

1 4VAC50-60-66 Water Quantity (Alternate Language for Water Quantity)

2 A. Channel protection and flood protection shall be addressed in accordance with  
3 the minimum standards set out in this section, which are established pursuant to the  
4 requirements of subdivision 7 of § 10.1-603.4 of the Code of Virginia. Nothing in this  
5 section shall prohibit a [qualifying] local [stormwater management] program from  
6 establishing a more stringent standard.

7 B. Channel protection. Concentrated stormwater flow [from the site and offsite  
8 contributing areas] shall be released into a stormwater conveyance system [and shall  
9 meet one of the following criteria as demonstrated by use of accepted hydrologic and  
10 hydraulic methodologies:

11 1. Concentrated stormwater flow to manmade stormwater conveyance systems.  
12 The point of discharge releases stormwater into a manmade stormwater  
13 conveyance system that, following the land-disturbing activity, conveys the  
14 postdevelopment peak flow rate from the two-year 24-hour storm without causing  
15 erosion of the system.

16 2. Concentrated stormwater flow to restored stormwater conveyance systems.  
17 The point of discharge releases stormwater into a stormwater conveyance  
18 system that (i) has been restored and is functioning as designed or (ii) will be  
19 restored. The applicant must demonstrate that the runoff following the land-  
20 disturbing activity, in combination with other existing stormwater runoff, will not  
21 exceed the design of the restored stormwater conveyance system nor result in  
22 instability of the system.

23 3. Concentrated stormwater flow to stable natural stormwater conveyance  
24 systems. The point of discharge releases stormwater into a natural stormwater  
25 conveyance system that is stable and, following the land-disturbing activity, (i)  
26 will not become unstable as a result of the discharge from the one-year 24-hour

27 storm, and (ii) provides a peak flow rate from the one year 24 hour storm  
28 calculated as follows or in accordance with another methodology that is  
29 demonstrated by the local program to achieve equivalent results and is approved  
30 by the board:

31  $Q_{\text{Developed}} * RV_{\text{Developed}} \leq Q_{\text{Pre-Developed}} * RV_{\text{Pre-Developed}}$ , where

32  $Q_{\text{Developed}}$  = The allowable peak flow rate of runoff from the developed site.

33 Such peak flow rate must be less than or equal to  $Q_{\text{Pre-developed}}$ :

34  $Q_{\text{Pre-Developed}}$  = The peak flow rate of runoff from the site in the predeveloped  
35 condition.

36  $RV_{\text{Pre-Developed}}$  = The volume of runoff from the site in the predeveloped  
37 condition.

38  $RV_{\text{Developed}}$  = The volume of runoff from the developed site.

39 4.] Concentrated [ Except as set out in subdivision 5 of this subsection,  
40 concentrated stormwater flow to unstable natural stormwater conveyance  
41 systems. Where the point of discharge releases stormwater into a natural  
42 stormwater conveyance system that is unstable, stormwater runoff following a  
43 land-disturbing activity shall be released into a channel at or below a peak flow  
44 rate ( $Q_{\text{Developed}}$ ) based on the one year 24-hour storm, calculated as follows or in  
45 accordance with another methodology that is demonstrated by the local program  
46 to achieve equivalent or more stringent results and is approved by the board:

47  $Q_{\text{Developed}} * RV_{\text{Developed}} \leq Q_{\text{Forested [ Good Pasture * RV ] Forested [ Good Pasture}}$ , where

48  $Q_{\text{Developed}}$  = The allowable peak flow rate from the developed site. Such peak  
49 flow rate must be less than or equal to  $Q_{\text{Good Pasture}}$ :

50  $Q_{\text{Forested [ Good Pasture}}$  = The peak flow rate from the site in a ] forested [ good  
51 pasture condition.

52  ~~$RV_{\text{Forested}}$  [  ~~$RV_{\text{Good Pasture}}$~~  = The volume of runoff from the site in a ] ~~forested~~  
53 ~~[ good pasture condition.~~~~

54  ~~$RV_{\text{Developed}}$  = The volume of runoff from the developed site.~~

55 ~~However, in the case that the predeveloped condition is forested, ] both the peak~~  
56 ~~flow rate and the volume of runoff from the developed site shall be held to the~~  
57 ~~forested condition [ the forested condition shall be utilized instead of the good~~  
58 ~~pasture condition in all instances in the calculation above.~~

59 ~~5. This subdivision shall apply to concentrated stormwater flow to unstable~~  
60 ~~natural stormwater conveyance systems from (i) a land disturbing activity less~~  
61 ~~than five acres on prior developed lands, or (ii) a regulated land disturbing~~  
62 ~~activity less than one acre for new development. Where the point of discharge~~  
63 ~~releases stormwater into a natural stormwater conveyance system that is~~  
64 ~~unstable, stormwater runoff following a land disturbing activity shall provide a~~  
65 ~~peak flow rate from the one year 24 hour storm, calculated as follows or in~~  
66 ~~accordance with another methodology that is demonstrated by the local program~~  
67 ~~to achieve equivalent or more stringent results and is approved by the board:~~

68  ~~$Q_{\text{Developed}} * RV_{\text{Developed}} < Q_{\text{Pre-Developed}} * RV_{\text{Pre-Developed}}$ , where~~

69  ~~$Q_{\text{Developed}}$  = The allowable peak flow rate from the developed site. Such peak~~  
70 ~~flow rate must be less than  $Q_{\text{Pre-Developed}}$ .~~

71  ~~$Q_{\text{Pre-Developed}}$  = The peak flow rate from the site in pre-development condition.~~

72  ~~$RV_{\text{Pre-Developed}}$  = The volume of runoff from the site in pre-development~~  
73 ~~condition.~~

74  ~~$RV_{\text{Developed}}$  = The volume of runoff from the developed site. ] Such volume~~  
75 ~~must be less than  $RV_{\text{Pre-Developed}}$ .~~

76 [ and shall meet criteria 1, 2 or 3 of this subsection, where applicable, from the  
77 point of discharge to the limits of analysis in subsection 4.

78 1. Manmade stormwater conveyance systems. When stormwater from a  
79 development is discharged to a manmade stormwater conveyance system,  
80 following the land-disturbing activity, either:

81 a. The manmade stormwater conveyance system shall convey the  
82 postdevelopment peak flow rate from the two-year 24-hour storm event  
83 without causing erosion of the system. Detention of stormwater by  
84 downstream stormwater management facilities may be incorporated into the  
85 approved land-disturbing activity to meet this criterion, at the discretion of the  
86 stormwater program administrative authority; or

87 b. The peak discharge requirements for concentrated stormwater flow to  
88 natural stormwater conveyance systems in subsection 3 shall be met.

89 2. Restored stormwater conveyance systems. When stormwater from a  
90 development is discharged to a restored stormwater conveyance system that has  
91 been restored using natural design concepts, either:

92 a. The development shall be consistent, in combination with other stormwater  
93 runoff, with the design parameters of the restored stormwater conveyance  
94 system and shall not result in erosion of the system; or

95 b. If the design parameters are not available or can not be calculated, the  
96 peak discharge requirements for concentrated stormwater flow to natural  
97 stormwater conveyance systems in subsection 3 shall be met.

98 3. Natural stormwater conveyance systems. When stormwater from a  
99 development is discharged to a natural stormwater conveyance system, the  
100 maximum peak flow rate from the one-year 24-hour storm following the land-  
101 disturbing activity shall be calculated either:

102 a. In accordance with the following methodology:

103 
$$Q_{\text{Developed}} \leq \text{I.F.} * (Q_{\text{Pre-Developed}} * RV_{\text{Pre-Developed}}) / RV_{\text{Developed}}$$

104 Under no condition shall  $Q_{\text{Developed}}$  be greater than  $Q_{\text{Pre-Developed}}$  nor shall  
105  $Q_{\text{Developed}}$  be required to be less than that calculated in the equation  $(Q_{\text{Forest}} *$   
106  $RV_{\text{Forest}}) / RV_{\text{Developed}}$ ; where

107 I.F. (Improvement Factor) equals 0.8 for sites > 1 acre or 0.9 for sites  $\leq$  1  
108 acre.

109  $Q_{\text{Developed}}$  = The allowable peak flow rate of runoff from the developed site.

110  $RV_{\text{Developed}}$  = The volume of runoff from the site in the developed condition.

111  $Q_{\text{Pre-Developed}}$  = The peak flow rate of runoff from the site in the pre-developed  
112 condition.

113  $RV_{\text{Pre-Developed}}$  = The volume of runoff from the site in pre-developed condition.

114  $Q_{\text{Forest}}$  = The peak flow rate of runoff from the site in a forested condition.

115  $RV_{\text{Forest}}$  = The volume of runoff from the site in a forested condition; or

116 b. In accordance with another methodology approved by the board as  
117 achieving equivalent results.

118 4. Limits of analysis. Stormwater conveyance systems shall be analyzed for  
119 compliance with channel protection criteria to a point where:

120 a. Based on land area, the site's contributing drainage area is less than or  
121 equal to 1.0% of the total watershed area; or

122 b. Based on peak flow rate, the site's peak flow rate from the one-year 24-  
123 hour storm is less than or equal to 1.0% of the existing peak flow rate from  
124 the one-year 24-hour storm prior to the implementation of any stormwater  
125 quantity control measures. ]

126 C. Flood protection. Concentrated stormwater flow shall be released into a  
127 stormwater conveyance system and shall meet one of the following criteria as  
128 demonstrated by use of [ ~~accepted~~ acceptable ] hydrologic and hydraulic  
129 methodologies:

130 1. Concentrated stormwater flow to [ ~~manmade~~ ] stormwater conveyance  
131 systems [ that currently do not experience localized flooding during the 10-year  
132 24-hour storm event.: ] The point of discharge releases stormwater into a  
133 [ ~~manmade~~ ] stormwater conveyance system that, following the land-disturbing  
134 activity, confines the postdevelopment peak flow rate from the 10-year 24-hour  
135 storm [ event ] within the [ ~~manmade~~ ] stormwater conveyance system.

136 2. Concentrated stormwater flow to [ ~~restored~~ ] stormwater conveyance systems  
137 [ that currently experience localized flooding during the 10-year 24-hour storm  
138 event.: ] The point of discharge [ ~~either: releases stormwater into a stormwater~~  
139 ~~conveyance system that (i) has been restored and is functioning as designed or~~  
140 ~~(ii) will be restored. The applicant must demonstrate that the peak flow rate from~~  
141 ~~the 10-year 24-hour storm following the land-disturbing activity will be confined~~  
142 ~~within the system.~~

143 a. Confines the postdevelopment peak flow rate from the 10-year 24-hour  
144 storm event within the stormwater conveyance system to avoid the localized  
145 flooding; or

146 b. Releases a postdevelopment peak flow rate for the 10-year 24-hour storm  
147 event that is less than the predevelopment peak flow rate from the 10-year  
148 24-hour storm event and calculations are provided that demonstrate to the  
149 limits of analysis in subdivision 3 that the duration of flow does not cause  
150 erosion of the system; or

151 c. Releases the postdevelopment peak flow rate for the 10-year 24-hour  
152 storm event in accordance with the following methodology:

153 
$$\underline{Q_{Developed} \leq I.F. * (Q_{Pre-Developed} * RV_{Pre-Developed}) / RV_{Developed}}$$

154 Under no condition shall  $Q_{Developed}$  be greater than  $Q_{Pre-Developed}$  nor shall  
155  $Q_{Developed}$  be required to be less than that calculated in the equation  $(Q_{Forest} *$   
156  $RV_{Forest}) / RV_{Developed}$ ; where

157 I.F. (Improvement Factor) equals 0.8 for sites > 1 acre or 0.9 for sites  $\leq$  1  
158 acre.

159  $Q_{Developed}$  = The allowable peak flow rate of runoff from the developed site.

160  $RV_{Developed}$  = The volume of runoff from the site in the developed condition.

161  $Q_{Pre-Developed}$  = The peak flow rate of runoff from the site in the pre-developed  
162 condition.

163  $RV_{Pre-Developed}$  = The volume of runoff from the site in pre-developed condition.

164  $Q_{Forest}$  = The peak flow rate of runoff from the site in a forested condition.

165  $RV_{Forest}$  = The volume of runoff from the site in a forested condition. ]

166 3. [ Concentrated stormwater flow to natural stormwater conveyance systems.  
167 The point of discharge releases stormwater into a natural stormwater  
168 conveyance system that currently does not flood during the 10-year 24-hour  
169 storm and, following the land-disturbing activity, confines the postdevelopment  
170 peak flow rate from the 10-year 24-hour storm within the system Limits of  
171 analysis. Stormwater conveyance systems shall be analyzed for compliance with  
172 flood protection criteria to a point where:

173 a. The site's contributing drainage area is less than or equal to 1.0% of the  
174 total watershed area draining to a point of analysis in the downstream  
175 stormwater conveyance system;

176 b. Based on peak flow rate, the site's peak flow rate from the 10-year 24-hour  
177 storm event is less than or equal to 1.0% of the existing peak flow rate from  
178 the 10-year 24-hour storm event prior to the implementation of any  
179 stormwater quantity control measures; or

180 c. The stormwater conveyance system enters a mapped floodplain or other  
181 flood-prone area, adopted by ordinance, of any locality ]\_.

182 [~~4. Concentrated stormwater flow to natural stormwater conveyance systems~~  
183 ~~where localized flooding exists during the 10-year 24-hour storm. The point of~~  
184 ~~discharge releases a postdevelopment peak flow rate for the 10-year 24-hour~~  
185 ~~storm that shall not exceed the predevelopment peak flow rate from the 10-year~~  
186 ~~24-hour storm based on forested good pasture conditions, unless the~~  
187 ~~predeveloped condition is forested, in which case the peak flow rate from the~~  
188 ~~developed site shall be held to the forested condition.~~

189 ~~5.] A local program may adopt alternate flood protection design criteria that (i)~~  
190 ~~achieve equivalent or more stringent results, (ii) are based upon geographic, land~~  
191 ~~use, topographic, geologic, or other downstream conveyance factors, and (iii) are~~  
192 ~~approved by the board. [ Subdivision C 4 of this subsection notwithstanding, this~~  
193 ~~subdivision shall apply to concentrated stormwater flow to natural stormwater~~  
194 ~~conveyance systems where localized flooding exists during the 10-year 24-hour~~  
195 ~~storm from (i) a land disturbing activity less than five acres on prior developed~~  
196 ~~lands, or (ii) a regulated land disturbing activity less than one acre for new~~  
197 ~~development. The point of discharge releases a postdevelopment peak flow rate~~  
198 ~~for the 10-year 24-hour storm that is less than the predevelopment peak flow rate~~  
199 ~~from the 10-year 24-hour storm. ]~~

200 D. [ One percent rule. If either of the following criteria are met, subsections A B and  
201 B C of this section do not apply, nor is the analysis of subsection H required:

202 1. Based on area. Prior to any land disturbance, the site's contributing drainage  
203 area to a point of discharge from the site is less than or equal to 1.0% of the total  
204 watershed area draining to that point of discharge; or

205 2. Based on peak flow rate. Based on the postdevelopment land cover conditions  
206 prior to the implementation of any stormwater quantity control measures, the  
207 development of the site results in an increase in the peak flow rate from the one-  
208 year 24-hour storm that is less than 1.0% of the existing peak flow rate from the  
209 one-year 24-hour storm generated by the total watershed area draining to that  
210 point of discharge.

211 E. ] Increased volumes of sheet flow resulting from pervious or disconnected  
212 impervious areas, or from physical spreading of concentrated flow through level  
213 spreaders, must be identified and evaluated for potential impacts on down gradient  
214 properties or resources. Increased volumes of sheet flow that will cause [ or contribute  
215 to ] erosion, sedimentation, or flooding of down gradient properties or resources shall be  
216 diverted to a detention stormwater management facility or a stormwater conveyance  
217 system that conveys the runoff without causing down gradient erosion, sedimentation,  
218 or flooding. If all runoff from the site is sheet flow and the conditions of this subsection  
219 are met, no further water quantity controls are required.

220 F. For purposes of computing predevelopment [ and postdevelopment ] runoff from  
221 prior developed [ sites lands ] , all pervious lands on the site shall be assumed to be in  
222 good hydrologic condition in accordance with the U.S. Department of Agriculture's  
223 Natural Resources Conservation Service (NRCS) standards, regardless of conditions  
224 existing at the time of computation. Predevelopment [ and postdevelopment ] runoff  
225 calculations utilizing other hydrologic conditions may be utilized provided that it is  
226 demonstrated to and approved by the [ local stormwater ] program [ administrative  
227 authority ] that actual site conditions warrant such considerations.

228 G. Predevelopment runoff characteristics and site hydrology shall be verified by site  
229 inspections, topographic surveys, available soil mapping or studies, and calculations  
230 consistent with good engineering practices in accordance with guidance. Guidance  
231 provided in the Virginia Stormwater Management Handbook [ and by the ]-qualifying  
232 local program [ Virginia Stormwater BMP Clearinghouse ] shall be considered  
233 appropriate [ standards practices ].

234 [ H. Except where the compliance options under subdivisions B 4 and 5 and C 4 and  
235 5 of this section are utilized, flooding and channel erosion impacts to stormwater  
236 conveyance systems shall be analyzed for each point of discharge in accordance with  
237 channel analysis guidance provided in Technical Bulletin # 1, Stream Channel Erosion  
238 Control, or in accordance with more stringent channel analysis guidance established by  
239 the qualifying local program and provided to the department. Such analysis shall include  
240 estimates of runoff from the developed site and the entire upstream watershed that  
241 contributes to that point of discharge. Good engineering practices and calculations in  
242 accordance with department guidance shall be used to evaluate postdevelopment runoff  
243 characteristics and site hydrology, and flooding and channel erosion impacts.

244 If the downstream owner or owners refuse to give permission to access the property  
245 for the collection of data, evidence of this refusal shall be given and arrangements made  
246 satisfactory to the local program to provide an alternative method for the collection of  
247 data to complete the analysis, such as through the use of photos, aerial surveys, "as  
248 built" plans, topographic maps, soils maps, and any other relevant information. ]  
249