



MAY RIVER WATERSHED ACTION PLAN

APPENDIX E:

ORDINANCE SUMMARY

The following ordinances for land development were reviewed, and the below summary of stormwater practices is presented for each.

- **Town of Bluffton Stormwater Design Manual**

- Provides the following general design criteria:
 - The design storm duration shall be the 24-hour rainfall event, using the National Resource Conservation Service (NRCS), formerly known as Soil Conservation Service (SCS), Type III rainfall distribution with a maximum 6-minute time increment.
 - If the contributing drainage area is 20 acres or less, the design requires a single culvert or channel, and if no storage design or runoff volume is required, the Rational Method or the NRCS (SCS) Method of runoff calculation shall be acceptable.
 - If the contributing drainage area is greater than 20 acres, or if storage or runoff volume design is required, only the NRCS (SCS) Method of runoff calculation shall be acceptable.
- Defines the rainfall amount in inches, as well as the rainfall intensity coefficients, for the 2, 5, 10, 25, 50 and 100 yr storm events
- Provides the rainfall intensity curve for Bluffton, SC
- Provides detailed design information for conveyance system/infrastructure piping design
- Provides detailed design information and instruction for design of culverts and bridges
- Provides detailed design information and instruction for the design of open channel flow, including natural channels.
 - Open channels shall be designed to convey the 10-year event below its freeboard height and the 25-year event below its bankfull elevation. For channels three feet or less in depth, one half of foot of freeboard shall be provided. For channels deeper than three feet and up to five feet in depth, one foot of freeboard shall be provided. For channels deeper than five feet in depth, freeboard that is at least equal to 20 percent of the total channel depth shall be provided.
 - Defines the maximum velocities for channel flow given various channel material types
- Provides detailed design information and instruction for the design of stormwater storage facilities
 - Storage volume shall be adequate to attenuate the post-development peak discharge rates to predevelopment discharge rates for the 2-, 10- and 25-year storms.
 - Development projects shall use a calculated natural ground cover and vegetated surface condition for the determination of predevelopment discharge rates from the site.

- The stored detention volume shall be released within 24 to 48 hours and normal pool elevations returned, unless otherwise specified.
- Parking lot, cul-de-sac, and traffic islands shall be designed to be depressed and open to receive stormwater runoff storage and treatment.
- Control structure release rates shall be less than or equal to predevelopment peak runoff rates for the 2-, 10- and 25-year storms, with emergency overflow adequately designed for the 100-year discharge.
- Design calculations must demonstrate that the facility will limit runoff from the 2-, 10- and 25-year post-development discharge rates to predevelopment peak discharge rates.
- Outlet structures that draw water from or near the normal pool surface of the storage facility shall be used
- Discharge velocities shall be non-erosive for the design storm.
- For all parking lots, strategically placed vegetated swales or depressed uncurbed bioretention areas between parking stalls shall be constructed for a minimum of 50% (fifty percent) of islands between parking stalls to retain and treat any runoff generated onsite. In addition, below-ground proprietary structural storage products that are commercially available can be employed to meet both water quantity and water quality goals if approved as part of the stormwater system design by the Administrators(s).
- Another strategy for stormwater detention on parking lots consists of using the paved areas of the lot to channel runoff to grassed areas or gravel-filled seepage pits. Water from pavement should flow across a grassed vegetative buffer before entering a collection swale, infiltration swale, trench, or basin where the flow will then infiltrate into the ground.
- For detention basin design, 24-hour design storm duration should be used.
- Provides detailed design information and instruction for the design of Structural BMPs, including detention, filtration and infiltration
 - All projects shall have in series BMPs and all stormwater management system designs shall contain at a minimum one wet detention BMP, one vegetative BMP and one filter or infiltration based BMP.
 - Projects shall be designed to include a minimum of three BMPs in series to meet the requirements set forth in the Stormwater Management Ordinance. The BMPs shall be selected based on site conditions to maximize their effectiveness.
 - Provides pollutant removal efficiencies for various structural BMPs for TSS, Total P, Total N, and Trace Metals.

- References stormwater design documents:
 - Georgia Storm Water Management Manual Sediment, Atlanta Regional Commission and Georgia Department of Natural Resources-Environmental Protection Division, 2001 <http://www.georgiastormwater.com/>
 - Manual of Stormwater Best Management Practices, North Carolina Department of Environment and Natural Resources-Division of Water Quality, 2005 http://h2o.enr.state.nc.us/su/bmp_updates.htm
 - Bioretention Manual, Prince George's Town Programs and Planning Division-Department of Environmental Resources, 2001 [http://www.co.pg.md.us/Government/AgencyIndex/DER/ESD/Bioretention/bioretention.asp?nivel=foldmenu\(7\)](http://www.co.pg.md.us/Government/AgencyIndex/DER/ESD/Bioretention/bioretention.asp?nivel=foldmenu(7))
 - Pervious Concrete Pavements, Paul D. Tennis, Michael L. Leming, and David J. Akers, 2004 <http://www.concrete.org/pubs/newpubs/pcp.htm>
- Provides design components, design guidelines, maintenance and monitoring, and general plan and profile information, all of which include water quality treatment volume requirements and BMP sizing, for the following BMPs:
 - Bioretention Area
 - Permeable Pavement System
 - Infiltration Trench
 - Filter Strip
 - Vegetated Swale
 - Sand Filter
 - Exfiltration Trench
 - Wet Pond
 - Extended Detention Pond
- Provides engineering worksheets to assist in determining pollutant removal and BMP efficiencies for site specific designs
- Steps to minimize construction site erosion and sedimentation
- Discusses innovative stormwater solutions in Appendix A, such as rooftop practices, pervious pavement, runoff for irrigation, disconnection of impervious area, rain gardens, and swales.
- **Beaufort County Stormwater Manual for Stormwater Best Management Practices**
 - The County Manual offer similar information as the Town Stormwater Design Manual. However, the County Manual offers some additional information that will be very useful to the goals of the Action Plan, which follow:

- Provide information regarding Federal, State and County regulations, including specific design criteria for each
- Gives information regarding stormwater coordinate with the Town of Bluffton
- States that coordination between the Town and the County is covered by an interagency agreement. The May 2010 version of the BMP Manual incorporates the Town's in-series BMPs into the manual. These include:
 - Redirecting roof drainage onto adjacent impervious surfaces;
 - Installing grassed swales on lots with suitable soils;
 - Installing sunken island in parking lots instead of raised islands with curbs;
 - Installing pervious pavement (at least 50 percent) in commercial parking lots; and
 - Installing disconnected drainage where possible.
- In areas of Hydrologic Soil Groups A and B, development shall control and infiltrate the first one (1) inch of stormwater runoff from the entire development with structural BMPs.
- In areas of Hydrologic Soil Groups C and D, development shall store and release the first one (1) inch of stormwater runoff from the entire development with structural BMPs, and the captured runoff shall be discharged over a 72-hour period.
- New developments receiving a Development Standards Ordinance permit from the Town shall be required to perform stormwater quality monitoring to ensure compliance with the Ordinance and proper operation of the BMPs.
- New developments must provide an estimate of pre-development pollutant loading levels and demonstrate that post-development pollutant loading does not exceed pre-development levels
- Defines stormwater pollutants of concern:
 - Sediments,
 - Nutrients
 - Oxygen Demand
 - Heavy Metals
 - Pathogens and Polycyclic aromatic hydrocarbons
- Defines stormwater loading factors for urban development that establishes specific EMC loadings. These EMC loadings were established based on a review of multiple other documents, including nine within the state of Georgia and six within the state of Florida.
 - Provides EMC's for the following constituents for six different landuses:
 - BOD
 - COD
 - TSS
 - TDS

- Total-P
- Dissolved-P
- Total-N
- Lead
- Copper
- Zinc
- Cadmium
- Defines the average annual fecal coliform runoff load calculations for various land uses, including:
 - Open Space
 - Low Density Residential
 - Medium Density Residential
 - High Density Residential
 - Industrial
 - Commercial
- Provides BMP efficiencies for extended dry detention, wet detention, infiltration and swales for the following:
 - BOD
 - COD
 - TSS
 - TDS
 - Total-P
 - Dissolved-P
 - TKN-N
 - NO₂+NO₃-N
 - Total-N
 - Lead
 - Copper
 - Zinc
 - Cadmium
- Provides BMP efficiencies for Fecal Coliform for the following BMPs:
 - Wet Detention
 - Extended Dry Detention
 - Modified Extended Dry Detention
 - Infiltration
 - Grass Swale with Check Dams
 - Biofiltration Swale
 - Bioretention
 - Innovative Techniques including swirl concentrator, sedimentation/media filtration, and sedimentation/constructed wetland
- Provides a detailed BMP technology criteria matrix that details which type of BMPs should be used for which developments.

- Provides detailed worksheets for stormwater design for various BMP types
- Provides structural BMP design guidelines (including a description, implementation applicability, items/issues required for planning considerations, stormwater design criteria, and recommended maintenance) for various BMPs including:
 - Wet detention basin
 - Extended dry detention basin
 - Modified extended dry detention basin
 - Infiltration basin
 - Grass swale with check dams
 - Biofiltration swale
 - Bioretention BMP
 - Innovative technologies BMPs
- Provides appendixes specific for stormwater design and management, which include:
 - Appendix A: Forms for Proper Sizing of BMPs
 - Appendix B: Stormwater BMP Maintenance Agreement form
 - Appendix C: Stormwater Volume Control
 - Appendix D: Sediment Control Certification form for Construction Sites
- **Town of Bluffton Unified Ordinance**
 - Officially adopts the Stormwater Design Manual
 - The Stormwater Design Manual includes a list of acceptable stormwater treatment practices, including the specific design criteria for each stormwater practice.
 - Requires that Stormwater Management Plan review and approval shall be required for the design, installation, and construction of stormwater management and control practices on the site, including structural BMPs and elements of site design for stormwater management other than structural BMPs.
 - Mandates that the review process for stormwater plans include a pre-application meeting, stormwater plan review, and submittal of record drawings upon completion.
 - Includes the following general requirements:
 - All development shall disconnect Impervious Surfaces with vegetative surfaces to the maximum extent practicable.
 - Stormwater runoff shall be controlled in a manner that:
 - Promotes positive drainage from structures resulting from development.
 - Includes the use of vegetated conveyances, such as swales and existing natural channels to promote infiltration.
 - Promotes runoff velocities and maintains sheet flow condition to prevent erosion and promote infiltration.

- Limits its interaction with potential pollutant sources that may become water-borne and create non-point source pollution.
- Natural vegetative buffers play an integral part in minimizing the volume of stormwater runoff by promoting infiltration and acting as a first line of treatment of water quality pollution. Development shall observe the buffer requirements of Section 5.5; or if applicable the relevant development agreement, concept plan, and/or approved master plan.
- Implements the following design standards:
 - Development shall control the post-development runoff discharge rate for the 2-, 10-, and 25-year, 24-hour design storm events to pre-development levels with structural BMPs.
 - All development and redevelopment, including highways, shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the pre-development hydrology of the property with regard to the temperature, rate, volume, and duration of flow.
 - Development that incorporates engineered stormwater collection, conveyance, and storage systems shall design the systems to design criteria established in Stormwater Design Manual.
 - In areas of Hydrologic Soil Groups A and B, the development shall control and infiltrate the first one inch of stormwater runoff from the entire development or maintain the pre-development hydrology of the property for the Water Quality Design Storm Event, whichever is greater.
 - In areas of Hydrologic Soil Groups C and D only, the development shall maintain the pre-development hydrology of the property for the Water Quality Design Storm Event.
 - Undisturbed natural areas will not be required to demonstrate that such areas can retain the first one inch of runoff.
- Implements monitoring policies to ensure performance of designed/constructed BMPs:
 - The owners of all new developments that receive a permit from the Town shall be required to perform stormwater quality monitoring at their expense to ensure compliance with the provisions of this article and ensure that structural BMPs are operated as intended.
 - Structural BMPs shall be monitored individually up to 36 months from final as-built inspection for water quality performance. This initial monitoring period shall provide the Town and owner or operator of the structural BMP with information to improve the performance of the structural BMP if failing to operate as intended.

- Monitoring test results from a DHEC Certified Laboratory of fecal coliform, turbidity, total phosphorus and total nitrogen will be required to be submitted to the Town each month from May to September and each November, January and March.
- At least half of the samples gathered will need to be taken within 24 hours of a rain event one-half inch or greater.
- If 20 percent or more of the samples fail to meet the water quality, then within 60 days of reporting of such a sample failure, the operator of the stormwater system shall submit to the Town Engineer a corrective action plan stipulating how compliance with the DHEC water quality standards will be met. Violations of any single test parameter shall constitute a failure for that sampling period.
- Water quality standards will be initially established as the pre development pollutant loading levels. A determination of the pre development pollutant loading (either in the form of a detailed report of predevelopment monitoring in similar southern coastal regions or from actual field monitoring) shall be provided to the Code Administrator and the Code Administrator shall determine if such information is sufficient to establish the pre development pollutant loading levels. In all cases, post development pollutant loading cannot exceed pre development levels.
- All construction and implementation of erosion and sediment control BMPs shall comply with the requirements of the South Carolina Stormwater Management and Sediment Reduction Act.
- Developments submitting monthly inspection reports in accordance with the State Sediment and Erosion Control Act shall submit copies of those reports to the Town for the duration of the construction phase. The Town reserves the right to perform other monitoring as it deems appropriate to determine compliance with the State Sediment and Erosion Control Act.
- Development shall construct permeable paving where soil conditions allow. Requirements for permeable paving are outlined in Section 7.8.2 in the Stormwater Design Manual.
- Irrigation systems must first make use of all available surface stormwater runoff or other retained or detained stormwater as the water supply. No groundwater wells or use of potable water for irrigation of any kind will be permitted in developments or redevelopments unless it can be demonstrated that alternative sources of irrigation water will not exceed pre-development conditions. In addition, no irrigation systems shall be placed within fifty (50) feet of a natural creek, marsh, or estuary where soils and/or grade will allow such irrigation water to flow or migrate to such a natural creek, marsh, or estuary.

- The person responsible for maintenance of any structural BMP installed pursuant to this article shall submit to the Code Administrator an inspection report from a registered South Carolina Professional Engineer or Landscape Architect.
- **Town of Bluffton Comprehensive Plan 2007**
 - Recommends that Bluffton should establish extraterritorial land management authority within the May River watershed and in conjunction with Beaufort County, create a joint action agency. This agency should then designate a May River Overlay Protection District that clearly identifies authority over all land and water related activities. Bluffton should have authority to oversee zoning and land use decisions and could also deal with emergency situations.
 - Recommends that Bluffton organize a watershed education campaign with signs announcing entry into a community watershed similar to those seen across North Carolina, Pennsylvania, Maryland, and Virginia. Also, recommends to foster community accountability, such as marking storm drains with statements or symbols such as “This flows into the May River.”
 - States that Bluffton’s Stormwater Ordinance should be used to guide stormwater management based on the community’s desire to protect, maintain, and enhance its environment and to protect the health, safety, and general welfare of its citizens.
 - Recommends in the short term to develop watershed and drainage basin plans. Begin with drainage basins that are identified as releasing high levels of pollutants.
 - Recommends to complete recommendations of Environmental and Ecological Assessment of the May River Report in the long term.
 - Recommends to Support Stormwater Utility efforts to complete Beaufort County Special Area Management Plan recommendations in the Medium term.
 - Recommends to Assist Stormwater Utility with establishing water quality protocol in the short term.
 - Recommends to continue monitoring efforts which target and identify point sources in the short term.
 - Recommends to pursue grants and other funds for infrastructure and sewer.
 - Recommend to identify infrastructure projects for CIP list through a needs study in the short term.
 - Recommends to develop and implement a Town plan for upgrade and repair of Bluffton’s drainage system.
 - Encourages the use of innovative stormwater management, such as permeable pavement and LID designs.
 - States that parking lots should have an increased amount of pervious surface in order to minimize stormwater runoff and non-point source

pollution. Landscaped islands within off-street parking lots should be required.