Stormwater Design Standards Manual
Educational Workshop #4:
Modeling Wetland Areas for Conveyance
Submerged Systems
Low Impact Development: A Planning and Design Guide

18 June 2020
Agenda

• General Manual Information
• Specific Workshop Information
• General Public Q&A
• Technical Information
  – Wetland Systems – Modeling and Baseline Functionality
  – Equalization Pipes and Submerged Systems
  – Low Impact Development in Coastal South Carolina: A Planning and Design Guide
• Technical Q&A
Stormwater Design Standards Manual (SWDSM) is a federally mandated requirement of the National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Program. SWDSM is used by design community to develop designs and used by the City to review, approving, and permitting designs. SWDSM has 8 chapters: 

1. Introduction and Legal Authority
2. Conceptual Overview
3. Design Requirements
4. Construction Activity Permitting
5. Construction Phase
6. Post-Construction
7. City Inspection and Enforcement
8. References

Originally passed in 2007, first update was completed in 2013. Newest update goes into effect July 1, 2020.
Specific Workshop Information

• Wetland Systems – Modeling and Baseline Functionality
  – Modeling
  – Baseline Functionality
• Equalization Pipes and Submerged Systems
• Low Impact Development in Coastal South Carolina: A Planning and Design Guide
  – Compliance Worksheet
General Public Questions

Send questions and comments to:

Kinsey Holton
Stormwater Program Manager
City of Charleston
holtonk@charleston-sc.gov
Wetland Systems
Technical Procedure Document #6

• General Guidelines
• Modeling Wetlands
  – General Parameters
  – Discharging to Wetlands when Performing 1% AEP Analysis
  – Discharging to Adjacent Wetlands with an Easement
  – Discharging to Adjacent Wetlands without an Easement
• Baseline Functionality Documentation
General Guidelines
Technical Procedure Document #6

• Developers/Designers must avoid negatively affecting natural wetlands and preserve the sensitive nature of the wetland environment.
• Should be used for Conveyance Only, use for additional storage will require additional analysis to avoid adverse impacts
• The City will use the analysis to confirm that the wetlands are functioning as a conveyance system and are formally integrated as part of the City’s stormwater infrastructure
General Guidelines
Technical Procedure Document #6

The following guidelines shall be used:

- Appropriate water levels must be maintained in all wetlands during dry conditions. In order to determine these levels and the baseline dry condition, it is recommended the designer/developer engage a wetlands scientist to determine baseline functionality. The baseline dry condition water level prior to the development of the site must be maintained post-development.

- The developer/designers must confirm and demonstrate that during post-development conditions stormwater conveyance does not cause adverse impacts upstream or downstream of the site.

- The modeling analysis must show that the volume of stormwater conveyed will not cause negative effects, such as over-inundation, and varies in each individual wetland system. It is important to engage a wetland scientist to determine baseline functionality and the Ordinary High Water Mark (OHWM) for the wetland system. In general, the City expects the water surface elevation for a 24-hour AEP to not cause adverse impacts and also the WSE in the wetland to return to OHWM within 24-72 hours.
General Parameters
Technical Procedure Document #6

• The following parameters must be used in the model:
  – Individual Wetlands must be modeled with a Curve Number of 98
  – Wetlands must be modeled with an overland roughness coefficient to represent natural vegetation. This information can be obtained from the NRCS Urban Hydrology for Small Watershed - TR-55 technical document.
  – Representative cross-sections should be used to model the conveyance through a wetland system that includes the main channel, the adjacent wetlands, secondary channels, and riparian zone.

Source: Wetland Project Permitting Guide (Ventura County Planning Division, 2006)
Discharging to Wetlands when Performing 1% AEP Analysis

Technical Procedure Document #6

• The following parameters must be used in the model when performing the 1% AEP Analysis:
  – Model Wetlands as conveyance/storage as the site warrants
  – Show that the entire basin does not have adverse impacts for the 1% AEP Storm Event
  – Maximum WSE in post-development should be less or equal to pre-development
Discharging to Adjacent Wetlands with an Easement

Technical Procedure Document #6

• The following parameters must be used in the model when discharging to adjacent wetlands that contain an easement:
  – Model the entire wetland as conveyance
  – Make sure the water level is maintained to pre-development conditions
  – No adverse impacts to downstream system
  – Does not require volume control from the wetland
  – Requires water quality pre-treatment prior to the discharge to the wetland within the project site
Discharging to Adjacent Wetlands without an Easement

*Technical Procedure Document #6*

• The following parameters must be used in the model when discharging to adjacent wetlands that do not contain an easement:
  – Model the wetland as conveyance within the site
  – Make sure the water level is maintained to pre-development conditions
  – No adverse impacts to downstream system
  – Volume/peak flow must be maintained the same or less than the pre-development conditions
  – Requires water quality pre-treatment prior to the discharge to the wetland within the project site
The City will use the analysis to confirm that the wetlands are functioning properly and can be formally integrated as a part of the City’s stormwater infrastructure and that require maintenance is accommodated.

Must include at a minimum:

**Description and Background**
- Acreage
- USGS Quadrangle
- Latitude and Longitude
- Purpose
- Physical Environment Characteristics
- Ecological Features
- Hydrological Features
- Man-made Structures/Improvements

**Appendices**
- Location Map
- USGS Topographic Map with Tract Boundaries
- Photo Location Map
- Infrared Soil Map
- Ecological Features Map
- Flow Map
- Photographic Data Sheet
- Photographs from Photo Locations
Example Project #1

- 56 New residential lots, 3 commercial tracks, and HOA green space.
- Total Project Site Area = 17.6 ac
- Disturbed Area = 14.9 ac
- Pre-developed Conditions = Sparsely wooded area, predominantly pine
- Post-developed Conditions = Impervious residential area
- Outfall from detention pond to existing wetlands
- This site is located on Johns Island
Example Project 1 - Wetlands Modeling

• Determine discharge point into wetlands

• On-Site Wetlands:
  – Establish cross section of conveyance reach
  – Maintain water level within wetlands

• Adjacent Wetlands with Easement:
  – Establish cross section of conveyance reach
  – Maintain water level/peak flow to pre-developed conditions.

• Adjacent Wetlands without Easement:
  – Establish cross section of conveyance reach
  – Maintain water level and volume/peak flow to pre-developed conditions.
Submerged Systems
Technical Procedure Document #7

• Design Requirements
• Design Exception
Submerged Systems – Design Requirements

Technical Procedure Document #7

- 2020 SWDSM Section 3.11 and Section 3.4.6.1.4
- Requires a design exception
- The following design criteria shall be used:

  - Isolator boxes must be installed at both ends of a conduit designed to be submerged to facilitate draining and maintenance.
  - For pipe runs of greater than 600 feet, the maximum distance between isolator boxes is 600 feet. Maintenance Access points are required every 200 feet (SWDSM Section 3.4.6.1.13).
  - The minimum pipe size shall be 24 inches in diameter.
Submerged Systems – Isolator Box Detail

Technical Procedure Document #7
Submerged Systems – Design Exception

Technical Procedure Document #7

• 2020 SWDSM Section 4.10

• A design exception may be granted by the City if there is an exceptional circumstance applicable to the site exists, such that the adherence to the provisions of the SWDSM will not fulfill the intent on the SWDSM.

• The City understands that the need for an exception may not be known during planning stages and only may be evident after a portion of the design is completed. The City intends to work with developer/designer during the design process to find a resolution.

• A written request will be required by the City and must contain:
  – Specific exception sought
  – Reason for exception
  – Supporting Data
  – An explanation why the exception should be granted by the City
Submerged Systems – Design Exception
Technical Procedure Document #7

• 2020 SWDSM Section 3.4.6.1.4
• Additional information required for the design exception for submerged systems includes:
  – Pretreatment accommodation for sediment
  – Description of the proposed construction method to replace system (including dewatering and excavation without the need for shoring)
  – Description of the maintenance method for the submerged pipes and isolator boxes (this must include drawdown and maintenance methods must be able to be completed in a day)
• Once a design exception is fully approved, it must be fully documented and included on the title sheet of the approved stamped construction and project record drawings
Low Impact Development in Coastal South Carolina: A Planning and Design Guide

Technical Procedure Document #8

• What is Low Impact Development (LID)?
• Principles of LID
• Benefits
• What is included in the Low Impact Development in Coastal South Carolina: A Planning and Design Guide (LID Design Guide)
  – Regulatory Strategies
  – Neighborhood Planning Considerations
• Implementation of LID Design Guide
  – Integration into Existing Developments
  – Stormwater Best Management Practices (BMPs)
  – Compliance Calculator
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – What is LID?

Technical Procedure Document #8

- Integrated, comprehensive approach to land development or redevelopment that works with nature to manage stormwater as close to the source as possible
- Aims to mimic the natural hydrology of an area through the use of Stormwater BMPs
- Uses techniques that promote evaporation, infiltration, localized storage, and runoff treatment
- General idea – have more smaller BMPs throughout a development that:
  - Increases water quality
  - Increases aesthetic appeal
  - Decrease stormwater runoff
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – Principles of LID

Technical Procedure Document #8

- Work with the Landscape
- Focus on Prevention
- Micromanage Stormwater
- Keep it Simple
- Practice Multi-Tasking
- Maintain and Sustain

Development
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – Benefits

Technical Procedure Document #8

**Developers**
- Reduced cost from land clearing, grading, infrastructure (streets, curbs, gutters, sidewalks), stormwater management, and environmental impact fees
- Potential for increased lot yields and marketability

**Municipalities**
- Protects native flora and fauna
- Balances urban growth with environmental protection
- Reduces municipal infrastructure
- Reduces system-wide operation and maintenance costs
- Reduces runoff and flooding
- Fosters Public/Private Partnership

**Home Buyers and Residents**
- Preserves and protects amenities that increases property value
- Lower energy costs due to increased shade from trees
- Reduced flooding
- Saves money through water conservation

**Environment**
- Preservation of ecological and biological systems
- Reduced water supply demand
- Protects site and regional water quality
- Reduces impact on local terrestrial and aquatic flora and fauna
- Preserves Trees and natural vegetation
- Improves air quality
- Reduces urban head stress
- Reduces sewer overflows

**Social**
- Enhanced aesthetics
- Stimulates economic development
- Creates “green” jobs
- Encourages more greenways
- Educates the public on their role in stormwater management
- Reduce flooding
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – What is Included

Technical Procedure Document #8

• Regulatory Strategies
  – City of Charleston has the authority from SC DHEC to maintain the municipal separate storm sewer system (MS4) with city limits
  – Projects in an MS4 must be designed, constructed, and maintained to control rainfall on-site, and prevent the first flush (1 inch) discharge runoff from the site’s disturbed area to the adjacent property

• Neighborhood Planning Considerations
  – Use innovative community and subdivision designs – compact development
  – Incorporate more LID BMPs to control stormwater and improve aesthetic appeal
• Integration into Existing Developments
  – LID can be incorporated through retrofitting and redevelopment
  – LID is an option for upgrading deteriorating and aging infrastructure

• Stormwater Best Management Practices (BMPs)
  – 2020 SWDSM Section 3.12 – refers to the LID Design Guide (Chapter 4)

1. Bioretention
2. Permeable Pavement Systems
3. Stormwater Infiltration
4. Green Roofs
5. Rainwater Harvesting
6. Impervious Surface Disconnection
7. Open Channel Systems
8. Stormwater Filtering Systems
9. Dry Detention Practices
10. Wet Detention Practices
11. Stormwater Wetlands
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – Example

Technical Procedure Document #8

Figure 3.3-7. Conventional Parking Lot Layout (RI DEM, 2013)
Conventional parking designs clear the entire site, that later needs to be revegetated, and creates one massive area for parking.

Figure 3.3-8. Parking Lot Layout Using LID Techniques (RI DEM, 2013)
The LID design leaves undisturbed buffer of native vegetation, incorporates landscaped islands that act as stormwater, and disperses the parking into smaller areas.

Table 1.2.3. Comparison of unit costs for materials for Boulder Hills LID Subdivision (UNH, 2011). Note the road for this development was porous asphalt.

<table>
<thead>
<tr>
<th>Item</th>
<th>Conventional</th>
<th>LID</th>
<th>Difference</th>
</tr>
</thead>
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<tr>
<td>Site Preparation</td>
<td>$23,200.00</td>
<td>$18,000.00</td>
<td>-$5,200.00</td>
</tr>
<tr>
<td>Temp. Erosion Control</td>
<td>$5,000.00</td>
<td>$3,000.00</td>
<td>-$2,000.00</td>
</tr>
<tr>
<td>Drainage</td>
<td>$92,400.00</td>
<td>$20,100.00</td>
<td>-$72,300.00</td>
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<tr>
<td>Roadway</td>
<td>$52,000.00</td>
<td>$128,000.00</td>
<td>$46,000.00</td>
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<tr>
<td>Driveways</td>
<td>$19,700.00</td>
<td>$30,100.00</td>
<td>$10,400.00</td>
</tr>
<tr>
<td>Cutting</td>
<td>$6,500.00</td>
<td>$0.00</td>
<td>-$6,500.00</td>
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<tr>
<td>Berm. Erosion Control</td>
<td>$70,000.00</td>
<td>$50,600.00</td>
<td>-$19,400.00</td>
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<tr>
<td>Additional Items</td>
<td>$489,700.00</td>
<td>$489,700.00</td>
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</tr>
<tr>
<td>Buildings</td>
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<td>$3,600,000.00</td>
<td>$0.00</td>
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<tr>
<td>Project Total</td>
<td>$4,389,300.00</td>
<td>$4,340,300.00</td>
<td>-$49,000.00</td>
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</table>
Low Impact Development in Coastal South Carolina: A Planning and Design Guide – Compliance Calculator

Technical Procedure Document #8

- Created by the Center of Watershed Protection
- Allows designer to quickly analyze a site with multiple LID options
- Calculator is NOT a model – it is a planning tool to help find the best set of LID BMPs for a development
- Detailed Instructions are in Appendix A of the LID Design Guide
- Website: [http://www.northinlet.sc.edu/compliance-calculator-for-sms4-and-statewide-regulations-april-2014/](http://www.northinlet.sc.edu/compliance-calculator-for-sms4-and-statewide-regulations-april-2014/)
## Compliance Calculator – Site Data

### Coastal South Carolina LID Compliance Spreadsheet

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Soi Type A</th>
<th>Soi Type B</th>
<th>Soi Type C</th>
<th>Soi Type D</th>
<th>Soi Type E</th>
<th>Soi Type F</th>
<th>CH</th>
<th>Total</th>
<th>% Cover</th>
<th>Rx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest/Grass/Space</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.95</td>
<td>0.95</td>
<td>0.02</td>
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<tr>
<td>Managed Turf</td>
<td>0.15</td>
<td>0.20</td>
<td>0.22</td>
<td>0.25</td>
<td>0.15</td>
<td>0.20</td>
<td>0.22</td>
<td>0.25</td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td>Impervious Cover</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
</tbody>
</table>

### Site Data

**Site Name:**

#### Indicate Pre-Development Land Cover and Runoff Curve Numbers in the Site’s Disturbed Area

<table>
<thead>
<tr>
<th>Area (acres)</th>
<th>Cover Type</th>
<th>Soi Type A</th>
<th>Soi Type B</th>
<th>Soi Type C</th>
<th>Soi Type D</th>
<th>Soi Type E</th>
<th>Soi Type F</th>
<th>CH</th>
<th>Total</th>
<th>% Cover</th>
<th>Rx</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Forest/Grass/Space</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
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<td>0.95</td>
<td>0.02</td>
<td>0.95</td>
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<tr>
<td>0.20</td>
<td>Managed Turf</td>
<td>0.15</td>
<td>0.20</td>
<td>0.22</td>
<td>0.25</td>
<td>0.15</td>
<td>0.20</td>
<td>0.22</td>
<td>0.25</td>
<td>0.15</td>
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<tr>
<td>0.00</td>
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<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
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<td>0.95</td>
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</table>

#### Indicate Post-Development Land Cover in the Site’s Disturbed Area

<table>
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<tr>
<th>Area (acres)</th>
<th>Cover Type</th>
<th>Soi Type A</th>
<th>Soi Type B</th>
<th>Soi Type C</th>
<th>Soi Type D</th>
<th>Soi Type E</th>
<th>Soi Type F</th>
<th>CH</th>
<th>Total</th>
<th>% Cover</th>
<th>Rx</th>
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<tbody>
<tr>
<td>0.00</td>
<td>Forest/Grass/Space</td>
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<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
</tbody>
</table>

**Is Site Located Within 1/2 Mile of a Coastal Receiving Water?** No
**Is Site Located Within 1000 ft of a Shoreline?** No
**Is Site Located Within a Regulated NSW?** No

### Resulting Rules for Stormwater Treatment and Runoff Reduction

<table>
<thead>
<tr>
<th>Treatment Mechanism</th>
<th>Treatment Volume</th>
<th>Equivalent Design Storm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Volume</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Practice Dependent Water Quality Volumes (If State Regulations)**

- LID Practices and Infiltration: N/A
- Ponds with a Permanent Pool: N/A
- Ponds without a Permanent Pool: N/A
Compliance Calculator – Site Data Example

Coastal South Carolina LiD Compliance Spreadsheet

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>CN</th>
<th>Dilled Type</th>
<th>CN</th>
<th>Total</th>
<th>% Cover</th>
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</thead>
<tbody>
<tr>
<td>A Soils</td>
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<td></td>
<td>0.95</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>B Soils</td>
<td>0.23</td>
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<td>0.95</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>C Soils</td>
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<td></td>
<td>0.95</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>D Soils</td>
<td>0.95</td>
<td></td>
<td>0.95</td>
<td></td>
<td>95%</td>
</tr>
</tbody>
</table>

Verify NRCS runoff CN for each land use, adjust if necessary

Insert Acreage for Each Cover Type and Hydrologic Soil Group

Insert Site Name

Use the puldown to answer these questions

Resulting Rules for Stormwater Treatment and Runoff Reduction

<table>
<thead>
<tr>
<th>Treatment Volume (cft)</th>
<th>Equivalent Design Storm (gal)</th>
<th>Treatment Mechanism</th>
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<tr>
<td>Practice Dependent Water Quality Volume (For State Regulations)</td>
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<td>LiD Practices and Infiltration</td>
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<tr>
<td>Ponds with a Permanent Pool</td>
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<td>N/A</td>
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<tr>
<td>Ponds without a Permanent Pool</td>
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# Compliance Calculator - BMPs

## Coastal South Carolina LID Compliance Spreadsheet

### BMPs

<table>
<thead>
<tr>
<th>BMPs</th>
<th>Forest Cover Draining to BMP</th>
<th>Turf Cover Draining to BMP</th>
<th>Improvised Cover Draining to BMP</th>
<th>Sw Provided by BMP (cubic feet)</th>
<th>Water Quality Credits (cf)</th>
<th>Total Volume Captured by BMP</th>
<th>Credit</th>
<th>Volume Credited</th>
<th>Remaining Water Quality Volume</th>
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<tr>
<td>Bioretention - Enhanced</td>
<td>#VALUE!</td>
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<td>100%</td>
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<td>#VALUE!</td>
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<td>#VALUE!</td>
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<td>Rainwater Harvesting</td>
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<td>100%</td>
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<td>#VALUE!</td>
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<td>#VALUE!</td>
<td>#VALUE!</td>
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<td>Disconnection to A1 or Amended Soils</td>
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<td>100%</td>
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<td>100%</td>
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<td>100%</td>
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### Target Water Quality Volume

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<th>Water Quality Volume Target</th>
<th>Water Quality Volume (cf)</th>
<th>Target Achieved?</th>
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### Compliance Calculator - BMPs

#### Water Quality Volume Credits

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<tr>
<th>BMP Type</th>
<th>Area (acres)</th>
<th>Area (acres)</th>
<th>Area (acres)</th>
<th>Volume from Direct Drainage</th>
<th>Remaining Water Quality Volume</th>
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<tbody>
<tr>
<td>Forest Cover Trees</td>
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<tr>
<td>Turf Cover Trees</td>
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<td>Infiltration</td>
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<td>Permeable Pavement - Infiltration</td>
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<td>Permeable Pavement - Standard</td>
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<td>Grass Channel in C/O Soils</td>
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<tr>
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<td>Detention Practice</td>
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#### Additional Volume Needs to be Captured

- To achieve compliance, additional volume needs to be captured.
- Use the pull down menu to connect BMPs in series.
- Insert total storage volume for each BMP type.
- Insert drainage areas for each BMP type.

---

AECOM
Compliance Calculator – Channel and Flood Protection

Coastal South Carolina LID Compliance Spreadsheet
Channel and Flood Protection Calculations

<table>
<thead>
<tr>
<th>Site Area (acres)</th>
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<tbody>
<tr>
<td>Runoff Reduction Provided by BMPs</td>
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</table>

Based on the use of stormwater BMPs, the spreadsheet calculates an adjusted Runoff Volume and Adjusted Curve Number.

<table>
<thead>
<tr>
<th>Pre-Development Conditions</th>
<th>A Soils</th>
<th>B Soils</th>
<th>C Soils</th>
<th>D Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Area</td>
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<tr>
<td>Forest Cover</td>
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<td>0.0</td>
</tr>
<tr>
<td>Area (ac)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Turf Cover</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Area (ac)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Impervious Cover</td>
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<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>CN</td>
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<td>0</td>
</tr>
<tr>
<td>Weighted CN</td>
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<table>
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<th>A Soils</th>
<th>B Soils</th>
<th>C Soils</th>
<th>D Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Area</td>
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</tr>
<tr>
<td>Forest Cover</td>
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<td>Area (ac)</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Impervious Cover</td>
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<td>89</td>
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<tr>
<td>CN</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weighted CN</td>
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<td>1000.00</td>
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</table>

2 year storm | 10 year storm | 25 year storm | 100 year storm |
<table>
<thead>
<tr>
<th></th>
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<tbody>
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<td>Pre-Development Runoff Volume (m)</td>
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<td>Adjusted CN</td>
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<tr>
<td>Additional Detention Required?</td>
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</tr>
</tbody>
</table>

*Only if required by local government.*
Coastal South Carolina LID Compliance Spreadsheet
Channel and Flood Protection Calculations

Target Rainfall Event (in):
- 2-year storm: 4.96
- 10-year storm: 7.09
- 25-year storm: 9.85
- 100-year storm: 11.30

Site Area (acres): 10.00
Runoff Reduction Provided by BMPs: 15,800

Based on the use of stormwater BMPs, the spreadsheet calculates an adjusted Runoff Volume and Adjusted Curve Number.

Pre-Development Conditions
- Land Area
  - A Soils
    - Forest Cover: Area (ac): 36, CN: 90
    - Tariff Cover: Area (ac): 0, CN: 80
    - Impervious Cover: Area (ac): 0, CN: 98
  - B Soils
  - C Soils
  - D Soils

Post-Development Conditions
- Land Area
  - A Soils
    - Forest Cover: Area (ac): 0, CN: 84
    - Tariff Cover: Area (ac): 0, CN: 98
    - Impervious Cover: Area (ac): 0, CN: 98

Weighted CN $3.64

Pre-Development Runoff Volume (in)
- 2-year storm: 1.99
- 10-year storm: 4.14
- 25-year storm: 6.66
- 100-year storm: 7.86

Post-Development Runoff Volume (in) with no BMPs
- 2-year storm: 2.92
- 10-year storm: 5.34
- 25-year storm: 7.94
- 100-year storm: 9.31

Additional Detention Required?
- Yes
- Yes
- Yes

*Only if required by local government.

Update to SWDSM Section 3.4.2

Results for Runoff Volume
Technical Q&A

Send questions and comments to:

Kinsey Holton
Stormwater Program Manager
City of Charleston
holtonk@charleston-sc.gov