7.1.7 Temporary Stormwater Management

A. When Required

1. Temporary Stormwater Management (TSWM) shall be addressed for development projects that are subject to Stormwater Management (SWM) requirements.

2. TSWM is required when the peak discharge during the interim conditions exceeds the pre-development discharge from the site and has been a requirement for all new grading permit applications submitted on or after March 1, 2017. This updated guidance provides clarification and additional guidance regarding the application of this requirement as a part of the design review.

3. This guidance is effective for all new grading permits and revisions to grading permits if the limit of disturbance is expanded and only for the area added.

4. TSWM shall be required for all projects that require grading permits.

5. TSWM may be waived:

    a. If the disturbance is less than 5,000 SF.
    b. If the existing conditions curve number is higher than the zoning-based curve number (refer to the Anne Arundel County SWM Practices and Procedure Manual, Appendix 11.9).
    c. If the drainage area to the Erosion and Sediment Control is less than 1.5 acres and/or the Erosion and Sediment Control plan is designed to allow the interim discharge to leave the site via sheet flow under non-erosive conditions at all times during construction. At the discretion of the County and on a case-by-case basis, TSWM may be required for sites that include disturbances or discharge to sensitive environmental features.
    d. If the site discharges to a public storm drain that has been shown to provide an adequate outfall for the site as outlined in Chapter 7.2 of the County's Stormwater Management Practices and Procedures Manual. The limits of the adequacy assessment will begin at the site outfall(s) and progress downstream to the Point(s) of Investigation (POI).

B. Calculations

1. The SWM Report shall include All TSWM computations as a separate chapter.

2. The criteria for sizing TSWM is based on capturing and detaining (over 24 hour period) rainfall volume to prevent downstream degradation by controlling the Bankfull discharge, also known as the channel-forming event. The extensive literature research on this topic suggests that the

Bankfull event ranges between the 1 and 2-year storm events. Based on this, a total volume of storage based on 2 inches of rainfall was chosen as the basis for sizing TSWM facilities. The volume of storage is calculated based on a simplified form of the Soil Conservation Service, SCS rainfall-runoff relationship (simplified to exclude the initial abstraction) as shown in Equation 1 below. Table 5.3 of the Maryland Stormwater Design Manual (October 2000, Revised May 2009) is used to determine "I", which is the equivalent percent imperviousness of the drainage area that corresponds to the Runoff Curve Number for the interim conditions of the site. The RCN and I values for TSWM calculations are shown below in Table 1. The Runoff Curve Numbers during the interim construction conditions as shown in Table 1 represent (newly graded areas with no vegetation) land cover conditions during construction. The hydrologic soil group shall be downgraded by one category group in the TSWM volume calculations. The equations for estimating the Runoff volume in Cubic Feet that must be treated in the TSWM device and the draw-down flow rate required to drain the dry storage volume in 24 hours are shown below.

Table 1:

Method	Runoff Coefficient/Curve Numbers during interim construction conditions				
SCS TR-55	RCN	77 (A soils)	86 (B soils)	91 (C soils)	94 (D soils)
	I	65%	70%	70%	80%

Equation 1:

$$Q_v = \frac{P \, x \, R_v \, x \, A}{12}$$

Equation 2:

$$Q_{d-d} = \frac{Q_v \; in \; Cubic \; Feet}{24 \; hours \; x \; 3600 \; seconds/hour}$$

Where,

Q_v is the runoff volume in cubic feet or acre-feet
P is the rainfall depth in inches,
R_v is the dimensionless volumetric runoff coefficient = 0.05 + 0.009(I)
I is the "equivalent percent impervious" cover from Table 1
A is the contributory drainage area to the TSWM device
Q_{d-d} is the draw-down flow rate in cfs to drain the dry storage volume in 24 hours

3. TSWM is considered to be provided when calculations show that the trapping device is sized for a total of 2 inches of rainfall, where 1 inch of rainfall (i.e., P = 1 inch) is stored as wet storage and 1 inch of rainfall will be stored as extended detention dry storage to be released over 24 hours (extended drawdown). The design engineer will need to adjust, modify the design of the dewatering device to drain the dry storage over a 24-hr period. The volumes of storage (wet and

dry) provided in the trapping device shall be based on the Qv or Tables G.1 and G.3 of the ESC manual (whichever is greater). I&P understands that no single guidance document or manual can cover each and every site situation regarding E&S design and the county looks to the design engineer to ensure that TSWM is provided. The designer should consider potential clogging of orifice, ports, and weirs as a part of the design.

4. The minimum design requirements stipulated in the ESC Manual must be followed for all TSWM practices. Notes and calculations shall be provided to the contractor on the grading plans to indicate how the vertical draw-down device for sediment trapping devices is modified to meet the TSWM requirements. A TSWM summary table (see below example) shall be added per trapping device to the grading plans.

TSWM design Summary Table – Trapping Device # __	
Contributory DA (acres)	
TSWM P (inches)	1 rainfall inches (dry) & 1 rainfall inches (wet)
TSWM RCN	
TSWM (I) %	
TSWM R_v	
Qv Wet Volume (ft^3)	
Qv Dry Volume (ft^3)	
Basin Bottom Elevation (ft)	
Wet storage (Permanent pool/draw-down) elevation (ft)	
$Q_{d\text{-}d}$ (cfs)	
Calculated A_o (ft^2)	
Calculated D_o (inches)	

5. An outfall protection plunge pool shall be required at the outlet of all TSWM traps to ensure that adequate energy dissipation is provided for higher-frequency storm events. To the extent practical, onsite or off-site plunge pools need to be constructed in the sequence of construction to provide added protection from blowouts during the interim conditions. The MDE Detail D-4-2 (attached at the end of this document) may be used to design the plunge pool. For pipe outlet structures, E=d shall be determined based on the outlet barrel size. For stone outlet structures, the equivalent E=d parameter shall be assumed to be 48 inches.

C. Providing TSWM

1. TSWM volume requirement will be preliminary reviewed by I&P Engineering during the Final Plan or Site Development Plan process, with a final review of the devices to be provided during the grading permit review of the project.

2. The designer shall make a concerted effort to maintain the drainage pattern for the site. The TSWM design, to the extent practical, should follow the permanent proposed drainage patterns.

In the event that the proposed TSWM devices create new discharge points that were not considered in the project's downstream investigation study, the designer will be required to provide additional downstream investigations for these TSWM discharge points.

3. Erosion and Sediment Control Plans shall clearly show and label all proposed ESD devices in red so that reviewers, contractors, and inspectors are aware of the location of SWM facilities and can take proper precautions while in the field. For facilities proposed within the footprint of a TSWM device, special construction notes shall be added to the grading plan to show diversion devices around SWM facilities installed pre-95% stabilization of the site and to indicate the sequence for conversion of a TSWM facility to a permanent SWM facility and specifically how the integrity of infiltration and or filtration performance will be maintained. Best construction practices, such as limiting the use of heavy equipment on SWM areas that rely on the underlying soil infiltration capacity to drain, shall be added to the plan.

4. The sequence of construction shall demonstrate that closed storm pipe conveyance does not bypass the trap/basin until the permanent SWM design is in place. Outfall protection systems (onsite or off-site) shall be constructed first to the extent practical.

5. To improve sediment detention and allow maximum circulation time, the outlet structure for TSWM devices shall be located as far as possible from the inlet structure. Other techniques, such as guiding channels and hybrid check dams/baffles, can be used to increase sediment detention within the traps. A L:W ratio of 2:1 or greater is recommended.

6. If the use of internal earth dikes changes the location of the discharge points/site outfalls, a new downstream investigation study will be required to assess the downstream adequacy/stability and the need to obtain temporary rights to discharge.

7. TSWM facilities shall not be placed in areas where existing and/or proposed permanent protective areas and their buffers exist. This excludes stream restoration, outfall stabilization, maintenance, and other management practices permitted under the conservation plan. Velocity control and conveyance structures designed downstream of the TSWM facility to maintain downstream stability may be allowed within these areas as permitted.

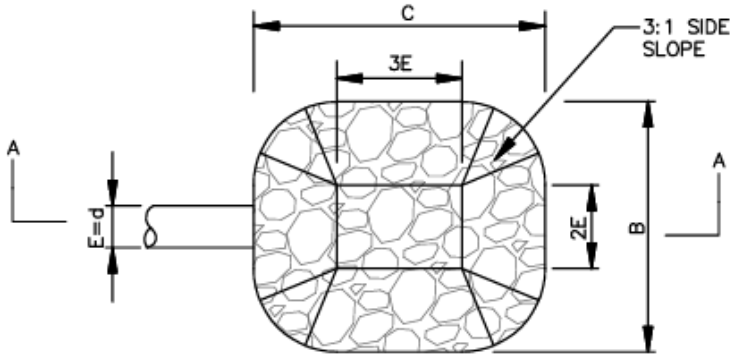
8. A TSWM may not discharge to steep slopes or their buffers (even under a right to discharge). Under certain circumstances and at the discretion of the County, an allowance, on a case-by-case basis, may be granted if the applicant proposes adequate mitigation measures such as slope stabilization and/or extension of the outfall protection system to stabilize and safely traverse the steep slopes.

9. TSWM facilities must be maintained to ensure design surface areas and volumes are not compromised. This may include, but is not limited to, sediment removal, vegetative maintenance, continued operation, and good working conditions of all orifices, ports, weirs, draw-down devices, and structures. Notes regarding these requirements must be provided on the maintenance notes for facilities providing TSWM.

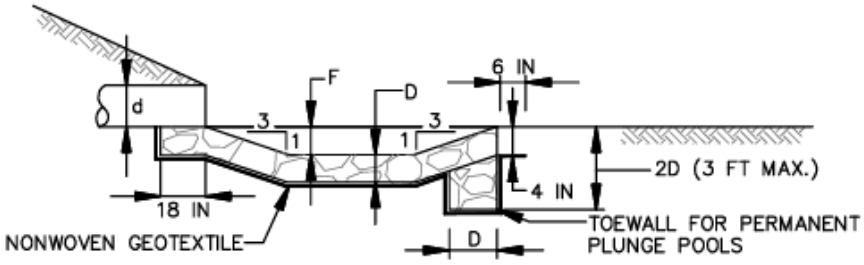
DETAIL D-4-2 PLUNGE POOL

STANDARD SYMBOL

PP



PLAN VIEW



SECTION A–A

CONSTRUCTION SPECIFICATIONS

1. USE SPECIFIED CLASS OF RIPRAP.
2. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H–1 MATERIALS, AND PROTECT FROM PUNCHING, CUTTING, OR TEARING. REPAIR ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE BY PLACING ANOTHER PIECE OF GEOTEXTILE OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE GEOTEXTILE. PROVIDE A MINIMUM OF ONE FOOT OVERLAP FOR ALL REPAIRS AND FOR JOINING TWO PIECES OF GEOTEXTILE.
3. PREPARE THE SUBGRADE FOR THE PLUNGE POOL TO THE REQUIRED LINES AND GRADES. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO A DENSITY OF APPROXIMATELY THAT OF THE SURROUNDING UNDISTURBED MATERIAL.
4. EMBED THE GEOTEXTILE A MINIMUM OF 4 INCHES AND EXTEND THE GEOTEXTILE A MINIMUM OF 6 INCHES BEYOND THE EDGE OF THE SCOUR HOLE.
5. STONE FOR THE PLUNGE POOL MAY BE PLACED BY EQUIPMENT. CONSTRUCT TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. DELIVER AND PLACE THE STONE FOR THE PLUNGE POOL IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES AND SPALLS FILLING THE VOIDS BETWEEN THE LARGER STONES. PLACE STONE FOR THE PLUNGE POOL IN A MANNER TO PREVENT DAMAGE TO THE GEOTEXTILE. HAND PLACE TO THE EXTENT NECESSARY.
6. AT THE PLUNGE POOL OUTLET, PLACE THE STONE SO THAT IT MEETS THE EXISTING GRADE.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. KEEP OUTLET FREE OF EROSION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS. AFTER HIGH FLOWS INSPECT FOR SCOUR AND DISLODGED RIPRAP. MAKE NECESSARY REPAIRS IMMEDIATELY.