

SCM 3.4.4 SPREADSHEET REVEGETATION AND SOIL RESTORATION INSTRUCTIONS

Draft, August 10, 2026

Introduction

The Department of Environmental Protection (DEP) has developed the SCM 3.4.4 Spreadsheet (Spreadsheet) to calculate volume management credit when revegetation and soil restoration is proposed as a stormwater control measure (SCM), implementing Section 3.4.4 of the Pennsylvania Post-Construction Stormwater Management Manual (PCSM Manual). Revegetation must be implemented in conjunction with soil restoration (i.e., amendment and subsoiling if limiting layers are identified) for this credit to apply. For non-Chapter 102 projects, impervious surfaces must be removed, the soils restored, and the area revegetated to an open space (turf grass), meadow, or forested (woods) condition. For Chapter 102 projects, any existing land cover can be restored and revegetated to a meadow or woods condition.

The Spreadsheet was designed using the latest version of Microsoft Excel® and is in Excel macro workbook (XLSM) format.

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

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.

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 top of the 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. 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.

SCM 3.4.4 Spreadsheet
Draft, August 10, 2026

Completing the Spreadsheet

General Section



**SCM 3.4.4
Revegetation and Soil Restoration**

CLEAR FORM

Project Name:

SCM ID: ☒ Chapter 102 Revegetation and Soil Restoration Area: ac

2-year/24-hour precipitation depth: in ☐ Tree Planting

- **Project Name** – Enter the Project (Site) Name as reported on the NOI, application, or plan submitted to DEP/CCD.
- **SCM ID** – Enter the SCM ID as is identified on plan drawings and PCSM Module 2 (for Chapter 102 projects) or in a Volume Management Plan (for MS4s). A legal instrument, easement or other recording will be needed to ensure long-term protection.
- **Chapter 102** – Check the box next to “Chapter 102” if the SCM is being implemented to comply with Chapter 102 PCSM requirements, otherwise uncheck the box.
- **Revegetation and Soil Restoration Area** – Enter the proposed area of the SCM, in acres.
- **2-Year/24-Hour Precipitation Depth** – Enter the 90th upper confidence interval statistic for the 2-year/24-hour precipitation depth using [NOAA Atlas 14](#) or other published sources, in inches (optional, not used in credit calculations).
- **Tree Planting** – Check the box next to “Tree Planting” if trees will be planted for volume management credit. Do not check the box if trees will be planted as part of another SCM. To obtain credit, trees must be planted in areas characterized as “Open Space” or similar land cover (i.e., not meadow or woods) or trees must be planted adjacent to impervious areas. When checked, the Tree Planting Information Section becomes available in the spreadsheet as described below. ***If the applicant or permittee is only planting trees and is not conducting revegetation and soil restoration, all other sections of the spreadsheet may remain blank.***

Tree Planting Information

☒ **Tree Planting Information**

☒ No. trees to be planted within Open Space or similar land cover:

No. Deciduous trees that will be planted:

No. Evergreen trees that will be planted:

☒ No. trees to be planted within 10 feet of impervious surfaces:

No. Deciduous trees that will be planted:

No. Evergreen trees that will be planted:

SCM 3.4.4 Spreadsheet
Draft, August 10, 2026

- **No. trees to be planted within Open Space or similar land cover** – Select the number of trees to be planted within Open Space or similar land cover from the dropdown list. If the number of trees exceeds the maximum number in the dropdown list, contact DEP's Bureau of Clean Water (RA-EPChapter102@pa.gov). After selecting the total number of trees, select the number of deciduous trees that will be planted. The number of evergreen trees is automatically displayed as the difference between total and deciduous trees. For full credit, each tree should be planted at least 10 feet apart (measured trunk to trunk). If trees will be planted less than 10 feet apart, enter the number of trees from the dropdown list. If planted less than 10 feet apart, one tree is assigned full credit and the remainder receive half credit. Full credit is 6 CF per deciduous tree and 10 CF per evergreen tree. *Every highlighted cell must be populated for volume management credit to be calculated.*
- **No. trees to be planted within 10 feet of impervious surfaces** – Select the number of trees to be planted within 10 feet of impervious surfaces (as measured from the trunk) from the dropdown list. Follow all other instructions for Open Space above. Note that the impervious surface must drain as sheet flow or shallow concentrated flow to uncompacted, vegetated soil associated with the tree planting, or the tree canopy must directly overhang or intercept runoff from the contributing impervious surface. Also, runoff from impervious may not bypass directly to a curb, inlet, pipe, or other conveyance before entering the tree planting area. Full credit is 9 CF per deciduous tree and 15 CF per evergreen tree. *Every highlighted cell must be populated for volume management credit to be calculated.*

Revegetation Information Section

☒ **Revegetation Information**

Pre-Restoration Land Cover Type	Area (ac)	HSG	(CF)
Post-Restoration SCM Land Cover Type	Area (ac)	HSG	(CF)

- **Pre-Restoration Land Cover Type** – Select the pre-construction land cover type for the SCM area. For Chapter 102 projects the true pre-construction land cover should be selected. For non-Chapter 102 projects select the type of impervious surface that will be removed. The area is automatically populated from the SCM Area, entered above. Select the predominant Hydrologic Soil Group (HSG) soil type; for existing impervious surfaces the [NRCS Web Soil Survey](#) may be used (field verification is encouraged). The 2-year/24-hour storm runoff will be automatically calculated if the 2-year/24-hour precipitation depth is populated (this volume is not used in credit calculations).
- **Post-Restoration SCM Land Cover** – Select the post-construction SCM land cover type for the SCM area. For Chapter 102 projects the options are Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay (Meadow) and Woods (Good Condition). For non-Chapter 102 projects the options are Meadow, Woods (Good Condition) and Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%). The area is automatically populated from the SCM Area, entered above. The HSG soil type is automatically populated from the pre-construction land cover and the 2-year/24-hour storm runoff will be automatically calculated if the 2-year/24-hour precipitation depth is populated.

Both pre- and post-construction land covers must be populated for volume management credit to be calculated.

Design Standards Section

☒ **Design Standards**

Variation:

Parameter	Standard	Design Value
Average slope over SCM area (maximum)	15%	
Soil restoration will not be implemented within 50 feet of any structure	TRUE	
Post-restoration depth of A horizon (amended) soil layer (minimum) (in)		
Depth to bedrock (in)		
Depth to compacted limiting zone (in)		
Stormwater (other than direct precipitation) will be directed to the SCM		

- **Variation** – Select “Biological Soil Restoration” or “Exposed Subsoil Restoration” if these variations of soil restoration will be implemented as described in Section 3.4.4 of the PCSM Manual, otherwise select “None.”
- **Average slope over SCM area (maximum)** – Enter the average slope of the SCM area, up to 15%. If the slope exceeds 15% the area cannot be used for Revegetation and Soil Restoration Credit.
- **Soil restoration will not be implemented within 50 feet of any structure** – Select TRUE if the area of soil restoration is at least 50 feet away from existing and planned structures. If FALSE is selected a 25% deduction in Soil Restoration Credit applies.
- **Post-restoration depth of A horizon (amended) soil layer (minimum) (in)** – Select the depth of the A horizon (topsoil) amended soil layer that is planned for restoration, in inches. Include the top (O) horizon layer in the depth. The standard is 8 inches unless the depth to bedrock is 12 inches or less, in which case the standard is 12 inches. A 50% deduction applies if the planned A horizon depth is more than 2 inches shallower than the standard and a 25% deduction applies if the planned depth is less than the standard. For example, if the standard is 8 inches, a planned depth of 6 inches will result in a deduction of 25% and a planned depth of 5 inches will result in a deduction of 50%.
- **Depth to bedrock (in)** – Select the depth to bedrock, in inches, as determined through test pits.
- **Depth to compacted limiting zone (in)** – Select the depth to a compacted limiting zone, in inches, as determined through test pits. If the compacted limiting zone is located at a depth of 20 inches or less, the following information must be provided:
 - **Subsoils will be decompacted to a depth of 12 - 20 inches and the top 8 inches or more of soils will be amended** – Select TRUE if subsoils will be decompacted in accordance with Section 3.4.4 of the PCSM Manual. If FALSE is selected, a deduction of 50% applies.
 - **Decompaction method** – Select the method used to decompact soils; options are Wing-tipped subsoiler, Ripper, and VTSPR ([Virginia Tech Soil Profile Rebuilding](#)).
- **Stormwater (other than direct precipitation) will be directed to the SCM** – Select TRUE if stormwater other than direct precipitation will be directed to the SCM following restoration (regardless of whether the stormwater originates from impervious or pervious surfaces), otherwise select FALSE. Note that the routing of stormwater to the restored area does not result in additional credit; however, if a retentive grading berm is constructed, credit for routed stormwater may be obtained in accordance with Section 3.4.5 of the PCSM Manual.

If TRUE is selected, report the following information concerning protection of the SCM:

SCM 3.4.4 Spreadsheet
Draft, August 10, 2026

- **Impervious area routed to SCM (maximum) (ac)** – Enter the impervious area, in acres, that will be routed to the SCM. The standard is 0.5 acre per 1 acre of SCM area. An allowance of 10% is provided. When impervious routed to the SCM is 110% of the standard, a deduction applies, as follows:

$$\text{Actual Impervious} - (\text{Impervious Standard} \times 1.1) / (\text{Impervious Standard} \times 1.1)$$

- **Inflow velocity @ 10-year/24-hour storm (fps)** – Calculate and enter the peak inflow velocity (at the location where runoff enters the SCM) at the 10-year/24-hour storm. The standard is 2 fps. An allowance of 10% is provided. When the velocity is more than 110% of the standard, a deduction applies, as follows:

$$\text{Calculated Inflow Velocity} - (\text{Inflow Velocity Standard} \times 1.1) / (\text{Inflow Velocity Standard} \times 1.1)$$

Volume Management Credit Section

☒ **Volume Management Credit**

☐ *Manually enter all soil properties*

USDA Soil Type:	
Organic Matter, Pre-Restoration:	
Organic Matter, Post-Restoration:	
Field-Measured Bulk Density, Pre-Restoration (lbs/ft ³):	
Compaction Level, Pre-Restoration:	
Compaction Level, Post-Restoration:	Normal
Average Rooting Depth, Pre-Restoration (in)	
Average Rooting Depth, Post-Restoration (in)	

A certified soils scientist or licensed professional with expertise in soils should complete this section.

- **Manually enter all soil properties** – When this box is checked, all soil properties can be manually entered by the user (except for Compaction Level, Post-Restoration). When this box is unchecked, the spreadsheet will estimate Compaction Level, Pre-Restoration, and Pre- and Post-Restoration Saturation, Field Capacity, and Wilting Point.
- **USDA Soil Type** – Select the predominant soil texture classification of soils within the SCM area, as defined by the U.S. Department of Agriculture (USDA): Clay, Clay Loam, Loam, Loamy Sand, Sand, Sandy Clay, Sandy Clay Loam, Sandy Loam, Silt, Silty Clay, Silty Clay Loam, or Silty Loam.
- **Organic Matter, Pre-Restoration** – Select the range (< 1%, 1%-3%, or > 3%) that describes the pre-restoration organic matter content (%) of soils to be restored as determined using the methods described in ASTM D2974 (Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils) or another published method at the discretion of the soils scientist or licensed professional.
- **Organic Matter, Post-Restoration** – Select the range (< 1%, 1%-3%, or > 3%) that describes the organic matter content (%) that is planned following restoration. Typically, "> 3%" should be selected.
- **Field-Measured Bulk Density, Pre-Restoration (lbs/ft³)** – Enter the bulk density of A horizon soils, in lbs/ft³, prior to restoration, using the methods described in ASTM D7263 (Standard Test Methods for Laboratory Determination of Density and Unit Weight of Soil Specimens) or another published method at the discretion of the soils scientist or licensed professional.

SCM 3.4.4 Spreadsheet Draft, August 10, 2026

- **Compaction Level, Pre-Restoration** – If the “Manually enter all soil properties” box is unchecked, a qualitative description of the level of compaction (Normal, Dense, Hard or Severe) is displayed based on Soil Type, Organic Matter, Pre-Restoration, and Bulk Density, Pre-Restoration. If checked the user can select from Normal, Dense, Hard or Severe. This is for information only (not used to calculate credit).
- **Compaction Level, Post-Restoration** – A compaction level of Normal is selected by default as the goal of soil restoration efforts.
- **Average Rooting Depth, Pre-Restoration (in)** – Enter the average rooting depth for pre-restoration vegetation, in inches, if applicable. This is the depth where the majority of a plant’s or tree’s root system is located (not the deepest rooting depth). If impervious will be removed for revegetation, enter zero (0). For turf grass enter a value of 4 inches or less. For other vegetation consult published sources or a landscape professional.
- **Average Rooting Depth, Post-Restoration (in)** – Enter the average rooting depth for pre-restoration vegetation, in inches, if applicable. This is the depth where the majority of a plant’s or tree’s root system is located (not the deepest rooting depth). Rooting depth will vary based on species and on site-specific factors such as soil type and water availability. If impervious will be removed for restoration and revegetation, enter zero (0). For turf grass enter a value of 4 inches or less. For other vegetation, use a test pit to estimate this value, consult published sources, consult a landscape professional, or use best professional judgment. Use a weighted average if there is a variety of vegetation with different rooting depths. Average Rooting Depth is used to estimate the ET Void Space Credit component of Soil Restoration Credit.
- **Pre-Restoration Saturation (%), Field Capacity (%) and Wilting Point (%)** – If the “Manually enter all soil properties” box is unchecked, the spreadsheet will populate these soil properties (% Volume) using the Soil – Plant – Air – Water (SPAW) model, Soil Water Characteristics function, which is based on the work of Saxton and Rawls (2006)¹. If the “Manually enter all soil properties” box is checked, the user must enter these values, preferably using output from the SPAW model.

Analysis Method: ☒ Default ☐ Other Design Storm Model ☐ Continuous Simulation

Infiltration & ET Void Space Credit (CF):	
ET Void Space Credit (CF):	0
Infiltration Void Space Credit (CF):	0
Deductions (CF):	
Tree Planting Credit (CF):	0
Volume Management Credit (CF):	0

- **Analysis Method** – Select the method used to analyze the SCM’s performance by checking the appropriate box. If “Default” is checked, credit calculations are performed in the Spreadsheet using the methods explained below for *ET Void Space Credit* and *Infiltration Void Space Credit*. Check the box for “Other Design Storm Model” if a different model is used that evaluates a design storm but uses a method that differs from the default (e.g., Green-Ampt, Horton, others). Check the box for “Continuous Simulation” if a dynamic model is used to evaluate SCM performance through a long-term precipitation data set (e.g., EPA’s SWMM). If a selection is made that is not “Default”, *Infiltration & ET Void Space Credit* must be manually entered, which must be supported by the submission of model inputs and outputs. An input box will be displayed for manual entry of the credit determined by modeling:

¹ K. E. Saxton and W. J. Rawls (2006). Soil Water Characteristic Estimates by Texture and Organic Matter for Hydrologic Solutions. *Soil Science Society of America Journal*, Vol. 70.

Enter a valid whole number and click “OK”. The entered value will be displayed as Infiltration & ET Void Space Credit. If a number is entered that exceeds 150% of the credit calculated by the default method, a message is displayed and a value equal to 1.5 times the credit calculated by the default method is populated into the Volume Management Credit cell.

- **Infiltration & ET Void Space Credit** – This credit is displayed only when the default method is not used, as described above.
- **ET Void Space Credit (CF)** – When the default method is used, ET Void Space Credit is calculated using the following equation:

$$(\text{Post-Restoration Field Capacity (\%)} - \text{Post-Restoration Wilting Point (\%)}) - (\text{Pre-Restoration Field Capacity (\%)} - \text{Pre-Restoration Wilting Point (\%)}) * 70\% (0.7) * (\text{Post-Restoration Average Rooting Depth (in)} - \text{Pre-Restoration Average Rooting Depth (in)}) * \text{SCM Area (SF)} * 1 \text{ ft}/12 \text{ in}$$

When revegetation will be to open space (turf grass; available for non-Chapter 102 projects only), meadow, and woods, the maximum differences in rooting depth for credit are 4, 8, and 16 inches, respectively.

ET Void Space Credit for this SCM is limited to 70% of the difference between field capacity and wilting point as plants are less capable of extracting water as wilting point is reached.

- **Infiltration Void Space Credit (CF)** – When the default method is used, Infiltration Void Space Credit is calculated using the following equation:

$$(\text{Post-Restoration Saturation (\%)} - \text{Post-Restoration Field Capacity (\%)}) - (\text{Pre-Restoration Saturation (\%)} - \text{Pre-Restoration Field Capacity (\%)}) * 70\% (0.7) * \text{Post-restoration depth of A horizon (amended) soil layer (up to 12 inches)} * \text{SCM Area (SF)} * 1 \text{ ft}/12 \text{ in}$$

Infiltration Void Space Credit is limited to 70% of the difference between field capacity and saturation for the soil amendment depth due to anticipated compaction.

- **Deductions (CF)** – If there are any deductions due to deviations from design standards, the magnitude of the deductions is displayed.

SCM 3.4.4 Spreadsheet
Draft, August 10, 2026

- **Volume Management Credit** – If the default method is used, Volume Management Credit is the sum of ET Void Space Credit, Infiltration Void Space Credit and Tree Planting Credit (if applicable) minus Deductions. If a method other than the default is used, Volume Management Credit is the manually entered credit (up to 150% of the default credit) minus Deductions.

The user of the spreadsheet should enter their name and company after reading the certification statement.

Revision History

Date	Version	Revision Reason
8/10/2026	1.0	Revised Draft