**Calculating Runoff Volume Using the SCS Method as a Voluntary Alternative to the Simple Method**

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| | | Initials | Date |
|---|---|---|---|
| **Approvals:** | Bradley Bennett, DEMLR Stormwater Program Supervisor | BB | 3/7/14 |
| | Toby Vinson, DEMLR Acting Land Quality Section Chief | TV | 3/7/14 |

Effective immediately, the Division of Energy, Mineral and Land Resources will allow the use of the **SCS Discrete Curve Number Method** (USDA TR-55) to calculate runoff volume as a voluntary alternative to the Simple Method provided that:

- The 90th percentile storm event is used for runoff depth for non-SA waters and the 1-year, 24-hour storm is used for runoff depth in SA waters

  **AND**

- The runoff volume is computed as the difference between pre and post development conditions.

"**Discrete**" means that the SCS Method is run twice: first, to yield runoff volume from the connected impervious surface and second, to yield runoff volume from the remainder of the site. (The total runoff volume is the sum of the two results.)

The 90th percentile storm event depths are available on the attached table compiled by the NC State University Department of Biological and Agricultural Engineering.

Any questions regarding the use of this alternative method for runoff volume calculations can be directed to Annette Lucas at (919) 807-6381

## Explanation

In the past, the NC Stormwater Program has used the Simple Method as its benchmark for computing stormwater volumes from development projects. This has been based on the language in 15A NCAC 2H .1008(c)(1), which states that the storage volume of the system shall be calculated to provide for the most conservative protection using runoff calculation methods described on pages A.1 and A.2 in "Controlling Urban Runoff: A Practical Manual For Planning

and Designing Urban BMPs" [The Simple Method]… Other engineering methods may be approved if these methods are shown to provide for equivalent protection."

In most cases, the Simple Method results in a higher estimation of runoff volume than the SCS Method when analyzing equivalent storms in equivalent drainage areas. Therefore, the use of the SCS Method has not previously been considered by the state to provide equivalent protection. However, the state is very interested in allowing the use of the SCS Method going forward. One reason is that the SCS Method accounts for soil characteristics, which have a significant impact on the expected volume of surface runoff in response to the relatively small rain events that drive stormwater designs. Unlike the Simple Method, the SCS Method can account for the reduction in runoff volume resulting from disconnecting impervious surfaces and siting impervious surfaces on less permeable soils.

When using the Discrete SCS Method, the runoff depth for non-SA waters shall be based on the $90^{th}$ percentile storm event (not the arbitrary 1" or 1.5" storm depth traditionally used). Using $90^{th}$ percentile storm event instead of the arbitrary 1" or 1.5" inch storm is a more "custom fit" for the hydrology across the state. For projects within ½ mile of and draining to SA waters, the runoff depth will be based on the 1-year, 24-hour storm.

Compared with the Simple Method, using the pre/post for the $90^{th}$ percentile storm even in combination with the Discrete SCS Method generally results in slightly larger BMPs for sites on A and B soils and slightly smaller BMPs for sites on C and D soils. However, the new credits for using disconnected impervious surfaces will allow developers to reduce BMP footprints for all soil types, particularly for A and B soils.

The recommendation for sizing BMPs for the change between pre and post development runoff is based on scientific research showing that impacts to the uses of surface waters are often caused by sudden changes in hydrologic conditions after development. If applied to the post development condition only, the Discrete SCS Method results in larger BMPs for sites on D soils, and smaller BMPs on sites on A soils (because the A soils have higher infiltration capacities, and therefore result in less runoff). However, impervious surfaces installed on top of A soils cause a more drastic change to hydrology than impervious surfaces installed on D soils. Therefore, using the pre/post approach results in slightly larger BMPs on A soils compared with D soils. However, this increase in BMP footprint on A soils can be easily offset by taking advantage of opportunities for infiltration.

*Percentile Storms Based on 24-hour Total Precipitation*

| Station Name | COOP ID | n | P80 (in.) | P85 (in.) | P90 (in.) | P95 (in.) |
|---|---|---|---|---|---|---|
| Asheville WSO AP | COOP:310300 | 3816 | 0.9492 | 1.1187 | 1.39555 | 1.878625 |
| Asheville | COOP:310301 | 8413 | 0.7684 | 0.904 | 1.1074 | 1.5255 |
| Ashford | COOP:310312 | 4534 | 0.904 | 1.0622 | 1.356 | 1.8758 |
| Badin | COOP:310438 | 4623 | 0.904 | 1.13 | 1.356 | 1.89727 |
| B Everett Jordan Dam | COOP:310750 | 1706 | 0.791 | 1.017 | 1.356 | 1.695 |
| Blue Ridge Post Office | COOP:310909 | 2004 | 1.0509 | 1.2543 | 1.5481 | 2.14022 |
| Boomer | COOP:310967 | 1904 | 0.904 | 1.13 | 1.356 | 1.808 |
| Bryson City | COOP:311164 | 2302 | 0.8588 | 1.017 | 1.2317 | 1.6159 |
| Burlington 3 NNE | COOP:311241 | 4069 | 0.791 | 1.017 | 1.243 | 1.695 |
| Cape Hatteras WSO | COOP:311458 | 4374 | 1.13 | 1.4012 | 1.75941 | 2.3956 |
| Carthage 8 SE | COOP:311515 | 3234 | 1.017 | 1.2091 | 1.469 | 1.95151 |
| Cataloochee | COOP:311564 | 1917 | 0.8249 | 0.9605 | 1.1526 | 1.5255 |
| Charlotte WSO Arpt | COOP:311690 | 4645 | 0.9605 | 1.12322 | 1.4012 | 1.86224 |
| Clinton | COOP:311881 | 2721 | 0.904 | 1.13 | 1.356 | 1.808 |
| Dalton | COOP:312230 | 4031 | 0.8814 | 1.017 | 1.2882 | 1.695 |
| Dunn 4 NW | COOP:312388 | 4954 | 0.904 | 1.0961 | 1.356 | 1.808 |
| Elizabeth City FAA Air | COOP:312719 | 3971 | 0.904 | 1.12435 | 1.356 | 1.808 |
| Elkin | COOP:312732 | 4399 | 0.904 | 1.13 | 1.4238 | 1.921 |
| Elkville | COOP:312757 | 3071 | 0.9718 | 1.13 | 1.4351 | 1.9436 |
| Fayetteville | COOP:313017 | 2942 | 0.904 | 1.13 | 1.356 | 1.808 |
| Franklinton | COOP:313232 | 4568 | 0.904 | 1.0622 | 1.356 | 1.808 |
| Gatesville | COOP:313364 | 1715 | 1.017 | 1.1978 | 1.4577 | 2.01479 |
| Greensboro WSO Airport | COOP:313630 | 4755 | 0.904 | 1.0735 | 1.3334 | 1.7402 |
| Pope AFB | COOP:316891 | 1425 | 0.9831 | 1.1413 | 1.44188 | 2.0566 |
| Greenville 2 | COOP:313638 | 3729 | 0.904 | 1.13 | 1.39442 | 1.921 |
| Hickory FAA Airport | COOP:314020 | 535 | 0.9379 | 1.0735 | 1.3334 | 1.90857 |
| Hobucken Bridge | COOP:314136 | 2781 | 1.017 | 1.13 | 1.4803 | 2.0792 |
| Kill Devil Hills N M | COOP:314649 | 2041 | 0.9718 | 1.1413 | 1.4803 | 2.0905 |
| Lake Lure 2 | COOP:314764 | 3768 | 1.0283 | 1.2769 | 1.5933 | 2.26 |
| Laurinburg | COOP:314860 | 4571 | 0.904 | 1.13 | 1.4351 | 1.93795 |
| Lexington | COOP:314970 | 2232 | 0.791 | 1.017 | 1.243 | 1.695 |
| Lexington 7 | COOP:314975 | 2146 | 1.0057 | 1.1865 | 1.469 | 1.9097 |
| Lumberton Regional Airport | COOP:315182 | 258 | 0.95598 | 1.1187 | 1.34809 | 1.599515 |
| Manteo Airport | COOP:315303 | 1310 | 0.904 | 1.13 | 1.582 | 2.147 |
| Mooresville | COOP:315814 | 4644 | 0.904 | 1.13 | 1.356 | 1.808 |
| Morehead City 2 WNW | COOP:315830 | 4562 | 1.017 | 1.243 | 1.582 | 2.282035 |
| Mount Pleasant | COOP:315945 | 4810 | 0.904 | 1.0509 | 1.2656 | 1.695 |
| New Bern FAA Airport | COOP:316108 | 670 | 0.88366 | 1.02039 | 1.32323 | 2.141915 |
| North Fork | COOP:316231 | 3044 | 0.9944 | 1.1639 | 1.4125 | 1.930605 |
| N Wilkesboro 11 SE | COOP:316261 | 4748 | 0.9266 | 1.13 | 1.44979 | 1.921 |
| Polkton 2 NE | COOP:316867 | 3723 | 0.904 | 1.13 | 1.38764 | 1.9097 |
| Quebec | COOP:317037 | 1975 | 1.13 | 1.356 | 1.808 | 2.599 |
| Raleigh Durham WSFO AP | COOP:317069 | 4699 | 0.9492 | 1.09949 | 1.3447 | 1.7515 |
| Raleigh NC State Univ | COOP:317079 | 3445 | 0.9605 | 1.13 | 1.4125 | 1.8758 |
| Roaring Gap 1 NW | COOP:317324 | 6066 | 1.017 | 1.243 | 1.5255 | 2.042475 |
| Shelby | COOP:317850 | 3516 | 0.9605 | 1.13 | 1.4012 | 1.889925 |
| Sneads Ferry | COOP:318037 | 2542 | 1.12774 | 1.365605 | 1.7176 | 2.39447 |
| Spruce Mountain | COOP:318216 | 2906 | 1.017 | 1.234525 | 1.469 | 1.91535 |
| Swannanoa | COOP:318448 | 2111 | 0.9266 | 1.0961 | 1.3786 | 1.8645 |
| Wilmington WSO Airport | COOP:319457 | 4817 | 1.1526 | 1.3673 | 1.7402 | 2.4521 |
| Wilson 3 SW | COOP:319476 | 4669 | 0.904 | 1.13 | 1.356 | 1.808 |
| Yadkinville6 E | COOP:319675 | 5425 | 0.791 | 1.017 | 1.243 | 1.695 |
| Eden | COOP:312631 | 2791 | 0.791 | 1.017 | 1.243 | 1.808 |
| Helton | COOP:313957 | 2813 | 0.678 | 0.791 | 1.017 | 1.356 |
| Roanoke Rapids | COOP:317319 | 2613 | 0.791 | 1.017 | 1.243 | 1.695 |