Hamilton County Stormwater Regulations Workshop

Session 6 – Post-Construction Stormwater Pollution Prevention

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STRUCTURE OF PRESENTATION

- Applicability and Exemptions
- Policy
- Easement Requirements
- Inspection and Maintenance of BMPs
- Design Standards and Calculations

APPLICABILITY AND EXEMPTIONS
(Section 701.04)

- Applies to development and re-development projects disturbing 1 acre or more of ground (same as Construction)
- Following activities are exempt:
  - agricultural land disturbing activities; or
  - timber harvesting activities; or
  - construction activities associated with a single family residential dwelling disturbing less than 5 acres, when the dwelling is not part of a larger common plan of development or sale; or

APPLICABILITY AND EXEMPTIONS
(Section 701.04)

  - Single family residential developments consisting of four or less lots; or
  - a single-family residential strip development where the developer offers for sale or lease without land improvements and the project is not part of a larger common plan of development of sale; or
  - individual building lots within a larger permitted project

APPLICABILITY AND EXEMPTIONS
(Section 701.04)

- Activities such as certain landfill and coal mining activities are exempt if other State permits require soil erosion control measures

POLICY **(Section 701.03)**

- Measures must be taken to intercept and filter pollutants from stormwater runoff prior to reaching regional creeks, streams, and rivers
- Stormwater runoff will be filtered and harmful amounts of sediment, nutrients, and contaminants will be removed using BMPs
- Control of Stormwater quality will be based on the management of Total Suspended Solids (TSS)
- New gas stations or stations replacing their tanks must install BMPs to reduce lead, copper, zinc, and hydrocarbons in runoff

POLICY (Section 701.03)

- Pre-approved BMP methods, used alone or in combination, must achieve the TSS removal stormwater quality goals according to each jurisdictional entity's Ordinance (generally 80%)
- Table 701-1 provides a list of pre-approved BMPs along with widely accepted TSS removal rates for each
- Accepted removal rates are reliant on proper sizing, installation, and maintenance of BMPs
- BMPs not on the pre-approved list are allowed with proof of effectiveness
- Details regarding the applicability and design of the pre-approved BMPs are provided in Appendix 701-1

EASEMENT REQUIREMENTS
(Section 701.08)

- All post-construction BMPs located outside of the ROW must be designated as common areas or incorporated into permanent easements
- Easement widths for the pre-approved BMPs, beyond the actual footprint of the BMP, are provided in Table 701-1
- Also need a 20 foot wide access easement from a public ROW to each BMP
- For projects under the jurisdiction of the Hamilton County, the developer shall petition to establish BMPs and their associated easements as a portion of the Hamilton County Regulated Drainage System

MAINTENANCE AND MONITORING
(Section 701.09)

- The developer is responsible for overseeing proper installation and protection of Post-Construction BMPs during construction
- The jurisdictional entity may randomly inspect construction sites to confirm proper installation and protection
- BMPs are to be maintained in accordance with the Operation and Maintenance manual included in the permit application and the terms and conditions of the approved stormwater permit

MAINTENANCE AND MONITORING
(Section 701.09)

- Long-term maintenance and monitoring of Post-Construction BMPs is the responsibility of the owner although the jurisdictional entity has the authority to conduct inspections to insure proper care
- For projects under the jurisdiction of Hamilton County, the County may take over the maintenance responsibility (petition procedure details are in the standards, Chapter 100)

DESIGN STANDARDS – PRE-APPROVED BMPS (Table 701-1)

BMP Description	Anticipated Average % TSS Removal Rate[D]	Fact Sheet	Maintenance Easement Requirements
Bioretention[A]	75	PC-101	25 feet wide along the perimeter
Constructed Wetland	65	PC-102	25 feet wide along the outer perimeter of forebay & 30 feet wide along centerline of outlet
Underground detention	70	PC-103	20 feet wide strip from access easement to tank's access shaft & 30 feet wide along centerline of inlet and outlet
Extended Dry Detention	72	PC-103	25 feet wide along the outer perimeter of forebay & 30 feet wide along centerline of outlet
Infiltration Basin[A]	87	PC-104	25 feet wide along the perimeter
Infiltration Trench[A]	87	PC-105	25 feet wide along the perimeter
Media Filtration – Underground Sand	80	PC-106	25 feet wide along the perimeter
Media Filtration – Surface Sand	83	PC-106	25 feet wide along the perimeter
Storm Drain Insert[C] (Hydrodynamic Seperators)	NA[B]	PC-107	20 feet wide strip from access easement to chamber's access shaft
Filter Strip	48	PC-108	25 feet wide along the length on the pavement side
Vegetated Swale	60	PC-109	25 feet wide along the top of bank on one side
Wet Pond	80	PC-110	25 feet wide along the outer perimeter of forebay & 30 feet wide along centerline of outlet

DESIGN STANDARDS – INNOVATIVE BMPS (Section 701.07)

- New BMPs, individually or in combination, must meet the Ordinance-required TSS removal rate at the 50-125 micron range (silt/fine sand)
- Burden of proof of removal rates is on the applicant
- Testing must have been completed by an independent lab rather than the manufacturer
- Must have a low to medium maintenance requirement
- Must be certified by a Professional Engineer licensed in Indiana
- Must be approved through the jurisdictional entity

BMP SELECTION

- Selection of BMPs is based on several variables including:
  - Space Limitations
  - Budget Limitations
  - Soil Permeability
  - Annual Temperature Ranges
  - Depth to Bedrock
  - Public Perception (i.e. mosquito problems)

BMP SIZING – WATER QUALITY VOLUME (Section 701.05)

- BMPs should be sized to treat the runoff generated from the first inch of rainfall
- Sizing for Detention BMPs

$$WQv = \frac{(P)\,(Rv)\,(A)}{12}$$

where:

WQv = water quality volume (acre-feet)

P = 1 inch of rainfall

Rv = volumetric runoff coefficient

A = area in acres

BMP SIZING – WATER QUALITY VOLUME (Section 701.05)

The volumetric runoff coefficient (Rv) is a measure of imperviousness for the contributing area, and is calculated as:

Rv = 0.05 + 0.009(I)

where:

I = percent impervious cover

EXAMPLE EXERCISE – WATER QUALITY VOLUME (Section 701.05)

For example, a proposed commercial site will be designed to drain to three different outlets, with the following drainage areas and impervious percentages:

Subarea ID	On-site Contributing Area (acres)	Impervious Area (%)	Off-Site Contributing Area (acres)
A	7.5	80	0.0
B	4.3	75	0.0
C	6.0	77	0.0

EXAMPLE EXERCISE – WATER QUALITY VOLUME (Section 701.05)

Calculating the volumetric runoff coefficient for subareas A, B and C yields:

Rv (subarea A) = 0.05+0.009(80)=0.77

Rv (subarea B) = 0.05+0.009(75)=0.73

Rv (subarea C) = 0.05+0.009(77)=0.74

The water quality volumes for these three areas are then calculated as:

WQv (subarea A) = (1")(Rv)(A)/12=0.77(7.5)/12=0.48 ac-ft

WQv (subarea B) = 0.73(4.3)/12=0.26 ac-ft

WQv (subarea C) = 0.74(6.0)/12=0.37 ac-ft

EXAMPLE EXERCISE – WATER QUALITY VOLUME (Section 701.05)

Note that this example assumed no offsite sources of discharge through the water quality detention BMPs. If there were significant sources of off-site runoff (sometimes called runon for upstream areas draining to the site), the designer would have the option of diverting off-site runoff around the on-site systems, or the detention BMP should be sized to treat the water quality volume for the entire contributing area, including off-site sources.

BMP SIZING – WATER QUALITY RATE (Section 701.05)

- Sizing for Flow-Through BMPs

  Using the WQv methodology, a corresponding Curve Number (CNwq) is computed utilizing the following equation:

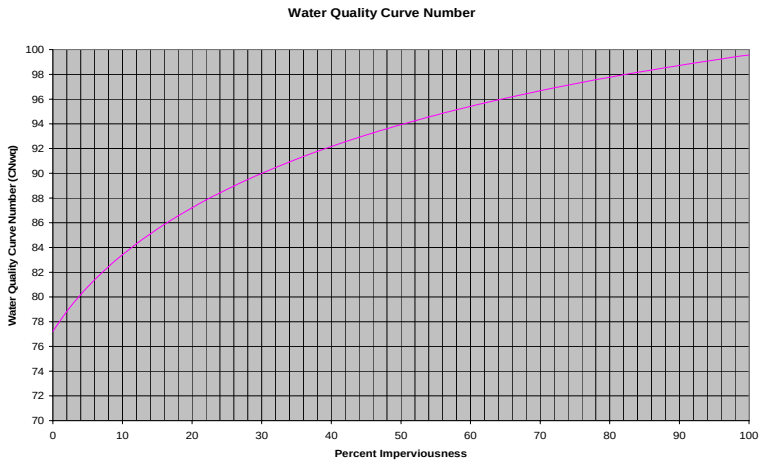
$$CNwq = \left[\frac{1000}{10 + 5P + 10Qa - 10\sqrt{Qa^2 + 1.25QaP}}\right]$$

  where:

  CNwq = curve number for water quality storm event
  P = 1" (rainfall for water quality storm event)
  Qa = runoff volume, in inches = 1"×Rv = Rv (inches)
  Rv=volumetric runoff coefficient (see previous section)

  Or you can use the table on the following slide.

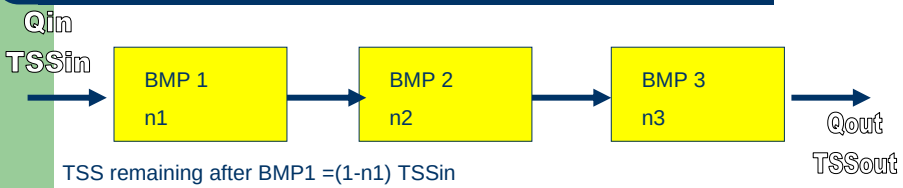
WATER QUALITY CURVE NUMBER (Exhibit 701-1)



BMP SIZING – WATER QUALITY RATE (Section 701.05)

The water quality curve number, CNwq, is then used in conjunction with the Standard calculated time-of-concentration, tc, and drainage area as the basic input for TR-55 calculations. Using the SCS Type II distribution for 1 inch of rainfall in 24-hours, the water quality treatment rate, Qwq, can then be calculated.

BMP's in Series (Treatment Train)



TSS remaining after BMP1 =(1-n1) TSSin

ex. If n1=80%, TSS remaining = (1-0.8) TSSin=20% TSSin

= 80% TSS Removal

TSS remaining after BMP2 = (1-n1)(1-n2) TSSin

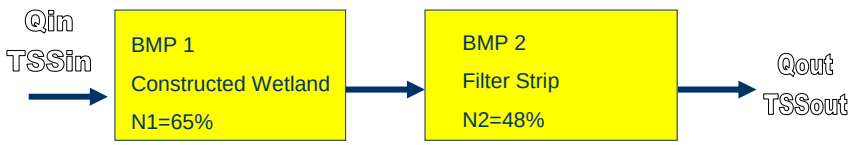
ex. If n1=40%, n2=60%, TSS remaining after first two BMPs= (1-0.4)(1-.6) TSSin=24% TSSin

= 76% TSS Removal

TSS remaining after BMP3 = (1-n1)(1-n2)(1-n3) TSSin

Treatment Train Example

A designer plans to use a constructed wetland at a site to achieve 80%TSS removal, but the average TSS removal efficiency of a stormwater wetland is only 65%. The designer decides to add another step to the treatment process. What would be the anticipated removal efficiency of a constructed wetland and filter strip combination?



TSS remaining after BMP1 =(1-n1) TSSin

= (1-0.65) TSSin=35% TSSin

= 65% TSS Removal

TSS remaining after BMP2 = (1-n1)(1-n2) TSSin

= (1-0.65)(1-0.48) TSSin=18.2% TSSin

= 81.8% TSS Removal

The two step process exceeds the target 80% TSS removal

QUESTIONS