

 October 28-29, 2025

 Orlando, FL



**TRANSPORTATION
SYMPOSIUM**

FDOT Implementation Plan to Meet the New Stormwater Rule

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Transportation Symposium
Website



SCAN ME



2024 Changes to the ERP Program

- **AH Volume 1, Part I – Procedures**
 - Section 3.1.2 – Grandfathering Provisions
- **AH Volume 1, Part II – Criteria for Evaluation**
 - Sections 8 and 9 - Water Quality Standards
- **AH Volume 1, Part IV – Erosion & Sediment Control**
 - Section 11 - Temporary E&SC
- **AH Volume 1, Part V – Operations & Maintenance Requirements**
 - Section 12 - O&M Plan, Cost Estimate, Inspections & Reporting

Outline - Path to Implementation

- **Complete & Available Now**

- Temporary E&SC Plan Narrative
- Comprehensive O&M Plan and Cost Estimate Forms
- 2025 Drainage Manual Updates
- Drainage Website
 - Stormwater FAQs
 - Ambient Water Quality GIS Map
 - BMP Trains 2020 software



Outline - Path to Implementation

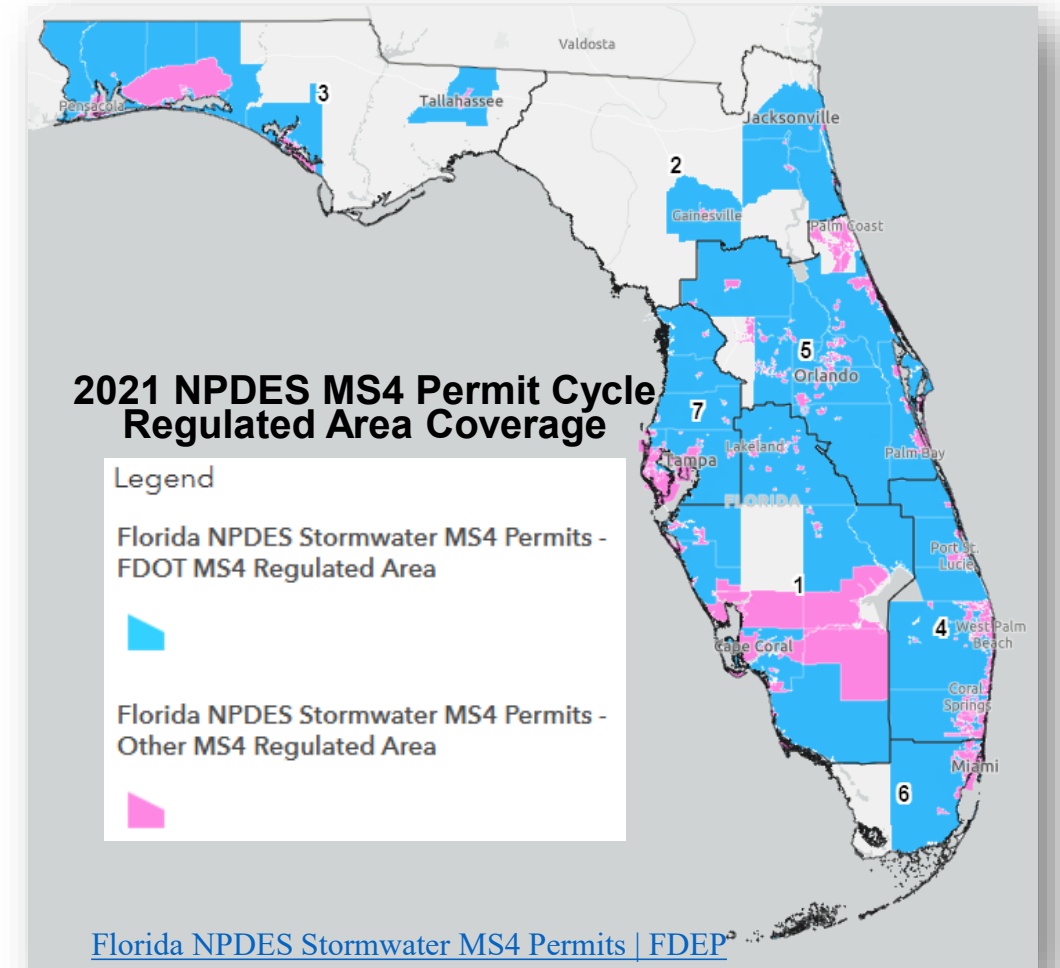
- **In Development**

- DDG Chapter 9 updates
- BMP Fact Sheets
- Standard Narratives for Non-Nutrient Impairments
- WATERSS Success Stories
- Standard RAI Responses
- Developmental / Revise Standard Plans & Specifications
- BMP Trains 2020 software updates
- Stormwater research
 - EMC, Soil Sequestration, Landscape



Regulatory Awareness

- **ERP Program**
 - Covers the entire State of Florida
 - Federal 401 Certification (CWA)
- **NPDES Program**
 - Municipal Separate Storm Sewer System Permit (MS4)
 - Construction Generic Permit (CGP)
- **FDOT Statewide Consistency**
 - FDOT Specifications and O&M Program centered around NPDES Program



Temporary Erosion and Sediment Control

- **ERP applications**
 - Temporary E&SC Plan Narrative (Form 251-A)
- **Plan Review Submittals** (*Ph. III & IV*)
 - SWPPP Template (Form 251-B)
 - Stormwater Runoff Control Concept (SRCC) Worksheet

Applicant Handbook Vol. I (effective 6/28/2024) Description/Requirement	FDOT Standard Specification	NPDES CGP 62-621.300(4)(a) F.A.C. (effective 02/2015)
Section 11.2 Development of an Erosion and Sediment Control Plan		
Identify location, relative timing, and specifications for E&SC and stabilization measures that will be implemented as part of the project's construction.	104-3 through 104-7	4.7 Part 5
Compliance with terms and schedule of implementing the proposed project, beginning with initiation of construction activities.	8-3, 104-5 through 104-7	4.7
Section 11.2.1 Erosion and Sediment Control Principles that Must be Considered		
Plan the development to fit topography, soils, drainage patterns, and natural vegetation of the site	104-5 104-6	4.7 5.3, 5.4, 5.5
Minimize both the extent of area exposed at one time and the duration of exposure	104-6	4.7 5.2, 5.3 6.2
Apply erosion control practices to minimize erosion from disturbed areas	104-6	4.3, 4.7 5.1, 5.3 6.2
Apply perimeter controls to protect disturbed areas from off-site runoff and to trap eroded material on-site to prevent sedimentation in downstream areas	104-5 104-6	4.3, 4.7 5.3, 5.5 6.2
Reduce runoff velocities and retain runoff on-site	104-6	1.2, Part 3 5.2, 5.3, 5.5, 5.7

Operation and Maintenance Plan

- Comprehensive approach via standard form
- Applicable Statewide for FDOT ponds
- Individual pond/project O&M plans are not required for FDOT ponds
- Ponds to be maintained by others will require additional coordination with maintaining entity

Florida Department of Transportation
Operation & Maintenance (O&M) Plan

Project Name: _____
FPID Project Number: _____
FDEP/WMD Permit/Application Number: _____

O&M Letter of Intent

Pursuant to Section 12.3.1 AH Vol. 1, an acceptable operation and maintenance (O&M) entity shall have the financial, administrative, and legal capability to access, monitor, operate, and maintain its permitted projects. As a state agency, the Florida Department of Transportation (FDOT)¹ is identified under Section 12.3.1(c), AH Vol. 1, as an acceptable entity for ensuring that an activity will be operated and maintained in compliance with the requirements of Section 373.416(2), F.S., and Chapter 62-330, F.A.C. Per Section 12.3.2, AH Vol. 1, FDOT provides this document as its letter of intent to accept responsibility for the operation and maintenance of the entire stormwater management system(s) associated with the above referenced permit number.

Comprehensive O&M Program

Section 12.4.1 AH Vol. 1 requires preparation of an operation and maintenance (O&M) plan to describe the O&M activities necessary to ensure the stormwater management system's perpetual performance. Municipal Separate Storm Sewer System (MS4) permittees subject to Chapter 62-624, F.A.C. (MS4 Entity) are not required to submit a separate O&M Plan but shall instead conduct operation and maintenance of the ERP-permitted stormwater management systems in accordance with their MS4 permit requirements and any associated stormwater management program requirements.

FDOT is an MS4 Entity throughout most of the state and has developed a comprehensive stormwater management program which includes inspection and maintenance activities to ensure perpetual operation and maintenance of the FDOT's permitted stormwater management systems. This comprehensive O&M program is consistent with the MS4 stormwater management program and is applicable within those areas where FDOT is an MS4 Entity. For those ERP projects which extend outside of permitted MS4 areas (i.e., non-regulated MS4 areas), FDOT is implementing the same consistent and comprehensive statewide O&M Program as described herein.

To meet the requirements of Section 12.4.1 AH Vol. 1, FDOT, in coordination with FDEP, has agreed to apply this comprehensive O&M Program on a statewide basis. The FDEP and FDOT therefore have agreed that separate or individual O&M Plan submittals are not required as the O&M activities for the above referenced project will be implemented pursuant to FDOT's statewide Comprehensive O&M Program.

¹"FDOT" herein refers to both the Florida Department of Transportation and the Florida Turnpike Enterprise.

September 2024
Page 1

New FDEP Form 62-330.301(26)

SAMPLE FOR FDOT PROJECTS

Certification Of Financial Capability For Perpetual Operations And Maintenance Entities

Permit No.: ##### Application No.: ##### Date Issued (if modification): _____

Identification or Name of Stormwater Management System: SR # from Here to There

Phase of Stormwater Management System (if applicable): _____

Name of Operation and Maintenance Entity: Florida Department of Transportation

Address of Operation and Maintenance Entity: Address

City, State, Zip

☒ Cost estimate attached

Check box and fill out FDOT Cost Estimate Document

Total annual operating expenses, including maintenance costs, for the estimated remaining useful life of the system accounting for annualized capital or replacement costs or deferred maintenance expenses for the system, including those components where maintenance or replacement frequencies are less frequent than once per year, for each BMP in the stormwater management system and any associated infrastructure, in current year dollars.

Enter project total from FDOT Cost Estimate Document in this field.

Operation and Maintenance Entity (Select All That Apply):

☒ Local, state, or federal government agencies; municipal service other special taxing units, water control or drainage districts; community development, special assessment, or water management districts

Check box

☐ Communication, water, sewer, stormwater, electrical, or other public utility

☐ Construction permittee (see Section 12, Volume I)

☐ Non-profit corporations, including homeowners' associations, property owners' associations, condominium owners' or master associations

☐ Other (Describe the Other Operation and Maintenance Entity below)

Certification Of Financial Capability For Perpetual Operations And Maintenance Entities

Certification by Operation and Maintenance Entity:

Certification Provisions for the Operation and Maintenance Entity (Select All That Apply):

☐ Municipal Separate Storm Sewer System (MS4) permittee subject to Chapter 62-624, F.A.C. (Identify the applicable Florida Department of Environmental MS4 permit below:)

If within an MS4 regulated area – check box and add permit number(s) in this field

☐ Non-profit corporation subject to the Homeowners' Association Act under Chapter 720, Florida Statutes

☐ Construction permittee that will not be the Operation and Maintenance Entity. (Identify the intended Operation and Maintenance Entity below:)

☐ Other: Operation and Maintenance Entity not otherwise selected for this section. Describe the Other Operation and Maintenance Entity below, such as State or federal agency, Property Owners' Association, etc.:

If outside an MS4 regulated area – check box and type "State Agency – FDOT" in this field

The below Permittee or Operation and Maintenance Entity certifies that this form is true, accurate, and complete; and that it has the financial capability to operate and maintain the system in perpetuity including costs of inspections, operation, repair, and replacement of the system once the system meets its expected life. The signee below will be responsible for all maintenance, operation, and repair costs for the stormwater system of the above permit in perpetuity, until such time the system is properly abandoned, or the permit is transferred to a new operation and maintenance entity.

Name of Permittee or Operation and Maintenance Entity: Florida Department of Transportation

Name: _____ Title: _____

Signature: _____ Date: _____

The District ERP Applicant Contact Person listed in Application Section A Part 3A can sign and date this form.

FDOT Cost Estimate Form

- Approved cost estimate approach for the new FDEP Form
- Creates Cost Estimate Tool for statewide consistency
- Only applicable when FDOT is the maintaining entity
- Updated annually

Florida Department of Transportation
Cost Estimate for FDEP Form 62-330.301(26)

Project Name:

FPID Project Number:

FDEP/WMD Permit/Application Number:

As directed by the Florida Legislature, the Florida Department of Transportation's (FDOT) prevailing principles include the preservation of its infrastructure investment and Florida's natural resources [Section 334.046(4), Florida Statutes (F.S.)]. As a state agency, FDOT is funded annually by the Florida Legislature and receives a multi-billion-dollar budget. Consistent with its charge to ensure that 100 percent of the acceptable maintenance standards are met on the state highway system, FDOT first budgets for operation and maintenance (O&M) costs of approximately one billion dollars per year, which includes stormwater infrastructure O&M.

FDOT must follow Chapters 287 and 337, F.S., and adopted rules for competitive solicitation to obtain commodities and contractual services, which includes the maintenance of the State Highway System. Pursuant to Section 337.168, F.S., FDOT project specific cost estimates in development are exempt from Public Records Requests under Section 119.07, F.S., which includes contracting for stormwater management systems along the State Highway System.

Development of the official confidential cost estimate must follow defined procedures and associated scope of work for the forecasted tentative work program. The FDOT Office of Maintenance compiles these estimates to determine the Maintenance Program's total budget for the State Transportation Trust Fund (STTF) Work Program and Legislative Budget Request [Section 339.135, F.S.].

The budgeted stormwater O&M activities account for annual operating expenses, including inspection costs, and maintenance costs for the estimated remaining useful life of the system, accounting for replacement costs or deferred maintenance expenses for non-annual expenditures, for all components of the stormwater management system, including for each BMP in the stormwater management system.

FDOT O&M Cost Estimator Tool

FDOT O&M Cost Estimator Tool^a

STTF Tentative Work Program Financial Plan				Above Referenced Project	
6-year Total Maintenance Expenditures ¹	Average Annual Maintenance Expenditures	FDOT Centerline (CL) Miles ²	Average Annual O&M Budget per CL Mile ³	Project Length (miles)	Estimated Average Annual O&M Budget for the Project
\$ 5,733,400,000	\$ 955,566,666	12,190	\$78,389.39		

1. Source: [FDOT State Transportation Trust Fund \(STTF\) Tentative Work Program Financial Plan](#) (FY 2025/26 through FY 2029/30)
2. Source: [Florida Transportation Fast Facts](#) by FDOT's Systems Forecasting and Trends Office (March 2025). Centerline Miles account for all roads that are maintained by FDOT.
3. Assumes a uniform distribution of the budget. Includes all aspects of maintaining the State Highway System – e.g. pavement, signage, lighting, roadside safety, and associated stormwater management features. O&M activities include routine and periodic maintenance during the useful life of the system.

^a Note: This tool and its estimated results are not to be used to make FDOT financial or contractual decisions. This cost estimate is provided solely to comply with Chapter 62-330, F.A.C., and Section 12.3.5, AH Vol. 1, subject to the limitations of Chapter 337, F.S., and the prevailing principles specified under Section 334.046, F.S. Actual maintenance needs and expenditures are based on factors such as, but not limited to, site-specific conditions and unexpected non-annual expenses, contract negotiations, location, year, scoping, complexity, staffing, and selected means and methods.

July 2025

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FDOT Drainage Manual – Chapters 1 & 5

- Drainage Manual Forms
- WNAS impairment categories
- Transportation Stormwater BMPs

Drainage Manual Forms

Form	Description
FDM Form 251-A	Erosion and Sediment Control Plan Narrative for FDOT Project ERP application
FDM Form 251-B	NPDES CGP SWPPP Template for FDOT Projects
O&M Plan	ERP Operations and Maintenance Plan Form
O&M Cost Estimate	ERP Operations and Maintenance Cost Estimate Form - FY 2024/25 - 2028/29
Intake Form - Internal	Drainage Manual Revision Request Intake Form - FDOT Users
Intake Form - External	Drainage Manual Revision Request Intake Form - External Users

Topic No. 625-040-002
Drainage Manual

Effective: January 2025

Table 5-1: Structural Stormwater Treatment BMP Options

Location	BMP ⁽¹⁾	Maintenance ⁽²⁾
Roadside Collection and Conveyance (small or linear drainage areas, initial treatments)	Vegetated Filter Strips	Low
	Bioswales (ditches, swales with/without blocks/control structures, linear ponds)	Low Medium
	Retention Detention with filtration	
	Bioretention Systems (landscaped areas or planters, rain gardens, stormwater trees)	Low Medium
	Retention Detention with filtration	
	Exfiltration Trench/French Drain Systems	Medium
Attenuation Storage (larger drainage areas, secondary treatments)	Pollution Control Boxes (Baffle boxes, hydrodynamic separators, catch basin inserts/ inlet filter cleanouts, up-flow filters)	High
	Retention Pond	Low
Pond Add-Ons	Detention Pond	Low
	Littoral Zone (Wet detention ponds)	Medium
	Floating Managed Aquatic Plant Systems (MAPS)	High
Outfalls	Underdrains or Side Bank Filters	Medium
	Vegetated Natural Buffers (sheet flow within riparian/forested buffers)	Low

1. Any BMP not listed herein must be approved by the District Drainage Engineer and consulted with the District Maintenance Office prior to implementation in design plans.
2. High Maintenance activities must have District Maintenance Office consultation prior to proposing for permitting.

Water Quality Criteria

Transition of the Presumptive Criteria

- First Flush Design and Performance Standards (*old criteria*)
 - Volumetric calculation with percent reductions or increases for retention vs. detention, on-line vs. off-line, OFWs, or impaired waters (varied by WMD)
 - ***Upfront treatment volume***
- Nutrient Reduction Design and Performance Standards (*new criteria*)
 - Statewide consistency to connect project to downstream impaired waterbodies & OFWs within USGS HUC12 sub-watersheds
 - ***Variable treatment volume***

Both performance standards provide the presumption that discharge from the development will not cause or contribute to violations of applicable state water quality standards as stated in Section 373.4131(3)(b), F.S.

Water Quality Criteria

Greater Nutrient Reduction Rate:

- Post TN/TP Loading \leq Pre TN/TP Loading (*Section 9.3, AH Vol. 1*)
- Minimum TN/TP Reduction Rate Standards (*Section 8.3, AH Vol. 1*)

Minimum Stormwater Treatment Performance Standards

HUC12 Downstream Ambient Water Quality	Nutrient Reduction Rate	
	TN	TP
Not Impaired (All Sites)	55%	80%
OFW	80%	90%
Impaired	80%	80%
Impaired + OFW	95%	95%

Water Quality Criteria

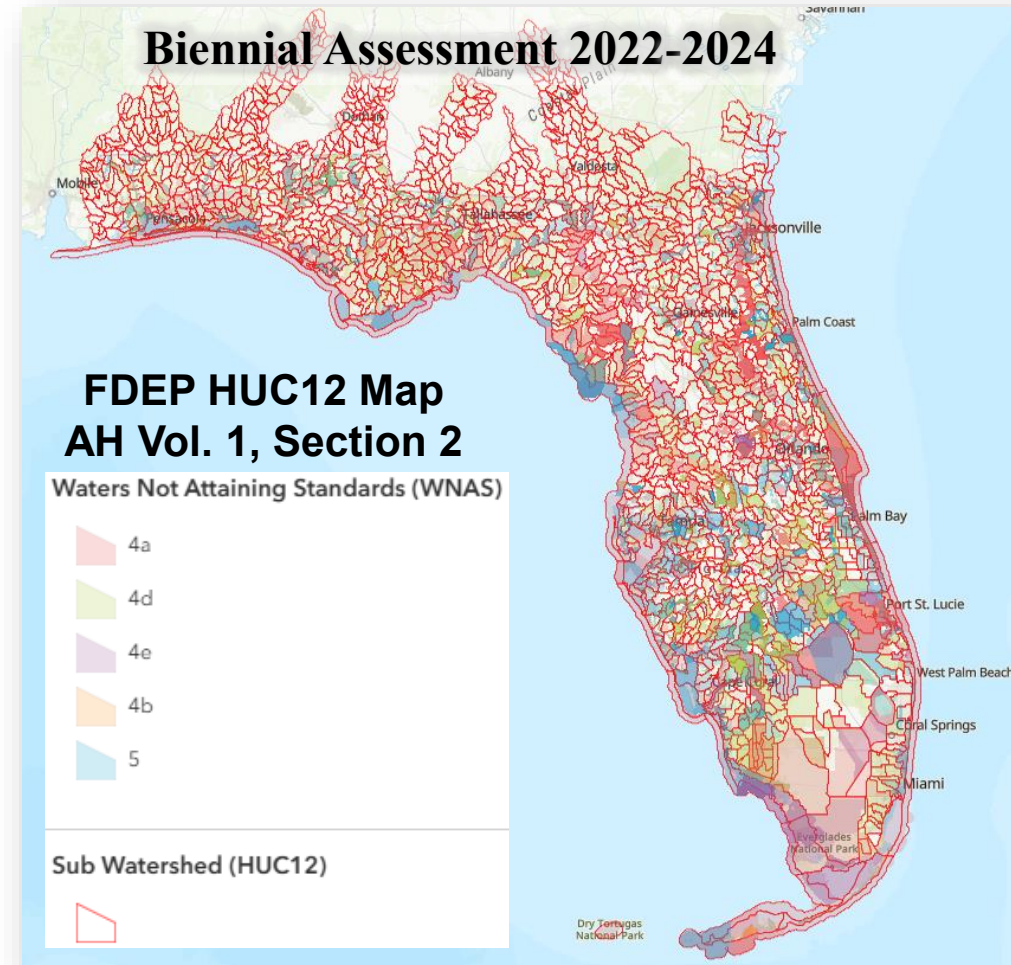
HUC12 sub-watersheds (USGS)

- Project's downstream Waters of the State
- Review any impaired WBIDs or OFWs

WNAS Database (FDEP DEAR)

Assessment Category	Defined
4a	TMDL Adopted
4b	RAP Adopted
4c	Natural Impairment
4d	Study List
4e	Alternative Restoration Plan
5	Verified Impaired

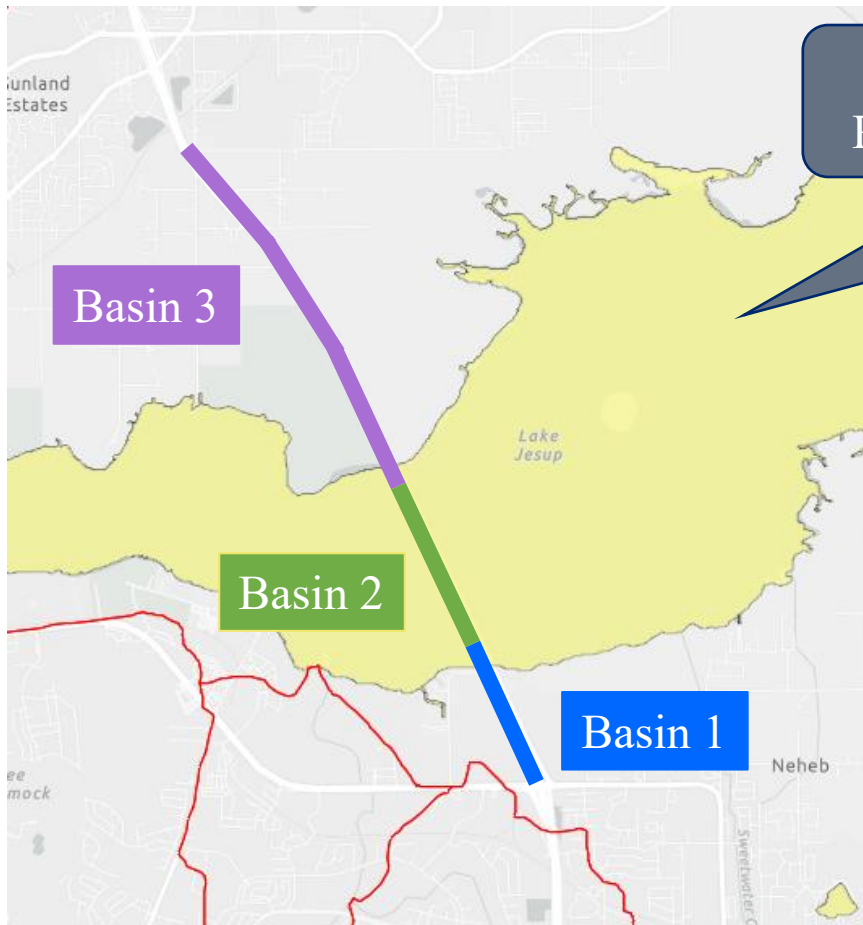
BMAP & RAP boundary not basis for impairment classification.



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Water Quality Criteria

Compensatory Treatment *(Section 9.7, AH Vol. 1)*



Lake Jesup Impaired with TMDL for TN/TP
Required Nutrient Reduction Rate = 80% TN & TP

	Basin 1	Basin 2	Basin 3
Contributed Loading to Lake Jesup	22%	12%	66%
Treatment Train Efficiency	82%	0%	94%
Overall Treatment Contribution	18%	0%	62%
Provided Overall Nutrient Reduction to Lake Jesup		80.1%	

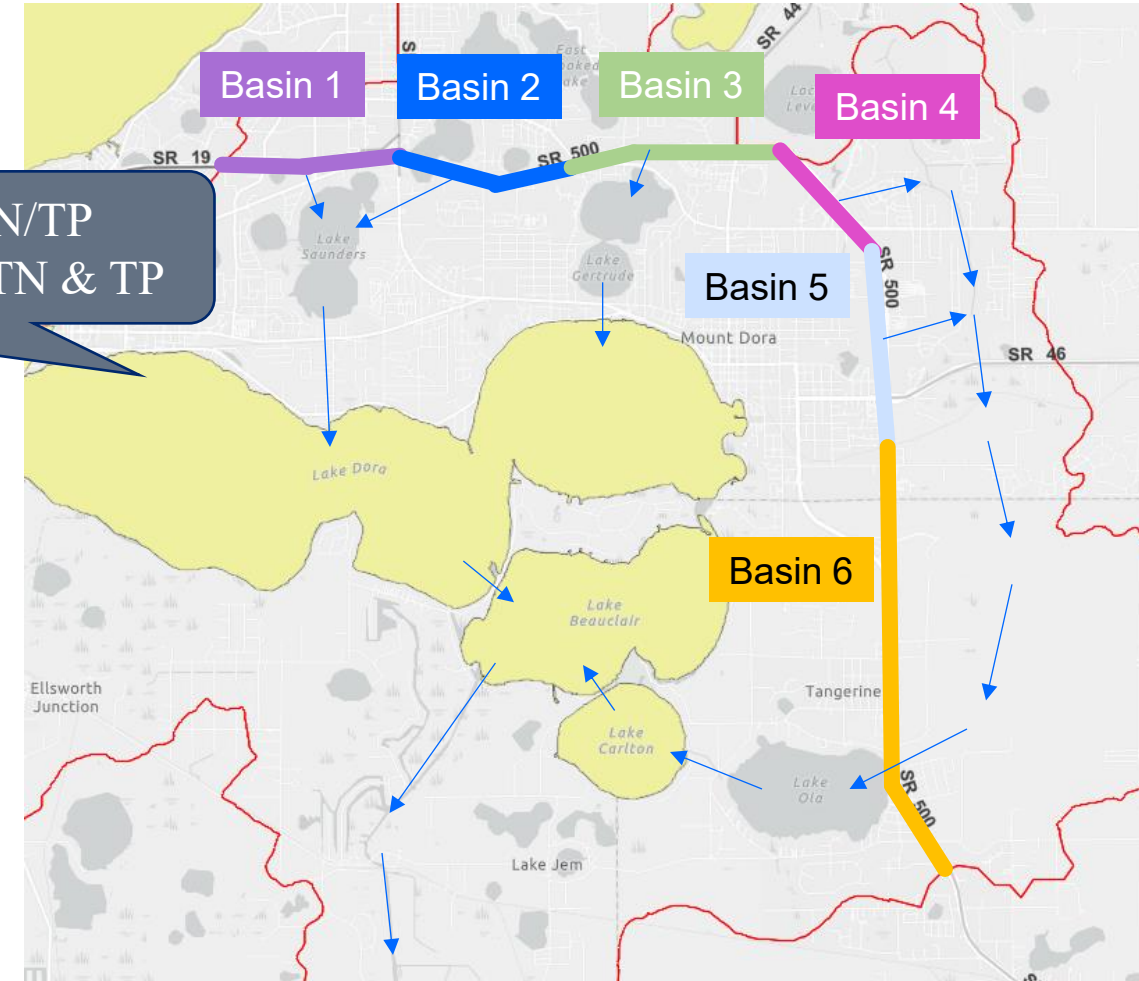
Theoretical Project

Water Quality Criteria

Compensatory Treatment (Section 9.7, AH Vol. 1)

Lake Dora Impaired with TMDL for TN/TP
Required Nutrient Reduction Rate = 80% TN & TP

	Contributed Load	Treatment Train TN Efficiency	Overall Treatment Contribution	Intermediate Lake TN Efficiency
Basin 1	10%	45%	5%	61.4%
Basin 2	12%	75%	9%	
Basin 3	15%	75%	11%	
Basin 4	10%	45%	5%	87.3%
Basin 5	20%	95%	19%	
Basin 6	33%	95%	31%	
SR 500 Overall Treatment Efficiency to Lake Dora			80%	



Theoretical Project

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Stormwater BMPs

- **AH Volume 1, Appendix O**
 - Nutrient Reduction Efficiencies
- **FDOT Drainage Manual**
 - Transportation BMPs
- **FDOT Statewide Stormwater Management Plan (SSWMP)**
 - O&M Inspection Frequencies and Maintenance Activities

2024 AH Volume 1, Appendix O: Traditional BMP Treatment Efficiencies

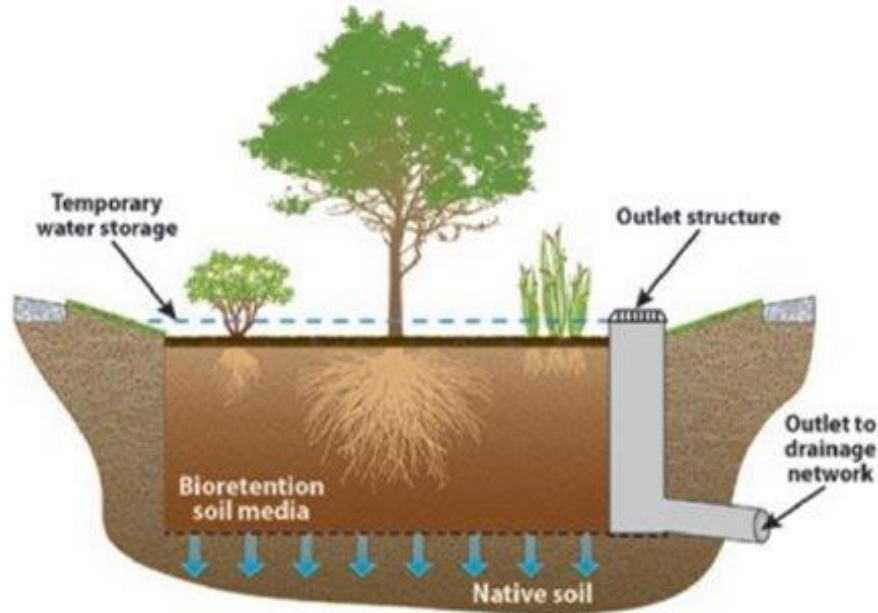
Table 1: of BMP Efficiencies

BMP	TP Reduction	TN Reduction	Data Source
Retention Pond and Retention Systems	Based on percent reduction using project's percent directly connected impervious area (DCIA), non-DCIA curve number (CN), and rainfall zone	Based on percent reduction using project's percent directly connected impervious area (DCIA), non-DCIA curve number (CN), and rainfall zone	Evaluation of current stormwater design criteria within the state of Florida, Harper and Baker 2007
Wet detention ponds	Formula based on Average Annual Residence Time for Removal Efficiency of Total Phosphorus	Formula based on Average Annual Residence Time Removal Efficiency of Total Nitrogen	Evaluation of current stormwater design criteria within the state of Florida, Harper and Baker 2007
Baffle boxes (gravity-based separators)—First generation	2.30%	0.50%	Final report, Contract S0236, Effectiveness of baffle boxes plus media filter, by GPI Southeast 2010; Demonstration bio media for ultra-urban stormwater treatment, by University of Central Florida (UCF) for Florida Department of Transportation (FDOT); and Final report, Contract S0497, Baffle box with media filtration installation and effectiveness evaluation by City of Casselberrv.
Baffle boxes (gravity-based separators)—Second generation	15.50%	19.05%	
Baffle boxes (gravity-based separators)—Second generation plus media filter	Media Mix Efficiency	Media Mix Efficiency	

Stormwater BMPs

Retention

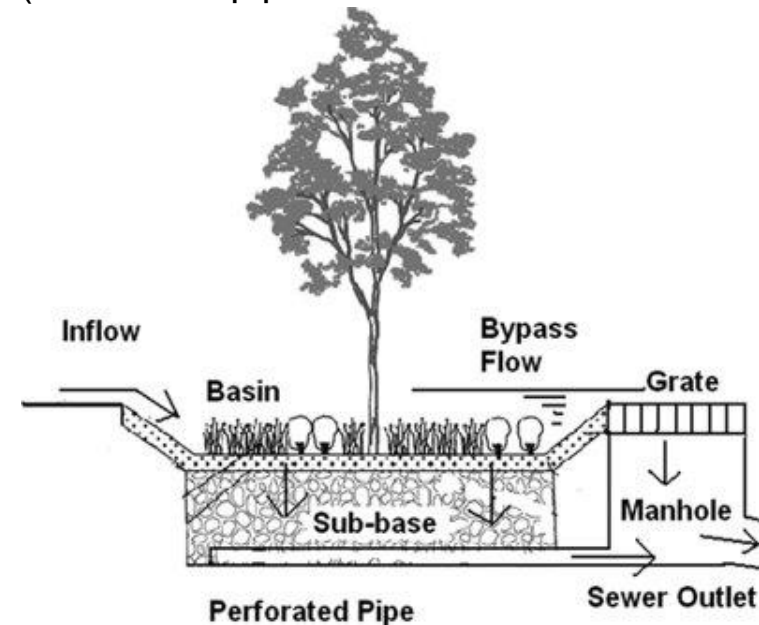
Loss of runoff volume
(Infiltration/evapotranspiration)



Annual Capture Efficiency
AH Vol. 1, App. O Tables

Detention with Filtration

Nutrients sequestered by soil column
(Perforated pipes/orifice at bottom of BMP)



Annual Capture Efficiency * Media's Sequestration Rate

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Stormwater BMPs

A.H. Vol. 1, Appendix O: Annual Capture Efficiencies

Zone 2

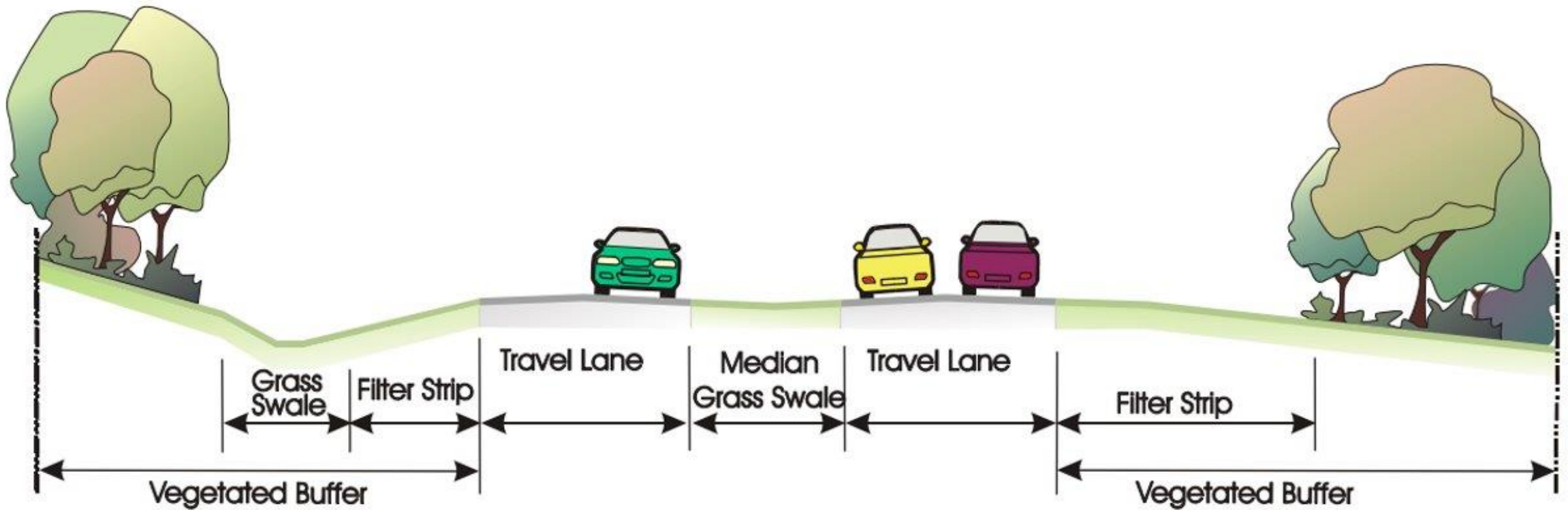
1.00-inches

Annual Capture Retention Tables (AH Volume 1, Appendix O)

Non-DCIA CN	DCIA Percentage																			
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
30	98.5	98.8	98.5	97.9	96.9	95.6	94.1	92.3	90.4	88.4	86.3	84.2	82.1	80	77.9	75.9	74	72.2	70.3	68.6
35	97.5	98.2	98	97.4	96.5	95.3	93.7	92	90.2	88.2	86.2	84.1	82	79.9	77.9	75.9	74	72.1	70.3	68.6
40	96.4	97.3	97.2	96.8	95.9	94.8	93.3	91.7	89.9	87.9	85.9	83.9	81.8	79.8	77.8	75.8	73.9	72.1	70.3	68.6
45	94.8	96.1	96.3	96	95.2	94.1	92.7	91.2	89.4	87.6	85.6	83.6	81.6	79.6	77.7	75.8	73.9	72.1	70.3	68.6
50	93	94.8	95.2	94.9	94.3	93.3	92	90.5	88.9	87.1	85.3	83.3	81.4	79.5	77.5	75.6	73.8	72	70.3	68.6
55	91	93.2	93.7	93.6	93.1	92.3	91.1	89.8	88.2	86.6	84.8	82.9	81.1	79.2	77.3	75.5	73.7	72	70.2	68.6
60	88.8	91.2	92	92	91.7	91	90	88.8	87.4	85.9	84.2	82.4	80.7	78.9	77.1	75.3	73.6	71.9	70.2	68.6
65	86.2	88.9	89.9	90.2	90	89.5	88.7	87.6	86.4	85	83.4	81.8	80.2	78.5	76.8	75.1	73.4	71.8	70.2	68.6
70	83.6	86.4	87.5	88	88	87.6	86.9	86.1	85.1	83.8	82.5	81	79.5	77.9	76.4	74.8	73.2	71.6	70.1	68.6
75	81	83.6	84.9	85.5	85.6	85.3	84.9	84.2	83.4	82.4	81.2	80	78.6	77.2	75.8	74.3	72.9	71.5	70	68.6
80	78.6	80.8	82	82.5	82.8	82.7	82.4	81.9	81.3	80.5	79.6	78.5	77.4	76.3	75	73.8	72.5	71.2	69.9	68.6
85	76.1	77.7	78.7	79.3	79.6	79.7	79.5	79.2	78.8	78.2	77.5	76.7	75.9	74.9	74	72.9	71.9	70.8	69.7	68.6
90	73.9	74.8	75.5	75.9	76.1	76.2	76.2	76	75.7	75.3	74.9	74.4	73.8	73.2	72.5	71.8	71	70.3	69.4	68.6
95	71.5	71.8	72	72.1	72.2	72.2	72.2	72.1	72	71.9	71.7	71.4	71.2	70.9	70.6	70.2	69.9	69.5	69	68.6
98	70.2	70.2	70.2	70.2	70.1	70.1	70.1	70	69.9	69.8	69.7	69.7	69.6	69.4	69.3	69.2	69	68.9	68.8	68.6

Stormwater BMPs

Flush Shoulder Typical Section Roadside BMPs



NCHRP 25-25 (53): Stormwater Treatment with Vegetated Buffers
AASHTO, Standing Committee on Environment

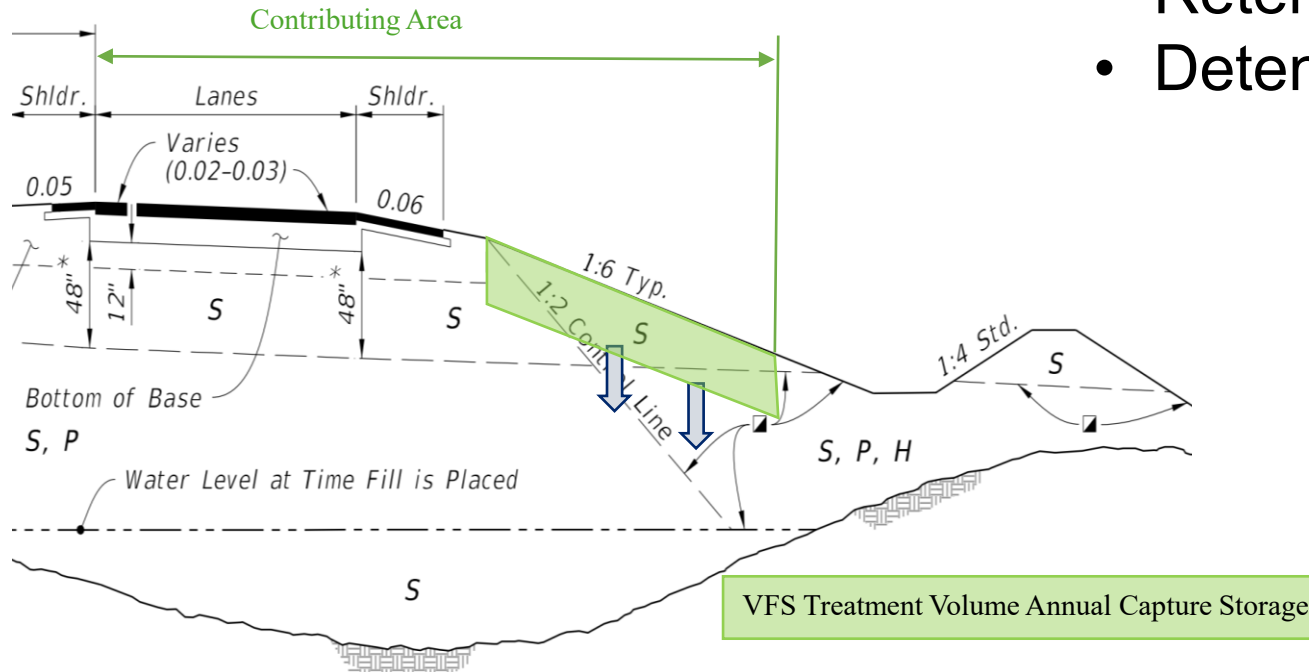
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Stormwater BMPs

Flush Shoulder Typical Section Roadside BMPs

Vegetated Filter Strips

- Standard roadway front slope
- Retention BMP
- Detention with Filtration BMP (underdrain)



VFS Retention BMP Efficiencies:

C1/C2	2-3 Lanes	80% - 95%
C2T/C3/C4	2-3 Lanes	68% - 88%
LA R/W	2-3 Lanes	75% - 91%
LA R/W	4-5 Lanes	64% - 81%

Meteorological Zone 1

Minimum 10-ft wide or end of Clear Zone

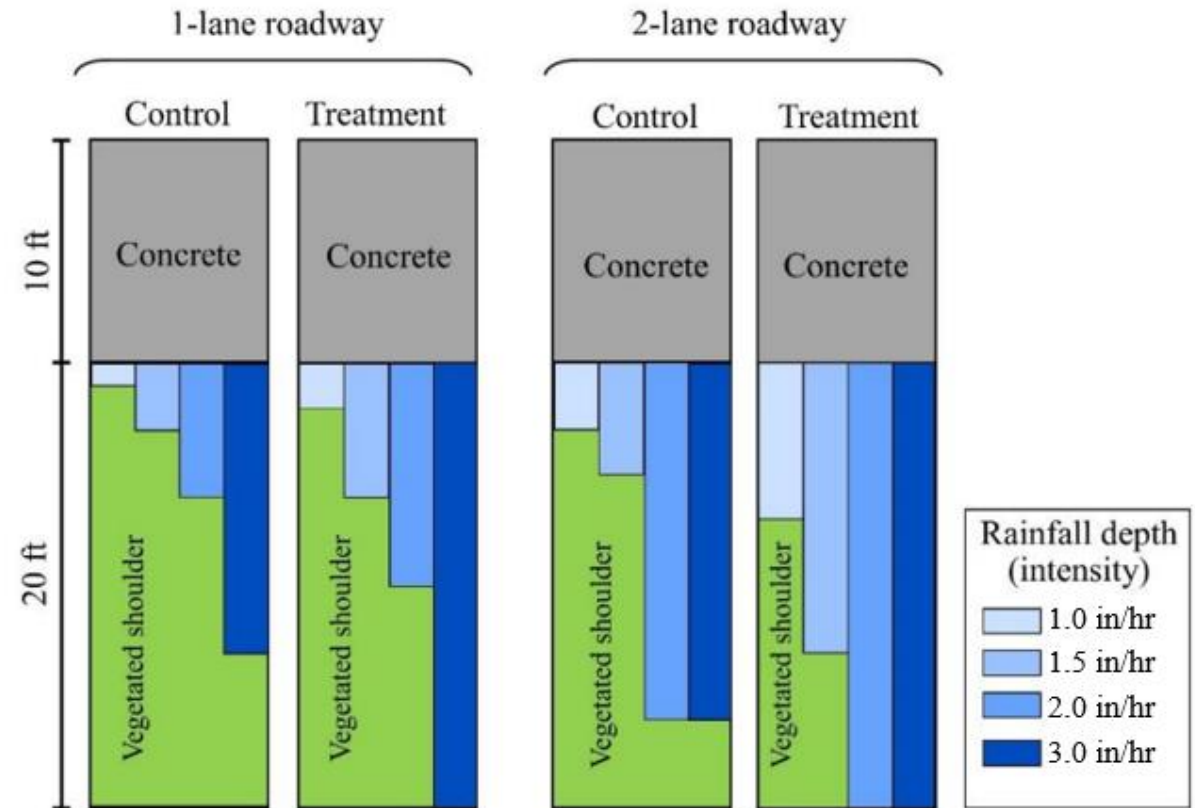
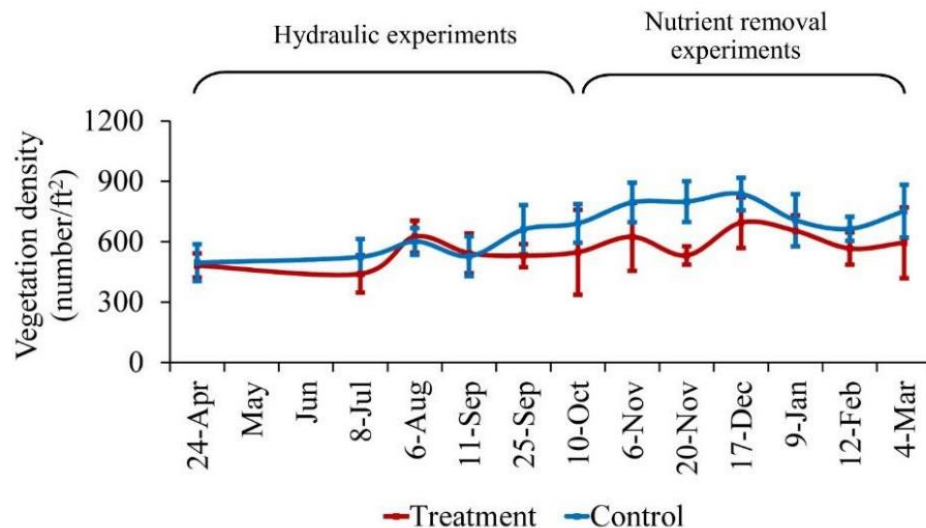
FDOT Standard Plans Index 120-001

Stormwater BMPs

Flush Shoulder Typical Section Roadside BMPs

Vegetated Filter Strips

- FDOT 2020 Research [BDV24-977-25]
 - Demonstrated FDOT's 1:6 roadside slope VFS
 - In-situ & select soils outperformed BAM
- Retention VFS functions [EPA 840-B-92-002]
 - Vegetative coverage
 - Infiltration capacity
 - Aerobic conditions



Stormwater BMPs

Flush Shoulder Typical Section Roadside BMPs

Bioswales

Conveyance Swales



Retention Swales

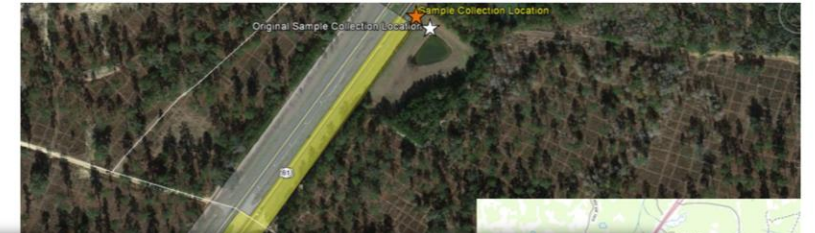
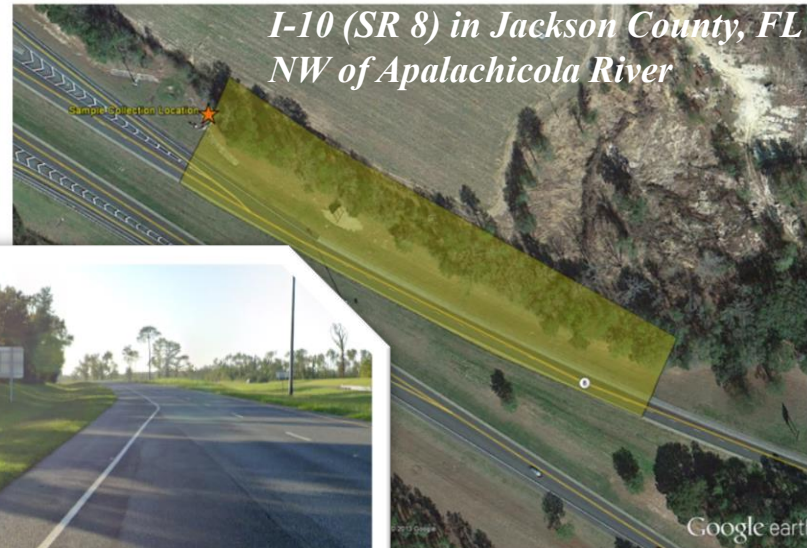
Stormwater BMPs

Flush Shoulder Typical Section Roadside BMPs

Bioswales

2016 FDOT EMC Study by FDOT NPDES

*I-10 (SR 8) in Jackson County, FL
NW of Apalachicola River*

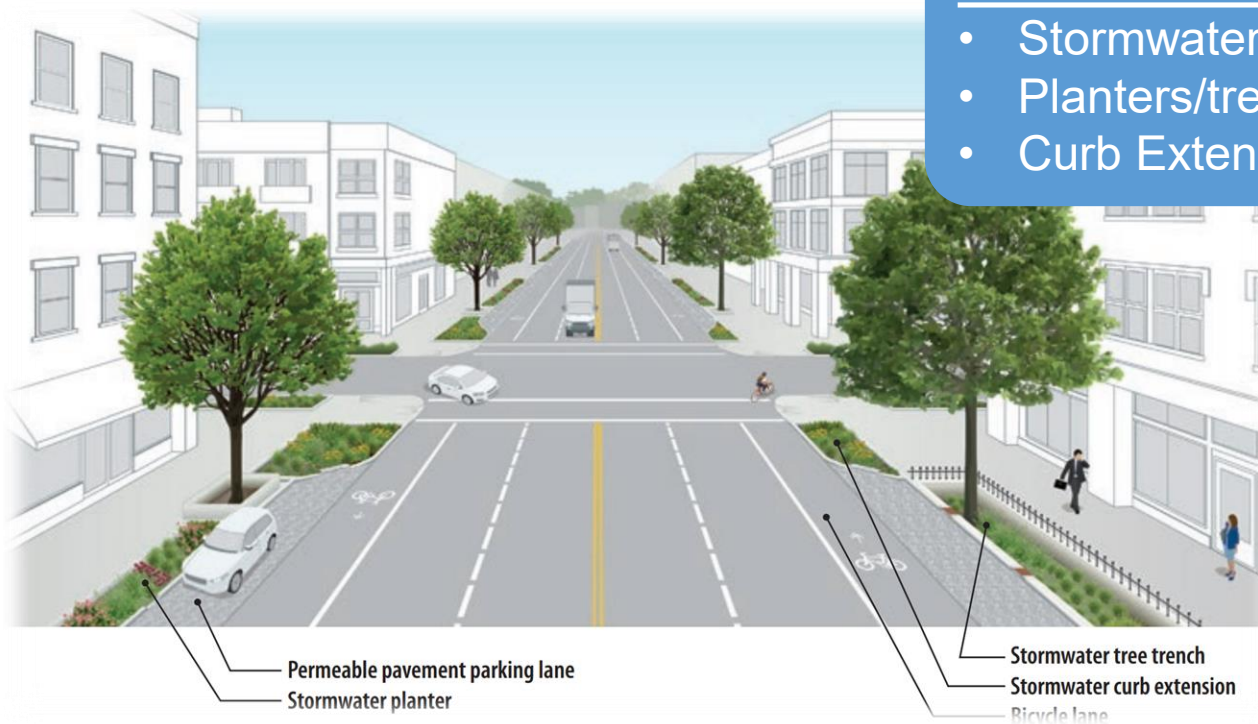


- Standard roadside swale (with or without ditch blocks)
- Retention BMP
- Detention with Filtration BMP (underdrain)
- ***Do not contribute to springshed impairments***

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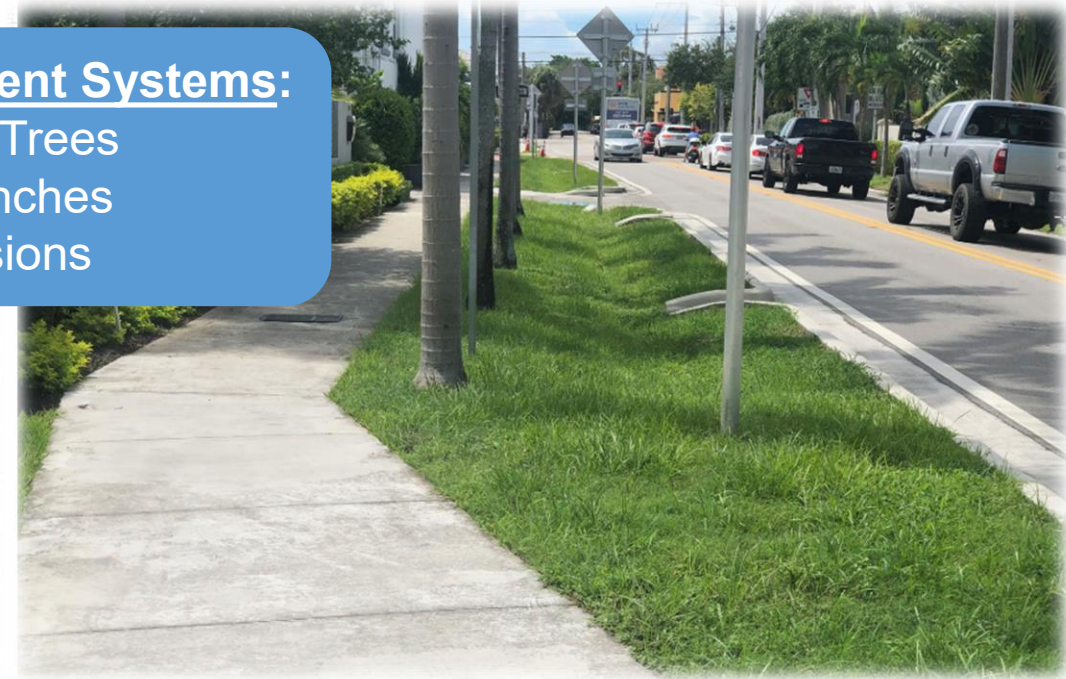
Stormwater BMPs

Curb & Gutter Typical Section Roadside BMPs **Bioretention Systems**



Linear Treatment Systems:

- Stormwater Trees
- Planters/trenches
- Curb Extensions



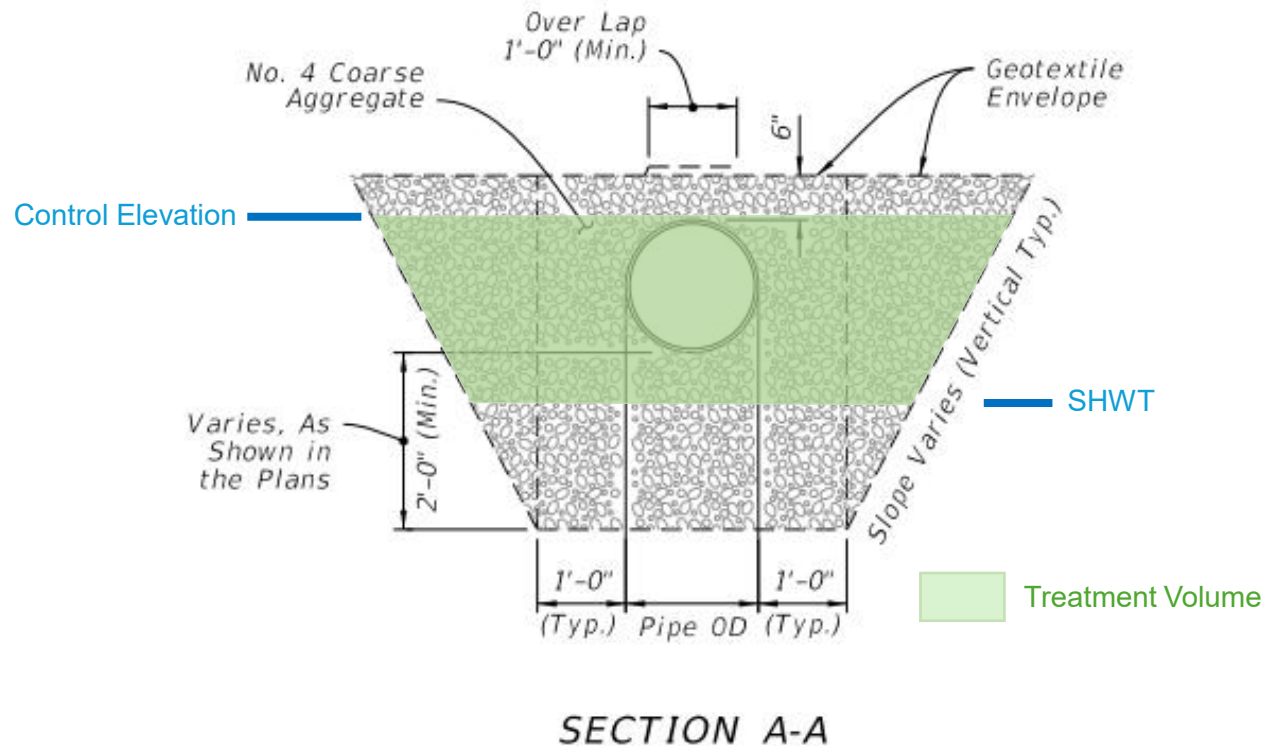
- Retention BMPs
- Detention with Filtration BMPs (underdrains)

US EPA's Green Streets Handbook (EPA 841-B-18-001), Bioretention Fact Sheet (EPA 832-F-21-031L), & Bioretention Design Handbook (EPA 841-B-23-002)

**TRANSPORTATION
SYMPOSIUM**

Stormwater BMPs

Curb & Gutter Typical Section Roadside BMPs Exfiltration Trench Systems

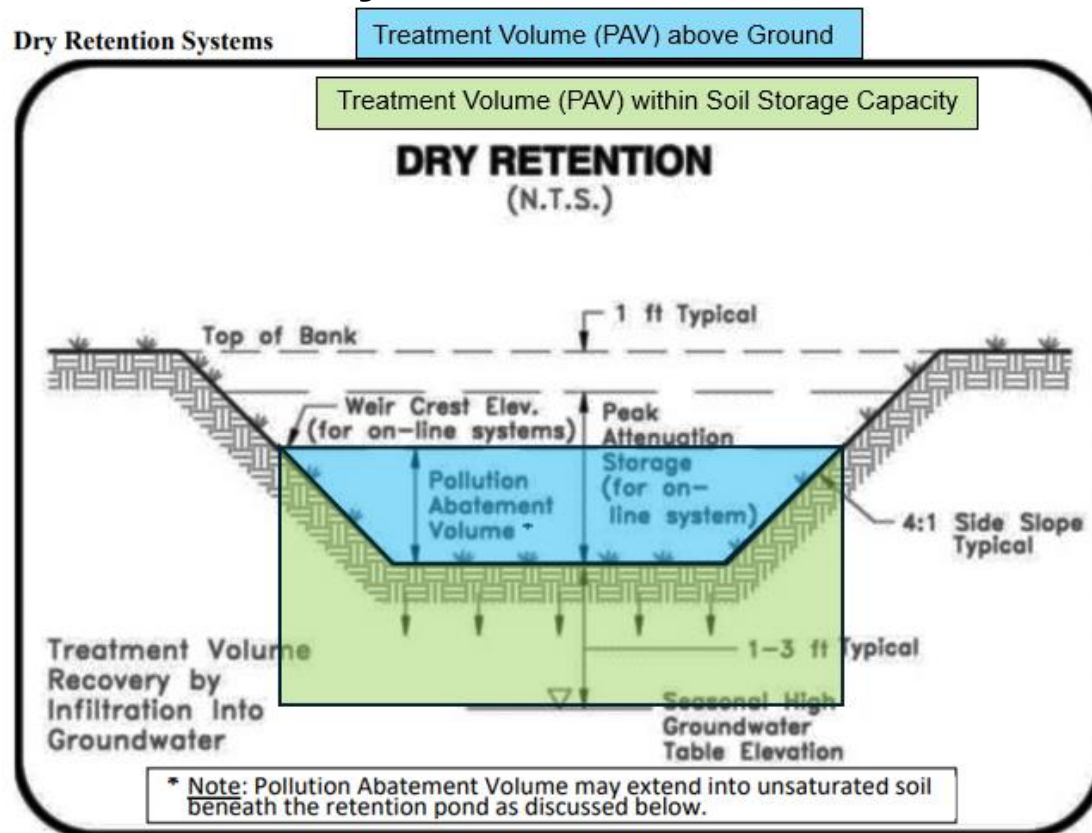


- Standard exfiltration trench Standard Plans Indices 443-001 & 443-002
- Retention BMP

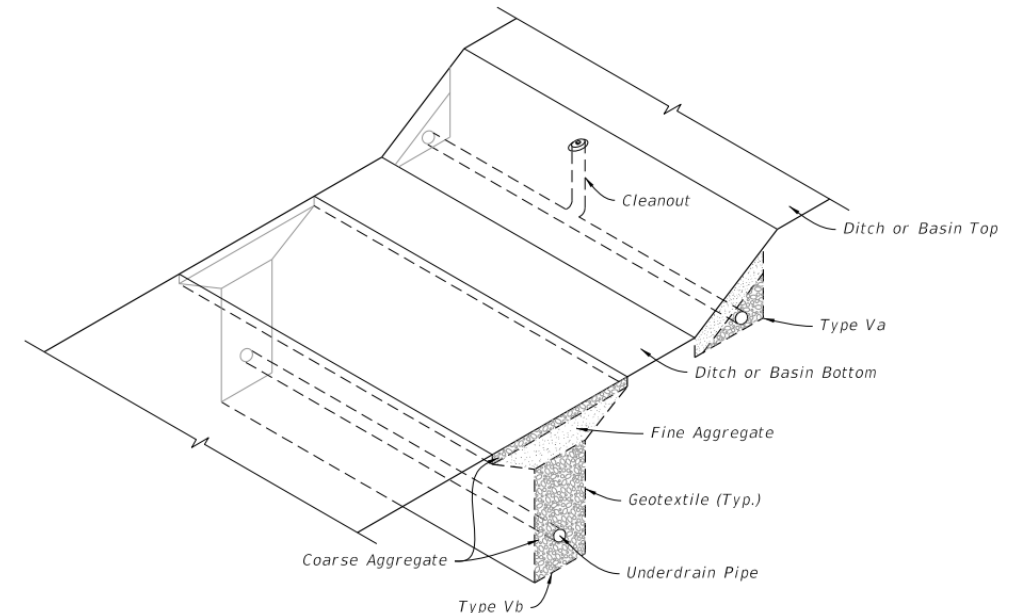
Stormwater BMPs

Stormwater Management Facilities BMPs

Dry Retention Ponds



Detention with Filtration Ponds



UNDERDRAIN TYPE Va AND Vb ASSEMBLY

FDOT Standard Plans 440-001

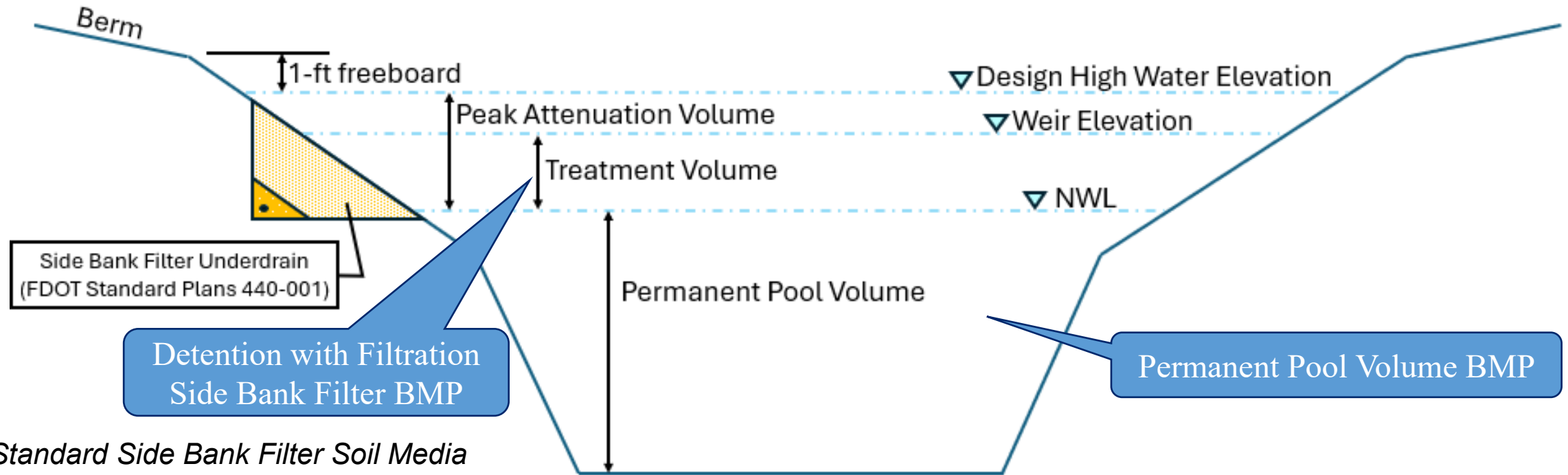
**TRANSPORTATION
SYMPOSIUM**

Stormwater BMPs

Stormwater Management Facilities BMPs

Wet Detention Ponds

- Treatment Train of PPV & SBF BMPs
- Overall Treatment Efficiency can meet the 55% TN & 80% TP



*Standard Side Bank Filter Soil Media
Nutrient Attenuation = 34% TN & 81% TP*

[Underdrain Type V Specifications & results from BDV24-977-25]

Stormwater BMPs

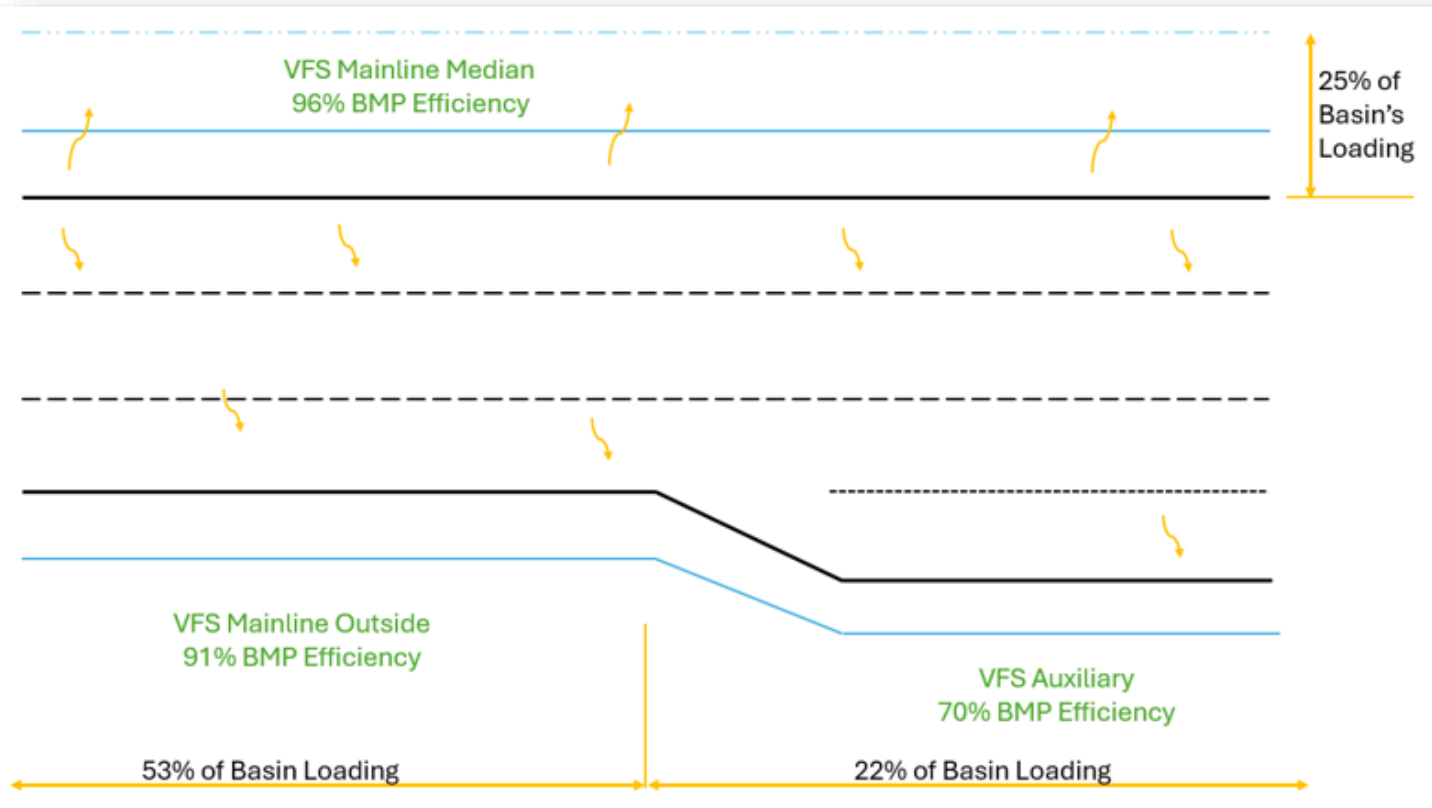
DDG Chapter 9 Sneak Peek

Section 9.3 Water Quality Updates

- Determination of applicable Minimum Nutrient Reduction Rate in Section 8.3
- Compensatory Treatment Example
- Overall Treatment Efficiency for:
 - Parallel Systems
 - Systems in Series (Treatment Train)
- Step-by-Step calculations for Transportation Stormwater BMPs

Stormwater BMPs

DDG Chapter 9 Sneak Peek Stormwater BMPs in Parallel



Parallel BMP Overall Efficiency =

$$\sum_{i=1}^n (\text{Loading Ratio} * \text{BMP Efficiency})_i$$

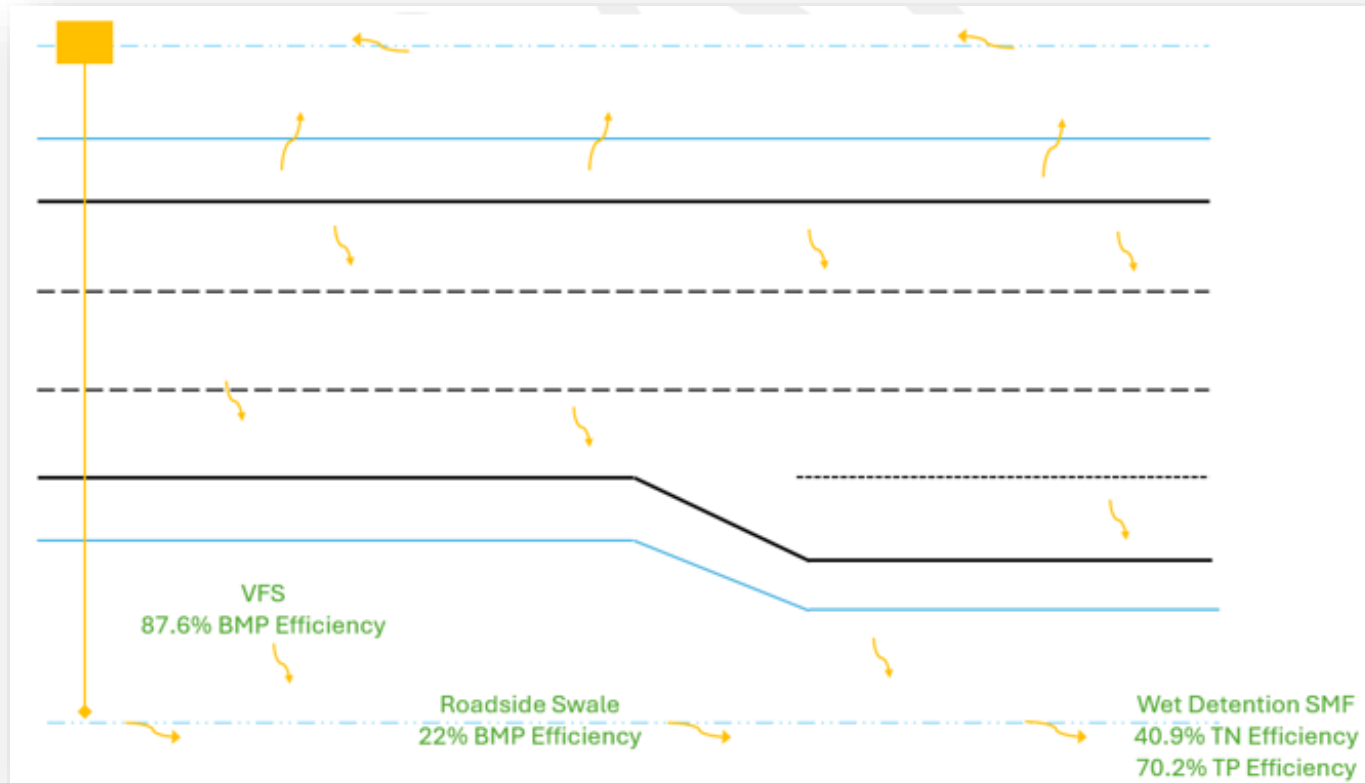
VFS BMP Treatment Efficiency =

Median	Mainline	Auxiliary	
25%*96%	+ 53%*91%	+ 22%*70%	= 87.6%

Stormwater BMPs

DDG Chapter 9 Sneak Peek Stormwater BMPs In Series

$$\begin{aligned} \text{Overall Treatment Train Efficiency} \\ = 1 - ((1 - BMP_1) * (1 - BMP_2) * (1 - BMP_3) * \dots * (1 - BMP_n)) \end{aligned}$$



VFS » Swale » Wet Detention PPV

$$\begin{aligned} \text{Overall TN BMP Efficiency} = \\ 1 - ((1 - 87.6\%) * (1 - 22\%) * (1 - 40.9\%)) = \mathbf{94.3\%} \end{aligned}$$

$$\begin{aligned} \text{Overall TP BMP Efficiency} = \\ 1 - ((1 - 87.6\%) * (1 - 22\%) * (1 - 70.2\%)) = \mathbf{97.1\%} \end{aligned}$$

Stormwater BMPs

DDG Chapter 9 Sneak Peek

Stormwater BMPs In Series – Reverse Engineering

$$\text{Additional BMP Treatment Efficiency Needed} = \frac{\text{Required Reduction Rate} + (1 - \text{Overall BMP Efficiency}) - 1}{(1 - \text{Overall BMP Efficiency})}$$

??? » Wet Detention PPV

$$\text{Additional TN Treatment Efficiency} = \frac{80\% + (1 - 42.8\%) - 1}{(1 - 42.8\%)} = 65.0\%$$

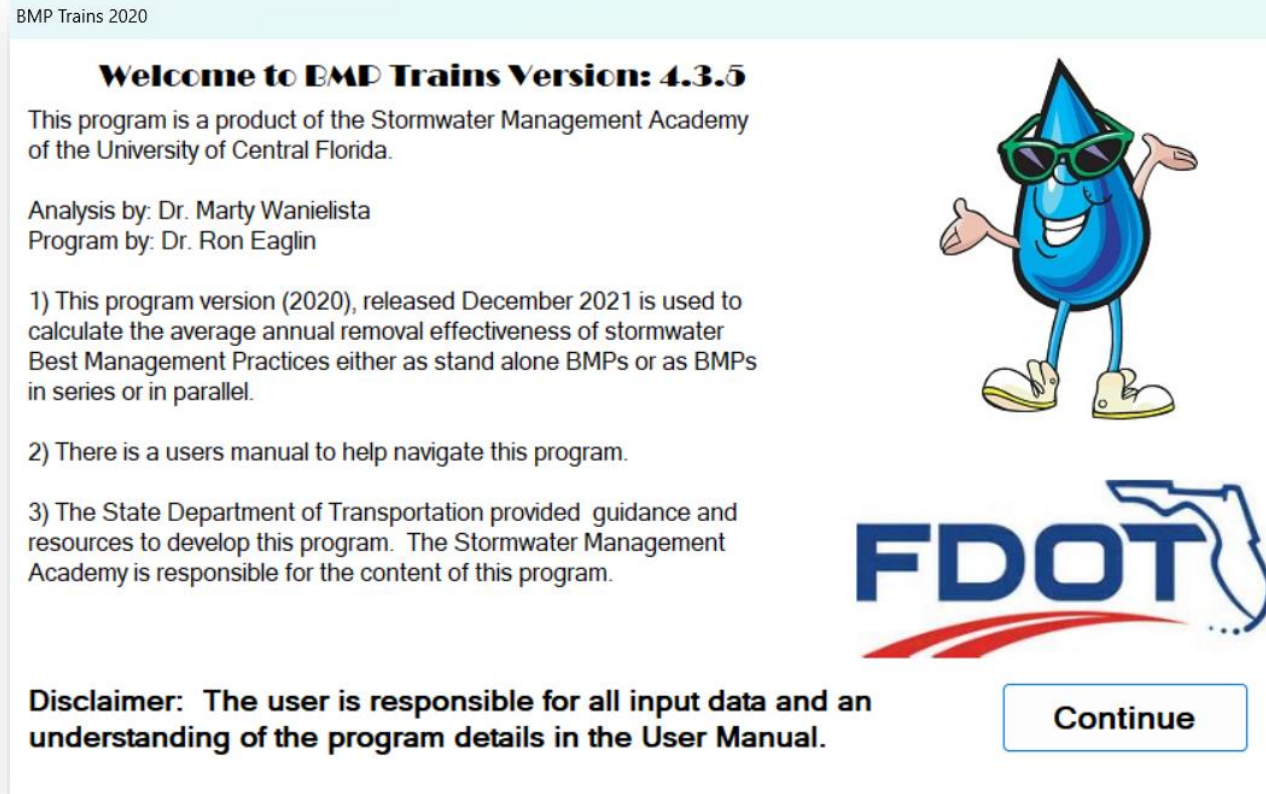
$$\text{Additional TP Treatment Efficiency} = \frac{80\% + (1 - 79.9\%) - 1}{(1 - 79.9\%)} = 0.5\%$$

BMP Trains 2020 – Tips & Tricks

BMP Trains 2020 (version 4.3.5)

Can download on FDOT Drainage Design's Stormwater website:


<https://www.fdot.gov/roadway/drainage/drainage-design-aids>



BMP Trains – Tips & Tricks

Retention BMPs

Retention System Worksheet Analysis: BMP Analysis

 Provided Retention Depth (in over Catchment):

Project: 01
Date: 10/6/2025

Retention Design
Retention Depth (in) 0.000
Retention Volume (ac-ft) 0.000

Watershed Characteristics
Catchment Area (acres) 10.00
Contributing Area (acres) 10.000
Non-DCIA Curve Number 80.00
DCIA Percent 50.00
Rainfall Zone Florida Zone 1
Rainfall (in) 60.00

Get Depth Dialog:
Name:
Enter Average Annual Efficiency (%) for calculating required retention depth (in)

OK Cancel

Buttons: Calculate, Media, **Get Depth**, Copy, Plot, Cost, Print, Back


Treatment Options

Retention Basin	Greenroof
Wet Detention	Rainwater Harvesting
Exfiltration Trench	Vegetated Buffer
Permeable Pavement	Vegetated Filter Strip
Stormwater Harvesting	Rain Garden
Surface Discharge Filter	Tree Well
Swale	User Defined
BMPs in Series	

BMP Trains – Tips & Tricks

Retention BMPs

Retention System Worksheet Analysis: BMP Analysis

 Provided Retention Depth (in over Catchment):

Project: 01
Date: 10/6/2025

Retention Design

Retention Depth (in)	0.829
Retention Volume (ac-ft)	0.691

Watershed Characteristics

Catchment Area (acres)	10.00
Contributing Area (acres)	10.000
Non-DCIA Curve Number	80.00
DCIA Percent	50.00
Rainfall Zone	Florida Zone 1
Rainfall (in)	60.00

Buttons: Calculate, Media, Get Depth, Copy, Plot, Cost, Print, Back

Retention BMPs:

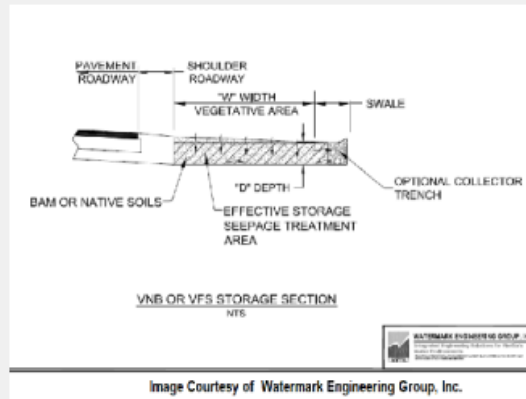
- Retention Pond
- Swales
- Bioretention Areas
 - Planters/Trenches
 - Rain Gardens
 - Stormwater Trees
- Exfiltration Trench
- Vegetated Filter Strip
- Vegetated Buffer
- Permeable Pavement

BMP Trains – Tips & Tricks

Vegetated Filter Strips

Vegetated Filter Strip Worksheet Analysis: BMP Analysis

VFS Width (10 - 30 ft): 24
VFS Length (ft): 1
VFS Depth (1 - 2 ft): 2
Width of DCIA (ft): 36
VFS Storage Capacity (in/in): 0.2
VFS Slope (2 - 20%): 16.67



Note: VFS Contributing Area must equal the Catchment Area

Project: 001
Date: 6/4/2025

Vegetated Filter Strip with media Design

VFS Width (ft) 24.000
VFS Length (ft) 1.000
VFS Depth (ft) 2.000
Width of Area Feeding Buffer (ft) 36.000
Water storage capacity of soil (in/in) 0.200
Slope of VFS (< 20%) 16.670

Annual Capture Percentage 85

Media

Calculate

Cost

Print

Plot

Copy

Retention Treatment Efficiency

Treatment Options

Retention
Basin

Greenroof

Wet
Detention

Rainwater
Harvesting

Exfiltration
Trench

Vegetated
Buffer

Permeable
Pavement

Vegetated
Filter Strip

Stormwater
Harvesting

Rain
Garden

Surface
Discharge Filter

Tree Well

Swale

User
Defined

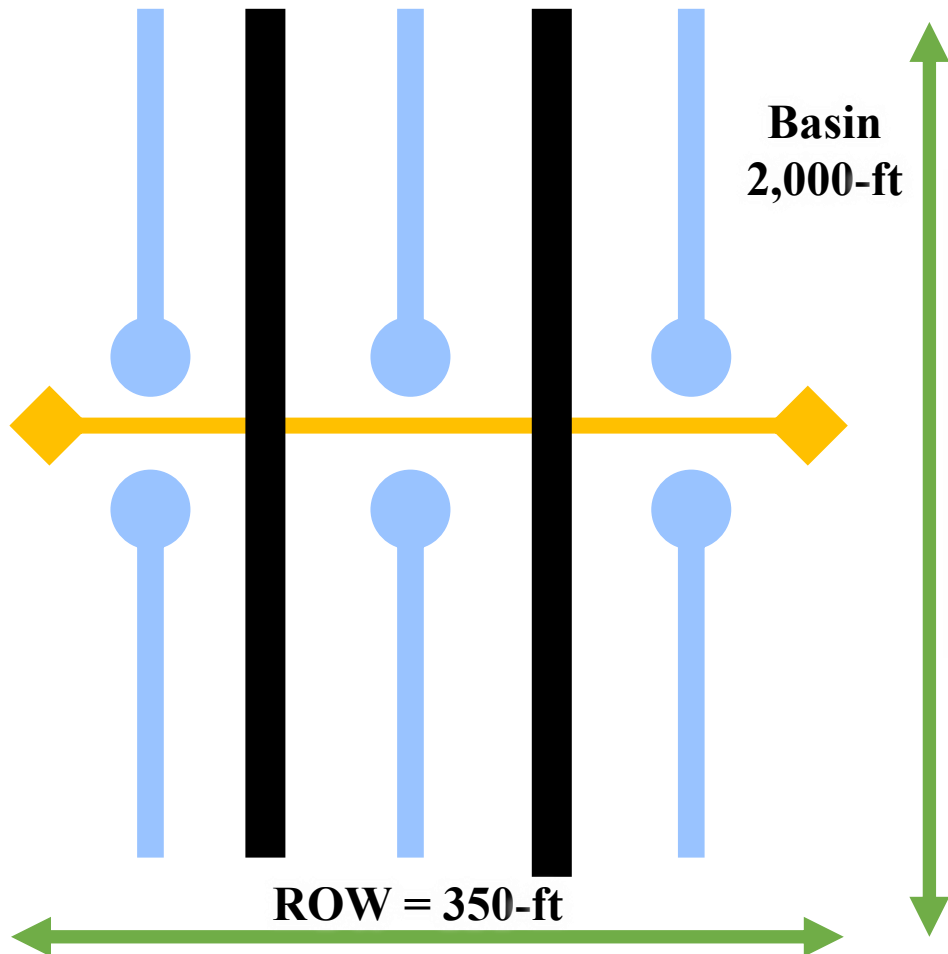
BMPs in Series

Tables in A.H. Vol. 1 Appendix O

TRANSPORTATION
SYMPOSIUM

BMP Trains – Tips & Tricks

Swales



Basin = 350-ft * 2,000-ft = 16.1 ac

Non-DCIA CN = 80

DCIA = $2 * (3 * 12\text{-ft travel} + 2 * 10\text{-ft shoulders}) = 112\text{-ft} / 350\text{-ft ROW} = 32\%$

Meteorological Zone 1

Swale Worksheet Analysis: BMP Analysis

Swale top width calculated for flood conditions (ft) [W]: 0

Swale bottom width (0 for triangular section) (ft) [B]: 5

Swale length (ft) [L]: 6000

Average impervious length (ft): 2000

Average impervious width (including shoulder) (ft): 112

Average width of pervious area including swale width (ft): 238

Swale slope (ft drop/ft length) [S]: 0.02

Manning's N: 0.2

Soil infiltration rate (in/hr): 1.5

Side slope of swale (horizontal ft/vertical ft) [Z]: 6

Average height of the swale blocks (ft) [H]: 0

Length of the berm upstream of the crest (ft): 0

Number of Swale blocks: 0

Surface Water Discharge

Required TN Treatment Efficiency (%)

Provided TN Treatment Efficiency (%) 58

Required TP Treatment Efficiency (%)

Provided TP Treatment Efficiency (%) 58

Must equal Average Contributing
Basin to Swale BMP

**TRANSPORTATION
SYMPOSIUM**

BMP Trains 2020 – Tips & Tricks

Side Bank Filters

Treatment Options

Retention Basin	Greenroof
Wet Detention	Rainwater Harvesting
Exfiltration Trench	Vegetated Buffer
Permeable Pavement	Vegetated Filter Strip
Stormwater Harvesting	Rain Garden
Surface Discharge Filter	Tree Well
Swale	User Defined
BMPs in Series	

Filtration System Worksheet Analysis: BMP Analysis

Click Button to Select Media: **Media** User Defined

Treatment Depth (0.0-4.0 inches): 1

Enter Media Mix Information

Is there an upstream BMP in this Catchment (ex. wet pond)? Yes ▾



Select Media Mix: User Defined ▾

If all runoff are treated: {
TN Reduction (%): 34
TP Reduction (%): 81

Back

Assign Media's Sequestration Efficiency

Assign Treatment Volume's Retention Depth to lookup Annual Capture Efficiency (AH. Volume 1, Appendix O tables)

FDOT's Standard Underdrain Type V Media Sequestration Efficiency

BMP Trains 2020 – Tips & Tricks

BMPs in Series

Known error in software when using “BMPs in Series” with certain BMPs

Recommend calculating Overall BMP Treatment Train Efficiency
externally to follow **A.H. Vol. 1, Equation 9-5**

Stormwater BMPs

Summary

- **Retention BMPs**
 - Treatment efficiency from tables in AH Volume 1, Appendix O
 - Highest BMP treatment efficiencies
 - New BMPs opportunities: VFS, conveyance swales, bioretention areas
- **Detention with Filtration BMPs** (*BMP with underdrains*)
 - Retention Treatment Efficiency x Soil Media's Nutrient Sequestration
 - Standard Underdrains (440-001) Media = 34% TN & 81% TP sequestration rates
 - Additional soils research ongoing
- **Wet Detention SMF**
 - PPV treatment equations (max residence time = 200 days)
 - Minimize use of littoral zones or floating wetlands

Stormwater BMPs

Summary

- **Innovative Stormwater BMPs**
 - FCA to function as Vegetated Buffer BMP (requires sheetflow)
 - Split BMPs – one pond site divided into wet and dry areas
 - Pilot projects
- **Proprietary Products**
 - High O&M inspection frequencies and replacement/repair costs
 - Unique pay items, sole source product approvals, technical specs, BABA

Special Considerations

- **BMAP with FDOT as listed Stakeholder**
 - Coordinate with NPDES Coordinator for documentation for STAR Database
- **WATERSS regional or watershed level water quality credits**
- **Flexibility for linear transportation projects**
 - *Section 373.413(6), F.S.*
 - Coordinate with FDOT District Drainage Engineer

FDOT Drainage Website

- **Frequently Asked Questions**










- Grandfathering
- Permit modifications
- Conceptual permits
- Temporary E&SC

- **Design Aids**

- **Ambient Water Quality Map**

- **BMP Trains 2020**

CRITERIA AND GUIDANCE

 Criteria Current Drainage Manual Drainage Manual Forms Historic Drainage Manuals Office of Design Bulletins Roadway Design Bulletins	 Handbooks Drainage Design Guide Drainage Connection Permits Handbook FHWA Hydraulic Engineering	 Hydrology NOAA Atlas 14 FDOT Rainfall Distributions FDOT IDF Curves (Archive) Statewide LiDAR Resources
 Bridge Scour Bridge Scour Manual Scour Program (Download)	 Coastal Engineering Hurricane Rainfall Procedure Design Hurricane Surge Hydrographs ADCIRC Comparison to Calibrated RMA2 Model in SE Florida	 Stormwater FAQ for Stormwater ERP Ambient Water Quality Map Download BMP Trains 2020 Additional Stormwater Design Aids
 Hydroplaning BE570 - Hydroplaning Tool Report BE570 - Hydroplaning Tool v.2 BE570 - Deliverable 5 CBT Old Hydroplaning Tool (ZIP)	 Pipe Design Culvert Service Life Estimator 2008 Storm Drain Tabulation PDF (Download) Slide Chart Hydraulic Calculator	 Temporary Drainage ERP Temp. E&SC Plan Narrative (Download) NPDES SWPPP Template (Download) 2013 Designer and Reviewer E&SC Manual

Key Points to Remember

- **Float**
- **Understand the new rule**
 - Applicants Handbook Vol. 1 Sections 8, 9, and Appendices N, M, and O
 - Drainage Design Guide Updates
- **Requests for Additional Information (RAI) and Permit Conditions**
 - Review for applicability
 - Coordinate with District Environmental Permits Coordinator & District Drainage Engineer
 - Reach out to Central Office, if needed
- **Projects to be maintained by others will require additional coordination and documentation from the maintaining agency**

Safety Message

Don't Drive Into the Unknown.....



.....Stay Away from Flooded Streets!

Contact Us

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 October 28-29, 2025

 Orlando, FL



DEADLINE



Please be sure to **certify your attendance** before leaving this event or no later than **Friday, November 21st**, in order to receive PDH/CEC. Detailed instructions are available on the Transportation Symposium website.

Transportation Symposium
Website



SCAN ME

