COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

DEP POST-CONSTRUCTION STORMWATER MANAGEMENT (PCSM) SPREADSHEET INSTRUCTIONS

Revised, September 1, 2026

Introduction

The Department of Environmental Protection (DEP) has developed the DEP PCSM Spreadsheet (spreadsheet) to facilitate calculations necessary for completing the stormwater analysis required by § 102.8(g) for PCSM Plans. The spreadsheet is intended to streamline PCSM calculations and help applicants demonstrate compliance with the regulations when a permit under Chapter 102 is required. The spreadsheet was designed using the latest version of Microsoft Excel® and is in Excel binary workbook (XLSB) format.

The Volume Worksheet of the spreadsheet utilizes the Curve Number method from TR-55 to estimate runoff volumes from land covers. The Rate Worksheet utilizes the Graphical Peak Discharge Method from TR-55; as noted below, this method is limited in use and may not be appropriate in many cases. The Quality Worksheet utilizes the volumes determined in the Volume Worksheet to calculate pollutant loads from land cover concentrations using the National Stormwater Quality Database and stormwater control measure (SCM) outflow concentrations from the International BMP Database. The Quality Worksheet includes a Certification statement that must be acknowledged by the user of the spreadsheet for submission to DEP or delegated county conservation districts (CCDs) as part of a Chapter 102 permit application.

The spreadsheet contains default calculations that may in some cases be overridden by the user's own calculations through manual entry (e.g., runoff volumes), providing flexibility. However, if the user overrides any of the spreadsheet's calculations, the applicant should attach additional documentation explaining what specifically was overridden with justification. The use of the spreadsheet and attachment of spreadsheet printouts to Chapter 102 applications is encouraged, and in certain cases is required, because the reviewing agency will receive calculations in a consistent format, which is intended to provide for more efficient and timely reviews.

Users should check DEP's website periodically for updates to the spreadsheet and instructions by visiting www.dep.pa.gov/constructionstormwater and selecting "E&S Resources". In general, DEP/CCD will accept older versions of the spreadsheet no more than 6 months following the revision date of the spreadsheet. DEP/CCD also reserves the right to request completion of the latest version of the spreadsheet for any project.

Questions on the use of the spreadsheet can be directed to the Bureau of Clean Water at **RA-EPCHAPTER102@pa.gov**.

General Information

> **NOTE 1** – It is important that the user follow these instructions carefully. Omission of data in any cell designed for data entry may result in the failure of important calculations on the same or different worksheets.

If prompted by Excel after opening the spreadsheet, enable editing and macros. *Note that you may need to add additional Trusted Locations in the Trust Center Settings of Excel in order to run the macros*. These locations may include server drives and/or locations where you intend to save the file for use. The following steps may be taken:

1. Excel Options > Trust Center > Trust Center Settings > Trusted Locations
2. Check the box to "Allow Trusted Locations on my network"
3. Select "Add new location"
4. Browse to select the folder (or server) where the file will be saved, check the "Subfolders of this location are also trusted" box, and then OK.

The spreadsheet consists of five hyperlink tabs: Instructions, General, Volume, Rate and Quality. Each tab has a corresponding worksheet. A Versions Worksheet is also visible to identify changes made to the spreadsheet over time. To begin, click on the General tab.

The top of each worksheet contains a "Clear Form" button. The user may click on the "Clear Form" button at any time to delete **all** data from the current worksheet. There is also a "Clear Project" button at the top of the General Worksheet that may be used to remove all entries throughout the entire spreadsheet. If the user wants to revise the information in only one cell, the user should select that cell and use the backspace or delete key to remove the current value and then enter the new value into the cell.

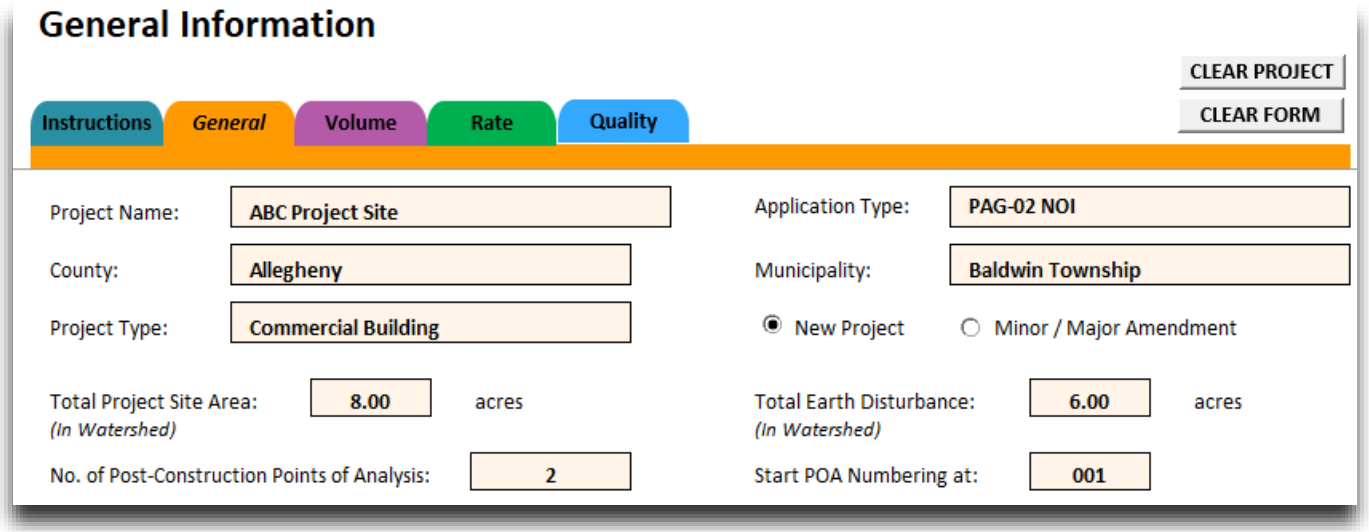
> **NOTE 2** - The spreadsheet is intended for the evaluation of volume, rate, and water quality for discharges to a **single receiving surface water**. If for example there are 3 post-construction points of analysis (POAs) to Mud Run and 3 post-construction POAs to Clear Creek, two spreadsheets should be completed (one for Mud Run and one for Clear Creek). Alternatively, the spreadsheet can be used on a POA basis.

All cells available for data entry or selection from a drop-down menu are highlighted. **The user may use the Tab, arrow, or Enter keys to move from cell to cell. Using the mouse to click from cell to cell may result in validation errors**.

Care must be taken to enter the data in the correct order identified in these instructions to avoid potential errors with the calculations and logic. For example, skipping a cell may prevent a calculation or produce an error message. The spreadsheet is protected. Formulas are not visible but are explained in this document. Validation that exists in the spreadsheet is highlighted and explained in this document.

> **NOTE 3** – Throughout the spreadsheet decisions were made concerning cell formatting with respect to the number of decimal places displayed. The number displayed in a cell is not necessarily the number that is stored by the spreadsheet. Therefore, you may not be able to replicate a calculated value using only the numbers displayed in the cells due to the spreadsheet's rounding of input values to meet formatting requirements.
>
> ***Example 1*** – Cell A1 is formatted to 1 decimal place. The user enters "2.171", which is displayed as "2.2". Cell A2 is formatted to 1 decimal place also. The user enters "0.5421", which is displayed as "0.5". Cell A3 is the product of A1 and A2 and is formatted to 2 decimal places. The actual result calculated by the spreadsheet is "1.1768991" and "1.18" is displayed. This is different than the product of the input values displayed on the screen (i.e., 2.2 x 0.5 = 1.10).

General Worksheet



- **Project Name** – Enter the name of the project as it will be recorded on the Chapter 102 permit application.
- **Application Type** – Select the type of Chapter 102 permit application that will be submitted to DEP or a county conservation district (CCD) for the project.

- **County** – Select the county where the project is located from the drop-down list. If the project is located in multiple counties, select the county with the greatest area of earth disturbance.

- **Municipality** – Select the municipality where the project is located from the drop-down list. If the project is located in multiple municipalities, select the municipality with the greatest area of earth disturbance.

- **Project Type** – Select the applicable project type from the drop-down list. If the project type is not shown, select "Other". For mixed uses select the primary use or select "Other".

- **New Project or Minor / Major Amendment** – Select the appropriate radio button to indicate whether the spreadsheet is being completed for a new project or for a minor or major amendment to an existing project (e.g., additional phases of a larger common plan of development or sale).

- **Total Project Site Area** – Enter the total number of acres for the project site **in the watershed of interest**. See 25 Pa. Code § 102.1 for the definition of Project Site. Note that Total Project Site Area does not mean the entire tributary drainage area to the site or to SCMs on the site (i.e., off-site area where stormwater runs onto the Project Site should not be included).

  VALIDATION – The sum of land cover /soil type combinations within both the pre- and post-construction land cover tables in the Volume Worksheet may not exceed the value for ***Total Project Site Area***. For ***Total Project Site Area*** and all other areas reported in the PCSM Spreadsheet, validation is enforced that area is to be reported to the one-thousandths of an acre. For example, if the value "1.12345" is entered into a cell used to report an area, a validation error will be shown, and the area should be entered as "1.123". A less precise value may be entered but will be displayed to the one-thousandths of an acre (i.e., entering "1" into a cell will display as "1.000").

  NOTE 4 – If there will be post-construction discharges to two or more surface waters, and therefore multiple spreadsheets must be completed in order to analyze all sitewide discharges, the Total Project Site Area must be divided amongst the analyses. For example, if the Total Project Site Area is 10 acres and there will be post-construction discharges to Mud Run and Clear Creek, the user should determine the portion of the project site area that drains to each surface water (e.g., 6 acres to Mud Run and 4 acres to Clear Creek).

  NOTE 5 – The entire Project Site Area should be accounted for in the Volume Worksheet. For example, if the value entered for ***Total Project Site Area*** is 5 acres, the sum of areas for land covers for both pre- and post-construction conditions in the Volume Worksheet should be 5 acres, unless the project site includes multiple watersheds and earth disturbance activities will result in changes to drainage areas, as noted above.

- **Total Earth Disturbance** – Enter the total number of acres of earth disturbance (i.e., disturbed area) within the project site **for the watershed of interest**.

  VALIDATION – The value for ***Total Earth Disturbance*** may not exceed the value for ***Total Project Site Area***.

- **No. of Post-Construction POAs** – Select the number of post-construction points of analysis (POAs) that are proposed for a specific receiving surface water. The term "point of analysis" means a location on a project site boundary, or at a surface water, that receives stormwater runoff from all, or a portion of, a project site. A POA is the location where stormwater management requirements of 25 Pa. Code § 102.8(g) must be demonstrated. POAs are selected considering both pre-construction and post-construction conditions. All runoff from a project site must be accounted for at one or more POAs and any undetained areas.

  NOTE 6 – All POAs reported on the spreadsheet should be identified on PCSM Plan Drawings and PCSM Module 2.

  A maximum of 20 POAs can be selected; if a project involves more than 20 POAs, additional POAs should be recorded on a separate spreadsheet. Selection of the number of post-construction POAs will open a table for data entry.

Point of Analysis (POA) No.	Total Drainage Area (DA) (acres)	Project Site DA (acres)	Existing Imp., Project Site DA (acres)	Proposed Imp., Project Site DA (acres)	Receiving Waters	Ch. 93 Class	Structural SCM(s)
001	4.10	3.50	0.00	2.20	Clear Creek	WWF, MF	Yes
002	3.90	3.90	0.50	1.10	Clear Creek	WWF, MF	Yes
Undetained Areas	0.00	0.00	0.00	0.00			
Totals:	**8.00**	**7.40**	**0.50**	**3.30**			

Enter a number in the cell next to "**Start POA Numbering at:**". Normally this should be "001" (the user can enter "1"). However, if a project site contains drainage area to two or more surface waters, and therefore multiple instances of the spreadsheet will be used for the project, you may enter a different number to avoid the use of duplicate POA numbers on plan drawings.

An explanation of the columns in this table is as follows:

- **Point of Analysis (POA) No.** – Sequential POA numbers are assigned after the user enters a value for the starting number. In addition to POAs, at the bottom of the table the user is requested to enter information on "**Undetained Areas**." These are areas that are part of the Project Site but do not drain to (i.e., bypass) an SCM; for example, areas that due to final grade will not drain to an SCM should be considered undetained areas.

- **Total Drainage Area (DA) (acres)** – For each POA, report the total post-construction drainage area tributary to the POA that will be treated by a structural SCM, including area outside the project site, if applicable. The surface area of SCMs, if present, should be included in this value. If there are undetained drainage areas that are tributary to one or more POAs, those areas should be cumulatively reported in the field for "**Undetained Areas**."

- **Project Site DA (acres)** – For each POA, report the post-construction drainage area tributary to the POA, within the project site.

  Example – A POA has a Total Drainage Area of 10 acres. Two (2) acres are outside of the Project Site (i.e., off-site). The Project Site DA should be entered as 8 acres.

  VALIDATION – The ***Project Site DA*** for individual POAs and undetained areas may not exceed the ***Total Drainage Area*** or ***Total Project Site Area*** entered on this worksheet. In addition, the sum of all drainage areas and undetained areas may not exceed the sum of ***Total Drainage Area*** or ***Total Project Site Area***.

- **Existing Impervious (Imp.), Project Site DA (acres)** – For each POA, enter the actual acres of impervious surface – prior to construction – within the post-construction Project Site drainage area.

  VALIDATION – The ***Existing Impervious, Project Site DA (acres)*** may not exceed the value entered for ***Project Site DA*** for the POA and the sum of all ***Existing Impervious*** may not exceed the ***Total Project Site Area***.

- **Proposed Impervious (Imp.), Project Site DA (acres)** – For each POA, enter the acres of impervious surface that are planned within the post-construction Project Site drainage area.

  VALIDATION – The ***Proposed Impervious, Project Site DA (acres)*** may not exceed the value entered for ***Project Site DA*** for the POA and the sum of all ***Existing Impervious*** may not exceed the ***Total Project Site Area***.

- **Receiving Waters** – The user may select a value from the dropdown list, if applicable, or enter the name of the surface water receiving stormwater discharges from the discharge point. If the surface water is not named, use "unnamed tributary to XXX", where "XXX" is the name of the first named surface water downstream.

  NOTE 7 – If the discharge is to non-surface waters, the applicant typically must investigate the flow path to verify non-erosive conveyance to the surface water.

- **Ch. 93 Class** – Select the existing or designated use of the named surface water from the drop-down list. Users should check DEP's Existing Use website first, and if not found on this website, use the designated use as contained in Chapter 93.

- **Structural SCM(s)** – Select "Yes" if stormwater in the drainage area of the POA will be treated by a structural SCM, otherwise select "No".

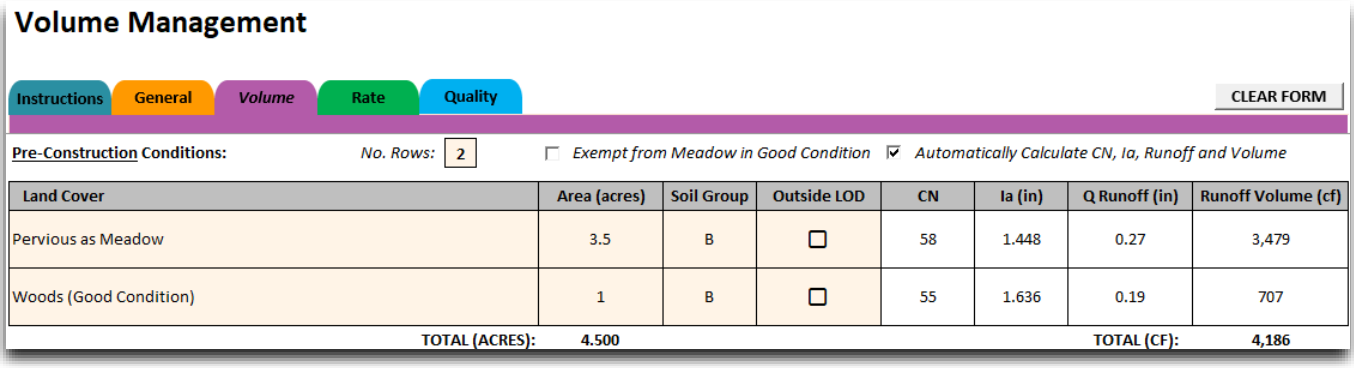
Based on the project and entries made on this worksheet, the following message may be displayed below the table:

PROJECT SITE MEETS SMALL SITE EXCEPTION - RATE WORKSHEET NOT REQUIRED

If the following two items are true, the applicant does not need to complete the Rate Worksheet or otherwise complete an analysis of peak rates: 1) the ***Total Earth Disturbance*** area is less than 5 acres; and 2) the area of post-construction impervious surface within the watershed is less than or equal to one acre. Note that **this exception applies on a surface water basis rather than a POA basis** (i.e., if there are multiple POAs for a surface water but the spreadsheet is completed for a single POA, the user should not assume that a small site exception applies to either the single POA or all POAs for the surface water, regardless of the message displayed).

Volume Worksheet

The Volume Worksheet utilizes the design standard under 25 Pa. Code § 102.8(g)(2) that applicants must manage the net change in volume for storms up to and including the 2-year/24-hour storm event when compared to pre-construction runoff volume. Use of the Volume Worksheet may not be appropriate when a design standard under an approved Act 167 Plan or other alternative design standards are used. However, completion of the Volume Worksheet is necessary in order to complete the Rate and Quality Worksheets. Notices of Intent (NOIs) and individual permit applications for Chapter 102 NPDES permits require the submission of the Quality Worksheet, at a minimum. Calculations (including modeling software results) that clearly demonstrate how the volume management requirements of 25 Pa. Code § 102.8(g)(2) are met may be submitted in lieu of the Volume Worksheet.



Volume Management

Instructions | General | *Volume* | Rate | Quality | CLEAR FORM

Pre-Construction Conditions: No. Rows: 2 ☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	Outside LOD	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Pervious as Meadow	3.5	B	☐	58	1.448	0.27	3,479
Woods (Good Condition)	1	B	☐	55	1.636	0.19	707
TOTAL (ACRES):	4.500					TOTAL (CF):	4,186

- **2-Year / 24-Hour Storm Event (NOAA Atlas 14)** – DEP recommends that applicants utilize the NOAA Atlas 14 online service to locate the weather station closest to the project site and select the 2-year / 24-hour storm event total, in inches. If this value is entered, it will be used throughout the spreadsheet for calculations.

  - **Alternative 2-Year / 24-Hour Storm Event** - If the user decides to use a different source of information for precipitation data, the NOAA Atlas 14 field may remain blank and the user may enter an alternative rainfall

amount in the appropriate box, in inches. If an alternative is selected, the user should report the source of the alternative data.

- **Pre-Construction Volume Calculation Table** – The purpose of this table is to calculate the total pre-construction runoff volume for the Project Site area (or portion of the Project Site area within a specific watershed). All existing land covers within the Project Site area must be identified in this table. By default, the program will automatically calculate curve number ("CN"), initial abstraction ("Ia"), "Q Runoff (in)", and "Runoff Volume (cf)." If the user prefers to calculate these values independently, uncheck the box for ***Automatically Calculate CN, Ia, Runoff and Volume***.

  By default, the box for ***Exempt from Meadow in Good Condition*** is unchecked. This box may be checked only for those projects that do not need to consider pre-development non-forested pervious area as meadow in good condition (25 Pa. Code § 102.8(g)(2)(i)), and 20% of existing impervious surface to be disturbed as meadow in good condition (25 Pa. Code § 102.8(g)(2)(ii)). Such projects would include the repair, reconstruction or restoration of roadways or rail lines, or construction, repair, reconstruction or restoration of utility infrastructure when the site will be returned to existing condition. The box for ***Exempt from Meadow in Good Condition*** may also be checked when an applicant is proposing a demonstration that treating 20% of existing impervious surface as meadow in good condition is not practicable due to public health, safety or environmental limitations under existing site conditions (and such demonstration is attached to the NOI or application). The effect of checking this box is to allow for additional pre-construction land cover options, as explained below.

  NOTE 8 – The user may select the number of rows, up to 20, for the number of pre-construction land covers to be reported.

  NOTE 9 – The ***Automatically Calculate CN, Ia, Runoff and Volume*** box controls the user's ability to manually enter values for CN, Ia, Runoff and Volume for both pre-construction and post-construction tables. In addition, when checked, this box allows the user to select land cover options from a drop-down list (otherwise land covers must be entered manually).

  - **Land Cover** – Select the land cover description(s) that best characterize pre-construction conditions within the project site area. For pre-construction conditions, the land cover options when the ***Exempt from Meadow in Good Condition*** box is not checked are Pervious as Meadow, Impervious as Meadow, Woods (Good Condition), and all Impervious Land Covers that are available in the post-construction condition (see **NOTE 14** below). All post-construction impervious land covers are available to improve the accuracy of calculations made on the Quality Worksheet. The land cover options when the ***Exempt from Meadow in Good Condition*** box is checked and when the "Outside LOD" box is checked are the same as described below for post-construction conditions. If the ***Automatically Calculate CN, Ia, Runoff and Volume*** box is not checked, the user must enter pre-construction land covers manually.

    NOTE 10 – Care should be given to properly selecting the correct land cover types, as different types may have the same Curve Number for runoff purposes but may have different pollutant concentrations for water quality purposes.

    NOTE 11 – The "Outside LOD" column is intended to include checkboxes (pre-construction only). However, earlier versions of Excel are not capable of displaying these checkboxes. For earlier versions of Excel, typing "TRUE" into the cell has the same effect as checking the box. When the box is checked (or TRUE is entered), the land covers for post-construction conditions become available. If a land cover, area, and soil type are entered first and then the Outside LOD box is checked, all calculated values will disappear except when the same land cover exists for both pre- and post-construction conditions (e.g., "Woods (Good Condition)"). If the values disappear the user must reselect land cover.

  - **Area (Acres)** – Enter the area within the project site, in acres, associated with the land cover selected.

    VALIDATION – The entry of an area for an individual ***land cover*** as well as the sum of all ***land cover*** areas may not exceed the ***Total Project Site Area*** that was entered in the General Worksheet.

- **Soil Group** – Select a Hydrologic Soil Group (HSG) from the drop-down list for the ***land cover***. Soil groups are based on NRCS' National Engineering Handbook (Chapter 7, Hydrologic Soil Groups). The NRCS Web Soil Survey tool may be used to initially characterize soils present at a site (instructions on using the Survey tool to determine HSG are available – use this link). However, for the stormwater analysis, it is expected that soils are field verified through a pre-development site characterization. For soils assigned dual soil groups (e.g., A/D, B/D, etc.), use the first group for your selection.

  NOTE 12 – An option of "N/A" is available to select for impervious surfaces where any HSG would result in a CN value of 98. If accidentally selected for any other land cover, the spreadsheet assumes that HSG "D" was intended.

- **Outside LOD** – Optionally, the designer may distinguish area based on whether it is inside or outside of the limit of disturbance (LOD). When the ***Outside LOD*** box is checked, the full list of post-construction land covers become available.

- **Curve Number (CN)** – The spreadsheet uses CN values from TR-55 by looking up the combination of land cover and soil group. If the ***Automatically Calculate CN, Runoff and Volume*** box is unchecked, the user may enter user-defined values for CN (from 30 to 98). DEP/CCD may request additional documentation for user-defined CN values.

  The CN values in **Table 1** are used when pre-construction land cover (where ***Exempt from Meadow in Good Condition*** and ***Outside LOD*** boxes are not checked) is selected in combination with the Hydrologic Soil Group (HSG).

Table 1: CN Values for Pre-Construction Land Covers

Pre-Construction Land Cover	Curve Numbers			
	HSG A	HSG B	HSG C	HSG D
Pervious as Meadow	30	58	71	78
Impervious as Meadow	30	58	71	78
Woods (Good Condition)	30	55	70	77
Impervious Areas: Paved Parking Lots, Roofs, Driveways, etc. (Excluding ROW)	98	98	98	98
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	98	98	98	98
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	83	89	92	93
Impervious Areas: Streets and Roads - Gravel (Including ROW)	76	85	89	91
Impervious Areas: Streets and Roads - Dirt (Including ROW)	72	82	87	89
Impervious Areas: Commercial	98	98	98	98
Impervious Areas: Industrial	98	98	98	98
Impervious Areas: Institutional	98	98	98	98
Impervious Areas: Commercial Roof	98	98	98	98
Impervious Areas: Residential Roof	98	98	98	98
Open Water	100	100	100	100
Rock Cut/Bench	83	89	92	93

The CN values are generally based on NRCS' Urban Hydrology for Small Watersheds (TR-55) ("TR-55"). Note that certain land covers were established in order to identify distinct Event Mean Concentrations (EMCs) for water quality purposes. Also, there are no published CN values for Rock Cut/Bench, and DEP has used the CN values for Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW) as a match for Rock Cut/Bench.

The land covers of "Pervious as Meadow" and "Impervious as Meadow" are equivalent to "Meadow – Continuous Grass, Protected from Grazing and Generally Mowed for Hay" in TR-55.

NOTE 13 – Select the appropriate "Impervious" and "Impervious as Meadow" land covers to implement the requirement at 25 Pa. Code § 102.8(g)(2)(ii) that 20% of the existing impervious area to be disturbed must be considered meadow in good condition or better (unless exempt as described above). Please note that all cover types categorized as "Impervious Areas" are subject to § 102.8(g)(2)(ii), regardless of CN (unless exempt from the "Meadow in Good Condition" presumption). For example, if a redevelopment project will disturb one acre of existing impervious surface, enter 0.8 acre as "Impervious" and 0.2 acre as "Impervious as Meadow."

- **Initial Abstraction (Ia)** – The initial abstraction, in inches, is calculated and displayed based on methodology in TR-55 (**Equation 1**): 0.2 x (1000 / CN) – 10.

- **Q Runoff (in)** – The depth of runoff, in inches, is calculated by the following equation based on TR-55, where P equals the 2-year/24-hour storm event rainfall in inches (**Equation 2**):

$$(P - Ia)^2 / (P + 0.8 \times ((1000 / CN) - 10))$$

Where the user does not utilize the default calculation, the user must attach a copy of the runoff calculation. If P - Ia is less than or equal to zero, there is no runoff.

- **Runoff Volume (cf)** – Runoff volume, in cubic feet (cf), is calculated from Q Runoff and Area as follows (**Equation 3**):

$$\text{Runoff Volume (cf)} = \text{Area (acres)} \times 43{,}560\ ft^2/\text{acre} \times (\text{Q Runoff (in)} \times 1\ ft / 12\ \text{inches})$$

Where the user does not utilize the default calculation, the user must attach a copy of the runoff calculation.

- **Post-Construction Volume Calculation Table** – The purpose of this table is to calculate the total post-construction runoff volume for the project site. This table is completed the same way the Pre-Construction Volume Calculation Table is completed. The only difference between the tables is that the Post-Construction Volume Calculation Table provides all TR-55 land cover options.

NOTE 14 – In addition to the TR-55 land covers, five additional options are provided for impervious surfaces: 1) Impervious Areas: Commercial, 2) Impervious Areas: Industrial, 3) Impervious Areas: Institutional, 4) Impervious Areas: Commercial Roof, and 5) Impervious Areas: Residential Roof. These additional options, all of which have CN values of 98, have been provided to allow for more precise estimates of pollutant loads (Quality Worksheet). In addition, DEP provides a land cover option of Open Water, with a CN value of 100, that should be selected for precipitation falling directly on surface waters and SCMs on a site. The following provides DEP's recommendations on the selection of impervious cover:

- **Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)** – select this impervious land cover for all parking lots, roofs, and driveways that are not associated with commercial, industrial or institutional sites. For example, roofs on residential and agricultural structures would fall into this category.

- **Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW**) – select this impervious land cover for all streets and roads that are paved, are curbed, and direct stormwater to storm sewers, including such streets and roads located on commercial, industrial and institutional sites.

- **Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)** – select this impervious land cover for all streets and roads that are paved but are not curbed, and direct stormwater to roadside ditches, including such streets and roads located on commercial, industrial and institutional sites.

- **Impervious Areas: Streets and Roads - Gravel (Including ROW)** – select this impervious land cover for all gravel roads, including such roads located on commercial, industrial and institutional sites.

- **Impervious Areas: Streets and Roads - Dirt (Including ROW)** – select this impervious land cover for all dirt roads, including such roads located on commercial, industrial and institutional sites.

- **Impervious Areas: Commercial** – select this impervious land cover for impervious surfaces on commercial sites except for streets and roads and roofs (e.g., parking lots, walkways, etc.).

- **Impervious Areas: Industrial** – select this impervious land cover for all impervious surfaces on industrial sites except for streets and roads, in which one or more of the selections above should be made.

- **Impervious Areas: Institution** – select this impervious land cover for all impervious surfaces on institutional sites (e.g., college campuses) except for streets and roads, in which one or more of the selections above should be made.

- **Impervious Areas: Commercial Roof** – select this impervious land cover for roofs on commercial sites. This land cover may also be used for industrial roofs.

- **Impervious Areas: Residential Roof** – select this impervious land cover for roofs on residential sites. Other options such as Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW) should be used for other impervious surfaces on residential sites.

- **Net Change in Volume to Manage (cf)** – After the Pre- and Post-Construction Volume Calculation tables are completed, the Net Change in Volume to Manage (cf) will be displayed in the red box, based on the total runoff volume for pre-construction conditions subtracted from the total runoff volume for post-construction conditions at the 2-year, 24-hour storm event.

  The remainder of the worksheet deals with management of this net change in volume.

  NOTE 15 – IMPORTANT NOTE ABOUT PROJECT SITES IN MULTIPLE WATERSHEDS THAT WILL INVOLVE CHANGES TO PRE-CONSTRUCTION DRAINAGE AREAS: If a project site drains to two or more different surface waters, and earth disturbance activities will result in changes to pre-construction drainage areas, the applicant must account for the change across all spreadsheets prepared for the project. While normally users would enter a Total Earth Disturbance value in the General Worksheet corresponding to post-construction conditions, when a project site drains to two or more different surface waters and there will be changes to post-construction drainage areas, the user must enter the maximum earth disturbance area between pre- and post-construction conditions.

  Example 3: A project site consists of two drainage areas and 60 acres, with 30 acres draining to Mud Run and 30 acres draining to Clear Creek. As a result of earth disturbance activities, the drainage areas will change. Following construction, 38 acres will drain to Mud Run and 22 acres will drain to Clear Creek. Two instances of the PCSM Spreadsheet are prepared. The spreadsheet prepared for Mud Run will use a Total Project Site Area value of 38 acres in the General Worksheet, and the sum of pre-construction and post-construction land cover areas will be 30 acres and 38 acres, respectively, in the Volume Worksheet. The spreadsheet prepared for Clear Creek will use a Total Project Site Area value of 30 acres in the General Worksheet, and the sum of pre-construction and post-construction land cover areas will be 30 acres and 22 acres, respectively, in the Volume Worksheet.

- **Non-Structural SCM Volume Credits** – Select one or more of the optional checkboxes to pursue credit for non-structural SCM volume credits.

  NOTE 16 – The spreadsheet does not enforce a limit on the amount of non-structural SCM volume credit that can be claimed where valid non-structural SCMs from the Pennsylvania Stormwater BMP Manual (363-0300-002) will be implemented.

  NOTE 17 – Any non-structural SCM is still considered a PCSM SCM, and adequate plan information must be provided (details, notes, long-term operation and maintenance schedule, etc.).

- **Tree Planting Credit** – Check the box if native trees (minimum 2-inch caliper, minimum height 6 feet) will be planted within the Project Site following construction. However, do not include trees planted as part of a riparian forest buffer. Enter the number, if any, of deciduous and evergreen trees planted. Credits of 6 and 10 cubic feet are provided per deciduous and evergreen tree planted, respectively, per DEP's Stormwater BMP Manual.

- **Other Credit** – The user may enter a description of any other non-structural SCM volume credit that is calculated separately and those supporting calculations are attached to the permit application or Volume Worksheet. Enter the amount of the credit, if applicable, in the space provided. These credits should be consistent with the Pennsylvania Stormwater BMP Manual.

  NOTE 18 – Certain SCMs such as "Soil Amendment" are not available in the dropdown list for "SCM Name" in the Structural SCM Volume Credits table (see below) because this table does not calculate appropriate credits for the SCMs. Credits for Soil Amendment and other SCMs not identified in the Structural SCM Volume Credits table should be reported in the Non-Structural SCM Volume Credits – Other Credit fields, and the user should attach the calculations.

- **Structural SCM Volume Credits**

Identify all proposed structural SCMs for the project site in the table provided to calculate volume reduction credits. Select the number of structural SCMs that will be installed (***No. Structural SCMs:***), up to 50. If the proposed number of SCMs will exceed 50, a separate spreadsheet will need to be completed.

NOTE 19 – The selection of SCMs in this section will carry through to the Rate and Quality Worksheets. If there are planned SCMs that are intended only for water quality purposes, such water quality SCMs should be identified in this table.

NOTE 20 – The user should be familiar with the three basic functions of SCMs: infiltration, evapotranspiration and water quality treatment. Some SCMs provide one, two or all three of these functions. Proper use of and entry of infiltration, media and storage parameters is the responsibility of the user.

NOTE 21 – If the Rate Worksheet is not used to calculate peak rates and demonstrate rate controls, the user may identify only those structural SCMs that will be used for volume and water quality management in the Structural SCM Volume Credits table. If this is done, please note that all PCSM SCMs, including rate control SCMs, must be identified in PCSM Module 2, and the SCM numbers should correctly identify the same SCM across all documents used to complete a Chapter 102 permit application. Users may also identify all PCSM SCMs in the Structural SCM table, including rate control SCMs. If rate control SCMs are entered into the Structural SCM Volume Credits table, volume treated by upstream SCMs should be deducted from the Volume Routed to SCM (CF) for the rate control SCMs, and all cells other than Incremental SCM DA and Volume Routed to SCM should remain blank.

Structural SCM Volume Credits: *No. Structural SCMs:* 2 *Start SCM Numbering at:* 1

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Total Vol. Routed to SCM (CF)	Off-Site Vol. Routed to SCM (CF)	Infiltration / Vegetated	Infil. Rate (in/hr)	Infil. Period (hrs)	Vegetated?	Media Depth (ft)	Stored Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Infiltration Basin	-	to SCM No. 2	2.500	9,550	0	1,400	0.75	72	Yes	1.0	9,000	5,670	430
001	2	Wet Pond	-	Off-Site	1.000	8,000									
													Totals:	5,670	430

Select a number in the cell next to "**Start SCM Numbering at:**". Normally this should be "1." However, if a project site contains drainage area to two or more surface waters, and therefore multiple instances of the spreadsheet will be used for the project, you may enter a different number to avoid the use of duplicate SCM numbers on plan drawings.

An explanation of the columns in this table is as follows:

- **POA No.** – Select the POA associated with the structural SCM. Only those POAs where the user indicates a structural SCM will be installed on the General Worksheet will be available for selection. This entry must be made in order for the Quality Worksheet to calculate pollutant loads.

  NOTE 22 – SCMs that receive and discharge stormwater runoff as sheet flow should be identified in the Structural SCM Volume Credits table in order to demonstrate infiltration and evapotranspiration credit. For example, where a vegetated filter strip discharges stormwater as sheet flow to a riparian buffer, the vegetated filter strip and the riparian buffer should be identified in the table although neither may receive or discharge concentrated flows. A POA No. must nonetheless be selected in order to generate credit.

- **SCM No.** – A sequential ID number is assigned to each SCM after the starting number is selected.

- **SCM Name** – Select an SCM name from the drop-down list. SCM names generally correspond with the names identified in the Stormwater BMP Manual. If the name of a structural SCM is not available, the user may manually enter it. If the user manually enters an SCM name, the box for ***Use default SCM Outflows and Median SCM Outflow Concentrations*** on the Quality Worksheet must be unchecked (see below).

  NOTE 23 – Select "Riparian Forest Buffer (Min 150 Ft)" only if a new riparian forest buffer with a minimum width of 150 feet will be established as an SCM. Credit is provided for the net change in volume routed to this SCM (see below). **When "Riparian Forest Buffer (Min 150 Ft)" is selected, do not enter values for infiltration parameters (i.e., Infiltration / Vegetated Area, Infiltration Period, etc.), otherwise "double crediting" will occur.** Select "Riparian Buffer" only if a new riparian buffer will be established. There is no minimum width required in order to select this SCM – credit will be generated as a function of the vegetated area and soil infiltration properties.

- **MRC?** – Select "Y" in this column if the SCM has been designed as a Managed Release Concept (MRC) SCM, as described in DEP's MRC Concept Paper. If MRC = "Y", a cell appears to allow the user to manually enter Managed Release Credit:

INFILTRATION & ET CREDITS - PROJECT SITE (CF):	6,100
MANAGED RELEASE CREDIT (CF):	

  Managed Release Credit must be supported by the submission of the following:

  - For all MRC SCMs that meet the MRC Simplified Design Standards, the MRC Simplified Design Spreadsheet must be submitted. Enter the Volume Routed to MRC SCM from Drainage Area plus Additional Flows Routed to MRC SCM (not to exceed the 2-year/24-hour storm volume from the MRC drainage area) from the MRC Simplified Design Spreadsheet as Managed Release Credit in the PCSM Spreadsheet.

  - For all other MRC SCMs, the MRC Spreadsheet must be submitted, following the MRC Spreadsheet Instructions. Enter the Volume Management Credit from the MRC Spreadsheet as Managed Release Credit in the PCSM Spreadsheet.

  If there are multiple MRC SCMs (and multiple spreadsheets), enter the sum of all credits reported on the spreadsheets as Managed Release Credit.

  NOTE 24 – MRC SCM design standards are based on the controlled release of the 1.2-inch/2-hour storm event volume and management of the post-construction 2-year/24-hour peak flow back to the pre-construction 1-year/24-hour peak flow. MRC credit may be provided for volume routed to or diverted/bypassed around the MRC SCM up to the 2-year/24-hour storm event if management of the post-construction 2-year/24-hour peak flow back to the pre-construction 1-year/24-hour peak flow will occur within the MRC SCM or a rate control SCM.

NOTE 25 – When a Constructed Wetland is designed in accordance with the draft PCSM Manual (see Section 3.6.6, *Engineered Stormwater Treatment Wetland*) and the Constructed Wetland will include an IWS zone and controlled release, it is considered functionally equivalent to an MRC Bioretention SCM. The designer may select MRC = "Y" to report Managed Release Credit. Completion of the MRC Spreadsheet is not necessary.

- **Discharge** – Select "Off-Site" if outflows from the SCM will discharge off-site to surface waters, storm sewers, or other off-site conveyance rather than another SCM (except as noted below). When Off-Site is selected, outflows from SCMs will be used in the Quality Worksheet to calculate pollutant loads leaving the site at the 2-year/24-hour storm event.

  Select "to SCM No. X" (where X is the SCM No. shown in the table) when the discharge from the SCM will be to a downstream SCM.

  Users should select "Off-Site" for all standalone SCMs and final SCMs in series. For example, a vegetated swale that is followed by a rain garden should be entered into the spreadsheet as shown below:

POA No.	SCM No.	SCM Name	MRC?	Discharge
001	1	Vegetated Swale	-	to SCM No. 2
002	2	Rain Garden / Bioretention	-	Off-Site

  Attachment A provides a detailed example of how SCMs in series can be entered into the spreadsheet and how volume and water quality credits are calculated.

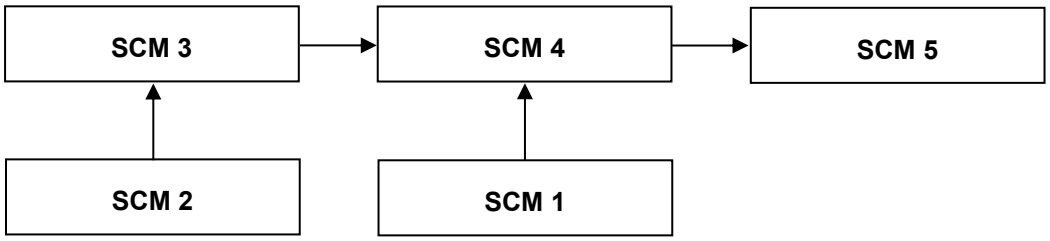
  NOTE 26 – If an SCM is in series with another SCM that is off-site, and the owner of the off-site SCM has provided permission for stormwater flows from the project site to enter the SCM, select "Another SCM" for the Discharge, even though the discharge will be routed off-site. The off-site SCM will then need to be identified in the Structural SCM table as the final SCM in series.

  NOTE 27 – SCMs that are in series are separate and distinct SCMs, such as a vegetated swale followed by a rain garden. A SCM's components cannot be broken down and treated as separate SCMs. For example, a rain garden that dewaters in more than 24 hours cannot be broken into soil amendments followed by a dry extended detention basin.

- **Incremental SCM DA (acres)** – Enter the total drainage area, in acres, that is tributary to the reported SCM, including areas outside of the project site, if applicable. This value may be different than the drainage area reported on the General Worksheet for the POA (i.e., the POA may receive flows that are not treated by the SCM).

  For downstream SCMs in series enter "0" if the only flows received are from an upstream SCM. If a downstream SCM receives flow from drainage areas that do not flow to upstream SCMs, enter the incremental SCM drainage area.

  Example 4: There are five SCMs on a project site as shown below. SCMs Nos. 1 and 3 discharge to SCM No. 4, SCM No. 2 discharges to SCM No. 3, and SCM No. 4 discharges to SCM No. 5. The drainage areas to SCMs Nos. 1 and 2 are 4 acres and 3 acres, respectively. SCM No. 3 receives flow from an additional 2 acres, as well as the discharge from SCM No. 2. SCM Nos 4 and 5 only receive the discharges from upstream SCMs.



Entries into the Structural SCM table for this example would be as follows:

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)
001	1	Vegetated Swale	-	to SCM No. 4	4.00
001	2	Rain Garden / Bioretention	-	to SCM No. 3	3.00
001	3	Vegetated Swale	-	to SCM No. 4	2.00
001	4	Infiltration Basin	-	to SCM No. 5	0.00
001	5	Infiltration Basin	-	Off-Site	0.00

VALIDATION – The ***Incremental SCM DA*** may not exceed the ***Total Drainage Area*** in the General Worksheet for the same POA, and the sum of ***Incremental SCM DA*** for all SCMs may not exceed the sum of ***Total Drainage Areas*** for all POAs and undetained area in the General Worksheet.

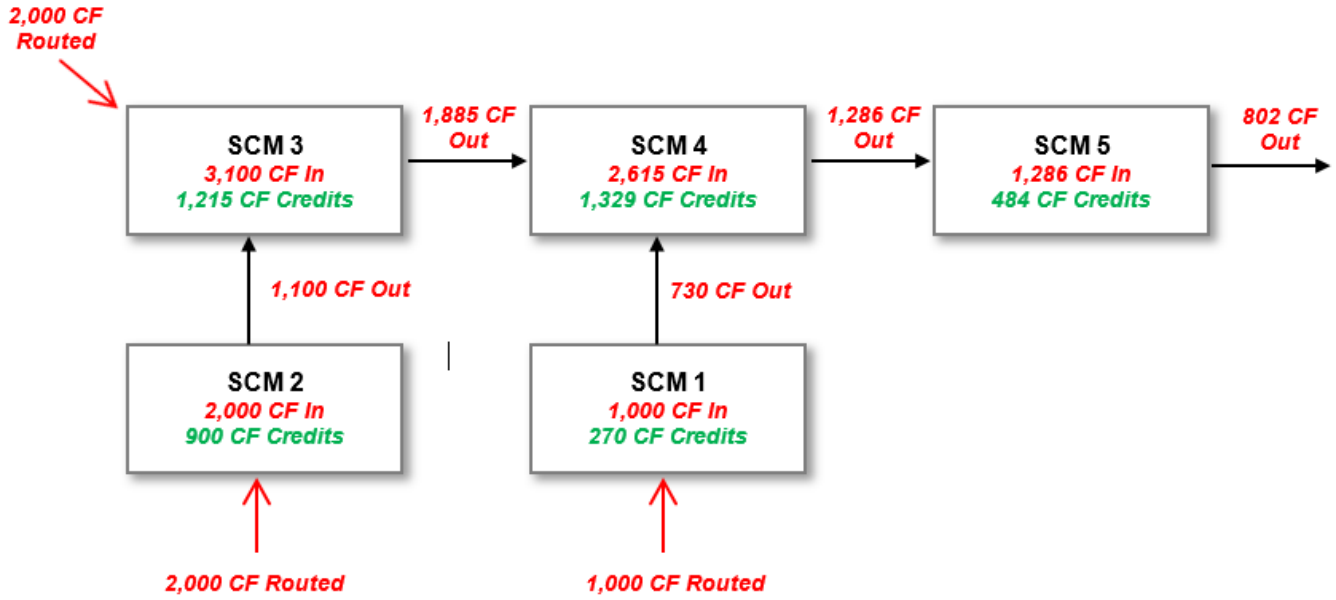
NOTE 28 – SCMs must be designed considering the entire drainage area that is tributary to the SCM and the resultant flows. SCM design calculations must reflect these flows. However, runoff from outside the project site boundary is deducted from management credits, as explained below.

- **Total Vol. (Volume) Routed to SCM (CF)** – Calculate and report the total volume routed to the SCM during the 2-year/24-hour storm event, in cubic feet (CF), including areas outside the project site, if applicable. The spreadsheet does not calculate this volume automatically.

NOTE 29 – Include the area associated with the SCM as part of the volume calculation, as applicable. For example, the volume routed to an infiltration basin must include stormwater from the drainage area routed to the SCM along with direct precipitation on the infiltration basin.

NOTE 30 – A SCM that is in series with another SCM for the same POA should have a volume routed to the SCM that is no less than the preceding SCM in the series, minus infiltration and ET credits. Volume that is permanently removed by infiltration or ET cannot be counted as volume contributing to a subsequent SCM in a series. Applicants should develop a water balance for complex SCMs in series scenarios (see Example 5).

Example 5 – SCMs are in series as described in Example 4. Stormwater is routed to SCM Nos. 1, 2, and 3 as shown below, and the following water balance is generated upon entry of design parameters into the Structural SCMs table:



The following (abbreviated) table illustrates how this scenario appears in the Structural SCMs table:

SCM No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Volume Routed to SCM (CF)
001	1	Vegetated Swale	-	to SCM No. 4	4.00	1,000
001	2	Rain Garden / Bioretention	-	to SCM No. 3	3.00	2,000
001	3	Vegetated Swale	-	to SCM No. 4	2.00	3,100
001	4	Infiltration Basin	-	to SCM No. 5	0.00	2,615
001	5	Infiltration Basin	-	Off-Site	0.00	1,286

The following (abbreviated) table illustrates how this scenario appears in the Structural SCM Water Quality Credits table in the Quality Worksheet:

POA No.	SCM No.	SCM Name	MRC?	SCM DA (acres)	Vol. Routed to SCM (CF)	Inf. & ET Credits (CF)	Outflow (CF)
001	1	Vegetated Swale	-	4.00	1,000	270	730
001	2	Rain Garden / Bioretention	-	3.00	2,000	900	1,100
001	3	Vegetated Swale	-	2.00	3,100	1,215	1,885
001	4	Infiltration Basin	-	0.00	2,615	1,329	1,286
001	5	Infiltration Basin	-	0.00	1,286	484	802

NOTE 31 – All values input into the Volume Routed to SCM column should have corresponding calculations that support the reported volume. Flow charts, diagrams, or other graphical depictions are recommended, especially for more complex sites. This will also provide for more timely reviews.

NOTE 32 – When the Capture and Use SCM is selected, the volume that is captured and reused should be entered in "Volume Routed to SCM". For example, a retention basin is used in conjunction with capture and reuse, where 20,000 CF is routed to the SCM but only 5,000 CF is captured and used, the "Volume Routed to SCM" for the Capture and Use SCM would be 5,000 CF. A water budget should be developed and attached to the worksheet. Also, all of the volume reused must be collected and dispersed in a timely manner.

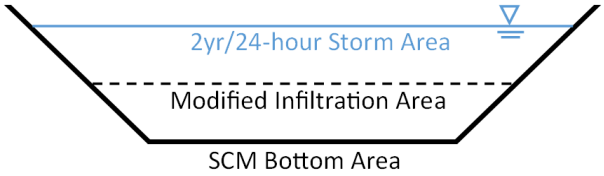
VALIDATION – The Total Volume Routed to any individual SCM must be greater than or equal to the Off-Site Volume Routed to the SCM and the difference between the sums of Total Volume Routed to SCM and Off-Site Volume Routed to SCM may not exceed the calculated post-construction runoff volume for the 2-year/24-hour storm.

- **Off-Site Vol. (Volume) Routed to SCM (CF)** – If the Total Volume Routed to SCM includes any runoff from outside the project site, enter this off-site volume at the 2-year/24-hour storm event, in CF.

- **Infiltration / Vegetated Area (SF)** – Enter the infiltration area of the SCM in square feet (SF), if applicable. If the SCM is not designed as an infiltration SCM, but will maintain vegetation, enter the area of vegetation in which the root zone is expected to be in contact with stormwater at the 2-year/24-hour storm event.

  For a vegetated surface SCM, only the bottom of the SCM may be reported as Infiltration / Vegetated Area because ET credit assumes that soils are saturated at the rooting depth. Side slopes may not be considered part of the Infiltration / Vegetated Area.

  For a subsurface infiltration SCM, the designer may choose to report either the bottom area or a modified infiltration area. To use a modified infiltration area, the designer must use a model that considers soil physics and variable hydraulic head conditions to demonstrate that the total infiltration volume exceeds the Infiltration Credit calculated by the PCSM Spreadsheet. The modified infiltration area may not result in an Infiltration Credit calculated by the PCSM Spreadsheet that exceeds the total infiltration volume demonstrated by the model using the same variables (e.g., infiltration duration, storage, etc.). The modified infiltration area can be calculated by the average of the 2-year/24-hour surface area and the bottom of the SCM area (see diagram below). For example, if the area associated with the 2-year/24-hour storm event is 5,000 sf and the bottom area is 2,500 sf, then 3,750 sf can be entered into the Spreadsheet (as long as the Infiltration Credit does not exceed the modeled infiltration volume). The supporting calculations and model output must be provided.



NOTE 33 – The spreadsheet does not consider hydraulic loading to SCMs. The SCM designer is responsible for selecting appropriate design criteria using the Stormwater BMP Manual or other published and defensible resources.

- **Infiltration Rate (in/hr)** – Report the design infiltration rate or design saturated hydraulic conductivity (Ksat) associated with the infiltration area, in inches per hour (in/hr). If the SCM is not designed as an infiltration SCM, leave this field blank. Appendix C of the 2006 Stormwater BMP Manual may be used for infiltration test frequency (i.e., for large infiltration areas, multiple test pits should be evenly distributed at the rate of 4 to 6 tests per acre of SCM infiltration area).and methods (although percolation tests are not acceptable) until December 31, 2027. If the methods recommended by the 2006 Stormwater BMP Manual are used, a safety factor of 2 or 3 should be applied when an infiltration rate is determined rather than Ksat. The infiltration rate entered into the PCSM Spreadsheet should be the geometric mean infiltration rate of the SCM-specific tests, divided by 2 or 3, as appropriate. This value can then be multiplied by 110% because the PCSM Spreadsheet deducts 10% from the infiltration rate when calculating infiltration credit. The new

testing methodologies and frequencies presented below can be utilized in lieu of Appendix C from the 2006 Stormwater BMP Manual, if desired.

Starting January 1, 2028, unless an alternative is approved by DEP/CCD, infiltration test frequency must be in accordance with **Table 2** below and one of the following methods must be utilized to obtain Ksat results:

- ASTM D3385 (Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer) for double ring infiltrometer tests.
- ASTM D5126, Section 4.1.2.1 (Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in Vadose Zone) for single ring infiltrometer tests.
- ASTM D8152 (Standard Practice for Measuring Field Infiltration Rate and Calculating Field Hydraulic Conductivity Using the Modified Philip Dunne Infiltrometer Test) for MPD infiltrometer tests.
- ASTM D6391 (Standard Test Method for Field Measurement of Hydraulic Conductivity Using Borehole Infiltration) for cased borehole infiltration tests.

Table 2: Minimum SCM-Specific Infiltration Test Methods and Frequencies (Starting January 1, 2028)

Criteria	Size of Infiltration SCM	Number of Infiltration Tests Required per Infiltration Test Type			
		Double Ring [1]	Single Ring	Single Ring (Cased Borehole)	Basin Flood Test
Minimum number of tests for each SCM	≤2,500 SF	3 tests	5 tests	5 tests	1 test [3]
	> 2,500 SF to ≤5,000 SF	4 tests	6 tests	6 tests	
	< 5,000 SF to ≤10,000 SF	5 tests	8 tests	8 tests	2 tests [3]
	>10,000 SF	1 test per 2,000 SF with a maximum of 15 tests	1 test per 1,250 SF with a maximum of 20 tests		1 test per 5,000 SF with a maximum of 3 tests [3]
Maximum number of tests per pit	-	2 tests per pit [2]	3 tests per pit [2]	2 tests per pit [2]	1 test per pit

1. Double ring methods require less tests due the area of influence of the testing methods (i.e. 12-inch diameter) compared to the smaller diameter of single ring methods (i.e., 4-inch diameter).
2. Recommendation based on shallow test pit excavation (i.e., small tests pits that accommodate the indicated number of tests). The number of infiltration tests per pit could be adjusted by the qualified professional based on size of test pit excavation, adequate space for testing such that tests do not influence one other, and that the test sites are distributed enough to describe the entire SCM infiltration area.
3. All basin flood tests must be performed within the SCM footprint with a minimum of one test within one vertical foot of proposed infiltration interface (SCM bottom elevation) unless the qualified professional determines that the soils are vertically consistent enough for the test depth to be relevant. See **Attachment B** for basin flood test procedures.

For the final design of each infiltration SCM, the minimum number of infiltration tests specified in the table above should be performed within 100 feet of the infiltration SCM. At least one test must be within 25 feet of the final location of each infiltration SCM and within one vertical foot of each proposed infiltration interface (SCM bottom elevation) unless the qualified professional determines that the soils are vertically consistent enough for the test depth to be relevant. More tests may be warranted if the results of the closest three tests vary significantly (i.e., by an order of magnitude). Infiltration tests may be used for the design of multiple SCMs as long as the minimum testing location requirements are met for each SCM. For example, one infiltration test could be used twice for two different infiltration SCMs if the infiltration test meets the requirements for both SCMs. Follow-up testing may be necessary if the location or elevation of any SCM changes to the degree that the infiltration testing previously performed no longer meets proximity, elevation, and density (i.e., number of tests per area) requirements.

If site soil conditions (for a well-seated and run test) are such that the Ksat result is less than or equal to 0.25 in/hr after 3 hours (excluding any presoak) or longer (based on the judgment of a qualified professional), the tests may be terminated and the data used to justify the use of MRC designs for stormwater management at the tested location. For the purposes of justification of use of MRC SCMs, the Ksat determined in the field should be used (i.e., no safety or reduction factors applied).

The geometric mean Ksat result of SCM-specific tests should be calculated and entered into the PCSM Spreadsheet without the use of safety or reduction factors.

- **Infiltration Period (hours)** – Select the infiltration period (i.e., dewatering time), in hours, for SCMs that will rely on infiltration. DEP may accept infiltration periods up to 4 days (96 hours). However, 1) the maximum ponding depth for infiltration and bioretention SCMs may not exceed 2 feet at the 2-year/24-hour storm event, and 2) local ordinance requirements must be met, where applicable. Many local ordinances require infiltration periods no greater than 3 days (72 hours). The minimum infiltration period is 12 hours, which accounts for the loss due to infiltration during the 24-hour storm event.

  NOTE 34 – The actual computed dewatering time should be entered here. Exaggerated (i.e., too short or too long) durations will negatively affect the infiltration credit calculations. However, if the computed dewatering time is less than 12 hours, you must select 12 hours.

  To calculate infiltration period use the following formula:

  Volume Routed to SCM* (CF) / Infiltration Capacity (CF/hr)

  Where Infiltration Capacity = Infiltration Surface Area (SF) x (Infiltration Rate (in/hr) / 12 in/ft)

  * Where the stored volume at the lowest orifice is less than the Volume Routed to SCM, the stored volume at the lowest orifice must be used.

- **Vegetated?** – Select "Yes" if the structural SCM will be "vegetated." A vegetated PCSM SCM is a permanent SCM where vegetation is a dominant or significant component within the storage area. **To qualify for ET credits, vegetation must include plug plantings with a mix of native woody, herbaceous, and grass species**. **Plug plantings should be spaced approximately 2-3 feet on center. Seed mixes may be used in addition to plug plantings but must not be the only form of vegetation planted to qualify for ET credit**. Grasses may be used, but may not be the only species planted, because other species with deeper penetrating root systems are needed to achieve the infiltration and ET credits calculated by the spreadsheet. Grasses within the vegetated area may be mowed twice per year to a height no lower than 6 inches (or cut back every year) but not more frequently. The choice of seed mixes and plantings is to be made by the designer in consultation with the site owner.

- **Media Depth (ft)** – Enter the design depth of media used for the SCM, in feet (e.g., 1.5 feet of planting soil for a rain garden or 2 feet of stone for an infiltration trench). This does not apply to certain SCMs. If an underdrain is used, report the depth from the bottom of the media to the invert of the underdrain. If the underdrain will not be capped or will otherwise allow water to drain freely, the media depth is zero (0). If the underdrain is capped and will allow for storage of water in the media, the entire depth of media may be reported. If there is an underdrain for an MRC SCM that uses an upturned elbow, the internal water storage (IWS) depth should be reported (i.e., depth of media from upturned elbow to SCM bottom).

  NOTE 35 – The media depth must be greater than or equal to 6 inches (0.5 ft) to obtain ET credits. If the design depth is less than 6 inches, leave this cell blank.

- **Stored Volume (CF)** – Enter the volume that the SCM is designed to store at the 2-year/24-hour storm event, in cubic feet (CF).

  - For vegetated SCMs that will receive infiltration and ET credit, the stored volume is calculated from the lowest orifice of the outlet structure to the top of the media surface.

  - For non-vegetated SCMs that will receive infiltration credit but not ET credit (e.g., underground infiltration SCMs), the stored volume is calculated from the lowest orifice of the outlet structure to the bottom of the media (i.e., top of native soils).

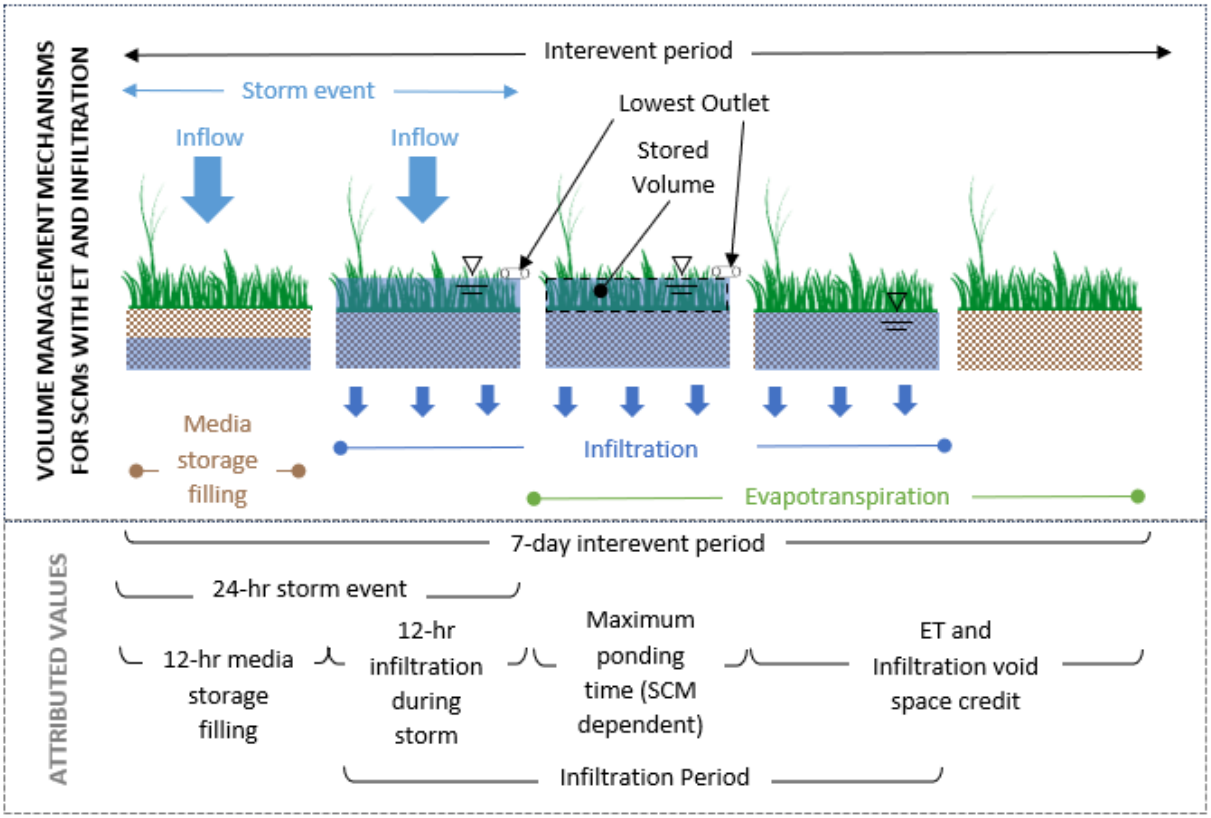
    NOTE 36 – Media void volume can be considered part of stored volume for non-vegetated infiltration SCMs but not vegetated infiltration SCMs because of the way the infiltration and ET crediting

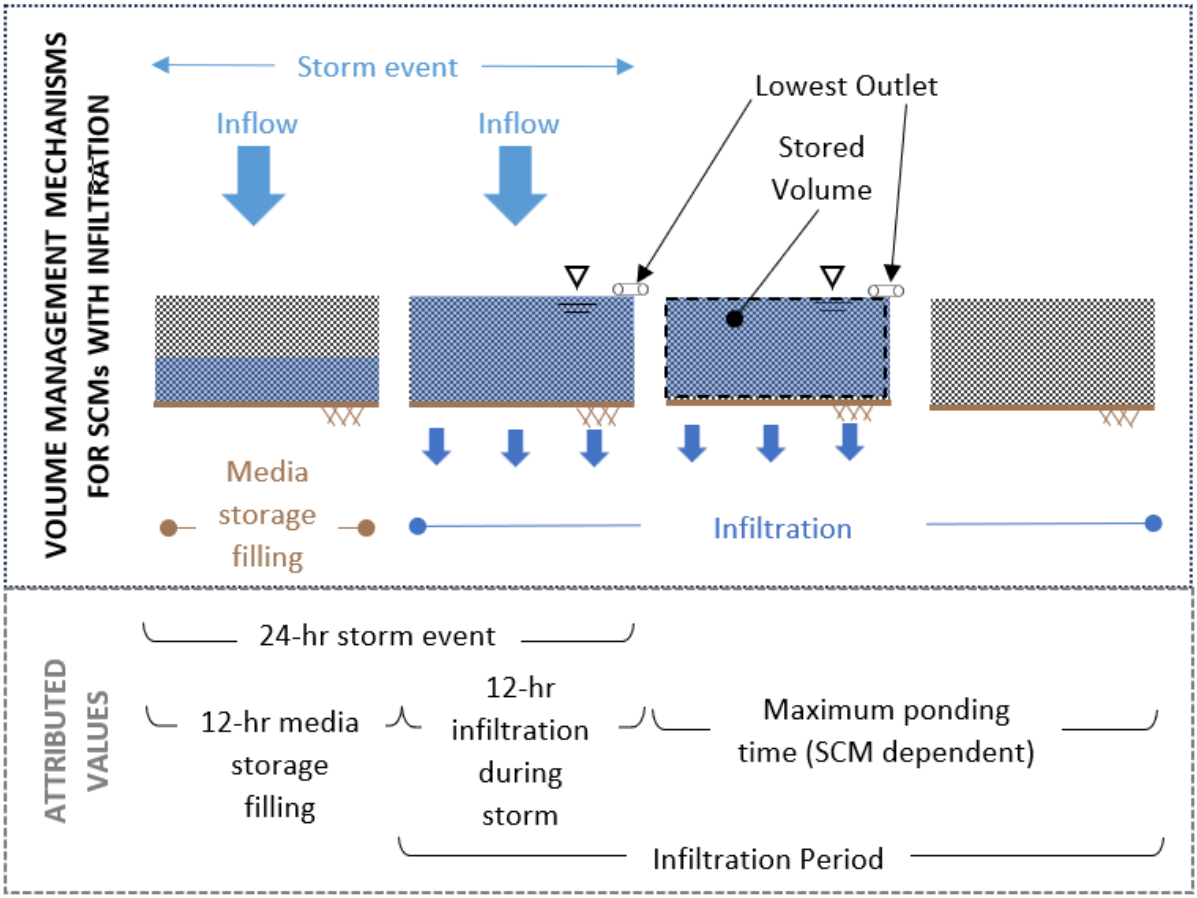
calculations are designed. Including media void volume for a vegetated infiltration SCM may result in "double counting" of credit.

NOTE 37 – Stored volume is not calculated automatically due to the number of variables required for certain SCMs to do so. Stored volume is not a credit because it does not represent volume reduction or management; when stored volume infiltrates, evapotranspires, is released or otherwise used, stored volume converts to credit. **Stored volumes should be calculated based on the lowest outlet elevation** (either an underdrain, overflow, or outlet to SCM in series), as the volume of water must be stored within the SCM for infiltration and ET credit following the storm event. If the design water level within an SCM at the 2-year/24-hour storm event exceeds the lowest outlet elevation, it may not be counted as stored volume. If the user believes that the release of stormwater from a control such as an orifice is sufficiently slow that water is available to be infiltrated or evapotranspired after the infiltration period, the user may use a more complex model to demonstrate additional volume reduction credit.

NOTE 38 – The volume associated with void spaces cannot be included in the calculation of Stored Volume below the bottom of the SCM (i.e., infiltration interface with the native or in-situ soil). The Infiltration Rate entered for the SCM should be associated with the elevation of the SCM bottom. A designer may not include in-situ soil depth below the SCM bottom as storage. If media such as amended soils will be placed on top of the SCM bottom, void spaces in the media may be used toward Stored Volume for non-vegetated infiltration SCMs only.

VALIDATION – Stored volume may not exceed the value entered for Volume Routed to SCM. It is understood that SCMs may be designed for storms larger than the 2-year/24-hour storm event, but stored volume as used in the Volume Worksheet pertains only to storage of stormwater associated with the 2-year/24-hour storm event.





- **Infiltration Credit (CF)** – The infiltration credit for an SCM is automatically calculated once the Infiltration Rate, Infiltration Period, Infiltration Area, Storage Volume and Total Volume Routed to SCM data are entered. If a value for Off-Site Volume Routed to SCM is entered, it is deducted from the Total Volume for this calculation. The calculation in narrative form is as follows (**Equation 4**):

  Infiltration Credit (CF) = Infiltration Rate (in/hr) x 0.9 (factor of safety) / 12 in/ft)) x 12 hrs (infiltration during storm) x Infiltration Area (ft^2) + (the lesser of Storage Volume or (Infiltration Period (hrs) – 12 hrs x (Infiltration Rate (in/hr) x 0.9 (factor of safety) / 12 in/ft) x Infiltration Area (ft^2)), where Infiltration Credit may not exceed the Volume Routed to the SCM – Off-Site Volume Routed to the SCM.

  This equation conservatively estimates infiltration in a manner consistent with soil physics models and assumes that infiltration at saturated hydraulic conductivity occurs at only 12 hours of a 24-hour storm event.

- **ET Credit (CF)** – The evapotranspiration credit for a vegetated SCM is automatically calculated when the user selects "Yes" in the "**Vegetated?**" column and when Volume Routed to SCM and Media Depth data are entered. Media depth should approximate rooting depth for this credit.

  DEP recognizes that over the infiltration period there will be evapotranspiration (ET) that occurs in these vegetated SCMs, even in poorly drained soils. ET credit is based on DEP-funded research conducted by Villanova University[1] on volume reduction credit within rain gardens (or generally, bioretention facilities). The research is most applicable to stormwater control measures utilizing vegetative growth in engineered media above native soils, but may also be used to estimate ET in native soils.

[1] Hess, Amanda Jean, Ph.D., May 2017. Rain Garden Evapotranspiration Accounting. Doctorate Dissertation, Villanova University College of Engineering.

Although DEP has categorized this credit as ET, the research on which the credit is based evaluated the full volume reduction credit potential for vegetated systems, including infiltration during storm events as well as void space credit. In order to put the findings of this research into practice, DEP decided to utilize total void space credit results from experiments on sandy loam soil with a medium-range crop coefficient at various soil/rooting depths over a six-day period following a one-inch storm event (see "Appendix M" of research). This approach is considered to be representative of actual volume reduction potential for most vegetated systems.

When infiltration is not limited (i.e., infiltration rate or Ksat is ≥ 0.25 in/hr), the spreadsheet utilizes **Table 3**, below, to determine the percentage of captured stormwater that is reduced through vegetated systems.

The spreadsheet executes the following calculation in narrative form (**Equation 5**):

ET Credit (CF) = ET Volume Reduction (%) (from **Table 3**) x Media Depth (ft) x Infiltration Area (ft^2), where ET Credit plus Infiltration Credit may not exceed Volume Routed to SCM.

NOTE 39 – This calculation assumes that all infiltrating area is vegetated.

DEP recognizes that this method is a simplification of the site-specific and regional factors that go into estimating potential ET. If an applicant wishes to pursue estimation of ET Credit in a different or more comprehensive manner, a separate analysis may be conducted and attached to the permit application or Volume Worksheet.

Table 3: Total Void Space Credit Used by Spreadsheet for Vegetated Systems with Infiltration Rates ≥ 0.25 in/hr

Media Depth (ft)	Volume Reduction (% Volume)	Media Depth (ft)	Volume Reduction (% Volume)
0.5	34.3	2.8	25.5
0.6	33.6	2.9	25.4
0.7	32.9	3.0	25.3
0.8	32.2	3.1	25.2
0.9	31.5	3.2	25.1
1.0	30.7	3.3	25
1.1	30	3.4	25
1.2	29.3	3.5	24.9
1.3	28.5	3.6	24.9
1.4	28.2	3.7	24.8
1.5	27.9	3.8	24.8
1.6	27.6	3.9	24.7
1.7	27.3	4.0	24.7
1.8	27	4.1	24.6
1.9	26.6	4.2	24.6
2.0	26.3	4.3	24.5
2.1	26.2	4.4	24.5
2.2	26.1	4.5	24.4
2.3	26	4.6	24.4
2.4	25.9	4.7	24.3
2.5	25.8	4.8	24.3
2.6	25.7	4.9	24.2
2.7	25.6	5.0	24.2

NOTE 40 – ET Credit is balanced with Infiltration Credit so that the sum of these Credits does not exceed the Total Volume Routed to SCM. Therefore, the actual volume of stormwater removed through

ET is not necessarily shown. For example, if the Total Volume Routed to SCM is 100 CF and the Infiltration Credit is determined to be 70 CF, the ET Credit may be displayed as 30 CF, although actual ET Credit may be higher. Actual ET Credit is shown when the sum of ET and Infiltration Credits is less than the Total Volume Routed to SCM – Off-Site Volume Routed to SCM.

When the infiltration rate or Ksat is less than 0.01 in/hr, the spreadsheet utilizes **Table 4**, below, to determine the percentage of captured stormwater that is reduced by ET through vegetated systems. **Table 4** is based on the same research as was used to derive Table 3 except only the volume associated with the difference between wilting point (i.e., the minimal point of soil moisture a plant requires not to wilt) and field capacity (i.e., the volume of water held in the soil after excess water is removed by gravity) is used.

Table 4: ET-Specific Credit Used by Spreadsheet for Vegetated Systems with Infiltration Rates < 0.01 in/hr

Media Depth (ft)	ET Volume Reduction (% Volume)	Media Depth (ft)	ET Volume Reduction (% Volume)
0.5	11.3	2.8	2.5
0.6	10.6	2.9	2.4
0.7	9.9	3.0	2.3
0.8	9.2	3.1	2.2
0.9	8.5	3.2	2.1
1.0	7.7	3.3	2
1.1	7	3.4	2
1.2	6.3	3.5	1.9
1.3	5.5	3.6	1.9
1.4	5.2	3.7	1.8
1.5	4.9	3.8	1.8
1.6	4.6	3.9	1.7
1.7	4.3	4.0	1.7
1.8	4	4.1	1.6
1.9	3.6	4.2	1.6
2.0	3.3	4.3	1.5
2.1	3.2	4.4	1.5
2.2	3.1	4.5	1.4
2.3	3	4.6	1.4
2.4	2.9	4.7	1.3
2.5	2.8	4.8	1.3
2.6	2.7	4.9	1.2
2.7	2.6	5.0	1.2

When the infiltration rate or Ksat is greater than or equal to 0.01 in/hr and less than 0.25 in/hr, ET credit is computed through linear interpolation between the volumes determined by Tables 3 and 4.

- **Infiltration & ET Credits – Total (CF)** – The sum of all Infiltration and ET Credits for all SCMs is calculated and presented only if one or more SCMs receive stormwater from off-site sources. It is shown only for the purpose of comparison with project site credits (see below).

- **Infiltration & ET Credits – Project Site (CF)** – The sum of all Infiltration and ET Credits for all SCMs is calculated and presented for the project site (i.e., not off-site stormwater routed to SCMs). This sum corresponds to the credits calculated and displayed for individual SCMs.

- **Managed Release Credit (CF)** – Enter the volume management credits reported on the MRC Simplified Design Spreadsheet and/or the MRC Spreadsheet, as applicable.

- **Capture and Use Credit (CF)** – If any selected SCM is a "Capture and Use" SCM, the Total Volume Routed to SCM is converted to a credit and the total of all credits is displayed. All other cells to the right after the Total Volume Routed to SCM column within the row for a Capture and Use SCM should be left blank.

- **Riparian Forest Buffer Credit (CF)** – If the SCM named "Riparian Forest Buffer (Min 150 Ft)" is selected, following the entry of Total Volume Routed to SCM, a Riparian Forest Buffer Credit field is displayed as shown below. Enter the ***net change in volume*** – ***not the total volume*** – routed to the riparian forest buffer from within the project site area. All other cells to the right after the Total Volume Routed to SCM column within the row for the Riparian Forest Buffer (Min 150 Ft) SCM should be left blank. If the SCM 3.4.2 Spreadsheet (Riparian Forest Buffers) is used to determine credit, enter the credit value determined by this spreadsheet into the PCSM Spreadsheet (Structural SCM Volume Credits Table, Total Volume Routed to SCM column).

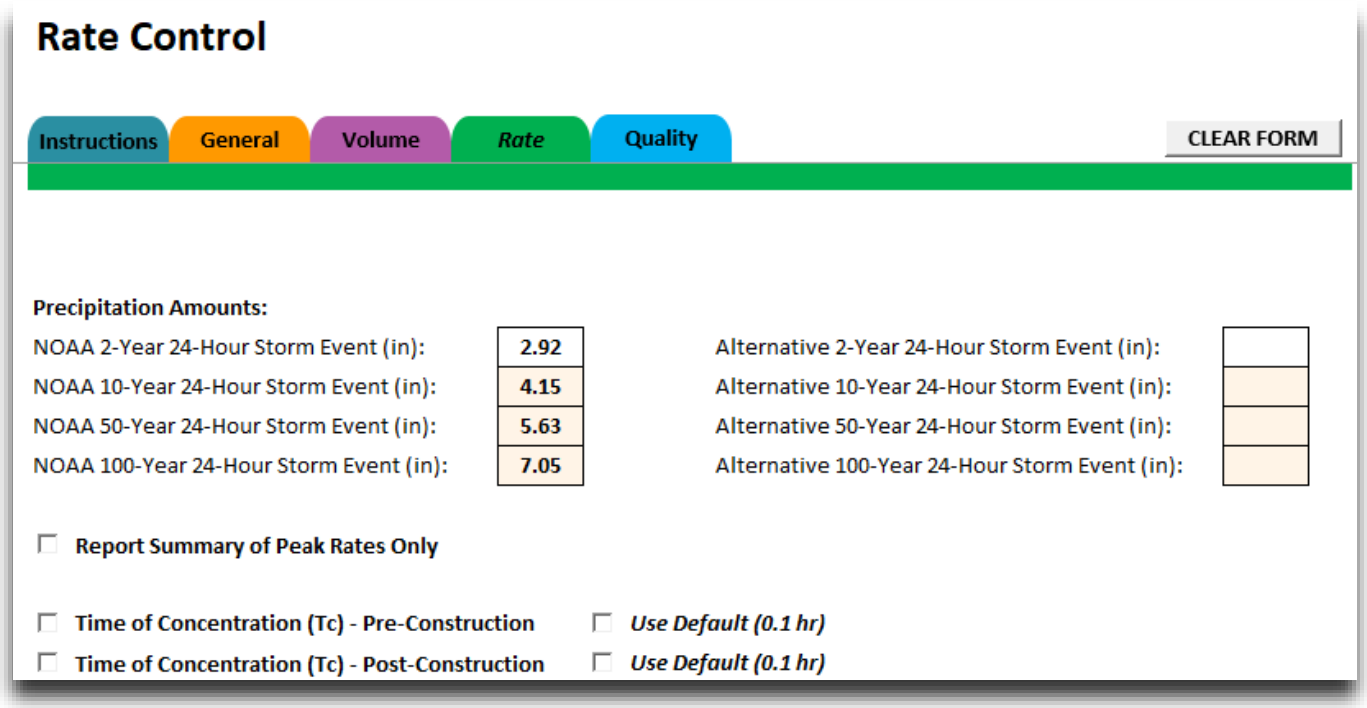
- **Total Credits (CF)** – The bottom of the worksheet displays the cumulative credits (non-structural, structural, managed release, capture and use, and riparian forest buffer credits) and compares it to the net change in volume to manage, calculated previously. The ***Total Off-Site Volume Treated by On-Site SCMs*** is deducted from ***Total Credits***. When the number of credits meets or exceeds the net change in volume, satisfaction of the volume management requirement will be shown in green text; in the interim, red text will indicate the volume requirement is not satisfied.

INFILTRATION & ET CREDITS - TOTAL (CF):	3,000
INFILTRATION & ET CREDITS - PROJECT SITE (CF):	2,500
MANAGED RELEASE CREDIT (CF):	4,000
CAPTURE AND USE CREDIT (CF):	3,000
RIPARIAN FOREST BUFFER CREDIT (CF):	2,000
NET CHANGE IN VOLUME TO MANAGE (CF):	11,004
TOTAL CREDITS (CF):	11,500

VOLUME REQUIREMENT SATISFIED

Rate Worksheet

The Rate Worksheet utilizes the design standard that applicants must manage the net change in peak rate for the 2-, 10-, 50- and 100-year/24-hour storm events. Peak rates are determined using the Graphical Peak Discharge Method in TR-55. The Rate Worksheet is intended for drainage areas less than 5 acres or for sites that contain simple land cover conditions (i.e., those projects where the limitations of the Graphical Peak Discharge Method do not apply). Any applicant with a project utilizing hydrological calculations that involve pond routings or otherwise involve multiple land covers may report a summary of peak rates in this worksheet but should not use the calculations in this worksheet to determine peak rates. In such cases the output of hydrologic modeling software should be attached to the permit application to demonstrate rate control requirements have been met.



The Rate Worksheet includes two possible advisory statements that may be displayed below the top menu:

1. If the criteria for a small site exception are satisfied as explained in the instructions for the General Worksheet, the following statement is displayed:

SMALL SITE EXCEPTION SATISFIED: RATE CONTROL NOT REQUIRED

2. If the weighted curve number for either pre-construction or post-construction conditions is less than 50, the Rate Worksheet should not be used due to the error associated with weighted curve numbers under 50 and the limitations of the Graphical Peak Discharge Method. In such cases, use hydrologic modeling software that enables the use of separate curve numbers. The user can report a summary of peak rates and attach model data or calculations. The following statement is displayed:

WEIGHTED CN FOR PRE- AND/OR POST-CONSTRUCTION CONDITIONS PRECLUDES USE OF RATE CALCULATIONS IN THIS WORKSHEET. REPORT SUMMARY OF PEAK RATES AND ATTACH MODEL DATA OR CALCULATIONS.

- **Precipitation Amounts** – Enter the NOAA Atlas 14 storm event totals for the 10-, 50- and 100-year/24-hour storm events (the 2-year/24-hour storm event total is reported as entered in the Volume Worksheet). If a different source of data was used for precipitation amounts, enter those values in the cells labeled for alternatives.

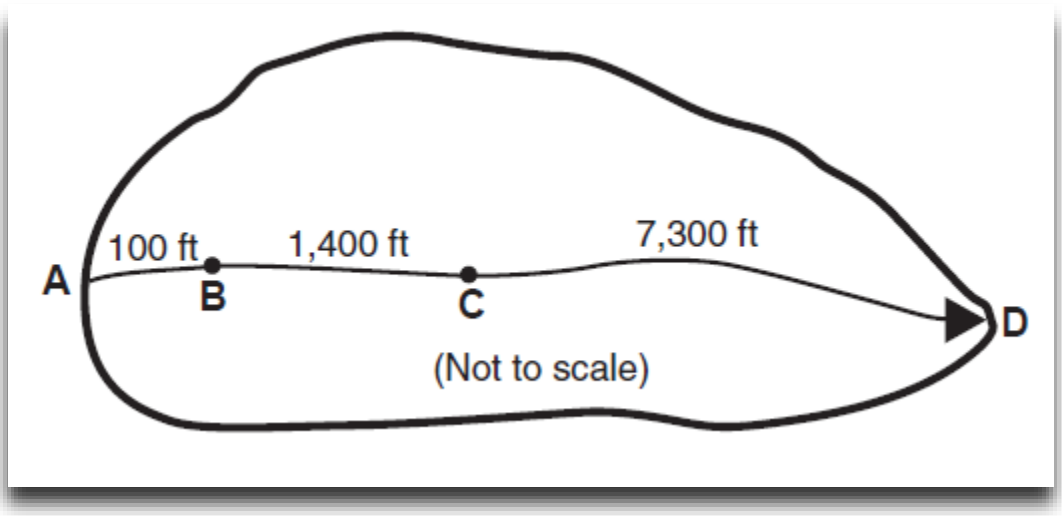
  NOTE 41 – If alternative precipitation amounts are utilized for the Rate Worksheet, they must be derived from the same source as the alternative precipitation amount used in the Volume Worksheet.

- **Report Summary of Peak Rates Only** – Users should select this box if modeling using software or other calculations are performed and the Rate Worksheet is not used for these calculations. Checking the box will provide a table where the user can manually enter pre- and post-construction peak rates for the storm events.

  NOTE 42 – The design of volume and rate control SCMs includes a consideration of stormwater from drainage areas that are outside of the disturbed area. SCM design calculations that are submitted as part

of a PCSM Plan must include all stormwater flows routed to them, including those originating from outside the disturbed area.

- **Time of Concentration (Tc) – Pre- and Post-Construction** – The time of concentration for pre- and post-construction runoff uses the methodologies contained in Chapter 3 of TR-55. The designer should be knowledgeable in determining the types of runoff and establishing hydraulic flow paths. A typical stormwater flow routing diagram is shown below ("D" is the SCM location or discharge point).



The user may check the box for "Use Default (0.1 hr)", if appropriate, to automatically set Tc values to 0.1 hour (6 minutes), which is the minimum recognized by the TR-55 method, in lieu of conducting further analysis. Note that you should check the Time of Concentration boxes first, and then check the "Use Default (0.1 hr)" box, in order for automated calculations to occur.

Otherwise, click on the appropriate boxes for Sheet Flow, Shallow Concentrated Flow and Open Channel Flow to determine the travel time for each of these types of runoff. Each runoff type provides for two flow segments. Once the minimum necessary information is entered by the user into the highlighted cells, travel time is computed using Equations 3-3, 3-1 and 3-4 of TR-55 for Sheet Flow, Shallow Concentrated Flow and Open Channel Flow, respectively. The average velocity for Shallow Concentrated Flow is calculated by the spreadsheet using Figure 3-1 of TR-55 for paved and unpaved surfaces. Velocity for open channel and piped flow is computed using Manning's equation.

The Tc values for Pre- and Post-Construction are summed for all flow conditions and are presented for each storm event.

- **Peak Discharge Rates** – Upon completing the Time of Concentration section, the Peak Discharge Rates table will be completed to show the difference in the estimated peak rates between pre- and post-construction (without SCMs) for each storm event.

  - **Disturbed Area (mi^2)** – The Area of Earth Disturbance in Drainage Area (acres) entered on the General Worksheet is divided by 640 to present the disturbed area in terms of square miles for both pre- and post-construction conditions.

  - **Runoff Depth (inches)** – An area-weighted CN value is computed from the values entered into the Pre- and Post-Construction Volume Calculation Tables (i.e., one weighted CN for pre-construction and one for post-construction). The depth of runoff associated with the weighted CN values is then looked up using the default or user-entered peak design storm events, based on NRCS' National Engineering Handbook (Chapter 10, Estimation of Direct Runoff from Storm Rainfall, Appendix 10A).

  - **Unit Peak Discharge (csm/in)** – Unit peak discharges are calculated using the Graphical Peak Discharge Method (Chapter 4 of TR-55). The following steps are taken in the spreadsheet for this calculation:

- Using the County selected on the General worksheet, the rainfall distribution type (A, B, C or D) is determined using a lookup chart based on the NRCS National Engineering Handbook Pennsylvania Notice 34 Supplement.

- The initial abstraction (Ia) for the area-weighted CN is determined using Table 4-1 of TR-55.

- Unit Peak Discharges are calculated using equation PA2-2 of the Pennsylvania Notice 34 Supplement, as shown below (**Equation 6**). Coefficients are derived using Tables A2-1 through A2-4 of the Supplement, which use the rainfall distribution type and the ratio of Ia to the various storm event totals (inches).

$$q = 10 \text{ ^ } (Coeff_1 + Coeff_2 * LOG(Tc) + Coeff_3 * (LOG(Tc))^2)$$

- **Peak Discharge Rates (cfs)** – The peak discharge rate for each storm event is calculated as the product of Disturbed Area (mi^2), Runoff Depth (inches) and Unit Peak Discharge (csm/in).

- **Peak Rate Mitigation** – SCMs that were selected on the Volume Worksheet are shown. The user must then enter the peak inflow and outflow rates to and from the SCMs for the various storm events (calculations must be attached). A separate table is populated to show the differences between pre-construction rates, post-construction rates without SCMs, and post-construction rates with SCMs. Peak rates will be satisfied when green text is visible to the right of each storm event row.

Quality Worksheet

The Quality worksheet utilizes a design standard that applicants must manage the net change in pollutant loads for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN) up to and including the 2-year/24-hour storm event when compared to pre-construction pollutant loads.

- **Pre- and Post-Construction Pollutant Load Tables** – If the ***Automatically Calculate CN, Ia, Runoff and Volume*** box is checked in the Volume Worksheet, the Pre- and Post-Construction Pollutant Load tables are completed automatically.

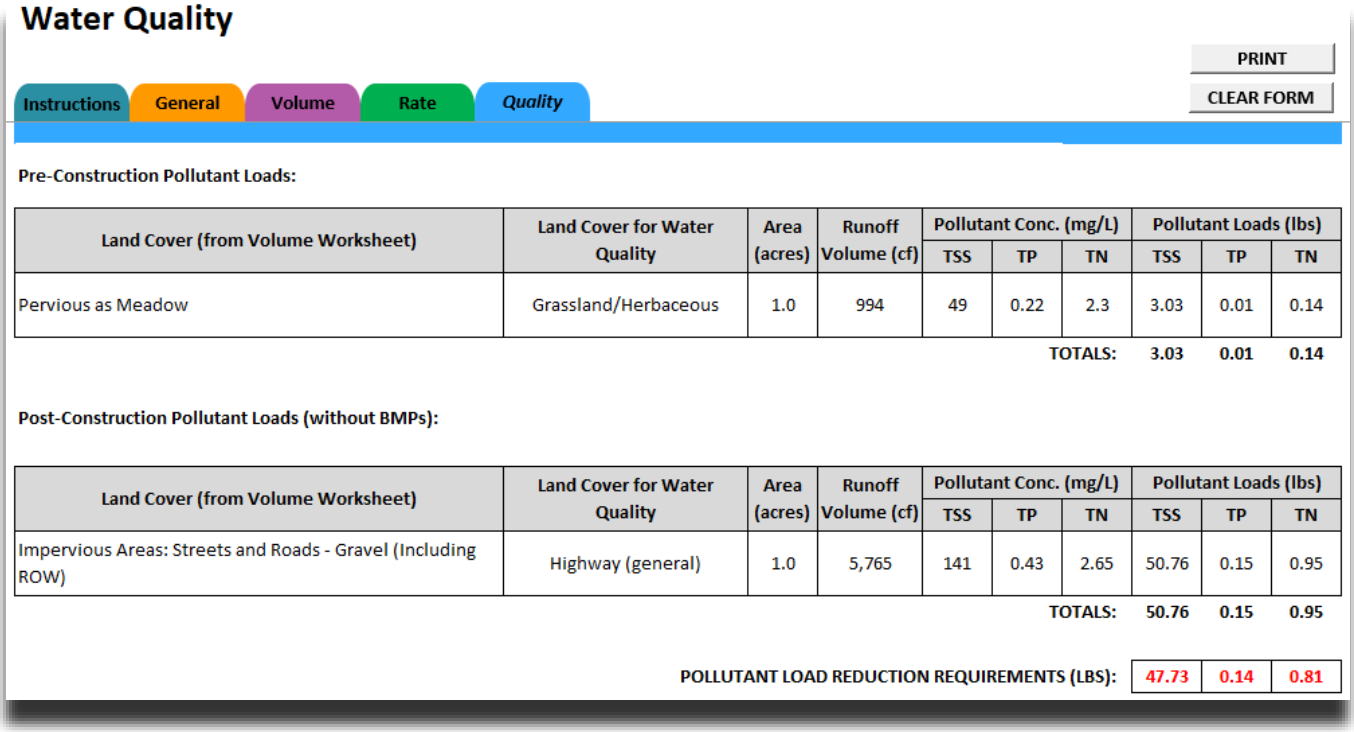
  The land covers selected or entered in the Volume Worksheet are shown in these tables and a crosswalk is used to show the land covers for Water Quality purposes. A crosswalk is necessary because available research on pollutant concentrations has not categorized concentrations by TR-55 land covers. The crosswalk, pollutant concentrations, and data sources are presented in **Attachment C**.

  If the ***Automatically Calculate CN, Ia, Runoff and Volume box*** is not checked in the Volume Worksheet, the user must enter pollutant concentrations for TSS, TP and TN. Entry of "Land Cover for Water Quality" is optional. Attach justification of the manually entered pollutant concentrations.

  Pollutant Loads are calculated by **Equation 7**:

  Event Mean Pollutant Concentration (mg/L) x (Runoff Volume (calculated in Volume Worksheet) (CF) / 43,560 CF/acre-ft) x 2.72 (conversion factor)

  Below the Pollutant Load Tables the Pollutant Load Reduction Requirements for TSS, TP and TN are presented in lbs (Post-Construction – Pre-Construction Loads). The remainder of this worksheet addresses credits to ensure Post-Construction Pollutant Loads do not exceed Pre-Construction Pollutant Loads.



Water Quality

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Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
				TSS	TP	TN	TSS	TP	TN
Pervious as Meadow	Grassland/Herbaceous	1.0	994	49	0.22	2.3	3.03	0.01	0.14
						TOTALS:	3.03	0.01	0.14

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
				TSS	TP	TN	TSS	TP	TN
Impervious Areas: Streets and Roads - Gravel (Including ROW)	Highway (general)	1.0	5,765	141	0.43	2.65	50.76	0.15	0.95
						TOTALS:	50.76	0.15	0.95
						POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	47.73	0.14	0.81

- **Characterize Undetained Areas (for Untreated Stormwater)** – This optional but recommended function allows the user to define the land cover of post-construction undetained areas, within the area of disturbance, for a more accurate estimate of the pollutant loads draining off-site through untreated stormwater. Users can check the box and complete the table by selecting Land Cover, Area (acres), and Soil Type within post-construction undetained areas, similar to how runoff volumes are estimated in the Volume Worksheet. The pollutant loads for each land cover are determined using Equation 7 and are summed. These pollutant loads are reported under "Pollutant Loads for Untreated Stormwater" (see below), unless this function is not used.

  If not used, a general estimate of pollutant loads in untreated stormwater is determined as follows:

  Step 1 – The volume of untreated stormwater is estimated by subtracting the Total Volume Routed to Structural SCMs and Non-Structural SCM Volume Credits from the Total Post-Construction Volume. It is noted that for SCMs in series in which downstream SCMs receive stormwater from additional drainage area (i.e., beyond the drainage area of prior SCMs in series), this additional volume is considered treated stormwater.

  Step 2 – Volume-weighted Event Mean Pollutant Concentrations are calculated and used to represent the average pollutant concentrations in stormwater runoff site-wide, regardless if the runoff is collected for treatment. Pollutant loads in untreated stormwater are then calculated using Equation 7, utilizing the runoff volume from Step 1 and the Volume-weighted Event Mean Pollutant Concentrations in Step 2.

  While this function is optional, in many cases its use will be beneficial as the general approach can overestimate pollutant loads from undetained areas, and is necessary to claim Pervious Undetained Area Credit (below).

- **Non-Structural SCM Water Quality Credits**

  - **Pervious Undetained Area Credit** – DEP provides this credit to promote the minimization of impervious areas and in recognition that it may not be feasible or necessary to route all post-construction stormwater flows to structural SCMs. Based on available research, DEP is applying reductions of 25%, 20%, and 15% from the Event Mean Pollutant Concentrations for TSS, TP, and TN for all post-construction land covers that are not impervious, as follows:

    - TSS Credit: 48.8 mg/L x 0.25 = 12.2 mg/L

- TP Credit: 0.22 mg/L x 0.2 = 0.044 mg/L
- TN Credit: 2.3 mg/L x 0.15 = 0.345 mg/L

When the box next to ***Pervious Undetained Area Credit*** is checked, assuming the Characterization of Undetained Areas box is checked and the table has been completed, the credit, in lbs, is calculated by (**Equation 8**):

(Runoff Volume for Pervious (non-Impervious) Undetained Area (CF) / 43,560 CF/acre-ft) x TSS, TP, and TN Credits (mg/L) x 2.72 (conversion factor)

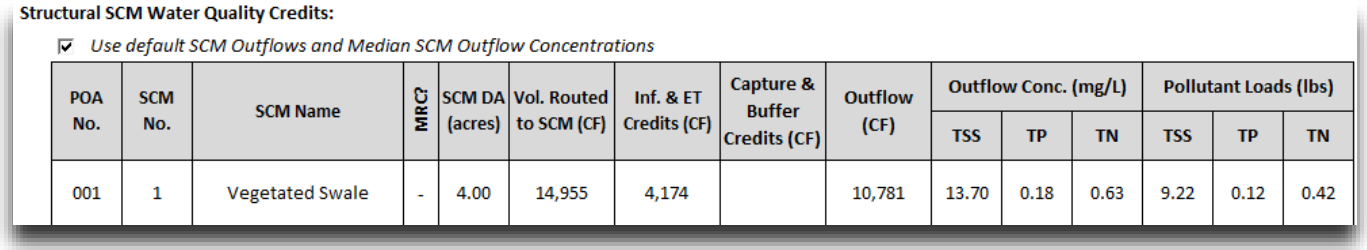
NOTE 43 – In prior versions of the PCSM Spreadsheet, DEP provided a volume credit for pervious undetained areas based on ET. Since ET is incorporated into the Curve Number approach, DEP no longer believes it is appropriate to provide volume credit, but believes water quality credit can be provided.

- **Other Credit –** If the user is claiming other non-structural SCM water quality credits, the user should enter a description of the non-structural SCM(s), enter the pollutant load reductions in the appropriate cells, and attach the supporting documentation to the permit application or the Quality Worksheet.

NOTE 44 – Street sweeping may be claimed as a water quality "Other Credit" by attaching pollutant load reduction calculations to the spreadsheet or application where the calculations are consistent with **Attachment D**.

NOTE 45 – When water quality filters or other stormwater treatment devices are used for pretreatment of stormwater prior to other structural SCMs, pollutant removal from the filters or devices are not automatically reflected in the Structural SCM Water Quality Credits table. Water quality credit is only calculated for those structural SCMs that discharge off-site. Upstream SCMs in series provide water quality benefit in the Structural SCM Water Quality Credits table only to the extent that volume is reduced. In the case of water quality filters and other devices, volume reduction does not take place, so the user must use a different approach to reflect water quality credit. A user can incorporate water quality credit for such filters or devices by reporting pollutant load reduction as an "Other Credit" or the user may manually adjust SCM Outflow Concentrations, as discussed below (in either case supporting calculations must be attached).

- **Structural SCM Water Quality Credits** – The SCMs that were selected in the Volume Worksheet will be displayed on the Quality Worksheet. As noted above, if there are SCMs that function only to improve water quality, such as inlet filters, such SCMs should be recorded on the Volume Worksheet, so that those SCMs are shown on the Quality Worksheet (although manual credit calculations will need to be provided).



Structural SCM Water Quality Credits:

☑ *Use default SCM Outflows and Median SCM Outflow Concentrations*

POA No.	SCM No.	SCM Name	MRC?	SCM DA (acres)	Vol. Routed to SCM (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	1	Vegetated Swale	-	4.00	14,955	4,174		10,781	13.70	0.18	0.63	9.22	0.12	0.42

The box for ***Use default SCM Outflows and Median SCM Outflow Concentrations*** is checked by default. When checked, Structural SCM Water Quality Credits will be calculated automatically for each SCM.

NOTE 46 – If the name of a SCM is entered by the user (rather than selected from the drop-down list) in the Volume Worksheet, the user must de-select the ***Use default SCM Outflows and Median SCM Outflow Concentrations*** box so that outflow concentrations (as described below) can be manually entered. The user may also wish to de-select this box to reflect alternative SCM Outflow Concentrations when water quality filters or devices are used as pretreatment.

The following describes the calculations in this table:

- **Outflow (CF)** –Infiltration (Inf.) & Evapotranspiration (ET) Credits and Capture (and Use) & (Riparian Forest) Buffer Credits are displayed as entered or calculated on the Volume Worksheet. The ***Volume Routed to SCM*** is the difference between ***Total Volume Routed to SCM*** and ***Off-Site Volume Routed to SCM*** on the Volume Worksheet. Outflow is calculated as the difference between ***Volume Routed to SCM*** and Inf. & ET Credits and Capture & Buffer Credits. This volume, which represents the volume not permanently removed by a SCM, is then used to calculate pollutant loads in the outflow.

  If the user wishes to use an SCM-specific outflow volume, uncheck the box for ***Use default SCM Outflows and Median SCM Outflow Concentrations*** (and attach calculations).

- **Outflow Concentrations (Conc.) (mg/L)** – Median SCM outflow concentrations (MOCs) are utilized from the International Stormwater BMP Database, 2020 Summary Statistics (The Water Research Foundation). As additional research is completed and new data are available, DEP will update MOCs accordingly. The following table presents the outflow concentrations used in the Quality Worksheet for the standard SCMs (updated October 2021):

SCM	TSS MOC (mg/L)	TP MOC (mg/L)	TN MOC (mg/L)
Porous Pavement w/Infiltration Bed	22	0.1	2.38
Infiltration Basin	10	0.24	0.96
Infiltration Bed	22	0.1	2.38
Infiltration Trench	22	0.1	2.38
Rain Garden / Bioretention	10	0.24	0.96
Dry Well / Seepage Pit	22	0.1	2.38
Constructed Filter	9	0.09	1.05
Vegetated Swale	13.7	0.18	0.63
Vegetated Filter Strip	23	0.23	1.27
Infiltration Berm & Retentive Grading	10	0.24	0.96
Vegetated Roof	23	0.23	1.27
Capture and Reuse	N/A	N/A	N/A
Constructed Wetland	14	0.12	1.37
Wet Pond / Retention Basin	12	0.12	1.2
Dry Extended Detention Basin	22	0.19	1.22
Rate Control SCM (general)	22	0.19	1.22
Water Quality Filters & Hydrodynamic Devices	39	0.18	2.21
Floodplain Restoration	24	0.18	1.45
Soil Amendment	23	0.23	1.27
Riparian Buffer	23	0.23	1.27

  NOTE 47 – A crosswalk is used to align SCM descriptions in the International Stormwater BMP Database with SCMs identified in the Stormwater BMP Manual.

  If the user wishes to use alternative SCM outflow concentrations for TSS, TP and TN, uncheck the box for ***Use default SCM Outflows and Median SCM Outflow Concentrations***.

  NOTE 48 – Pollutant concentrations are not assigned to the outflows of MRC SCMs that discharge off-site, and therefore pollutant loads are not calculated, as pollutants in such outflows are considered to be managed.

- **Pollutant Loads (lbs)** – Pollutant Loads in SCM Outflows are calculated by the equation:

  Median SCM Outflow Concentration (mg/L) x (Outflow (CF) / 43,560 CF/acre-ft) x 2.72 (conversion factor)

- **Pollutant Load Summary Table** – Below the table for Structural SCM Water Quality Credits is a summary of pollutant loading data:

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL SCM (TREATED) OUTFLOWS (LBS):	9.27	0.12	0.43
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	11.60	0.04	0.19
NON-STRUCTURAL SCM WATER QUALITY CREDITS (LBS):	8.81	0.12	0.45
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	12.05	0.04	0.16
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	13.22	0.05	0.50

WATER QUALITY REQUIREMENT SATISFIED

  - **Pollutant Loads from Structural SCM (Treated) Outflows (lbs)** – The total pollutant loads flowing out of structural SCMs is calculated and displayed.

  - **Pollutant Loads from Untreated Stormwater (lbs)** – The pollutant loads associated with untreated stormwater are calculated as explained in the section for Characterization of Undetained Areas, above.

  - **Non-Structural SCM Water Quality Credits (lbs)** – Credits entered in the worksheet for non-structural SCMs, if applicable.

  - **Net Pollutant Loads from Site, Post-Construction (lbs)** – The Net Pollutant Loads from the project site following construction is calculated by (**Equation 9**):

    Pollutant Loads from Structural SCM (Treated Outflows) (lbs) + Pollutant Loads from Untreated Stormwater (lbs) – Non-Structural SCM Water Quality Credits (lbs)

    If the Net Pollutant Loads from Site, Post-Construction, are less than or equal to the Pollutant Loads from Site, Pre-Construction, the calculated values will be shown in green text and a statement will be displayed, “Water Quality Requirements Satisfied.” Otherwise, pollutants that have post-construction loads greater than pre-construction loads will be shown in red.

Certification – Enter the name of the person who utilized the spreadsheet, which serves as an electronic signature, and the date the spreadsheet is signed, after reading the Certification statement. The spreadsheet should not be modified; if this recommendation is not followed, the user should attach an explanation of what modifications to the spreadsheet were made. DEP/CCD reviewers may request an electronic copy of the spreadsheet to aid in their review when deemed appropriate.

ATTACHMENT A
SCMs IN SERIES EXAMPLE

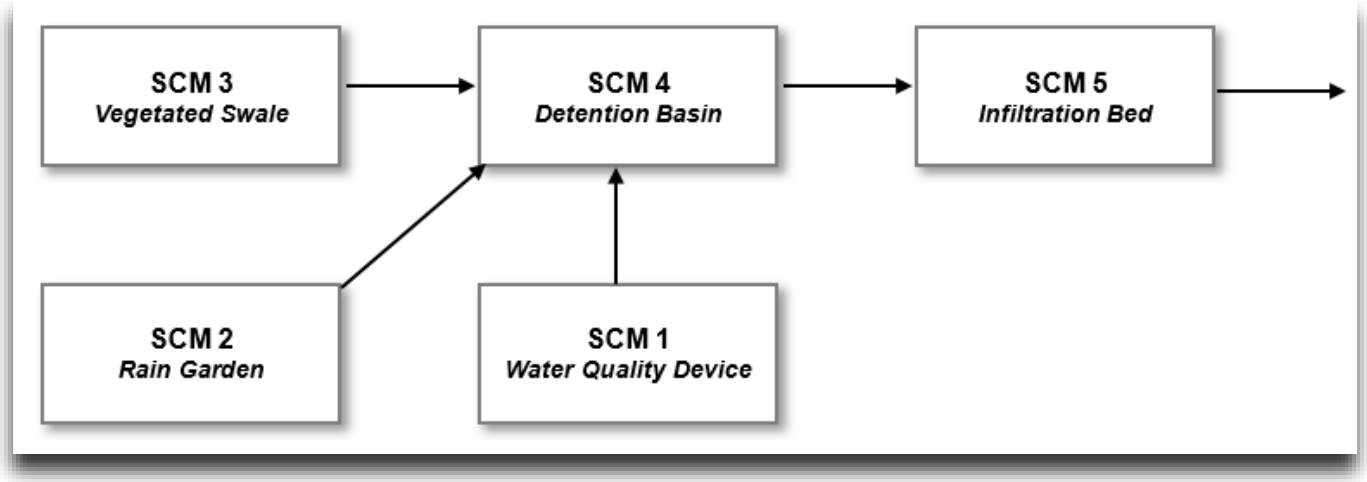
DEP provides this example of how SCMs in series may be entered into the DEP PCSM Spreadsheet to assist applicants.

The example site is located in Ferguson Township, Centre County. The project site is comprised of 6.90 acres of existing meadow in good condition, which slopes from the north to the south. Original drainage patterns will be maintained to the extent possible. The proposed improvements will consist of impervious and grass in good condition covers distributed across the site. The soil's Hydrological Soil Group is C across the entire project site. The proposed development includes 3.13 acres of impervious area, and 0.04 acres of undetained area (i.e., area that is not treated or managed by a SCM).

The stormwater runoff from the northern portion of the site will be collected, conveyed, and managed by 1) a vegetated swale (SCM 3) at the western portion of the site, 2) a rain garden (SCM 2) at the central portion, and 3) a storm sewer system with a water quality device (SCM 1) at the eastern portion of the site. The vegetated swale, rain garden, and water quality device discharge to a detention basin (SCM 4) that is located at the southern portion of the site. The detention basin discharges to an infiltration bed (SCM 5) that is adjacent to the southern property boundary. See Figure A-1 below.

The vegetated swale, rain garden and detention basin each contain 6 inches of filter soil mixture to promote water quality. The rain garden (SCM 2) will also be built with a 6-inch berm to provide surface stormwater volume storage. Overflow from the rain garden (SCM 2) will sheet flow to the detention basin (SCM 4). A water quality device (SCM 1) will be installed in the storm sewer system for initial treatment of that discharge before it enters the detention basin (SCM 4). The detention basin (SCM 4) is equipped with a typical outlet structure with a pipe that discharges into the subsurface infiltration bed (SCM 5). The infiltration bed (SCM 5) will be constructed with a 0.4-foot depression and 0.5 foot of topsoil over 0.6 foot of stone.

Figure A-1: Example SCM Diagram



Infiltration tests have been conducted uniformly across the entire site and suitable results were only found at the locations of the proposed rain garden (SCM 2) and infiltration bed (SCM 5). A geometric mean result of 1.5 inches per hour was determined. Shallow bedrock was encountered elsewhere throughout the site. Since there will be less than 2 feet of separation distance between the bottom of the other proposed SCMs and top of bedrock, infiltration will not be utilized. No groundwater was encountered during the geotechnical testing.

Design Considerations

The drainage areas to each of the 5 SCMs will be delineated and labeled as Drainage Area A for the storm sewer system with the Water Quality Device (SCM 1), Drainage Area B to the Rain Garden (SCM 2), Drainage Area 1 to the Vegetated Swale (SCM 3), Drainage Area 2 to the Detention Basin (SCM 4) and Drainage Area 3 to the

Infiltration Bed (SCM 5). A marginal area below the Infiltration Bed will bypass the SCMs and has been labeled as Undetained Area. The areas are shown in Figure A-2 below and are tabulated in the calculations.

It is important to label the SCMs and corresponding drainage areas in a logical order and remain consistent in entering the data onto the PCSM Spreadsheet. The final, and critical, SCM in the series should be placed last on the Structural SCM Volume Credits table. Consideration needs to be taken to list all of the SCMs that either perform volume removal and/or water quality functions. Improper data entry into the worksheets will cause incorrect results.

Infiltration, subsurface and above grade stormwater volume storage is demonstrated in this example. Understanding how each SCM functions is vital to successfully completing the Volume and Quality Worksheets.

Modeling the Series

The Vegetated Swale (SCM 3), Rain Garden (SCM 2) and Water Quality Device (SCM 1) all contribute to the downstream Detention Basin (SCM 4) so we will need to determine how to set up the series. Based upon the labeling of the drainage areas and numbering of the SCMs, the proceeding calculations will be presented to demonstrate how to account for the routed volume inflow and resultant outflow.

Figure A-2: Example Drainage Area Plan (not to scale)

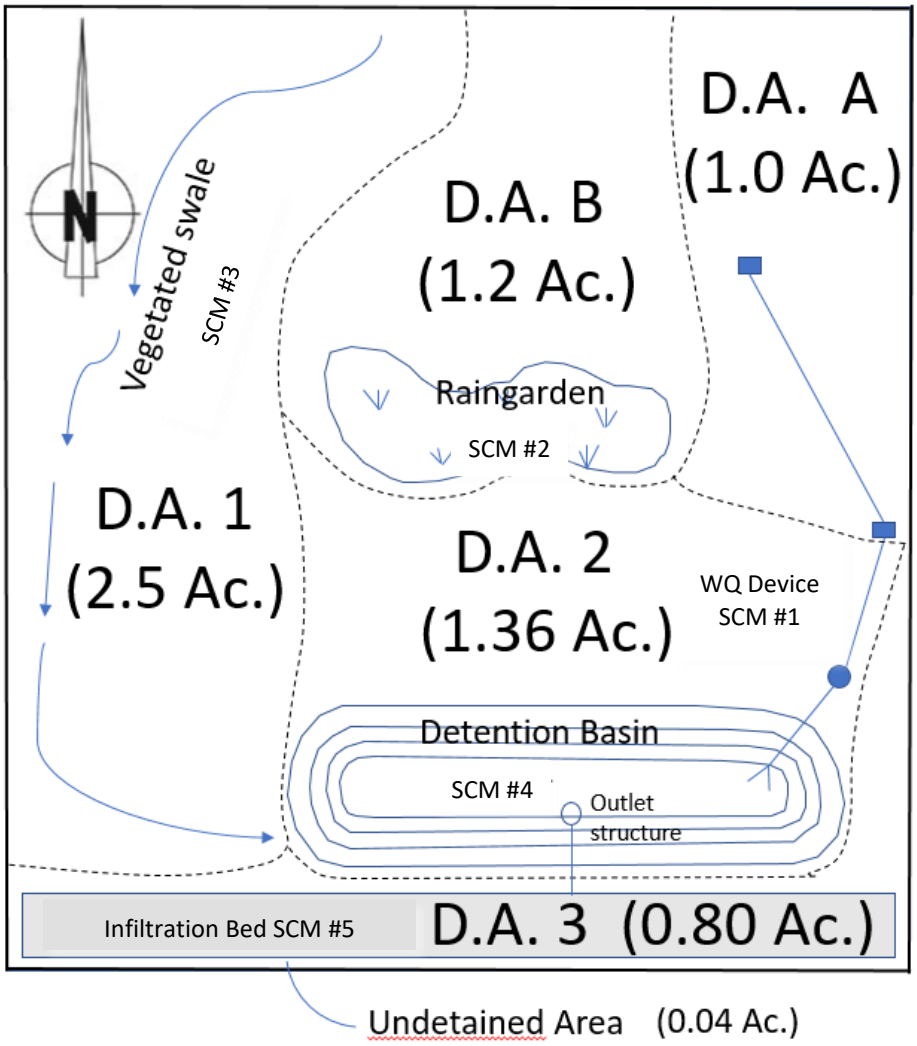


Table A-1 provides the distribution of drainage areas for the project site. In this example the entire project site of 6.90 acres will be disturbed, with 6.86 acres draining to SCMs and 0.04 acre bypassing the infiltration bed (SCM 5).

Table A-1: Example Drainage Area Distribution

Drainage Area	SCM	Total Drainage Area (Acres)*	Impervious Cover (Acres)	Vegetated Cover (Acres)
A	Water Quality Device (SCM 1)	1.00	0.67	0.33
B	Rain Garden (SCM 2)	1.20	0.95	0.25
1	Vegetated Swale (SCM 3)	2.50	0.60	1.90
2	Detention Basin (SCM 4)	1.36	0.91	0.45
3	Infiltration Bed (SCM 5)	0.80	0.00	0.80
---	Undetained	0.04	0.00	0.04

*To be input into the "Incremental SCM DA (acres)" column in the Volume Worksheet. Note that if a downstream SCM receives only the discharge from an upstream SCM, the incremental SCM DA would be entered as 0.

Surface areas of the vegetated SCMs are shown in Table A-2 below:

Table A-2: Example Surface Areas for Vegetated SCMs

Drainage Area	SCM	Bottom Surface Area (SF)*
B	Rain Garden (SCM 2)	4,300
1	Vegetated Swale (SCM 3)	767
2	Detention Basin (SCM 4)	6,500
3	Infiltration Bed (SCM 5)	11,000

*To be input into the "Infiltration/Vegetated Area (SF)" column in the Volume Worksheet.

The design infiltration rates listed in Table A-3 have used a safety factor of 3, resulting in 0.5 in/hr for the Rain Garden (SCM 2) and Infiltration Bed (SCM 5). The other results were not suitable so 0.0 is listed.

Table A-3: Example Infiltration Rates for SCMs

Drainage Area	SCM	Design Infiltration Rate (in/hr)
B	Rain Garden (SCM 2)	0.50
1	Vegetated Swale (SCM 3)	0.00
2	Detention Basin (SCM 4)	0.00
3	Infiltration Bed (SCM 5)	0.50

Next calculations are completed to determine volumes routed to SCMs. Before the final routed volume to the Infiltration Bed (SCM 5) can be determined, calculations for the Water Quality Device (SCM 1) and the Rain Garden (SCM 2) must be completed to apply the results to the downstream SCMs in the series. The calculations for the total volume of runoff for each individual drainage area used the TR-55 standard equations, as contained in the PCSM Spreadsheet. The 2-year/24-hour rainfall is 3.0 inches (i.e., P = 3.0 inches) for this example.

First, calculate the runoff volumes for the Water Quality Device (SCM 1) and the Rain Garden (SCM 2).

Post-Development DA = A (Water Quality Device)

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.67	C	98	0.041	2.77	6,733
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.33	C	74	0.703	0.91	1,088
TOTAL (ACRES):	**1.00**				**TOTAL (CF):**	**7,821**

Post-Development DA = B (Rain Garden)

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.95	C	98	0.041	2.77	9,546
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.25	C	74	0.703	0.91	824
TOTAL (ACRES):	**1.20**				**TOTAL (CF):**	**10,371**

The computed runoff volumes are entered into the "Volume Routed to SCM (CF)" column on the Volume Worksheet on each respective row as shown below.

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Total Vol. Routed to SCM (CF)	Off-Site Vol. Routed to SCM (CF)	Infiltration / Vegetated Area (SF)	Infil. Rate (in/hr)	Infil. Period (hrs)	Vegeta-ted?	Media Depth (ft)	Stored Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Water Quality Filters & Hydrodynamic Devices	-	to SCM No. 4	1.000	7,821									
001	2	Rain Garden / Bioretention	-	to SCM No. 4	1.200	10,371	0	4,300	0.5	16	Yes	0.5	2,795	**2,580**	**737**
													Totals:	**2,580**	**737**

The infiltration, vegetated, media and storage information are not applicable for the Water Quality Device (SCM 1), so those inputs are left blank. This particular type of SCM does not retain or infiltrate any inflow but only treats the stormwater runoff and discharges the entire volume. Any SCM that contributes to water quality, whether or not it has a volume removal function, should be included on the Structural SCM Volume Credit table of the Volume Worksheet.

Next, for the Rain Garden (SCM 2), the Stored Volume must be determined. Given 6 inches (0.5 ft) of filter soil mixture (assuming 30% void space), and the 6-inch (0.5 ft) berm, the storage volume is calculated as follows: 4,300 SF x [(0.5 ft soil x 0.30) + 0.5 ft berm] = 2,795 CF.

Finally, the infiltration period for the Rain Garden (SCM 2) must be determined. The Rain Garden's infiltration surface area is 4,300 SF (as identified previously). The 0.50 in/hr infiltration rate can be converted to feet per hour by dividing 0.50 in/hr by 12 inches per foot (which equates to 0.0417 ft/hr). The infiltration capacity is 4,300 SF x 0.0417 ft/hr = 179.31 CF/hr. The dewatering time can then be calculated by taking the lesser of Stored Volume and Volume Routed to SCM divided by this rate, or 2,795 CF / 179.31 CF/hr = 15.6 hours. The Rain Garden's (SCM 2) infiltration period will be the dewatering time, rounded up to 16 hours.

> **NOTE 49** – The SCM's bottom surface must have deep-rooted vegetation in order to qualify for ET credit. Also, if the "Vegetated" column is left blank or designated as "No", then ET credit will not be calculated.

The next SCM contributing to the Detention Basin (SCM 4) is the Vegetated Swale (SCM 3). The runoff volume that is calculated to SCM 3 is as follows:

Post-Development DA = 1 (Vegetated Swale)

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	1.90	C	74	0.703	0.91	6,264
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.60	C	98	0.041	2.77	6,029
TOTAL (ACRES):	2.50				TOTAL (CF):	12,293

The Vegetated Swale (SCM 3) has been designed to primarily convey runoff so it was designed without berms to retain stormwater runoff (i.e., no surface storage volume). Credit can still be taken for the 6 inches of subsurface filter soil, and the Storage Volume is calculated as 767 SF x 0.5 ft soil x 0.30 (30% voids) = 115 cubic feet. SCM 3 is then added to the Structural SCM Volume Credits table, where the 12,293 CF of runoff calculated previously is entered as the Volume Routed to SCM:

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Total Vol. Routed to SCM (CF)	Off-Site Vol. Routed to SCM (CF)	Infiltration / Vegetated Area (SF)	Infil. Rate (in/hr)	Infil. Period (hrs)	Vegeta-ted?	Media Depth (ft)	Stored Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Water Quality Filters & Hydrodynamic Devices	-	to SCM No. 4	1.000	7,821									
001	2	Rain Garden / Bioretention	-	to SCM No. 4	1.200	10,371	0	4,300	0.5	16	Yes	0.5	2,795	**2,580**	**737**
001	3	Vegetated Swale	-	to SCM No. 4	2.500	12,293	0	767	0		Yes	0.5	115		**25**
													Totals:	**2,580**	**763**

All three of these SCMs (Water Quality Device (SCM 1), Rain Garden (SCM 2) and Vegetated Swale (SCM 3)) contribute runoff to the Detention Basin (SCM 4). The resultant inflow into the Detention Basin (SCM 4) is the sum of the individual contributions of the upstream SCMs minus their volume management credits.

The sum of all of the inflow volumes for SCMs 1 through 3 are 7,821 CF + 10,371 CF + 12,293 CF = 30,485 CF.

The sum of all of the infiltration and ET credits for SCMs 1 through 3 are 2,580 CF + 737 CF + 25 CF = 3,342 CF.

The resultant inflow, from the upstream SCMs 1 through 3, into the Detention Basin (SCM 4) is 30,485 CF – 3,342 CF = 27,143 CF.

The drainage area tributary to the Detention Basin (SCM 4) adds an additional volume of 10,628 CF as shown in the calculation below:

Post-Development DA = 2 (Detention Basin)

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.45	C	74	0.703	0.91	1,484
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.91	C	98	0.041	2.77	9,144
TOTAL (ACRES):	1.36				TOTAL (CF):	10,628

A total of 37,771 CF therefore flows to the Detention Basin (SCM 4) (i.e, 27,143 CF from SCMs 1 – 3 + 10,628 CF from SCM 4 Drainage Area).

POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Total Vol. Routed to SCM (CF)	Off-Site Vol. Routed to SCM (CF)	Infiltration / Vegetated Area (SF)	Infil. Rate (in/hr)	Infil. Period (hrs)	Vegeta-ted?	Media Depth (ft)	Stored Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Water Quality Filters & Hydrodynamic Devices	-	to SCM No. 4	1.000	7,821									
001	2	Rain Garden / Bioretention	-	to SCM No. 4	1.200	10,371	0	4,300	0.5	16	Yes	0.5	2,795	**2,580**	**737**
001	3	Vegetated Swale	-	to SCM No. 4	2.500	12,293	0	767	0		Yes	0.5	115		**25**
001	4	Dry Extended Detention Basin	-	to SCM No. 5	1.360	37,771	0	6,500	0		Yes	0.5	975		**214**
													Totals:	**2,580**	**976**

The Detention Basin (SCM 4) was not designed for infiltration due to the encountered limiting zone for bedrock; therefore, it will completely dewater through the outlet structure. However, there will be Stored Volume associated with the 6 inches of filter soil mixture, calculated as follows: 6,500 SF x 0.5 ft x 0.30 (30% voids) = 975 CF. The 214 CF of ET credit will be subtracted from the Volume Routed to SCM 4 of 37,771 CF to produce a discharge of 37,771 CF – 214 CF = 37,557 CF, which is routed to the Infiltration Bed (SCM 5).

The total routed flow into the Infiltration Bed (SCM 5) will be 37,557 CF plus the runoff from the Infiltration Bed's drainage area, which is 2,638 CF, as shown below.

Post-Development DA = 3 (Infiltration Bed)

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	0.80	C	74	0.703	0.91	2,638
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	0.00	C	98	0.041	2.77	0
TOTAL (ACRES):	**0.80**				**TOTAL (CF):**	**2,638**

Therefore, the total volume routed to the Infiltration Bed is 37,557 CF + 2,638 CF = 40,195 CF.

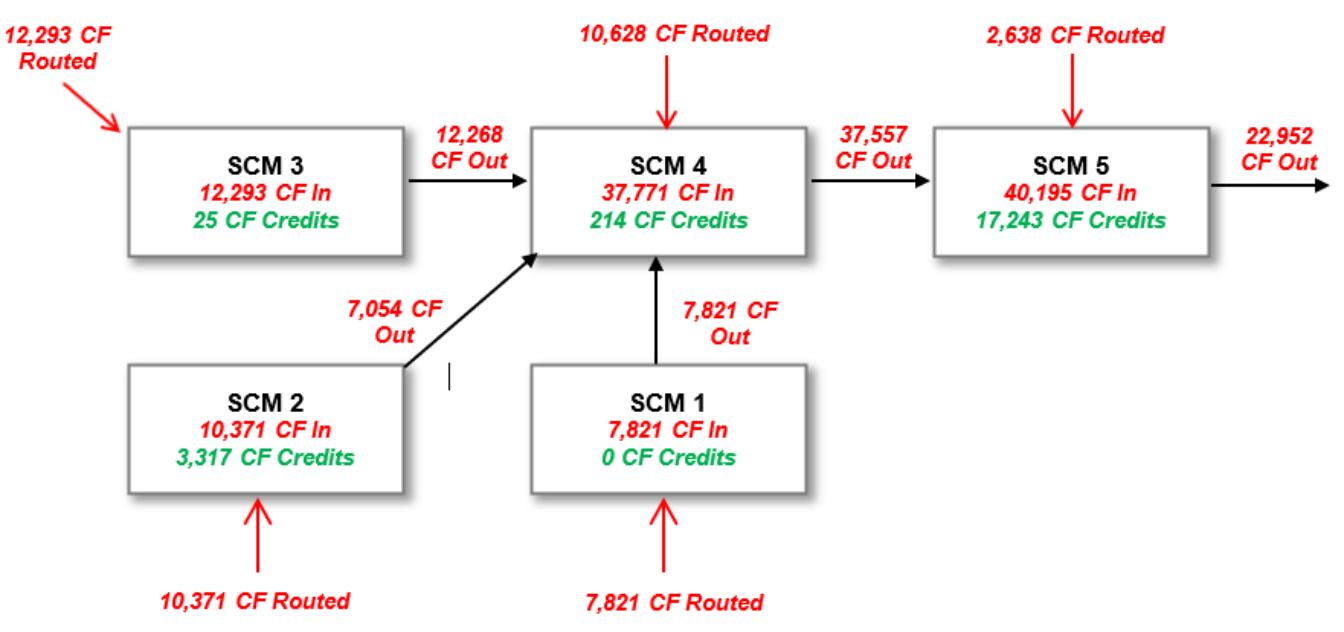
POA No.	SCM No.	SCM Name	MRC?	Discharge	Incremental SCM DA (acres)	Total Vol. Routed to SCM (CF)	Off-Site Vol. Routed to SCM (CF)	Infiltration / Vegetated Area (SF)	Infil. Rate (in/hr)	Infil. Period (hrs)	Vegeta-ted?	Media Depth (ft)	Stored Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Water Quality Filters & Hydrodynamic Devices	-	to SCM No. 4	1.000	7,821									
001	2	Rain Garden / Bioretention	-	to SCM No. 4	1.200	10,371	0	4,300	0.5	16	Yes	0.5	2,795	**2,580**	**737**
001	3	Vegetated Swale	-	to SCM No. 4	2.500	12,293	0	767	0		Yes	0.5	115		**25**
001	4	Dry Extended Detention Basin	-	to SCM No. 5	1.360	37,771	0	6,500	0		Yes	0.5	975		**214**
001	5	Infiltration Bed	-	Off-Site	0.800	40,195	0	11,000	0.5	33	Yes	1.1	15,290	**13,613**	**3,630**
													Totals:	**16,193**	**4,606**

The media depth includes 0.6 ft stone (40% voids), 0.5 ft topsoil (30% voids) and 1 ft of storage to the lowest orifice or 11,000 SF x [(0.6 ft)(0.40) + (0.5 ft)(0.30) + 1 ft] = 15,290 CF.

The infiltration period for the Infiltration Bed (SCM 5) is determined by calculating the dewatering time: 11,000 SF x 0.0417 ft/hr = 458.7 CF/hr. The lesser of Stored Volume and Volume Routed to SCM (15,290 CF) CF is divided by 458.7 CF/hr, resulting in 33.33 hours, which is rounded down to 33 hours.

A water balance for this example project is shown in Figure A-3 below.

Figure A-3: Example Water Balance for SCMs in Series



Careful organization and data entry must be taken to accurately calculate the volume removal for any SCMs in series. If multiple SCMs contribute to a singular SCM in another series, then a flow chart and supporting calculations should be provided and the final result input into the SCM in series provided on the worksheet. It is good to remember that all shaded cells (except those previously noted above) need to be completed for the calculations to run properly. Therefore, this will become a row-by-row iterative procedure to obtain all of the proper routed volumes and credits to apply to downstream SCMs in a series.

ATTACHMENT B
BASIN FLOOD TEST PROCEDURES

If the site is underlain by gravels or weathered rock materials where the qualified professional determines that the conditions inhibit the use of the methodologies presented in Table 2, the basin flood test method may be used to evaluate the site conditions and assess SCM-based infiltration. The Basin Flooding Test should be performed in accordance with the following (adopted from NJ Stormwater Management BMP Manual (2012) Chapter 12, Subsection A3):

1. The basin flood test may not be conducted in rock strata which have been blasted with explosives.

2. Equipment Requirements – The following equipment is required for performing a basin flood test:
   - Excavating equipment capable of producing a test basin as prescribed in #3 below;
   - A water supply (minimum of 375 gallons per basin filling); and
   - A means for accurately measuring the water level within the basin as required in #4 below.

3. Test Basin Preparation; the test basin should be prepared in accordance with the following:
   - A test basin meeting the following requirements shall be excavated within or immediately adjacent to the area of concern.
   - The bottom area of the basin shall be a minimum of 50 SF.
   - The bottom of the basin should be made as level as possible so that high areas of rock do not project above the water level when the basin is flooded as prescribed in #4 below.
   - If groundwater is observed within the test basin, the basin flood test should not be used.

4. Basin Flood Test Procedures:
   - Step 1: Fill the test basin with exactly 12 inches of water and record the time. Allow the basin to drain completely. If the time required for the basin to drain completely is greater than 24 hours, the test should be terminated and the limiting zone in question should be considered to be a massive rock substratum.
   - Step 2: If the basin drains completely within 24 hours after the first flooding, immediately refill the basin to a depth of 12 inches and record the time. If the basin drains completely within 24 hours of the second filling, the limiting zone in question should be considered to be fractured rock substratum. If water remains in the basin after 24 hours the limiting zone in question should be considered to be a massive rock substratum.

5. Infiltration Rate Determination – An infiltration rate should only be used if the basin drains completely within 12 hours while performing Step 2 described in #4 above.

   The infiltration rate used should be 0.5 in/hr. If using this method, infiltration rate and Ksat can be assumed to be equivalent. If the test results in an infiltration/Ksat of 0.5 in/hr, then measures must be taken to ensure infiltration rates do not exceed 6 in/hr (such as placement of a soil media buffer at the infiltration surface interface). Justification for the use of higher rates of infiltration or Ksat in gravelly soils (such as glacial till; not applicable to weathered/broken rock) should include ample photographic documentation of the stratum being tested to justify conclusions made by the professional.

ATTACHMENT C
LAND COVER CROSSWALK AND POLLUTANT CONCENTRATIONS

Pre-Construction Land Covers *

Land Cover for Volume (Based on TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Pervious as Meadow	Grassland/Herbaceous	48.8	0.22	2.3	1
Impervious as Meadow	Grassland/Herbaceous	48.8	0.22	2.3	1
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	142	0.32	3	3
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	Highway (general)	141	0.43	2.65	3
Impervious Areas: Streets and Roads - Gravel (Including ROW)	Highway (general)	141	0.43	2.65	3
Impervious Areas: Streets and Roads - Dirt (Including ROW)	Highway (general)	141	0.43	2.65	3
Impervious Areas: Commercial	Commercial	61.72	0.22	2.02	3
Impervious Areas: Industrial	Industrial	81	0.24	2.01	3
Impervious Areas: Institutional	Institutional	67.49	0.14	1.21	3
Impervious Areas: Commercial Roof	Commercial Roof	9	0.14	2.1	3
Impervious Areas: Residential Roof	Residential Roof	19	0.11	1.5	3
Open Water	Open Water	0	0	0	1
Rock Cut/Bench	Open Space	78	0.25	1.25	**

* When a project is exempt from the “meadow in good condition” requirement and for off-site land covers, all post-construction land covers are made available for the pre-construction condition.

** EMC values are not available for the Rock Cut/Bench land cover; the EMCs for Open Space are used for Rock Cut/Bench based on professional judgment.

Post-Construction Land Covers

Land Cover for Volume (TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Fallow - Bare Soil	Cultivated Crops	216	1.07	7.7	1
Fallow - Crop Residue Cover (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Fallow - Crop Residue Cover (Good Condition)	Cultivated Crops	216	1.07	7.7	1

Land Cover for Volume (TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Row Crops - Straight Row (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Straight Row (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Straight Row & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Row Crops - Straight Row & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1
Row Crops - Contoured (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Contoured (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Contoured & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Row Crops - Contoured & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1
Row Crops - Contoured & Terraced (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Contoured & Terraced (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Row Crops - Contoured, Terraced & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Row Crops - Contoured, Terraced & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1
Small Grain - Straight Row (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Straight Row (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Straight Row & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Small Grain - Straight Row & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1
Small Grain - Contoured (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Contoured (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Contoured & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Small Grain - Contoured & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1

Land Cover for Volume (TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Small Grain - Contoured & Terraced (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Contoured & Terraced (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Small Grain - Contoured, Terraced & Crop Residue (Poor Condition)	Cultivated Crops	216	1.07	7.7	1
Small Grain - Contoured, Terraced & Crop Residue (Good Condition)	Cultivated Crops	216	1.07	7.7	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Straight Row (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Straight Row (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Contoured (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Contoured (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Contoured & Terraced (Poor Condition)	Pasture/Hay	145	0.55	5.71	1
Close-Seeded or Broadcast Legumes or Rotation Meadow - Contoured & Terraced (Good Condition)	Pasture/Hay	145	0.55	5.71	1
Pasture, Grassland, or Range-Continuous Forage for Grazing (Poor Condition)	Grassland/Herbaceous	48.8	0.22	2.3	1
Pasture, Grassland, or Range-Continuous Forage for Grazing (Fair Condition)	Grassland/Herbaceous	48.8	0.22	2.3	1
Pasture, Grassland, or Range-Continuous Forage for Grazing (Good Condition)	Grassland/Herbaceous	48.8	0.22	2.3	1
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	Grassland/Herbaceous	48.8	0.22	2.3	1

Land Cover for Volume (TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Brush-Forbs-Grass Mixture with Brush the Major Element (Poor Condition)	Shrub/Scrub	39	0.15	0.19	1
Brush-Forbs-Grass Mixture with Brush the Major Element (Fair Condition)	Shrub/Scrub	39	0.15	0.19	1
Brush-Forbs-Grass Mixture with Brush the Major Element (Good Condition)	Shrub/Scrub	39	0.15	0.19	1
Woods-Grass Combination (Orchard or Tree Farm) (Poor Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Woods-Grass Combination (Orchard or Tree Farm) (Fair Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Woods-Grass Combination (Orchard or Tree Farm) (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Woods (Poor Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Woods (Fair Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Woods (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	45	0.13	1.05	1
Farmstead-Buildings, Lanes, Driveways and Surrounding Lots	Residential	65	0.29	2.05	2
Roads (Including ROW) - Dirt	Highway (general)	141	0.43	2.65	3
Roads (Including ROW) - Gravel	Highway (general)	141	0.43	2.65	3
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Poor Condition (Grass Cover < 50%)	Open Space	78	0.25	1.25	2
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Fair Condition (Grass Cover 50% to 75%)	Open Space	78	0.25	1.25	2
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	78	0.25	1.25	2
Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW)	Residential	65	0.29	2.05	2
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	142	0.32	3	3
Impervious Areas: Streets and Roads - Paved; Open Ditches (Including ROW)	Highway (general)	141	0.43	2.65	3

Land Cover for Volume (TR-55)	Land Cover for Water Quality	Event Mean Pollutant Concentrations			Source
		TSS (mg/L)	TP (mg/L)	TN (mg/L)	
Impervious Areas: Streets and Roads - Gravel (Including ROW)	Highway (general)	141	0.43	2.65	3
Impervious Areas: Streets and Roads - Dirt (Including ROW)	Highway (general)	141	0.43	2.65	3
Impervious Areas: Commercial	Commercial	61.72	0.22	2.02	3
Impervious Areas: Industrial	Industrial	81	0.24	2.01	3
Impervious Areas: Institutional	Institutional	67.49	0.14	1.21	3
Impervious Areas: Commercial Roof	Commercial Roof	9	0.14	2.1	3
Impervious Areas: Residential Roof	Residential Roof	19	0.11	1.5	3
Open Water	Open Water	0	0	0	1
Rock Cut/Bench	Open Space	78	0.25	1.25	*

* EMC values are not available for the Rock Cut/Bench land cover; the EMCs for Open Space are used for Rock Cut/Bench based on professional judgment.

Sources:

1. WikiWatershed. (2019). *WikiWatershed Site Storm Model: a hybrid Python implementation of TR-55 and SLAMM algorithms for runoff, and STEPL algorithms for water quality: WikiWatershed/TR-55*. Event mean concentrations (mg/L) by pollutant and National Land Cover Database (NLCD) type from multiple sources including:

   Keiser & Associates. (2003). *Empirical Sediment and Phosphorus Nonpoint Source Model for the St. Joseph River Watershed*. 48 pp.

   New Hampshire Department of Environmental Services (NHDES). (2008). *New Hampshire Stormwater Manual, Volume 1*.

   Pennsylvania Department of Environmental Protection (DEP). (2006). *Pennsylvania Stormwater Best Management Practices Manual.* 363-0300-002.

   U.S. Environmental Protection Agency (EPA). (2005). *The National Stormwater Quality Database, Version 1.2: A Compilation and Analysis of NPDES Stormwater Monitoring Information*. Office of Water, Washington, DC.

   U.S. Environmental Protection Agency (EPA). (2011). *User's Guide: Spreadsheet Tool for Estimation of Pollutant Loads (STEPL)*. Version 4.1.

   Washington State Department of Ecology (WSDC). (2007). *Efficiency of Urban Stormwater Best Management Practices: A Literature Review*. Publication No. 07-03-009.

2. U.S. Environmental Protection Agency (EPA). (2005). *The National Stormwater Quality Database, Version 1.2: A Compilation and Analysis of NPDES Stormwater Monitoring Information*. Office of Water, Washington, DC.

3. New Hampshire Department of Environmental Services (NHDES). (2008). *New Hampshire Stormwater Manual, Volume 1*.

ATTACHMENT D
STREET SWEEPING CREDITING

If street sweeping is used for additional water quality treatment, the PCSM Plan preparer may reduce the land cover Event Mean Pollutant Concentrations in **Attachment C** for developed roads and impervious land covers in accordance with Table 3. These values are in accordance with current protocols utilized by the Chesapeake Bay Program. The reductions are applied to an area of roads or impervious surfaces; generally, one curb-lane mile equals one acre in terms of area swept.

Table 3: Street Sweeping reductions (Chesapeake Bay Program 2024)

Type	Practice Identifier	Description of passes by sweeper; approx. # of passes per year	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)
Advanced†	SCP-2	1 pass/week; ~50/year	16	8	3
Advanced†	SCP-3	1 pass/2 weeks; ~25/year	11	5	2
Advanced†	SCP-4	1 pass/4 weeks; ~10/year	6	3	1
Advanced†	SCP-5	1 pass/8 weeks; ~6/year	4	2	0.7
Advanced†	SCP-6	1 pass/12 weeks; ~4/year	2	1	0
Advanced†	SCP-7*	Seasonal scenario 1 or 2; 15/year	7	4	1
Advanced†	SCP-8*	Seasonal scenario 3 or 4; 20/year	10	5	2
Mech. Broom‡	SCP-10	1 pass/week; ~50/year	0.5	N/A	N/A
Mech. Broom‡	SCP-11	1 pass/4 weeks; ~ 10/year	0.1	N/A	N/A

† Advanced sweeping technology: Technologies with greater demonstrated ability to remove solids and even finer particles from street surfaces. Advanced sweeping technology includes:Regenerative air sweepers (which are equipped with a sweeping head which creates suction and uses forced air to transfer street debris into the hopper) and vacuum-assisted sweepers (sweepers equipped with a high power vacuum to suction debris from street surface).

‡ Mechanical broom technology sweepers: Researchers have found that while mechanical sweepers are effective in picking up coarse-grained particles, they leave behind fine-grained particles, which are then subject to future wash-off. Therefore, mechanical broom sweepers are useful in removing gross solids, trash and litter from streets but have very limited capabilities to reduce nutrients and fine sediment.

* Seasonal scenarios for SCP-7 and SCP-8 are defined as follows:

- Seasonal scenario 1: Spring – One pass every week from March to April; monthly otherwise.
- Seasonal scenario 2: Spring – One pass every other week from March to April; monthly otherwise.
- Seasonal scenario 3: Spring and fall – One pass every week (March to April, October to November); monthly otherwise.
- Seasonal scenario 4: Spring and fall – One pass every other week during the season; monthly otherwise

Reduction values for street sweeping are based on annual performance.

Example – Practice Identifier SCP-5 will be used on 1 acre of paved roads within a development. Calculate water quality management credit assuming the 2-year/24-hour precipitation depth is 3 inches, producing 10,049 CF in runoff.

Event Mean Concentrations (EMCs) for Impervious Areas: Streets and Roads – Paved, Curbs and Storm Sewers (Excluding ROW) are:

TSS – 142 mg/L
Total P – 0.32 mg/L
Total N – 3.0 mg/L

Step 1 – Determine modified EMCs using the percent reductions in Table 3:

TSS – 142 mg/L * (1 – 0.04) = 136.32 mg/L
Total P – 0.32 mg/L * (1 – 0.02) = 0.3136 mg/L
Total N – 3.0 mg/L * (1 – 0.007) = 2.979 mg/L

Step 2 – Calculate pollutant loads without street sweeping:

TSS – (10,049 CF / 43,560) * 142 mg/L * 2.72 = 89.1 lbs
Total P – (10,049 CF / 43,560) * 0.32 mg/L * 2.72 = 0.2 lbs
Total N – (10,049 CF / 43,560) * 3 mg/L * 2.72 = 1.88 lbs

Step 3 – Calculate pollutant loads with street sweeping:

TSS – (10,049 CF / 43,560) * 136.32 mg/L * 2.72 = 85.54 lbs
Total P – (10,049 CF / 43,560) * 0.3136 mg/L * 2.72 = 0.197 lbs
Total N – (10,049 CF / 43,560) * 2.979 mg/L * 2.72 = 1.87 lbs

Step 4 – Subtract pollutant loads with street sweeping (Step 3) from pollutant loads without street sweeping (Step 2) to determine water quality management credit:

TSS credit – 89.1 lbs - 85.54 lbs = 3.56 lbs
Total P credit – 0.2 lbs - 0.197 lbs = 0.003 lbs
Total N credit – 1.88 lbs - 1.87 lbs = 0.01 lbs

These values should be entered into the PCSM Spreadsheet, Quality Worksheet as Non-Structural SCM Water Quality credits.

Revision History

Date	Version*	Revision Reason
9/1/2026	2.2	Modified Table 4 (ET rates) to be consistent with Table D-8 of the draft PCSM Manual.
8/11/2026	2.2	Revised Attachment A to clarify that the lesser of the Stored Volume and Volume Routed to SCM is used in the calculation of Infiltration Period.
5/28/2026	2.2	Added NOTE 11 (regarding the Outside LOD checkbox) for clarification and renumbered remaining notes.
4/17/2016	2.2	Revised approach for deducting off-site runoff routed to SCMs (deduction is now made before calculating infiltration and ET credits whereas previously it was done after calculating those credits). Added “Infiltration & ET Credits – Total (CF)” (only displayed when one or more SCMs receive off-site stormwater) and “Infiltration & ET Credits – Project Site (CF)” to the Structural SCM Volume Credit table to show the difference between the credits with and without off-site stormwater.
4/15/2026	2.2	Updated the validation for Total Volume Routed to SCM (Structural SCM Volume Credit table in Volume Worksheet) to allow for the entry of a value that exceeds the calculated post-construction runoff at the 2-year/24-hour storm. Added validation that prevents the entry of a value for Total Volume Routed to SCM or Off-Site Volume Routed to SCM that would result in the difference in the sums of Total Volume Routed and Off-Site Volume Routed exceeding the calculated post-construction runoff.
4/7/2026	2.2	For the purpose of consistency throughout the PCSM Spreadsheet, validation has been applied to all cells where an area is reported that prevents the user from entering an area more precise than one-thousandths of an acre, and all areas are displayed to the one-thousandth of an acre.
4/2/2026	2.2	Modified POA Table in General Worksheet to request Total Drainage Area (including off-site areas), Project Site Drainage Area, Existing Impervious within Project Site, and Proposed Impervious within Project Site. Modified Structural SCM Volume Credits table in Volume Worksheet by changing “Volume Routed to SCM” to “Total Volume Routed to SCM” and adding “Off-Site Volume Routed to SCM” so that an accurate accounting of all stormwater reaching SCMs can be reported. Off-Site Volume Routed to SCM is deducted from Volume Credits. Also added “Outside LOD” checkbox to pre-construction land cover table, which may be selected for area outside the limit of disturbance but within the project site area to make all post-construction land covers available. In Quality Worksheet modified calculation of “Volume Routed to SCM” to subtract “Off-Site Volume Routed to SCM” from “Total Volume Routed to SCM” on Volume Worksheet. Added “Rate Control SCM (general) to SCM dropdown list in Structural SCM Volume Credits table. Modified “Storage Volume” to “Stored Volume” in Structural SCM Volume Credits table and provided new guidance on the value that should be entered for SCMs. Added an example of how to calculate pollutant load reduction credit to Attachment D. Added four new land covers (Commercial Roofs, Residential Roofs, Open Water, and Rock Cut/Bench) to pre- and post-construction land cover tables.

Date	Version*	Revision Reason
8/5/2025	2.1	1) Removed NOTE 24 regarding the use of the MRC BMP Design Summary Sheet (no longer accepted after March 7, 2025) and renumbered notes. 2) Guidance has been provided for the Vegetation column of the Structural SCM Volume Credits table that plug plantings should be spaced approximately 2-3 feet on center to obtain ET Credit. 3) Revised guidance for Infiltration / Vegetated Area of the Structural SCM Volume Credits table by explaining when a modified infiltration area may be used for an underground infiltration SCM and clarifying that side slopes may not be considered part of Infiltration / Vegetated area of a vegetated surface SCM. 4) Revised ET Credit calculation by adding Table 2 and new procedures where the infiltration rate is less than 0.25 in/hr. 5) Modified NOTE 43 to refer to a new Attachment D, which provides percent reductions for EMC pollutant concentrations for various street sweeping practices.
6/20/2025	2.0	Added NOTE 26 to clarify that a constructed wetland that is designed in accordance with Section 3.6.6 of the draft PCSM Manual and includes an IWS and controlled release is functionally equivalent to MRC Bioretention and may be treated as an MRC SCM in the PCSM Spreadsheet.
4/22/2025	2.0	Clarified the instructions for Infiltration/Vegetated Area of the Volume Worksheet, Structural SCM Volume Credits table, that if a model is used that considers soil physics and variable hydraulic head conditions, the side slopes of the SCM may be considered part of that model and if the model results in total infiltration greater than what the spreadsheet is crediting, the infiltration/vegetated area value may be adjusted to match the modeled results (supporting calculations must be provided).
3/24/2025	2.0	Identified future standards for determining saturated hydraulic conductivity to be entered into the Volume Worksheet (see explanation of Infiltration Rate). Added Attachment B to describe the basin flood test option for determining infiltration rate or Ksat in gravel / weathered rock.
2/28/2025	2.0	Clarified in NOTE 23 and the description of the Riparian Forest Buffer Credit (CF) that the volume that should be entered for Volume Routed to SCM when the SCM “Riparian Forest Buffer (Min 150 Ft)” is selected should be the net change in volume, not the total post-construction volume, within the project site area.
2/20/2025	2.0	Changed requirement in Volume Worksheet, Structural SCM Volume Credits table, that the Discharge column must be set to “Off-Site” in order for Managed Release Credits cell to be available when an MRC SCM is entered. Any selection for Discharge will make the Managed Release Credits available when the MRC? column is set to “Y”.
11/18/2024	2.0	1) Changed "discharge points" ("DPs") to "points of analysis" ("POAs"). 2) Changed "BMP" to "SCM". 3) Removed automatic MRC credit calculation in Volume Worksheet; Managed Release Credits must be entered as reported on the MRC Simplified Design Spreadsheet or MRC Spreadsheet, as applicable.
7/9/2024	1.9	Added clarification to NOTE 13 that any land cover that is categorized as impervious is subject to § 102.8(g)(2)(ii), regardless of CN, unless regulatory exemptions apply.
9/13/2023	1.9	For Infiltration / Vegetated Area (Volume Worksheet), clarified that only the bottom of the BMP may be considered as the infiltrating area (side slopes may be considered if a dynamic model is used). For Infiltration Period (Volume Worksheet), identified the formula that should be used to calculate this value and clarified that where the storage volume at the lowest orifice is less than the Volume Routed to BMP, the storage volume at the lowest orifice must be used.

Date	Version*	Revision Reason
4/28/2022	1.9	Updated data sources in Attachment B. Updated description of "Vegetated?" column (Volume Worksheet, Structural BMP Volume Credits Table) to clarify that ET credits are generated under the presumption that the BMP will be planted with plugs and will include a mix of woody, herbaceous and grass species, and the vegetation may be mowed or cut back no more than twice per year.
10/18/2021	1.9	Modified the description for Infiltration Period (Volume Worksheet, Structural BMP Volume Credits table) and NOTE 33 to reflect a change in the PCSM Spreadsheet that a minimum of 12 hours must be selected to represent infiltration that is occurring during a storm event. In addition, the PCSM Spreadsheet has been modified to include updates to Median Outflow Concentrations (MOCs) for structural BMPs based on the latest analysis of literature data.
10/14/2021	1.8	Added clarification to the description of Drainage Area (General Worksheet) to explain that the value entered in this field for any discharge point should not include undetained areas, which are entered separately in the table.
8/17/2021	1.8	Added clarification in the instructions for the Volume Worksheet, Structural BMP Volume Credits, Media Depth, to assist users in properly reporting media depth when underdrains will be installed.
6/9/2021	1.8	Added NOTE 36 to clarify that the volume associated with void spaces cannot be included in the calculation of Storage Volume below the bottom of the BMP (i.e., infiltration interface with the in-situ soil) and the Infiltration Rate entered for the BMP should be associated with the elevation of the BMP bottom.
6/2/2021	1.8	Added clarification on page 1 of DEP's expectation on the use of the latest version of the spreadsheet: "In general, DEP/CCD will accept older versions of the spreadsheet no more than 6 months following the revision date of the spreadsheet. DEP/CCD also reserves the right to request completion of the latest version of the spreadsheet for any project."
2/4/2021	1.8	Updated NOTE 23 to explain that when a riparian forest buffer BMP is selected in the Structural BMP Volume Credit table of the Volume Worksheet, infiltration parameters such as Infiltration Period should remain blank, otherwise credit will be increased inappropriately. Updated NOTE 24 with another clarification that all MRC design standards may be met within one BMP (i.e., it is not necessary to bypass flows exceeding the 1.2-inch/2-hour storm to a downstream BMP in order to manage the post-construction 2-year/24-hour peak flow back to the pre-construction 1-year/24-hour peak flow).
1/27/2021	1.8	Updated NOTE 24 to clarify that MRC credit can be provided for volume routed to an MRC BMP up to the 2-year/24-hour storm event if the volume exceeding the 1.2-inch/2-hour storm event is designed to bypass the MRC BMP into a downstream BMP, assuming the downstream BMP reduces the post-construction 2-year/24-hour peak flow to the pre-construction 1-year/24-hour peak flow associated with the MRC.

Date	Version*	Revision Reason
12/1/2020	1.8	Completed the following for more accurate water quality analyses: 1) removed the “Impervious” Land Cover for pre-construction volume (Volume Worksheet) and the “Impervious (Mixed Use)” Land Cover for Water Quality for pre-construction water quality (Quality Worksheet); and 2) added all post-construction impervious land covers used for volume and water quality to the options for pre-construction conditions. Removed “Soil Amendment” from the dropdown list of BMPs in the Structural BMP Volume Credit table of the Volume Worksheet because credits for Soil Amendment should be calculated separately and reported in the Non-Structural BMP Volume Credit – Other Credit fields. (Note this revision history starts with changes from version 1.7 to version 1.8 only).

* Version refers to the version number of the DEP PCSM Spreadsheet. Updates to the instructions may be made without corresponding changes to the Spreadsheet.