land disturbing activity exceeding an area of 2500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 10-20 et seq.) adopted pursuant to the Chesapeake Bay Preservation Act (§ 10.1-2100 et seq.).”

## **C. Exemptions**

According to the Act (§ 10.1-603.8.B), “Notwithstanding any other provisions of this article, the following activities are exempt:

1. Permitted surface or deep mining operations and projects, or oil and gas operations and projects conducted under the provisions of Title 45.1;
2. Clearing of lands specifically for agricultural purposes and the management, tilling, planting or harvesting of agricultural, horticultural, or forest crops;
3. Single-family residences separately built and disturbing less than one-acre and not part of a larger common plan of development or sale, including additions or modifications to existing single-family detached residential structures. However, localities subject to the Chesapeake Bay Preservation Act (§ 10.1-2100 et seq.) may regulate these single family residences where land disturbance exceeds 2,500 square feet;
4. Land disturbing activities that disturb less than one acre of land area except for land disturbing activity exceeding an area of 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 10-20 et seq.) adopted pursuant to the Chesapeake Bay Preservation Act (§ 10.1-2100 et seq.) or activities that are part of a larger common plan of development or sale that is one acre or greater of disturbance;...

5. Linear development projects, provided that (i) less than one acre of land will be disturbed per outfall or watershed, (ii) there will be insignificant increases in peak flow rates, and (iii) there are no existing or anticipated flooding or erosion problems downstream of the discharge point;
6. Discharges to a sanitary sewer or a combined sewer system;
7. Activities under a State or federal reclamation program to return an abandoned property to an agricultural or open land use; and
8. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original construction of the project and that disturbs less than five acres of land.”

**D. Regulations (Virginia Stormwater Management Program (VSMP) Permit Regulations) can be viewed at:**

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/vaswmregs.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/vaswmregs.pdf)

The Virginia Stormwater Management Program (VSMP) Permit Regulations, Virginia Administrative Code (4 VAC 50-60 et seq.) became effective January 29, 2005. Following are the Technical Criteria for Stormwater Management Plans from the Regulations.

## **2. Technical Criteria for Stormwater Management Plans**

### **4VAC50-60-40. Applicability.**

This part specifies technical criteria for every stormwater management program and land-disturbing activity.

### **4VAC50-60-50. General.**

- A. Determination of flooding and channel erosion impacts to receiving streams due to land-disturbing activities shall be measured at each point of discharge from the land disturbance and such determination shall include any runoff from the balance of the watershed which also contributes to that point of discharge.
- B. The specified design storms shall be defined as either a 24-hour storm using the rainfall distribution recommended by the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) when using NRCS methods or as the storm of critical duration that produces the greatest required storage volume at the site when using a design method such as Modified Rational Method.
- C. For purposes of computing runoff, all pervious lands in the site shall be assumed prior to development to be in good condition (if the lands are pastures, lawns, or parks), with good cover (if the lands are woods), or with conservation treatment

(if the lands are cultivated); regardless of conditions existing at the time of computation.

- D. Construction of stormwater management facilities or modifications to channels shall comply with all applicable laws and regulations. Evidence of approval of all necessary permits shall be presented.
- E. Impounding structures that are not covered by the Impounding Structure Regulations (4VAC50-20) shall be engineered for structural integrity during the 100-year storm event.
- F. Pre-development and post-development runoff rates shall be verified by calculations that are consistent with good engineering practices.
- G. Outflows from a stormwater management facility or stormwater conveyance system, shall be discharged to an adequate channel.
- H. Proposed residential, commercial, or industrial subdivisions shall apply these stormwater management criteria to the land disturbance as a whole. Individual lots in new subdivisions shall not be considered separate land-disturbing activities, but rather the entire subdivision shall be considered a single land development project. Hydrologic parameters shall reflect the ultimate land disturbance and shall be used in all engineering calculations.
- I. All stormwater management facilities shall have an inspection and maintenance plan that identifies the owner and the responsible party for carrying out the inspection and maintenance plan.
- J. Construction of stormwater management impoundment structures within a Federal Emergency Management Agency (FEMA) designated 100-year floodplain shall be avoided to the extent possible. When this is unavoidable, all stormwater management facility construction shall be in compliance with all applicable regulations under the National Flood Insurance Program, 44CFR Part 59.
- K. Natural channel characteristics shall be preserved to the maximum extent practicable.
- L. Land-disturbing activities shall comply with the Virginia Erosion and Sediment Control Law (10.1-560 et seq. of the Code of Virginia) and attendant regulations.
- M. Flood control and stormwater management facilities that drain or treat water from multiple development projects or from a significant portion of a watershed may be allowed in Resource Protection Areas defined in the Chesapeake Bay Preservation Act, provided that (i) the local government has conclusively established that the location of the facility within the Resource Protection Area is the optimum location; (ii) the size of the facility is the minimum necessary to provide necessary flood control, stormwater treatment, or both; and, (iii) the facility must be consistent with a stormwater management program that has been approved by the board.

#### **4VAC50-60-60. Water quality.**

- A. Compliance with the water quality criteria may be achieved by applying the performance-based criteria or the technology-based criteria to either the site or a planning area.
- B. Performance-based criteria. For land-disturbing activities, the calculated post-development nonpoint source pollutant runoff load shall be compared to the calculated pre-development load based upon the average land cover condition or the existing site condition. A BMP shall be located, designed, and maintained to achieve the target pollutant removal efficiencies specified in Table 1 to effectively reduce the pollutant load to the required level based upon the following four applicable land development situations for which the performance criteria apply:
  - 1. Situation 1 consists of land-disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is less than the average land cover condition.  
Requirement: No reduction in the after disturbance pollutant discharge is required.
  - 2. Situation 2 consists of land-disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is greater than the average land cover condition.  
Requirement: The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the average land cover condition.
  - 3. Situation 3 consists of land disturbing activities where the existing percent impervious cover is greater than the average land cover condition.  
Requirement: The pollutant discharge after disturbance shall not exceed (i) the pollutant discharge based on existing conditions less 10% or (ii) the pollutant discharge based on the average land cover condition, whichever is greater.
  - 4. Situation 4 consists of land disturbing activities where the existing percent impervious cover is served by an existing stormwater management BMP that addresses water quality.  
Requirement: The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the existing percent impervious cover while served by the existing BMP. The existing BMP shall be shown to have been designed and constructed in accordance with proper design standards and specifications, and to be in proper functioning condition.
- C. Technology-based criteria. For land-disturbing activities, the post-developed stormwater runoff from the impervious cover shall be treated by an appropriate BMP as required by the post-developed condition percent impervious cover as specified in Table 1. The selected BMP shall be located, designed, and maintained to perform at the target pollutant removal efficiency specified in Table 1. Design standards and specifications for the BMPs in Table 1 that meet the required target pollutant removal efficiency will be available at the department.

**Table 1**

<b>Water Quality BMP*</b>	<b>Target Phosphorus Removal Efficiency</b>	<b>Percent Impervious Cover</b>
Vegetated filter strip	10%	16-21%
Grassed swale	15%	16-21%
Constructed wetlands	20%	22-37%
Extended detention (2 x WQ Vol)	35%	22-37%
Retention basin I (3 x WQ Vol)	40%	22-37%
Bioretention basin	50%	38-66%
Bioretention filter	50%	38-66%
Extended detention- enhanced	50%	38-66%
Retention basin II (4 x WQ Vol)	50%	38-66%
Infiltration (1 x WQ Vol)	50%	38-66%
Sand filter	65%	67-100%
Infiltration (2 x WQ Vol)	65%	67-100%
Retention basin III (4 x WQ Vol with aquatic bench)	65%	67-100%

\*Innovative or alternate BMPs not included in this table may be allowed at the discretion of the local program administrator or the department. Innovative or alternate BMPs not included in this table which target appropriate nonpoint source pollution other than phosphorous may be allowed at the discretion of the local program administrator or the department.

#### **4VAC50-60-70. Stream channel erosion.**

- A. Properties and receiving waterways downstream of any land-disturbing activity shall be protected from erosion and damage due to changes in runoff rate of flow and hydrologic characteristics, including but not limited to, changes in volume, velocity, frequency, duration, and peak flow rate of stormwater runoff in accordance with the minimum design standards set out in this section.
- B. The permit-issuing authority shall require compliance with subdivision 19 of 4VAC50-30-40 of the Erosion and Sediment Control Regulations, promulgated pursuant to Article 4 (10.1-560 et seq.) of Chapter 5 of Title 10.1 of the Code of Virginia.
- C. The permit-issuing authority may determine that some watersheds or receiving stream systems require enhanced criteria in order to address the increased frequency of bankfull flow conditions (top of bank) brought on by land-disturbing activities. Therefore, in lieu of the reduction of the two-year post-developed peak rate of runoff as required in subsection B of this section, the land development project being considered shall provide 24-hour extended detention of the runoff generated by the one-year, 24-hour duration storm.
- D. In addition to subsections B and C of this section permit-issuing authorities, by local ordinance may, or the board by state regulation may, adopt more stringent channel analysis criteria or design standards to ensure that the natural level of channel erosion, to the maximum extent practicable, will not increase due to the land-disturbing activities. These criteria may include, but are not limited to, the following:
  - 1. Criteria and procedures for channel analysis and classification.
  - 2. Procedures for channel data collection.
  - 3. Criteria and procedures for the determination of the magnitude and frequency of natural sediment transport loads.
  - 4. Criteria for the selection of the proposed natural or man-made linings.

#### **4VAC50-60-80. Flooding**

- A. Downstream properties and waterways shall be protected from damages from localized flooding due to changes in runoff rate of flow and hydrologic characteristics, including but not limited to, changes in volume, velocity, frequency, duration, and peak flow rate of stormwater runoff in accordance with the minimum design standards set out in this section.
- B. The 10-year post-developed peak rate of runoff from the development site shall not exceed the 10-year pre-developed peak rate of runoff.
- C. In lieu of subsection B of this section, localities may, by ordinance, adopt alternate design criteria based upon geographic, land use, topographic, geologic factors or other downstream conveyance factors as appropriate.
- D. Linear development projects shall not be required to control post-developed stormwater runoff for flooding, except in accordance with a watershed or regional stormwater management plan.

# 3. References/Links

## A. Water Quality Calculations

1. Water Quality Calculations Procedures, Pages 94-108, Chapter 5, *Virginia Stormwater Management Handbook*, 1999.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter\\_5.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter_5.pdf)

2. Performance-Based Water Quality Calculations Worksheets, Pages 5-24, Appendix 5D, Chapter 5, *Virginia Stormwater Management Handbook*, 1999.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter\\_5.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter_5.pdf)

## B. Stream Channel Erosion

1. Determination of an Adequate Channel, Pages 122-141, Chapter 5, *Virginia Erosion and Sediment Control Handbook*, 1992.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter%205.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter%205.pdf)

2. Technical Bulletin No. 1, Stream Channel Erosion Control Policy Guidance.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/tecbtln1.PDF](http://www.dcr.virginia.gov/soil_&_water/documents/tecbtln1.PDF)

3. Open channel flow, Manning's Equation, Continuity Equation, Pages 97-121, Chapter 5, *Virginia Erosion and Sediment Control Handbook*, 1992.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter%205.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter%205.pdf)

## C. Flooding

1. Hydrologic Methods, Pages 1-51, Chapter 4, *Virginia Stormwater Management Handbook*, 1999.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter\\_4.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter_4.pdf)

2. Rational Equation Coefficients for SCS Hydrologic Soil Groups (A, B, C, D), Tables 4-5a, b, c, d, Pages 4-21 to 4-24, Chapter 4, *Virginia Stormwater Management Handbook*, 1999.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter\\_4.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter_4.pdf)

3. Runoff Coefficients for Rational Equation, Page 29, Chapter 5, *Virginia Erosion and Sediment Control Handbook*, 1992.

[http://www.dcr.virginia.gov/soil\\_&\\_water/documents/Chapter%205.pdf](http://www.dcr.virginia.gov/soil_&_water/documents/Chapter%205.pdf)

#### 4. Technical Criteria Checklist for Stormwater Management Plans

##### 4VAC50-60-40. Applicability.

This part specifies technical criteria for every stormwater management program and land-disturbing activity.

##### 4VAC50-60-50. General.

Y	N	N/A	
			A. Determination of flooding and channel erosion impacts to receiving streams due to land-disturbing activities shall be measured at each point of discharge from the land disturbance and such determination shall include any runoff from the balance of the watershed which also contributes to that point of discharge.
			B. The specified design storms shall be defined as either a 24-hour storm using the rainfall distribution recommended by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) when using NRCS methods or as the storm of critical duration that produces the greatest required storage volume at the site when using a design method such as Modified Rational Method.
			C. For purposes of computing runoff, all pervious lands in the site shall be assumed prior to development to be in good condition (if the lands are pastures, lawns, or parks), with good cover (if the lands are woods), or with conservation treatment (if the lands are cultivated); regardless of conditions existing at the time of computation.
			D. Construction of stormwater management facilities or modifications to channels shall comply with all applicable laws and regulations. Evidence of approval of all necessary permits shall be presented.
			E. Impounding structures that are not covered by the Impounding Structure Regulations (4VAC50-20) shall be engineered for structural integrity during the 100-year storm event.
			F. Pre-development and post-development runoff rates shall be verified by calculations that are consistent with good engineering practices.
			G. Outflows from a stormwater management facility or stormwater conveyance system, shall be discharged to an adequate channel.
			H. Proposed residential, commercial, or industrial subdivisions shall apply these stormwater management criteria to the land disturbance as a whole. Individual lots in new subdivisions shall not be considered separate land-disturbing activities, but rather the entire subdivision shall be considered a single land development project. Hydrologic parameters shall reflect the ultimate land disturbance and shall be used in all engineering calculations.

### Technical Criteria Checklist for Stormwater Management Plans (Continued)

Y	N	N/A	
			I. All stormwater management facilities shall have an inspection and maintenance plan that identifies the owner and the responsible party for carrying out the inspection and maintenance plan.
			J. Construction of stormwater management impoundment structures within a Federal Emergency Management Agency (FEMA) designated 100-year floodplain shall be avoided to the extent possible. When this is unavoidable, all stormwater management facility construction shall be in compliance with all applicable regulations under the National Flood Insurance Program, 44CFR Part 59.
			K. Natural channel characteristics shall be preserved to the maximum extent practicable.
			L. Land-disturbing activities shall comply with the Virginia Erosion and Sediment Control Law (10.1-560 et seq. of the Code of Virginia) and attendant regulations.
			M. Flood control and stormwater management facilities that drain or treat water from multiple development projects or from a significant portion of a watershed may be allowed in Resource Protection Areas defined in the Chesapeake Bay Preservation Act, provided that (i) the local government has conclusively established that the location of the facility within the Resource Protection Area is the optimum location; (ii) the size of the facility is the minimum necessary to provide necessary flood control, stormwater treatment, or both; and, (iii) the facility must be consistent with a stormwater management program that has been approved by the board.

### 4VAC50-60-60. Water Quality.

Y	N	N/A	
			A. Compliance with the water quality criteria may be achieved by applying the performance-based criteria or the technology-based criteria to either the site or a planning area.
			B. Performance-based criteria. For land-disturbing activities, the calculated post-development nonpoint source pollutant runoff load shall be compared to the calculated pre-development load based upon the average land cover condition or the existing site condition. A BMP shall be located, designed, and maintained to achieve the target pollutant removal efficiencies specified in Table 1 to effectively reduce the pollutant load to the required level based upon the following four applicable land development situations for which the performance criteria apply:

## Technical Criteria Checklist for Stormwater Management Plans (Continued)

Y	N	N/A	
			<p>1. Situation 1 consists of land-disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is less than the average land cover condition.</p> <p><b>Requirement:</b> No reduction in the after disturbance pollutant discharge is required.</p>
			<p>2. Situation 2 consists of land-disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is greater than the average land cover condition.</p> <p><b>Requirement:</b> The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the average land cover condition.</p>
			<p>3. Situation 3 consists of land disturbing activities where the existing percent impervious cover is greater than the average land cover condition.</p> <p><b>Requirement:</b> The pollutant discharge after disturbance shall not exceed (i) the pollutant discharge based on existing conditions less 10% or (ii) the pollutant discharge based on the average land cover condition, whichever is greater.</p>
			<p>4. Situation 4 consists of land disturbing activities where the existing percent impervious cover is served by an existing stormwater management BMP that addresses water quality.</p> <p><b>Requirement:</b> The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the existing percent impervious cover while served by the existing BMP. The existing BMP shall be shown to have been designed and constructed in accordance with proper design standards and specifications, and to be in proper functioning condition.</p>
			<p>C. Technology-based criteria. For land-disturbing activities, the post-developed stormwater runoff from the impervious cover shall be treated by an appropriate BMP as required by the post-developed condition percent impervious cover as specified in Table 1. The selected BMP shall be located, designed, and maintained to perform at the target pollutant removal efficiency specified in Table 1. Design standards and specifications for the BMPs in Table 1 that meet the required target pollutant removal efficiency will be available at the department.</p>

**Technical Criteria Checklist for Stormwater Management Plans (Continued)**

**Table 1**

Water Quality BMP*	Target Phosphorus Removal Efficiency	Percent Impervious Cover
Vegetated filter strip	10%	16-21%
Grassed swale	15%	16-21%
Constructed wetlands	20%	22-37%
Extended detention (2 x WQ Vol)	35%	22-37%
Retention basin I (3 x WQ Vol)	40%	22-37%
Bioretention basin	50%	38-66%
Bioretention filter	50%	38-66%
Extended detention-enhanced	50%	38-66%
Retention basin II (4 x WQ Vol)	50%	38-66%
Infiltration (1 x WQ Vol)	50%	38-66%
Sand filter	65%	67-100%
Infiltration (2 x WQ Vol)	65%	67-100%
Retention basin III (4 x WQ Vol with aquatic bench)	65%	67-100%

\*Innovative or alternate BMPs not included in this table may be allowed at the discretion of the local program administrator or the department. Innovative or alternate BMPs not included in this table which target appropriate nonpoint source pollution other than phosphorous may be allowed at the discretion of the local program administrator or the department.

**4VAC50-60-70. Stream channel erosion.**

Y	N	N/A	
			A. Properties and receiving waterways downstream of any land-disturbing activity shall be protected from erosion and damage due to changes in runoff rate of flow and hydrologic characteristics, including but not limited to, changes in volume, velocity, frequency, duration, and peak flow rate of stormwater runoff in accordance with the minimum design standards set out in this section.
			B. The permit-issuing authority shall require compliance with subdivision 19 of 4VAC50-30-40 of the Erosion and Sediment Control Regulations, promulgated pursuant to Article 4 (10.1-560 et seq.) of Chapter 5 of Title 10.1 of the Code of Virginia.
			C. The permit-issuing authority may determine that some watersheds or receiving stream systems require enhanced criteria in order to address the increased frequency of bankfull flow conditions (top of bank) brought on by land-disturbing activities. Therefore, in lieu of the reduction of the two-year post-developed peak rate of runoff as required in subsection B of this section, the land development project being considered shall provide 24-hour extended detention of the runoff generated by the one-year, 24-hour duration storm.

**Technical Criteria Checklist for Stormwater Management Plans (Continued)**

Y	N	N/A	
			D. In addition to subsections B and C of this section permit-issuing authorities, by local ordinance may, or the board by state regulation may, adopt more stringent channel analysis criteria or design standards to ensure that the natural level of channel erosion, to the maximum extent practicable, will not increase due to the land-disturbing activities. These criteria may include, but are not limited to, the following:
			1. Criteria and procedures for channel analysis and classification.
			2. Procedures for channel data collection.
			3. Criteria and procedures for the determination of the magnitude and frequency of natural sediment transport loads.
			4. Criteria for the selection of the proposed natural or man-made linings.

**4VAC50-60-80. Flooding**

Y	N	N/A	
			A. Downstream properties and waterways shall be protected from damages from localized flooding due to changes in runoff rate of flow and hydrologic characteristics, including but not limited to, changes in volume, velocity, frequency, duration, and peak flow rate of stormwater runoff in accordance with the minimum design standards set out in this section.
			B. The 10-year post-developed peak rate of runoff from the development site shall not exceed the 10-year pre-developed peak rate of runoff.
			C. In lieu of subsection B of this section, localities may, by ordinance, adopt alternate design criteria based upon geographic, land use, topographic, geologic factors or other downstream conveyance factors as appropriate.
			D. Linear development projects shall not be required to control post-developed stormwater runoff for flooding, except in accordance with a watershed or regional stormwater management plan.