



# **Delaware Sediment & Stormwater Program**

***Revisions to the  
Delaware Sediment and Stormwater Regulations  
Public Workshop  
June 8, 2016***

# Schedule

- July 1, 2016 – Publish in State Register of Regulations
  - Proposed regulation revisions
  - Referenced Technical Document
  - Regulatory Flexibility Act response & Regulatory Impact Statement

# Schedule

- July 21, 2016 – Public Hearing
  - 6pm
  - DNREC Auditorium
- August 5, 2016 – Earliest date comment period closes

# Schedule

- October 1, 2016 – Publish Final Regulations in State Register
- October 11, 2016 – effective date
- October 13, 2016 – Emergency Regulations Expire

# Schedule

- May be subject to change based upon Senate Bill 253 status
- Interested Parties will be notified by email to any change in Public Hearing date

# Proposed Regulations

- 2014 Regulations as starting point
- Revisions to:
  - 1.7 Offset Provisions
  - Definitions
    - Offset
    - Runoff Reduction Practices
  - 3.0 Plan Approval Procedures
  - 5.2 Resource Protection Event Criteria
  - 5.6 Redevelopment Criteria

# Incorporate Articles of Technical Document by reference

- Article 1 – background information only; will not be published as regulation
- Article 2 with revisions
- Article 3 with revisions, excluding examples
- Article 4 as existing
- Article 5 as existing

# Technical Document

- Will be regulation by reference
- Requires regulatory revision to modify
- Remove procedures for modifications to Technical Document
  - Stricken from Article 2.02 of Technical Document

# Plan Review Process

# Plan Review Process Regulations

- Added 3.1.3
  - Allows Steps 2 & 3 to be combined
  - Determined at Project Application Meeting

3.1.3 Step 2 and Step 3 of the three-step approval process may be combined as determined by the Department or Delegated Agency on a case-by-case basis. This determination may be made at the project application meeting and documented in meeting minutes.

# Plan Review Process Technical Document

- **NEW** submittal checklist
  - 3.02.4.1 Combined Step 2 & 3 Plan Review



*Combined Step 2 & 3:  
Sediment & Stormwater Management Plan Review Checklist*

DATE RECEIVED: \_\_\_\_\_ PROJECT NUMBER: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

This checklist was developed to accommodate all project types. It is understood not all items will be applicable to all projects and as such marking an item "Not Applicable" (NA) is acceptable.

**General Information:**

1. \_\_\_\_\_ Completed application signed by the owner, review fee, one set of plans and reports, and a completed checklist must be submitted for review. Electronic plan and report program files (i.e., AutoCAD, Microstation, DURMM, HydroCAD, and/or equal/similar) shall be transmitted upon agency request. An electronic hardcopy of the plans and reports (i.e. PDF) shall also be transmitted for final approval.
2. \_\_\_\_\_ Provide a copy of the notice to DelDOT, a municipality, or a private entity (i.e., neighboring Homeowner's Association) for the intent to discharge or connect to their stormwater system. The notice shall indicate the proposed condition and that any comments regarding the discharge shall be returned within 30 calendar days, and if no comments are received than consent to discharge is assumed. If directly copied on the notice, indicate the date of the notice and the reviewer copied: \_\_\_\_\_
3. \_\_\_\_\_ Hydraulic and Hydrology computations shall reflect the proposed site conditions.
4. \_\_\_\_\_ All plans should be submitted on 24" x 36" (minimum) sheets unless otherwise approved.
5. \_\_\_\_\_ When two (2) or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one (1) 24" x 36" (minimum) sheet.
6. \_\_\_\_\_ Provide a north arrow on all plans.
7. \_\_\_\_\_ All plan views, cross-sections, profiles, and structural details shall be to a defined scale.
8. \_\_\_\_\_ Provide a scale bar for all plan views.
9. \_\_\_\_\_ Provide names of adjacent property owners on all plans.
10. \_\_\_\_\_ Provide existing and proposed contours based on NAVD 88 vertical datum at one (1) foot intervals (2 foot intervals can be provided for offsite drainage information based on the latest Lidar information).
11. \_\_\_\_\_ For small projects less than 1/2 acre of disturbance, provide existing and proposed elevations based on NAVD 88 vertical datum on a fifty-foot grid system. Include high and low points.
12. \_\_\_\_\_ Locate the site in NAD83 horizontal datum.
13. \_\_\_\_\_ Provide a copy of the Site Plan(s) and Grading Plan(s) as prepared for the local approval agencies for review and informational purposes.
14. \_\_\_\_\_ Provide a copy of the preliminary Record Plan as prepared for the local land use approval agency for review and informational purposes.
15. \_\_\_\_\_ All detailed plans submitted for review shall be prepared, signed, dated and sealed by a Licensed Professional in the State of Delaware.
16. \_\_\_\_\_ Provide the Sediment and Stormwater Management plans in the following order and title (sheet list to appear on the Coversheet, and each plan sheet shall be respectively titled):
  - a. \_\_\_\_\_ Coversheet and General Notes
  - b. \_\_\_\_\_ Overall Construction Site Phasing Plan (if applicable)
  - c. \_\_\_\_\_ Overall Pre-Construction Site Stormwater Management Plan (if applicable)
  - d. \_\_\_\_\_ Pre-Construction Site Stormwater Management Plan #X
  - e. \_\_\_\_\_ Overall Construction Site Stormwater Management Plan (if applicable)

06/15/2016 3.02.4.1-1

# Plan Review Process Regulations

- Deletes
  - Stormwater Assessment Report
  - Project Application Meeting Discussion & Agreement Items

# Plan Review Process Regulations

- Meeting minutes prepared by Owner representative
  - 3.2.4 Project application meeting discussion and agreement items will be documented in meeting minutes prepared by the Owner or the Owner's Representative and distributed to all in attendance.

# Plan Review Process Technical Document

- SAS Submittal Checklist
- Project Application Meeting Discussion and Agreement Items
- Preliminary plan submittal checklist
- S&S Plan submittal checklist
- **NEW** Combined Step 2 & 3 submittal checklist

# Plan Review Process Technical Document

- SAS Submittal Checklist
  - Pared down
  - Online info from SAS GIS Mapping
  - Less Soil Report info

- If project area is not impacted by layer, mark N/A
  - Site location
    - Parcel Boundary showing parcel and ID
    - NHD streams and water features
    - Existing 2' contours
  - Tax Ditch Mapping (watershed boundaries, channel locations, rights-of-way)
  - Aquifer and Wellhead areas
    - Wellhead protection
    - Aquifer recharge areas
  - FEMA Mapping (Floodways and Flood hazard areas)
  - 2007 Land Use / Land Cover (LULC)
  - State Wetland Mapping Project (SWMP)
  - Runoff Reduction Feasibility (*NOTE: much of New Castle County is not mapped*)
- StreamStats Map and Basin Characteristics Report showing limit of downstream analysis if beat the peak method is anticipated. (The downstream analysis point will be located at the point in the watershed where the site area comprises less than 10% of the watershed area. Alternative downstream limit points may be shown for discussion.  
*StreamStats Link: <http://water.usgs.gov/owp/streamstats/deliverable.html>*
- Customized Web Soil Survey reports for Stormwater Management for proposed developed area of the site.  
*Link: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>*  
The following elements are required for submittal:

SWM Soils Report Elements	Map	Table	Desc.
Soil Map Tab	X		X
Soil Data Explorer Tab			
Suitabilities and Limitations for Use			
Land Classifications			
Map Unit Hydric Rating	X	X	X
Soil Properties and Qualities			
Soil Qualities and Features			
Hydrologic Soil Group	X	X	X
Water Features			
Depth to Water Table	X	X	X

- Unit Discharge Approach Option - Completed Stormwater Assessment Report**  
If using the Unit Discharge Approach for the Cv and Fv, provide a copy of the completed Stormwater Assessment Report, including:
- Assessment item ratings for anticipated engineering effort
  - Computation sheet used to determine ratings

*This checklist is for guidance only. The Delegated Agency reserves the right to request additional information during the review process as it deems necessary. Compliance with the checklist in no way is meant to relieve the design professional of his/her professional responsibilities.*

# Plan Review Process Technical Document

- Project Application Meeting Discussion and Agreement Items
  - Maintained as reference
  - Edited Rpv notes with respect to redevelopment
  - Modified plan submittal lists

Sediment and Stormwater Program Project Application Meeting  
**Agreement Items**

**Project Name:** \_\_\_\_\_

**Meeting Date:** \_\_\_\_\_

c. Indicate section of Regulations for complying with Rpv:

- 5.2.3.1 Runoff reduced to equiv wooded condition
- 5.2.3.2 Equivalent 0% effective imperviousness
- 5.6.\_\_\_\_ Redevelopment (fill in Regulation section #)

d. List any other issues or notes related to compliance with Rpv requirements: \_\_\_\_\_  
\_\_\_\_\_

6. Stormwater Quantity Management

a. The following BMPs are being considered for stormwater quantity management for meeting the Cv and Fv requirements: \_\_\_\_\_  
\_\_\_\_\_

b. Indicate section of Regulations for complying with Cv:

- 5.3.3.1 Management for no adverse impact
- 5.3.3.2 Tidal Discharge
- 5.3.3.3 Watershed Location
- 5.3.3.4 De minimus discharge
- Management in accordance with watershed management plan

c. Indicate section of Regulations for complying with Fv.

06/15/2016 3.02.1.2-8

# Plan Review Process

## Technical Document

- Preliminary plan submittal checklist
- S&S Plan submittal checklist
  - N/A acceptable
  - Removed redundant items
  - Separation to SHWT



**Step 2:**  
*Preliminary Sediment & Stormwater Management Plan Review Checklist*

DATE RECEIVED: \_\_\_\_\_ PROJECT NUMBER: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

This checklist was developed to accommodate a wide variety of project types. It is understood not all items will be applicable to all projects and as such marking an item "Not Applicable" (N/A) is acceptable.

**General Information:**

1. \_\_\_\_\_ Completed application signed by the owner, review fee, one set of plans and reports, and a completed checklist must be submitted for review. Electronic plan and report program files (i.e., AutoCAD, Microstation, DURMM, HydroCAD, and/or equal/similar) shall be transmitted upon agency request.
2. \_\_\_\_\_ Provide a copy of the notice to DelDOT, a municipality, or a private entity (i.e., neighboring Homeowner's Association) for the intent to discharge or connect to their stormwater system. The notice shall indicate the proposed condition and that any comments regarding the discharge shall be returned within 30 calendar days, and if no comments are received than consent to discharge is assumed. If directly copied on the notice, indicate the date of the notice and the reviewer copied: \_\_\_\_\_
3. \_\_\_\_\_ Hydraulic and Hydrology computations shall reflect the proposed site conditions.
4. \_\_\_\_\_ All plans should be submitted on 24" x 36" (minimum) sheets unless otherwise approved.
5. \_\_\_\_\_ When two (2) or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one (1) 24" x 36" (minimum) sheet.
6. \_\_\_\_\_ Provide a north arrow on all plans.
7. \_\_\_\_\_ Provide all plan views to a defined scale with a scale bar.
8. \_\_\_\_\_ Provide names of adjacent property owners on all plans.
9. \_\_\_\_\_ Provide existing and proposed contours (if provided) based on NAVD 88 vertical datum at one (1) foot intervals (2 foot intervals can be provided for offsite drainage information based on the latest Lidar information).
10. \_\_\_\_\_ For small projects less than 1/2 acre of disturbance, provide existing and proposed spot elevations based on NAVD 88 vertical datum on a fifty-foot grid system. Include high and low points.
11. \_\_\_\_\_ Locate the site in NAD83 horizontal datum.
12. \_\_\_\_\_ Provide the contact information for the person or entity responsible for preparing the plans and report, including name, company, address and telephone number. Locate on both the plans and report.
13. \_\_\_\_\_ All detailed plans submitted for review shall be prepared, signed, dated and sealed by a Licensed Professional in the State of Delaware.
14. \_\_\_\_\_ Provide the Preliminary Sediment and Stormwater Management plans in the following order and title. The sheet list is to appear on the Coversheet, and on each plan sheet shall be respectively titled (include the title of the plan within the title block or lower right-hand corner of the sheet):
  - a. \_\_\_\_\_ Coversheet
  - b. \_\_\_\_\_ Schematic Pre-Construction Site Stormwater Management Plan
  - c. \_\_\_\_\_ Schematic Construction Site Stormwater Management Plan
  - d. \_\_\_\_\_ Overall BMP Contributing Drainage Area Plan
  - e. \_\_\_\_\_ BMP Contributing Drainage Area Plan

4407/201408/15/2016 3.02.2.1-1

# Resource Protection Event

# RPv - Regulations

- ~~“0% effective imperviousness”~~
- “open space in good condition”

5.2.3.2 All remaining disturbed areas shall employ runoff reduction practices to achieve an equivalent open space in good condition.

# RPv - Regulations

- Runoff reduction practices defined to include:
  - Tree canopy, Surface recharge, Evaporation, Rainfall harvesting, Infiltration, Evapotranspiration, Delayed discharge
  - 48-hour detention **NEW**
  - Any combination thereof **NEW**

# RPv – Technical Document

- 48-hour detention
  - Detention practices
  - Wet ponds

# RPv – Technical Document

- Alternate computational methods
  - $I_a/S=0.05$
  - Technical Document Article 3.04.2
- Tabular surface recharge reductions
  - Vegetated Channels
  - Sheet Flow
  - Included in 3.06.2 Appendix 7

# RPv-Regulations

- Alternate compliance for sites having a tidal discharge
  - Infiltrate, or
  - Meet TMDL

5.2.3.4 In cases where provisions will be made or exist for a non-erosive conveyance system to tidal waters, by either a closed drainage system or by open channel flow, that has adequate conveyance for the RPv, compliance with this section can be achieved by implementation of BMPs sufficient to provide treatment equal to infiltrating the RPv onsite or sufficient to meet Total Maximum Daily Load (TMDL) requirements for the receiving water.

# Redevelopment

## 5.6.2 Contaminated or Brownfield

- Contaminated or Brownfield Sites
  - Reduce impervious
    - Compliance
  - Increase impervious
    - 30% reduction in the required volume to be treated

## 5.6.3 Redevelopment RPv Compliance

- Disturbances less than one acre
  - Standard Plan
- Sites with post '91 stormwater systems
- Sites developed pre '91 stormwater

# Post '91 Redevelopment

- Existing SWM systems designed and functioning
- Reduce impervious
  - Comply
- Increase impervious
  - Runoff reduction to equivalent open space condition

# Pre '91 Redevelopment

- 15% or greater reduction in impervious
  - Complies
- <15% reduction in impervious
  - Achieve equivalent 15% reduction in effective impervious
- Increase in impervious
  - Existing Impervious: 15% reduction in effective impervious
  - New Impervious: equivalent open space condition

# Plan Review Process / Redevelopment Technical Document

- Project Application Meeting Discussion and Agreement Items
  - Maintained as reference
  - Edited RPv notes with respect to redevelopment
  - Modified plan submittal lists

Sediment and Stormwater Program Project Application Meeting  
**Agreement Items**

**Project Name:** \_\_\_\_\_

**Meeting Date:** \_\_\_\_\_

c. Indicate section of Regulations for complying with RPv:

- 5.2.3.1 Runoff reduced to equiv wooded condition
- 5.2.3.2 Equivalent 0% effective imperviousness
- 5.6.\_\_\_\_ Redevelopment (fill in Regulation section #)

d. List any other issues or notes related to compliance with RPv requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Stormwater Quantity Management

a. The following BMPs are being considered for stormwater quantity management for meeting the Cv and Fv requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. Indicate section of Regulations for complying with Cv:

- 5.3.3.1 Management for no adverse impact
- 5.3.3.2 Tidal Discharge
- 5.3.3.3 Watershed Location
- 5.3.3.4 De minimus discharge
- Management in accordance with watershed management plan

c. Indicate section of Regulations for complying with Fv.

06/15/2016 3.02.1.2-8

# Offsets

# Offsets - Regulations

- “Allow” offsets rather than “require”

1.7.1 The Department ~~may require~~ will allow an offset as an alternative to full or partial compliance with the Resource Protection Event requirements as provided in Sections 5.2 and 5.6.3 of these regulations.

# Offsets - Regulation

- New definition

“Offset” means an alternate mechanism to meet the regulations including, but not limited to fees-in-lieu, trading and mitigation.

# Offsets – Technical Document

## Edited Article 2.04

- Can be proposed for:
  - Sites with limitations
  - When compliance with alternatives is more efficient
- Cannot be used for 100% of R<sub>Pv</sub> requirement
- No longer volume-based
- Pollutant reduction based

# Offsets – Technical Document

## Edited Article 2.04

- Options include:
  - Fees-in-lieu
  - Trading
  - Mitigation
- Offsets Technical Document to be further refined
- More compliance options means less reliance on offsets

# Post Construction Stormwater BMP Standards and Specifications

3.06.2 Post Construction Stormwater BMP  
Standards and Specifications  
March 2013



# Proposed Revisions to Post Construction Stormwater BMP Standards & Specifications

- Infiltration
- Bioretention
- Rainwater Harvesting
- Vegetated Channels
- Sheet flow
- Detention Practices
- Constructed Wetlands
- Wet Ponds
-  Afforestation
- Appx. A-1 Soil Investigation Procedures
-  Appx. A-7 Alternative Methods for RPv Compliance

# Specification 1.0 Infiltration

## 1.0 Stormwater Infiltration

**Definition:** Practices that capture and temporarily store the design storm volume before allowing it to infiltrate into the soil over a two day period. Design variants include:

- 1-A Infiltration Trench
- 1-B Infiltration Basin



Infiltration practices use temporary surface or underground storage to allow incoming stormwater runoff to exfiltrate into underlying soils. Runoff first passes through multiple pretreatment mechanisms to trap sediment and organic matter before it reaches the practice. As the stormwater penetrates the underlying soil, chemical and physical adsorption processes remove pollutants. Infiltration practices are suitable for use in residential and other urban areas where *measured* soil permeability rates exceed 1 inch per hour. To prevent possible groundwater contamination, infiltration should not be utilized at sites designated as stormwater hotspots. Extraordinary care shall be taken to assure that long-term infiltration rates are achieved through the use of performance bonds, post construction inspection and long-term maintenance.

- Clarified sand layer to be determined by designer
- Added 2' catch basin sumps as pre-treatment for stormdrains in residential sites
- Clarified setbacks from wells and septic systems in accordance with Onsite and Water Supply requirements

# Specification 2.0 Bioretention

## 2.0 Bioretention

**Definition:** Practices that capture and store stormwater runoff and pass it through a filter bed of engineered soil media comprised of sand, lignin and organic matter. Filtered runoff may be collected and returned to the conveyance system, or allowed to infiltrate into the soil. Design variants include:



- 2-A Traditional Bioretention
- 2-B In-Situ Bioretention (including Rain Gardens)
- 2-C Streetscape Bioretention
- 2-D Engineered Tree Boxes
- 2-E Stormwater Planters
- 2-F Advanced Bioretention Systems

Bioretention systems are typically designed to manage stormwater runoff from frequent, small magnitude storm events, but may provide stormwater detention of larger storms (e.g., 10-yr) in some circumstances. Bioretention practices shall generally be designed such that larger storm events bypass the system into a separate facility where site conditions allow.

For each of the design variants above, there are two basic configurations:

- *Underdrain Designs:* Practices with a positive discharge using perforated pipe; pollutant reduction occurs through a combination of runoff reduction and treatment by the filtering media. Addition of an infiltration sump is required to maximize runoff reduction performance. Advanced systems may provide greater pollutant removal capabilities through the use of improved media components and/or internal modifications that encourage partial anaerobic conditions.
- *Infiltration Designs:* Practices with no underdrains that can infiltrate the design storm volume within 48 hours; pollutant reduction is based solely on the load reduction provided by the design retention storage volume.

The particular design configuration to be implemented on a site is typically dependent on specific site conditions and the characteristics of the underlying soils. These criteria are discussed in more detail below.

- Revised R<sub>Pv</sub> credit of 100% for bioretention facilities with underdrains
- Clarified setbacks from wells and septic systems in accordance with Onsite and Water Supply requirements.

# Specification 5.0 Rainwater Harvesting

## 5.0 Rainwater Harvesting

**Definition:** Rainwater Harvesting systems intercept, divert, store and release rainfall for future use. Rainwater that falls onto impervious surfaces is collected and conveyed into an above- or below-ground storage tank (also referred to as a cistern or rain tank), where it can be used for non-potable water uses and on-site stormwater disposal/infiltration. Non-potable uses may include landscape irrigation, exterior washing (e.g. car washes, building facades, sidewalks, street sweepers, fire trucks, etc.), flushing of toilets and urinals, fire suppression (sprinkler) systems, supply for chilled water cooling towers, replenishing and operation of water features, distribution to a green wall or living wall system, and laundry. In many instances, Rainwater Harvesting can be combined with a secondary stormwater practice to enhance stormwater retention and/or provide treatment of overflow from the Rainwater Harvesting system.



Photo courtesy of Lake County (IL) Stormwater Management Commission

Rainwater Harvesting systems are separated into two categories. Design variants include:

- 5-A Seasonal Rainwater Harvesting Systems
- 5-B Continuous Rainwater Harvesting Systems

By providing a renewable source of water to end users, Rainwater Harvesting systems can have environmental and economic benefits beyond stormwater management (e.g., increased water conservation, water supply during drought and mandatory municipal water supply restrictions, decreased demand on municipal or groundwater supply, decreased water costs for the end-user, potential for increased groundwater recharge, etc.).

- Added 50% R<sub>Pv</sub> credit for wet pond storage used for seasonal irrigation
- Added 75% R<sub>Pv</sub> credit for wet pond storage used in conjunction with spray irrigation applied to forested areas

# Specification 8.0 Vegetated Channels

## 8.0 Vegetated Channels

**Definition:** Vegetated open channels that are designed to convey the design storm volume (RPv and Cv, may also convey the Fv as designed).



Design variants include:

- 8-A Bioswale
- 8-B Grassed Channel

Vegetated channels systems shall not be designed to provide stormwater detention. Vegetated channels can provide a modest amount of runoff filtering and volume attenuation within the stormwater conveyance system resulting in the delivery of less runoff and pollutants than a traditional system of curb and gutter, storm drain inlets and pipes. The performance of vegetated channels will vary depending on the underlying soil permeability. Their runoff reduction performance can be boosted when compost amendments are added to the bottom of the channel. Vegetated channels are a preferable alternative to both curb and gutter and storm drains as a stormwater conveyance system, where development density, topography, soils, and water table permit.

- Revised min. slopes from 1% to 0.5%
- Revised SHWT requirements in accordance with changes to Soils Investigation Procedures

# Specification 9.0 Sheet Flow

## 9.0 Sheet Flow to Filter Strip or Open Space

### Definition:

Filter strips are vegetated areas that treat sheet flow delivered from adjacent impervious and managed turf areas by slowing runoff velocities and allowing sediment and attached pollutants to settle and/or be filtered by the vegetation. The two design variants of filter strips are *Vegetated Filter Strips* and *Conserved Open Space*. The design, installation, and management of these design variants are quite different, as outlined in this specification.



In both instances, stormwater must enter the filter strip or conserved open space as sheet flow. If the inflow is from a pipe or channel, an engineered level spreader must be designed in accordance with the criteria contained herein to convert the concentrated flow to sheet flow.

Applicable practices include:

- 9-A. Sheet Flow to Vegetated Filter Strip
- 9-B. Sheet Flow to Vegetated Conserved Open Space

Sheet flow practices reduce a portion of the Resource Protection Volume (RPV). In order to meet requirements for larger storm events, sheet flow practices must be combined with additional practices.

- Added R<sub>Pv</sub> credit for afforested filter strips and open space
- Added methodology to compute partial R<sub>Pv</sub> credit for filter strips less than 25'
- Deleted pond maintenance items erroneously included in Table 9.6

# Specification 10.0 Detention Practices

## 10.0 Detention Practices

**Definition:** Detention Practices are storage practices that are explicitly designed to provide stormwater detention for the Conveyance Event, Cv (10-year) and Flooding Event, Fv (100-year). Design variants include:

- 10-A Dry Detention Pond
- 10-B Dry Extended Detention Basin
- 10-C Underground Detention Facilities



Dry Detention Ponds and Dry Extended Detention Basins are widely applicable for most land uses and are best suited for larger drainage areas. An outlet structure restricts stormwater flow so it backs up and is stored within the basin. The temporary ponding reduces the maximum peak discharge to the downstream channel, thereby reducing the effective shear stress on the bed and banks of the receiving stream. Dry Detention Ponds receive some credit for pollutant removal, while Dry Extended Detention Basins receive both runoff reduction and pollutant removal credits.

The key difference between Dry Detention Ponds and Dry Extended Detention Basins is that, in addition to management of the Cv and Fv, a Dry Extended Detention Basin provides up to a 24-hour detention of all or a portion of the Resource Protection Volume (RPv). An under-sized outlet structure restricts stormwater flow so it backs up and is stored within the basin. The temporary ponding enables particulate pollutants to settle out and reduces the maximum peak discharge to the downstream channel, thereby reducing the effective shear stress on banks of the receiving stream. Extended detention differs from a Dry Detention Pond's stormwater detention, since it is designed to achieve a minimum drawdown time, rather than a maximum peak rate of flow. Dry Detention Ponds, which are designed only to manage the larger Conveyance Event and Flooding Event will often detain smaller storm events for only a few minutes or hours.

Underground Detention Facilities include vaults and tanks. Underground Detention Vaults are box-shaped underground stormwater storage facilities typically constructed with reinforced concrete. Underground Detention Tanks are underground storage facilities typically constructed with large diameter metal or plastic pipe. Both serve as an alternative to surface dry detention for stormwater quantity control, particularly for space-limited areas where there is not adequate land for a dry detention basin or multi-purpose detention area. Prefabricated concrete vaults are available from commercial vendors. In addition, several pipe manufacturers have developed packaged detention systems. Underground detention vaults do not receive any runoff reduction or pollutant removal credit, and should be considered only for management of larger storm events.

- Clarified Dry ED Basins with 24-hr detention receive 10% runoff reduction credit
- Added 100% RPv detention credit for 48-hr extended detention for Dry ED Basins and underground detention facilities
- Clarified setbacks from wells and septic systems in accordance with Onsite and Water Supply requirements.
- Clarified pretreatment requirements for underground detention facilities

# Specification 12.0 Constructed Wetlands

## 12.0 Constructed Wetlands

**Definition:** Practices that mimic natural wetland areas to treat urban stormwater by incorporating permanent pools with shallow storage areas. Constructed Wetlands are explicitly designed to provide stormwater detention for larger storms (Cv and Fv) above the Rpv storage. Design variants include:

- 12-A Traditional Constructed Wetlands
- 12-B Wetland Swales
- 12-C Ephemeral Constructed Wetlands
- 12-D Submerged Gravel Wetland (to be added at a later date)



Constructed Wetlands are shallow depressions that receive stormwater inputs for water quality treatment. The majority of the wetland surface area is covered by shallow (<1' deep) wetland area, with greater depths in the forebay and pools within the wetland. Wetlands possess variable microtopography to promote dense and diverse wetland cover. Runoff from each new storm displaces runoff from previous storms, and the long residence time allows multiple pollutant removal processes to operate. The wetland environment provides an ideal environment for gravitational settling, biological uptake, and microbial activity.

The Constructed Wetlands design variants all share commonalities, but are also unique in their performance credits. None of the design variants receive any retention allowance, though they all have pollutant reduction capabilities. Traditional Constructed Wetlands (12-A), should be considered for use after all other upland runoff reduction opportunities have been exhausted and there is still a remaining treatment volume or runoff from larger storms (i.e. 10-year, 100-year or flood control events) to manage. Both Wetland Swales (12-B) and Ephemeral Constructed Wetlands (12-C) can provide some runoff reduction credits, particularly in well drained soils. Submerged Gravel Wetlands are to be added at a later date, and will only provide pollution reduction credits.

Constructed Wetlands have both community and siting criteria (see *Section 12.3 Wetland Feasibility Criteria*) that should be considered before incorporating the stormwater practice onsite.

- Added language related to ephemeral wetlands serving as forebays for poultry house operations
  - Rpv credit based on storage provided
  - General design and construction guidance

# Specification 13.0 Wet Ponds

## 13.0 Wet Ponds

**Definition:** Wet Ponds are stormwater storage practices that consist of a combination of a permanent pool, micropool, or shallow marsh that promote a good environment for gravitational settling, biological uptake and microbial activity. Wet Ponds are widely applicable for most land uses and are best suited for larger drainage areas. Runoff from each new storm enters the wet pond and partially displaces pool water from previous storms. The pool also acts as a barrier to re-suspension of sediments and other pollutants deposited during prior storms. When sized properly, Wet Ponds have a residence time that ranges from many days to several weeks, which allows numerous pollutant removal mechanisms to operate. Wet Ponds can also provide storage above the permanent pool to help meet stormwater management requirements for larger storms. Design variants include:



- 13-A Wet Pond
- 13-B Wet Extended Detention (ED) Pond

A Wet ED Pond differs from a typical Wet Pond in that a Wet ED Pond provides 24-hour detention of all or a portion of the Resource Protection Volume (RPV). Optional internal baffles in the Wet ED Pond extend the flow path through the pond from the inflow point to the outlet. In addition, an undersized outlet structure restricts stormwater flow so it backs up and is stored within the Wet ED Pond. The temporary ponding enhances the ability of particulate pollutants to settle out and reduces the maximum peak discharge to the downstream channel, thereby reducing the effective shear stress on banks of the receiving stream.

Wet Ponds should be considered for use after all other upland runoff reduction opportunities have been exhausted and there is still a remaining treatment volume or runoff from larger storms (i.e. Cv an Fv) to manage.

Wet Ponds do not receive any stormwater retention credit and should be considered only for pollutant removal efficiency and to manage flood events. Wet Ponds have both community and environmental concerns (see *Section 13.3 Wet Pond Feasibility Criteria*) that need to be considered before applying them.

- Revised 24-hr detention to 48-hr detention for Wet ED Pond
- Added 7% RPV retention credit for Wet ED Pond
- Added 100% RPV detention credit Wet ED Pond
- Clarified wet ponds used only for quantity mgt receive no RPV or pollutant reduction credit
- Revised pond depths
  - Min. 3' – 4'
  - Max. 6' – 8'
- Added alternative outlet structures
  - Floating skimmers
  - Seepage Berms



# Specification 17.0 Afforestation

BMP Standards and Specifications

Afforestation

## 17.0 Afforestation

**Definition:** Practices that mimic the natural regeneration process of restoring forests to the landscape from herbaceous conditions by selectively planting woody species into existing or planted herbaceous cover to enhance the process.



These areas can be positioned on the landscape for retention of sediment and nutrients as well as improving the microclimate, such as providing shade, and habitat complexity. This practice is intended to be carried out on relatively natural soil and not on filled lands. These soils should have a seasonal high water table of greater than 12 inches from the soil surface; that is, the area could be documented as uplands. To provide for adequate rooting of woody species the minimum soil depth should be 4 feet. These areas should receive little management with a goal of establishing a good, brushy land cover in a few growing seasons.

Design variants for Afforestation include:

- 17-A. Afforestation

- Adds ability to receive credit for afforestation
  - Rpv credit for sheet flow
  - Change in RCN on-site
  - As mitigation for clearing of forested areas during development

# Appx. 1 - Soil Investigation Procedures

## Appendix 1. Soil Investigation Procedures for Stormwater BMPs

Delaware DNREC, Sediment & Stormwater Program  
(Adapted from Wisconsin Department of Natural Resources)

### I. Definition

This standard defines soil investigation procedures to:

1. Perform an initial screening of a *development site*<sup>1</sup> to determine its suitability for potential stormwater Best Management Practices (BMPs).
2. Evaluate each area within a development site that is selected for runoff reduction.
3. Determine suitability of on-site soils to meet any structural needs.
4. Prepare a Soils Investigation Report.

### II. Purpose

1. Establish methodologies to characterize the site and screen for exclusions and exemptions under the Delaware Sediment & Stormwater Regulations (DSSR).
2. Establish requirements for siting a *runoff reduction practice*<sup>1</sup> and the selection of design infiltration rates.
3. Establish location of on-site soils used for construction of stormwater BMPs.
4. Define requirements for a site evaluation report that insures appropriate areas are selected for infiltration and an appropriate *design infiltration rate*<sup>1</sup> is used, as well as whether on-site soils are adequate for the construction of proposed stormwater BMPs.

### III. Conditions where Practice Applies

This standard is intended for development sites being considered for stormwater management BMPs. Additional site location requirements may be imposed by other stormwater BMP technical standards.

### IV. Federal, State and Local Laws

Users of this standard shall be aware of applicable federal, state and local laws, rules, regulations or permit requirements governing infiltration devices. This standard does not contain the text of federal, state or local laws.

- Clarify infiltration testing procedures
- Clarify infiltration rate computations
- Clarify seasonal high water table separation criteria



# Appx. 7 - Alternative Methods for RPV Compliance

## Appendix 7. Alternative Methods for RPV Compliance

The following tables may be used to compute the Resource Protection event (RPV) surface recharge reductions. The BMP Performance percentage is based on the soil classification of the BMP and the Runoff Volume entering the BMP in the RPV event.

1. Bioswale:

RPV Bioswale Performance		
Runoff Volume (in/acre)	BMP performance	
	HSG A/B	HSG C/D
> 1.50 in / acre	44%	21%
0.76 - 1.50 in / acre	47%	23%
0.16 - 0.75 in / acre	57%	27%
0.00 - 0.15 in / acre	95%	95%

2. Grassed Channel:

RPV Grassed Channel Performance		
Runoff Volume (in/acre)	BMP performance	
	HSG A/B	HSG C/D
> 1.50 in / acre	16%	8%
0.76 - 1.50 in / acre	18%	9%
0.16 - 0.75 in / acre	22%	11%
0.00 - 0.15 in / acre	100%	100%

3. Sheet Flow to Turf Filter Strip:

RPV Turf Filter Strip Performance		
Runoff Volume (in/acre)	BMP performance	
	HSG A/B	HSG C/D
> 1.50 in / acre	21%	8%
0.76 - 1.50 in / acre	23%	9%
0.16 - 0.75 in / acre	28%	11%
0.00 - 0.15 in / acre	100%	100%

- New methodology for computing runoff reduction for surface recharge BMPs
- Based on NRCS runoff equation in lieu of DURMM analysis

# QUESTIONS????

3.06.2 Post Construction Stormwater BMP  
Standards and Specifications  
March 2013

