integrated Stormwater Management iSWM

REORGANIZE/RE-EVALUATE
SITE DEVELOPMENT CONTROLS
NCTCOG WORKSHOP

OCTOBER 9, 2019

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WORKSHOP OBJECTIVES

GOAL

- Discuss new best management practices (BMP) and technologies
- Consider BMPs that could be removed from the current document to make the document easier to use

Outcome

- Make recommendations to iSWM Implementation Subcommittee for revisions to the Site Development Controls section of the iSWM Technical Manual based on feedback at workshops.
- Additional workshops may be needed to achieve outcome.

INTRODUCTIONS

NCTCOG:

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Halff:

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URBAN ECOPLAN

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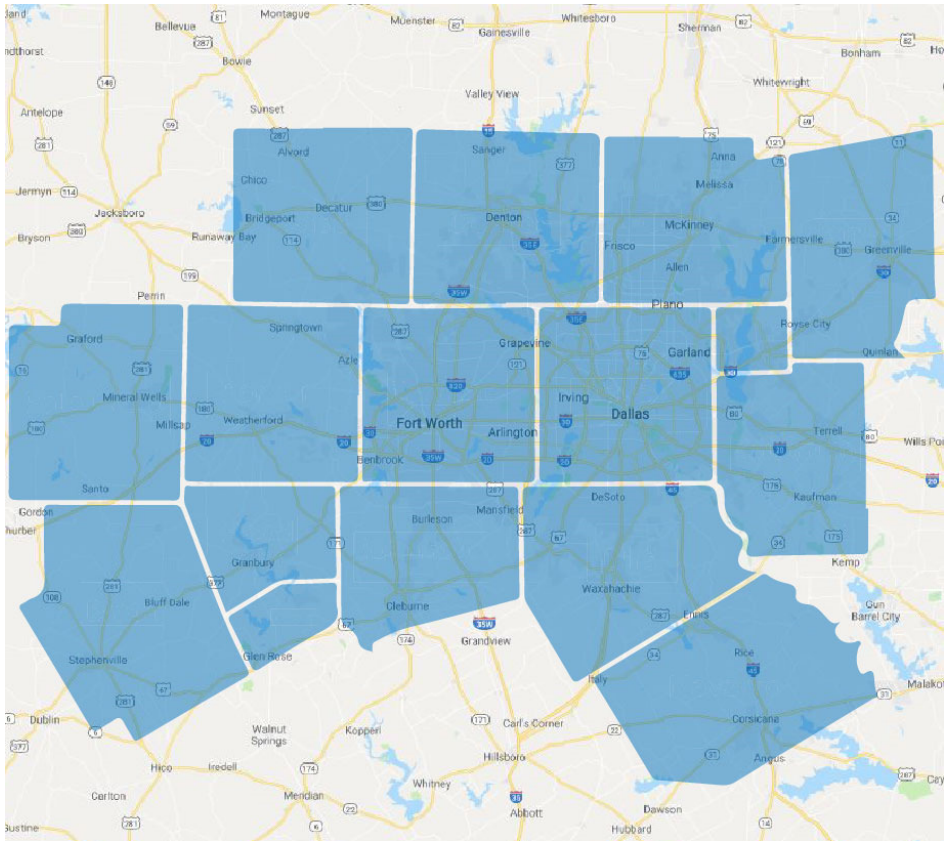
ISWM OVERVIEW

A regional program to assist local governments:

- Manage stormwater impacts
- Meet MS4 Permit requirements

Collaborative effort between:

- 60+ local governments
- iSWM Subcommittee
- Regional Public Works Council
- Consultant team led by Halff Associates



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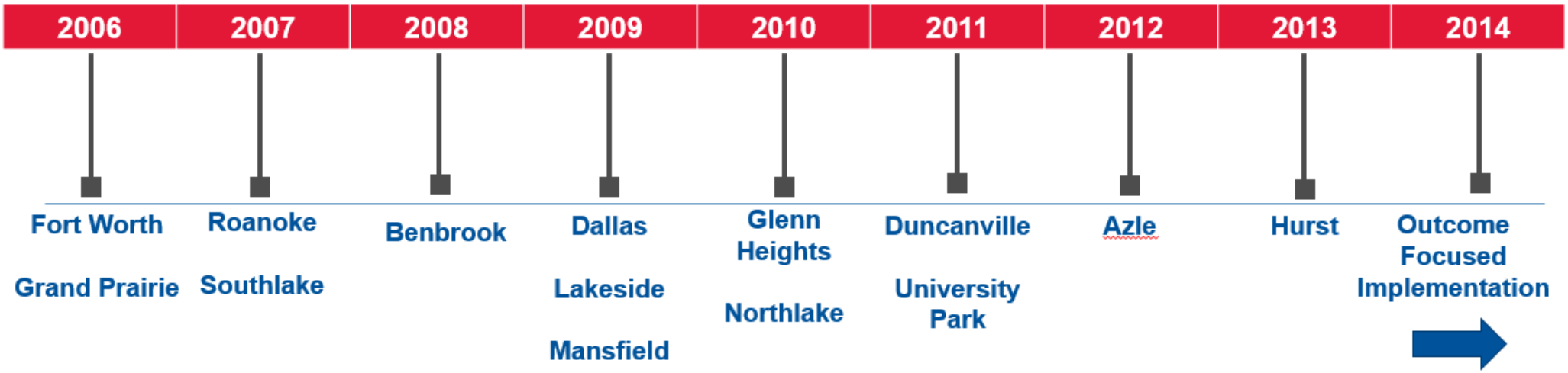
ISWM OVERVIEW

- **Between 2006 – 2011 –** iSWM was implemented
- **2009 –** Site Development Controls Technical Manual replaced the iSWM Design Manual for Site Development
- **2014 –** Last documented update to iSWM Technical Manual



SITE DEVELOPMENT CONTROLS OUTLINE

- Overview of Stormwater Controls for Site Development
- BMPs
  - General Description
  - Stormwater Management Suitability
  - Pollutant Removal Capabilities
  - Application and Site Feasibility Criteria
  - Planning and Design Criteria
  - Design Procedures
  - Inspection and Maintenance Requirements
  - Example Schematics
- Stormwater Control Design Examples
- References

Link to Technical Manual:

http://iswm.nctcog.org/Documents/technical_manual/Site_Development_Controls_4-2010.pdf

iSWM™ Technical Manual Site Development Controls

Site Development Controls:

1.0 Overview of Stormwater Controls for Site Development
2.0 Bioretention
3.0 Enhanced Swales
4.0 Grass Channel
5.0 Open Conveyance Channel
6.0 Alum Treatment System
7.0 Culverts
8.0 Inlets
9.0 Pipe Systems
10.0 Dry Detention / Extended Detention Dry Basins
11.0 Multi-Purpose Detention Areas
12.0 Underground Detention
13.0 Filter Strip
14.0 Organic Filter
15.0 Planter Boxes
16.0 Sand Filters
17.0 Underground Sand Filter
18.0 Gravity (Oil Grit) Separator
19.0 Downspout Drywell
20.0 Infiltration Trench
21.0 Soakage Trench
22.0 Stormwater Ponds
23.0 Green Roof
24.0 Modular Porous Pavement Systems
25.0 Porous Concrete
26.0 Proprietary Structural Controls
27.0 Rain Harvesting (Tanks/Barrels)
28.0 Stormwater Wetlands
29.0 Stormwater Control Design Examples
30.0 References

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1.0 OVERVIEW OF STORMWATER CONTROLS FOR SITE DEVELOPMENT

- Categories and Applicability
  - Primary vs. Secondary
- Suitability of Stormwater Controls
  - Water Quality vs. Streambank Protection vs. Flood Control
- Stormwater Control Selection
  - Table 1.3 Structural Control Screening Matrix
- On-line versus off-line structural controls
- Regional versus on-site stormwater management
- Using structural controls in series
  - Treatment Trains

Table 1.3 Structural Control Screening Matrix

Category	On-Site Storm Water Controls	STORM WATER TREATMENT SUITABILITY				WATER QUALITY PERFORMANCE				SITE APPLICABILITY					IMPLEMENTATION CONSIDERATIONS			
		Water Quality Protection	Streambank Protection	On-Site Flood Control	Downstream Flood Control	TSS/ Sediment Removal Rate	Nutrient Removal Rate (TP/TN)	Bacteria Removal Rate	Hotspot Application	Drainage Area (acres)	Space Req'd (% of tributary Imp. Area)	Site Slope	Minimum Head Required	Depth to Water Table	Residential Subdivision Use	High Density/Ultra Urban	Capital Cost	Maintenance Burden
Bioretention Areas	Bioretention Areas	P	S	S	-	80%	60%/60%	-	✔	5 max***	5-7%	6% max	5 ft	2 feet	✔	✔	Moderate	Low
Channels	Enhanced Swales	P	S	S	S	80%	25%/40%	-	✔	5 max	10-20%	4% max	1 ft	below WT	✔		High	Low
	Channels, Grass	S	S	P	S	60%	25%/20%	-							✔		Low	Moderate
	Channels, Open	-	-	P	S	-	-	-							✔		Low	Low
Chemical Treatment	Actifi Treatment System	P	-	-	-	90%	60%/60%	90%	✔	25 min	None				✔	✔	High	High
Conveyance Components	Culverts	-	-	P	P	-	-	-							✔	✔	Low	Low
	Energy Dissipation	-	P	S	S	-	-	-							✔	✔	Low	Low
	Inlets/Street Gutters	-		P	-	-	-	-							✔	✔	Low	Low
	Pipe Systems	-	P	P	P	-	-	-							✔	✔	Low	Low
Detention	Detention, Dry	S	P	P	P	60%	20%/20%	70%	✔		2 - 3%	15% across pond	6 to 8 ft	2 feet	✔		Low	Moderate to High
	Detention, Extended Dry	S	P	P	P	65%	20%/20%	70%	✔		2 - 3%	15% across pond	6 to 8 ft	2 feet	✔		Low	Moderate to High
	Detention, Multi-purpose Areas	-	P	P	P	-	-	-		200 max		1% for Parking 1-4ft 0.25 in/ft for Rooftop			✔	✔	Low	Low
	Detention, Underground	-	P	P	P	-	-	-		200 max						✔	High	Moderate
Filtration	Filter Strips	S	-	-	-	50%	20%/20%	-		2 max***	20-25%	2-6%			✔		Low	Moderate
	Organic Filters	P	-	-	-	80%	60%/40%	90%	✔	10 max***	2-3%		0 to 8 ft			✔	High	High
	Planter Boxes	P	-	-	-	80%	60%/40%	-			6%					✔	Low	Moderate
	Sand Filters, Surface/ Perimeter	P	S	-	-	80%	60%/20%	40%	✔	10 max*** 2 max***	2-3%	6% max	6 ft/ 2 to 3 ft	2 feet		✔	High	High
	Sand Filters, Underground	P	-	-	-	80%	60%/20%	40%	✔	5 max	None					✔	High	High
Hydrodynamic Devices	Grease and Grit Separator	S	-	-	-	40%	5%/0%	-		1 max***	None					✔	High	High
Infiltration	Downspout Drywell	P	-	-	-	80%	60%/60%	90%							✔	✔	Low	Moderate
	Infiltration Trenches	P	S	-	-	80%	60%/60%	90%		5 max	2-3%	6% max	1 ft	4 feet	✔	✔	High	High
	Soakage Trenches	P	S	-	-	80%	60%/60%	90%		5 max		6% max	1 ft	4 feet	✔	✔	High	High
Ponds	Wet Pond	P	P	P	P	80%	60%/20%	70%*	✔		87 per 1000 ft² impervious area				✔		Low	Low
	Wet ED Pond	P	P	P	P	80%	60%/20%	70%*	✔	25 min**					✔		Low	Low
	Micropool ED Pond	P	P	P	P	80%	60%/20%	70%*	✔	10 min**	2-3%	15% max	6 to 8 ft	2 feet, if hotspot or aquifer	✔		Low	Moderate
	Multiple ponds	P	P	P	P	80%	60%/20%	70%*	✔	25 min**					✔		Low	Low
Porous Surfaces	Green Roof	P	S	-	-	80%	60%/40%	-	✔							✔	High	High
	Modular Porous Pave Systems	S	S	-	-	**	60%/60%	-		5 max	Varies					✔	Moderate	High
	Porous Concrete	S	S	-	-	**	60%/40%	-		5 max	Varies					✔	High	High
Proprietary Systems	Proprietary Systems ***	S	S	S	S	****	***	****		****	****				****	✔	High	High
Re-Use	Rain Harvesting	P	-	-	-	-	-	-							✔	✔	Low	High
Wetlands	Wetlands, Storm Water	P	P	P	P	80%	40%/35%	70%*	✔	25 min	3-5%	8% max	3 to 5 ft (shallow) 6 to 8 ft (pond)	2 feet, if hotspot or aquifer	✔		Moderate	Moderate
	Wetlands, Submerged Gravel	P	P	S	-	80%	60%/20%	70%	✔	5 min			2 to 3 ft	below WT	✔	✔	Moderate	High

✔ Meets suitability criteria

P - Primary Control, meets suitability criteria

S - Secondary Control, can be incorporated into the structural control in certain situations

* Provides less than 80% TSS removal efficiency. May be used in pretreatment and as part of a "treatment train"

** Smaller area acceptable with adequate water balance and anti-clogging device

*** Drainage area can be larger in some instances

**** The application and performance of specific commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data

1 Porous surfaces provide water quantity benefits by reducing the effective impervious area

2 Due to the potential for clogging, porous surfaces should not be used for the removal of sediment or other coarse particulate pollutants

Figure 1.6 Generalized Stormwater Treatment Train

CURRENT LIST OF BMPS

- Bioretention
- Enhanced Swales
- Grass channel
- Open Conveyance Channel
- Alum Treatment System
- Culverts
- Inlets
- Pipe Systems
- Dry Detention/Extended Detention Dry Basins
- Multi Purpose Detention Areas
- Underground Detention
- Filter Strip
- Organic Filter
- Planter Boxes
- Sand Filters
- Underground Sand Filter
- Gravity (Oil Grit) Separator
- Downspout Drywell
- Infiltration Trench
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2.0 Bioretention

Structural Stormwater Control

Description: Shallow stormwater basin or landscaped area that utilizes engineered soils and vegetation to capture and treat runoff.

KEY CONSIDERATIONS

DESIGN CRITERIA:

- Maximum contributing drainage area of 5 acres (< 2 acres recommended)
- Often located in "landscaping islands"
- Treatment area consists of grass filter, sand bed, ponding area, organic/mulch layer, planting soil, and vegetation
- Typically requires 5 feet of head

ADVANTAGES / BENEFITS:

- Applicable to small drainage areas
- Good for highly impervious areas, flexible siting
- Good retrofit capability
- Relatively low maintenance requirements
- Can be planned as an aesthetic feature

DISADVANTAGES / LIMITATIONS:

- Requires extensive landscaping if in public area
- Not recommended for areas with steep slopes

MAINTENANCE REQUIREMENTS:

- Inspect and repair/replace treatment area components

POLLUTANT REMOVAL

80%	**Total Suspended Solids**
60/50%	**Nutrients** - Total Phosphorus / Total Nitrogen removal
M	**Metals** - Cadmium, Copper, Lead, and Zinc removal
No Data	**Pathogens** - Coliform, Streptococci, E. Coli removal

STORMWATER MANAGEMENT SUITABILITY

P	**Water Quality Protection**
S	**Streambank Protection**
S	**On-Site Flood Control**
	Downstream Flood Control

Accepts Hotspot Runoff: Yes (requires impermeable liner)

S - in certain situations

IMPLEMENTATION CONSIDERATIONS

M	**Land Requirement**
M	**Capital Cost**
L	**Maintenance Burden**

Residential Subdivision Use: Yes

High Density/Ultra-Urban: Yes

Drainage Area: 5 acres max. (< 2 acres recommended)

Soils: Planting soils must meet specified criteria; No restrictions on surrounding soils

Other Considerations: Use of native plants is recommended

L=Low M=Moderate H=High

2.8 Example Schematics

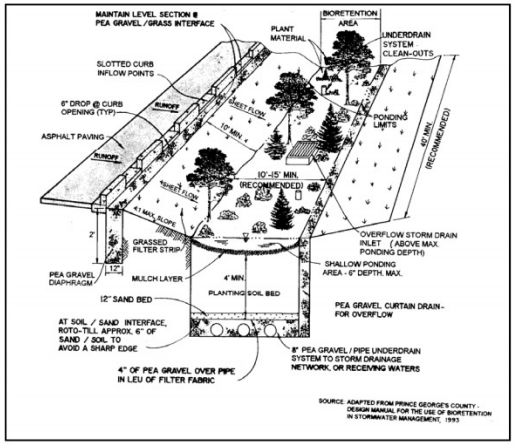

Figure 2.3 Schematic of a Typical Bioretention Area
(Source: Claytor and Schueler, 1996)

Table 2.2 Design Procedure Form: Bioretention Areas

Design Procedure Form: Bioretention Areas

PRELIMINARY HYDROLOGIC CALCULATIONS	
1a. Compute WQ_v volume requirements Compute Runoff Coefficient, R_v Compute WQ_v	R_v = _____ WQ_v = _____ acre-ft
1b. Compute SP_v Compute average release rate Compute (as necessary) Q_f	SP_v = _____ acre-ft release rate = _____ cfs Q_f = _____ cfs
BIORETENTION AREA DESIGN	
2. Is the use of a bioretention area appropriate?	*See subsections 5.2.1.4 and 5.2.1.5 - A*
3. Confirm local design criteria and applicability	
4. Determine size of bioretention filter area	A_f = _____ ft²
5. Set design elevations and dimensions	Length = _____ ft Width = _____ ft _____ elevation top of facility _____ other elev: _____ _____ other elev: _____ _____ other elev: _____
6. Conveyance to bioretention facility	____Online or ____ Offline?
7. Pretreatment	Type: _____
8. Size underdrain area Based on guidance: Approx. 10% A_f	Length = _____ ft
9. Overdrain design	Type: _____ Size: _____
10. Emergency storm weir design Overflow weir - Weir equation	Length = _____ ft
11. Choose plants for planting area	*Select native plants based on resistance to drought and inundation, cost, aesthetics, maintenance, etc.* ***See Appendix F***

Notes: _____

CASE STUDIES

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RAYZOR RANCH DEVELOPMENT

- Rayzor Ranch North (officially Rayzor Ranch Marketplace), is a 100-acre parcel within the Rayzor Ranch development, a privately-owned, 400-acre mixed-use development in Denton Texas.
- Key iSWM Features:
  - Water Quality Pond
  - Bioretention
  - Pocket Wetland
  - Enhanced swale
  - Filter strip
- Aesthetically pleasing, utilitarian in conveying drainage, and environmentally responsible in the treatment of the water quality for removing both on and off-site pollutants before discharging the storm drainage

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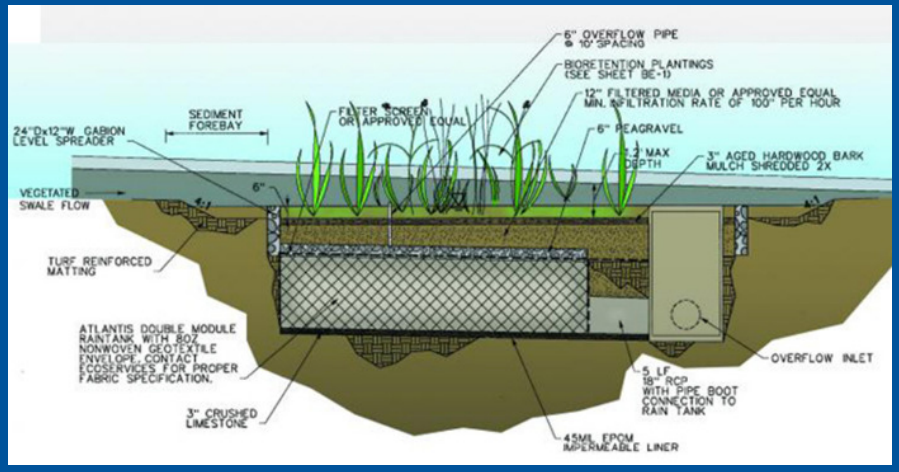
ELM FORK ATHLETIC COMPLEX

- 140 acre soccer complex located southwest of the intersection of Walnut Hill Drive and I-35E in Dallas. Built in 2012.
- Key iSWM Features:
  - Stormwater Quality
  - Rainwater Harvesting
  - Wastewater Recycling
  - Use of Recycle Material for Construction
- Seven bioretention cells used to treat runoff from the site
- Due to the previous use of the site as a landfill, stormwater is not allowed to infiltrate from the bioretention cells. Liners are used under each bioretention cell to prohibit infiltration and to direct drainage to the underdrain systems

MERRITT ROAD

- The City of Rowlett expanded Merritt Road to improve mobility and increase capacity on Merritt Road. Built in 2013.
- Innovative design intended to support surrounding area as a new technology corridor and to attract related business.
- Key iSWM Features:
  - 4 Bioretention systems utilizing treatment train drainage method:
    - Vegetated swale
    - Forebay sediment filtering
    - Biological uptake of pollutants with native plantings
    - Filtration of water before discharge
- Focuses on stormwater control designed solutions aimed to:
  - Improve water quality
  - Reduce landscaping maintenance
  - Reduce irrigation demands
  - Provide cost savings



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FEEDBACK SURVEY

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Test Question: What's your name?

What are existing projects you are aware of in the Metroplex utilizing BMPs from iSWM manual?

Out of the BMPs listed in the technical manual, in your experience which are most WIDELY used? (Part I)

Bioretention

Enhanced Swales

Grass Channels

Open Conveyance Channel

Alum Treatment System

Culverts

Inlets

Pipe Systems

Dry Detention/Extended Detention Dry Basins

Out of the BMPs listed in the technical manual, in your experience which are most WIDELY used? (Part II)

Multi-Purpose Detention Areas
Underground Detention
Filter Strip
Organic Filter
Planter Boxes
Sand Filters
Underground Sand Filter
Gravity (Oil Grit) Separator
Downspout Drywell

Out of the BMPs listed in the technical manual, in your experience which are most WIDELY used? (Part III)

Infiltration Trench
Soakage Trench
Stormwater Ponds
Green Roof
Modular Porous Pavement Systems
Porous Concrete
Proprietary Structural Controls
Rainwater Harvesting
Stormwater Wetlands

Out of the BMPs listed in the technical manual, in your experience which are most RARELY used? (Part I)

Bioretention

Enhanced Swales

Grass Channels

Open Conveyance Channel

Alum Treatment System

Culverts

Inlets

Pipe Systems

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Green Roof
Modular Porous Pavement Systems
Porous Concrete
Proprietary Structural Controls
Rainwater Harvesting
Stormwater Wetlands

Out of the information that is provided for each BMP, which part has been the most helpful?

General Description

Stormwater Management Suitability

Pollutant Removal Capabilities

Application and Site Feasibility Criteria

Planning and Design Criteria

Design Criteria/Procedures/Forms/Examples

Inspection and Maintenance Requirements

Example Schematics

Is there information you feel is missing for some or all of the BMPs that needs to be added? If so, please describe.

Are there BMPs commonly utilized that are not listed in the manual? If so which ones?

From a formatting or organization perspective, what is the most helpful aspect of the technical manual?

From a formatting or organization perspective, what aspect of the technical manual needs improvement?

NEXT STEPS

- Summarize feedback from today into recommended updates to technical manual
- **January 2020** – Workshop #2 to review recommended updates to technical manual
- **April 2020** – Present recommendations to iSWM Implementation Subcommittee

For follow up questions or information contact:

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