

MEMORANDUM

To: Mayor and City Council
From: Carl Thomas, Stormwater Utility Manager
Date: November 30th, 2020
Subject: SECOND READ Text Amendment to Chapter 16 of the Code of Ordinances for Post-Construction Stormwater Management

ITEM DESCRIPTION

This memo outlines proposed updates to ordinances governing post-construction stormwater management (Chapter 16, Article II, Division 5). The ordinance revisions accomplish the mandatory regulatory goals stated in the City's Municipal Separate Storm Sewer System (MS4) Permit and the Metropolitan North Georgia Water Planning District's Water Resource Management Plan. These updates will add requirements for management of the quality and quantity of stormwater runoff discharged from developed sites.

BACKGROUND

The Georgia Environmental Protection Division (EPD) requires local jurisdictions with MS4 permits to revise existing ordinances, when necessary, to remain in compliance with current standards. The updates to the MS4 Permit stipulate that new construction projects which require a stormwater management plan be designed to retain and treat the first 1.0 inch of rainfall, or Runoff Reduction Volume (RR_v), on the site to the maximum extent practicable. These updates to the Permit prompted an update to the City's existing ordinances.

The Center for Watershed Protection (CWP) developed the Runoff Reduction Method (RRM) in 2008. The goal was to decrease water pollutant levels and flooding from urban runoff by providing incentives for designers that reduced impervious cover and overall site disturbance in their stormwater management plan. In 2009, the Georgia Stormwater Management Manual Coastal Supplement was the first design manual to adopt the RRM in the State. The first Metro Atlanta municipality to adopt the RRM was the City of Atlanta in 2013. The City of Dunwoody incorporated runoff reduction as an optional design method by adopting the second edition of the Georgia Stormwater Management Manual in 2016.

In 2017, the District of Columbia Department of Energy & Environment released results from a ten-year collaborative study where it analyzed pollutant removal and runoff reduction performance from nearly 400 stormwater best management practices (BMPs) across the country. The conclusions from this study, along with others, were integral in determining effective BMP design and implementation. The research also identified common site conditions (infiltration rates, high water table,

soil contamination, etc.) that contributed to poor performance and became the guidelines to determine when the RRM is infeasible for a particular site.

On June 9th 2020, the Metropolitan North Georgia Water Planning District (Metro District) finalized updates to the Post-Construction Stormwater Management Model Ordinance to match the substance and language of the current MS4 permit and Georgia Stormwater Management Manual (GSMM). In addition to editing the ordinance language to improve consistency and clarity, the revised ordinance includes the following significant regulatory changes:

- Linear transportation projects specifically identified for compliance with the ordinance (Section 16.91.c.5). This includes Transportation projects constructed by the City unless compliance is determined to be infeasible based on criteria approved by EPD (Section 16.91.d.8).
- Exemptions added for emergency repairs by a governmental authority, utility work within existing streets, environmental restoration projects and work associated with implementing Americans with Disabilities Act requirements (Section 16.91.d)
- Exemption removed for individual single-family or duplex residential lots
- Requirement added to retain first 1" of rainfall on site unless infeasible based on Runoff Reduction Feasibility Policy. If retention is infeasible then remove 80% of total suspended solids for the first 1.2 inches of rain (Section 16.94.e.4).

Members located within the Metro District's jurisdiction (15 counties and 93 municipalities) must adopt the revised ordinance before the December 6th deadline stated in the MS4 permit.

RECOMMENDED ACTION

Staff recommends approval of the revised Post-Development Stormwater Management Ordinance to remain in compliance with the city's MS4 permit issued by the Georgia EPD.

APPENDIX A

Revisions to Chapter 16, Article II, Division 5 Post-Construction Stormwater Management Ordinance (changes highlighted)

DIVISION 5. - STORMWATER MANAGEMENT

Sec. 16-91. – Post-Construction Stormwater Management for New Development and Redevelopment.

- (a) *Purpose and Intent.* The regulations of this division are adopted to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-construction stormwater runoff and nonpoint source pollution associated with new development and redevelopment. Proper management of post-construction stormwater runoff will minimize damage to public and private property and infrastructure, safeguard the public health, safety, environment and general welfare of the public, and protect water and aquatic resources. Additionally, the City of Dunwoody is required to comply with several State and Federal laws, regulations and permits and the requirements of the Metropolitan North Georgia Water Planning District's regional water plan related to managing the water quantity, velocity, and quality of post-construction stormwater run-off.
- (b) Adoption and Implementation of the GSMM
- (1) *Georgia Stormwater Management Manual.* The City of Dunwoody must use and require compliance with all relevant criteria, specifications, calculations, formulas, methods, design standards, and other guidance provided in the Georgia Stormwater Management Manual and its appendices, as may be hereafter amended. The rainfall intensities used in hydrologic and hydraulic computations must be those published in the Georgia Stormwater Management Manual (GSMM).
 - (2) This division is not intended to modify or repeal any other Article, ordinance, rule, regulation or other provision of law, including but not limited to any applicable stream buffers under state and local laws, and the Georgia Safe Dams Act and Rules for Dam Safety. In the event of any conflict or inconsistency between any provision in the City of Dunwoody's MS4 permit and this division, the provision from the MS4 permit shall control. In the event of any conflict or inconsistency between any provision of this division and the GSMM, the provision in this division shall control. In the event of any other conflict or inconsistency between this division and any other regulation, the provision that is more restrictive or imposes higher protective standards for human health or the environment shall control.
 - (3) If any provision of this division is invalidated by a court of competent jurisdiction, such judgement shall not affect or invalidate the remainder of this division.
 - (4) *Designation of administrator.* The City Manager may from time to time appoint someone to administer and implement this division.
- (c) *Applicability Criteria for Stormwater Management Standards.* The stormwater management regulations of this division applies to the following activities:
- (1) New development that involves the creation or addition of 5,000 square feet or more of new impervious surface area or that involves other land disturbing activities of one acre or more;

- (2) Redevelopment (excluding routine maintenance and exterior remodeling) that creates, adds, or replaces 5,000 square feet or more of new impervious surface area or that involves land disturbing activity of 1 acre or more;
 - (3) New development and redevelopment if
 - a. such new development or redevelopment is part of a subdivision or other common plan of development, and
 - b. the sum of all associated impervious surface area or land disturbing activities meets or exceeds applicability criteria of paragraphs (1) and (2) above;
 - (4) Any commercial or industrial new development or redevelopment, regardless of size, that is a hotspot land use as defined in this division; and
 - (5) Linear transportation projects that exceed the threshold in paragraphs (1) or (2) above.
- (d) *Exemptions from Stormwater Management Standards.* The following activities are exempt from the stormwater management requirements of this division:
- (1) Land disturbing activity conducted by local, state, authority, or federal agencies solely to respond to an emergency need to protect life, limb, or property or conduct emergency repairs.
 - (2) Land disturbing activity that consists solely of cutting a trench for utility work and related pavement replacement;
 - (3) Land disturbing activity conducted by local, state, authority, or federal agencies whose sole purpose is to implement stormwater management or environmental restoration;
 - (4) Agricultural practices as described O.C.G.A. 12-7-17(5) within areas zoned for these activities with the exception of buildings or permanent structures that exceed the threshold in 16-91(c)(1) or 16-91(c)(2);
 - (5) Silvicultural land management activities as described in O.C.G.A. 12-7-17(6) within areas zoned for these activities with the exception of buildings or permanent structures that exceed the threshold in 16-91(c)(1) or 16-91(c)(2);
 - (6) Repairs to any stormwater management facility or practice deemed necessary by the community development director, or designee;
 - (7) Installations or modifications to existing structures solely to implement Americans with Disabilities Act (ADA) requirements, including but not limited to elevator shafts, handicapped access ramps and parking, and enlarged entrances or exists; and
 - (8) Linear transportation projects being constructed by the City of Dunwoody to the extent the administrator determines that the stormwater management standards may be infeasible to apply, all or in part, for any portion of the linear transportation project. For this exemption to apply, an infeasibility report that is compliant with the City of Dunwoody linear feasibility program shall first be submitted to the administrator that contains adequate documentation to support the evaluation for the applicable portion(s) and any resulting infeasibility determination, if any, by the administrator.
- (e) Stormwater Management Standards. Subject to the applicability criteria in Sec. 16-91(c) and exemptions in Sec. 16-91(d), the following standards apply.

- (1) Design of Stormwater Management System: The design of the stormwater management system shall be in accordance with the applicable sections of the GSMM as directed by the community development director, or designee. Any design which proposes a dam shall comply with the Georgia Safe Dams Act and Rules for Dam Safety as applicable.
- (2) Natural Resources Inventory: Site reconnaissance and surveying techniques shall be used to complete a thorough assessment of existing natural resources, both terrestrial and aquatic, found on the site. Resources to be identified, mapped, and shown on the Stormwater Management Plan, shall include, at a minimum (as applicable):
 - a. Topography (min. of 2-foot contours) and Steep Slopes (slopes >15%)
 - b. Natural drainage Divides and Patterns
 - c. Natural drainage features (e.g., swales, basins, depressed areas)
 - d. Natural feature protection and conservation areas (such as wetlands, lakes, ponds, floodplains, stream buffers, drinking water wellhead protection areas and river corridors).
 - e. Predominant soils (including erodible soils and karst areas), and
 - f. Existing, predominant vegetation including trees, high quality habitat and other existing vegetation.
- (3) Better Site Design Practices for Stormwater Management. Stormwater Management Plans shall preserve the natural drainage and treatment systems and reduce the generation of additional stormwater runoff and pollutants to the maximum extent practicable.
- (4) Stormwater Runoff Quality/Reduction:
 - a. For development with a stormwater management plan submitted before December 6, 2020, the applicant may choose either (A) Runoff Reduction or (B) Water Quality.
 - b. For development with a stormwater management plan submitted on or after December 6, 2020, the applicant shall choose (A) Runoff Reduction and additional water quality shall not be required. To the extent (A) Runoff Reduction has been determined to be infeasible for all or a portion of the site using the Practicability Policy, then (B) Water Quality shall apply for the remaining runoff from a 1.2 inch rainfall event and must be treated to remove at least 80% of the calculated average annual post-development total suspended solids (TSS) load or equivalent as defined in the GSMM.
 - (A) Runoff Reduction – The Stormwater management system shall be designed to retain the first 1.0inch of rainfall on the site using runoff reduction methods to the maximum extent practicable.
 - (B) Water Quality – The stormwater management system shall be designed to remove at least 80% of the calculated average annual post-development TSS load from a 1.2 inch rainfall event, or equivalent as defined in the GSMM.

- c. If a site is determined to be a hotspot, the City of Dunwoody may require the use of specific or additional components for the stormwater management system to address pollutants of concern generated by that site.

(5) Stream Channel Protection: Stream channel protection shall be provided by using all of the following three approaches:

- a. Preservation, restoration and/or reforestation (with native vegetation) of the applicable stream buffer;
 - b. 24-hour extended detention storage of the one-year, 24-hour return frequency storm event; and
 - c. Erosion prevention measures such as energy dissipation and velocity control.
- (6) *Overbank flooding protection.* Downstream overbank flood and property protection must be provided by controlling (attenuating) the post-development peak discharge rate to the pre-development rate for the 25-year, 24-hour storm event.
- (7) *Extreme flooding protection.* Extreme flood and public safety protection must be provided by controlling the 100-year, 24-hour storm event such that flooding is not exacerbated.
- (8) *Downstream analysis.* Due to peak flow timing and runoff volume effects, some structural components of the stormwater management system fail to reduce discharge peaks to pre-development levels downstream of the site. A downstream peak flow analysis must be provided to the point in the watershed downstream of the site or the stormwater management downstream from the project to a point in the drainage basin where the project area is ten percent of the total basin area (GSMM, Section 3.1.9). This is to help ensure that there are minimal downstream impacts from development on the site. The downstream analysis may result in the need to resize structural components of the stormwater management system. In calculating runoff volumes and discharge rates, consideration may need to be given to any planned future upstream land use changes.
- (9) *Stormwater Management System Inspection and Maintenance.* The components of the stormwater management system that will not be dedicated to and accepted by the City of Dunwoody, including all drainage facilities, best management practices, credited conservation spaces, and conveyance systems, shall have an inspection and maintenance agreement to ensure that they continue to function as designed. All new development and redevelopment sites are to prepare a comprehensive inspection and maintenance agreement for the on-site stormwater management system. This plan shall be written in accordance with the requirements in Sec. 16-92.
- (f) *Information required with land development permit applications.* Except as otherwise expressly exempted, land development permit applications must be accompanied by the following information:
- (1) Stormwater management plan in accordance with Sec. 16-92;
 - (2) Performance bond, if applicable; and
 - (3) Applicable permit application and plan review fees.

(Ord. No. 2013-10-14, 1(Exh. A § 16-7.10), 10-14-2013; Ord. No. 2015-01-04, § 1, 1-26-2015)

Sec. 16-92. - Pre-Submittal Meeting, Stormwater Concept Plan, and Stormwater Management Plan Requirements.

- (a) Before a land development permit application is submitted, an applicant shall request a pre-submittal meeting with the City of Dunwoody. The pre-submittal meeting should take place based on an early step in the development process such as before site analysis and inventory (GSMM Section 2.4.2.4) or the stormwater concept plan (GSMM Section 2.3.2.5). The purpose of the pre-submittal meeting is to discuss opportunities, constraints, and ideas for the stormwater management system before formal site design engineering. To the extent applicable, local and regional watershed plans, greenspace plans, trails and greenway plans, and other resource protection plans should be consulted in the pre-submittal meeting. Applicants must request a pre-submittal meeting with the City of Dunwoody when applying for a Determination of Infeasibility through the Practicability Policy.
- (b) The stormwater concept plan shall be prepared using the minimum following steps:
- (1) Develop the site layout using better site design techniques, as applicable (GSMM Section 2.3).
 - (2) Calculate preliminary estimates of the unified stormwater sizing criteria requirements for stormwater runoff quality/reduction, channel protection, overbank flooding protection and extreme flooding protection (GSMM Section 2.2).
 - (3) Perform screening and preliminary selection of appropriate best management practices and identification of potential siting locations (GSMM Section 4.1).
- (c) The stormwater concept plan shall contain:
- (1) Common address and legal description of the site,
 - (2) Vicinity Map, and
 - (3) Existing conditions and proposed site layout mapping and plans (recommended scale of 1"=50'), which illustrate at a minimum:
 - a. Existing and proposed topography (minimum of 2-foot contours).
 - b. Perennial and intermittent streams,
 - c. Mapping of predominant soils from USDA soil surveys
 - d. Boundaries of existing predominant vegetation and proposed limits of clearing and grading,
 - e. Location and boundaries of other natural feature protection and conservation areas such as wetlands, lakes, ponds, floodplains, stream buffers and other setbacks (e.g., drinking water well setbacks, septic setbacks, etc.)
 - f. Location of existing and proposed roads, buildings, parking areas and other impervious surfaces,
 - g. Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements,
 - h. Preliminary estimates of unified stormwater sizing criteria requirements,
 - i. Preliminary selection and location, size and limits of disturbance of proposed BMPs,

- j. Location of existing and proposed conveyance systems such as grass channels, swales, and storm drains,
- k. Flow paths
- l. Location of the boundaries of the base flood floodplain, future-conditions floodplain, and the floodway (as applicable) and relationship of site to upstream and downstream properties and drainage, and
- m. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings.

(d) The stormwater management plan shall contain the items listed in this part and be prepared under the direct supervisory control of either a registered Professional Engineer (PE) or a registered Landscape Architect licensed in the state of Georgia. Items (3), (4), (5) and (6) shall be sealed and signed by a registered PE licensed in the state of Georgia. The overall site plan must be stamped by a design professional licensed in the State of Georgia for such purpose (GSMM Section 2.4.2.7).

(1) Natural Resource Inventory

(2) Stormwater Concept Plan

(3) Existing conditions hydrologic analysis

(4) Post-development hydrologic analysis

(5) Stormwater management system

(6) Downstream analysis

(7) Erosion and sedimentation control plan

(8) BMP Landscaping plan

(9) Inspection and maintenance agreement

(10) Evidence of acquisition of applicable local and non-local permits

(11) Determination of Infeasibility (if applicable)

(e) For redevelopment sites, predevelopment conditions must be modeled using the established guidelines for the portion of the site undergoing land development activities. For redevelopment and to the extent existing stormwater management structures are being used to meet stormwater management standards, the following must also be included in the stormwater management plan for existing stormwater management structures:

(1) As-built drawings

(2) Hydrology Reports

(3) Current inspection of existing stormwater management structures with deficiencies noted

(4) BMP Landscaping Plan

Sec.16-93 – Application Fee.

- (a) The fee for review of any land development application shall be based on the fee structure established by the City of Dunwoody, and payment shall be made before the issuance of any land disturbance permit or building permit for the development.

Sec. 16-94 – Application Procedures.

- (a) Land development applications are handled as part of the process to obtain the land disturbance permit pursuant to Sec. 16-60 or building permit Sec. 16-29, as applicable. Before any person begins development on a site, the owner of the site shall first obtain approval in accordance with the following procedure:
- (b) File a land development application with the City of Dunwoody on the City's form of application with the following supporting materials:
- (1) the stormwater management plan prepared in accordance with Sec. 16-92(d).
 - (2) a certification that the development will be performed in accordance with the stormwater management plan once approved,
 - (3) a Preliminary Determination of Infeasibility, as applicable, prepared in accordance with the practicability policy, and
 - (4) an acknowledgement that the applicant has reviewed the City of Dunwoody's form of inspection and maintenance agreement and that applicant agrees to sign and record such inspection and maintenance agreement before the final inspection.
- (c) The administrator shall inform the applicant whether the application and supporting materials are approved or disapproved.
- (d) If the application and supporting materials are approved, the City of Dunwoody may issue the associated land disturbance permit or building permit, provided all other legal requirements for the issuance of such permits have been met. The stormwater management plan included in such applications becomes the approved stormwater management plan.

Sec.16-95. Compliance with the Approved Stormwater Management Plan.

- (a) All development shall be:
- (1) consistent with the approved stormwater management plan and all applicable land disturbance and building permits, and
 - (2) conducted only within the area specified in the approved stormwater management plan.
- (b) No changes may be made to an approved stormwater management plan without review and advanced written approval by the administrator.

Section 16-96. *Inspection and maintenance agreement.*

- (a) The owner shall execute an inspection and maintenance agreement with City of Dunwoody obligating the owner to inspect, clean, maintain, and repair the stormwater management system; including vegetation in the final BMP landscaping plan. The form of the inspection and maintenance agreement shall be the form provided by the City of Dunwoody. After the inspection

and maintenance agreement has been signed by the owner and the City of Dunwoody, the owner shall promptly record such agreement at the owner's cost in the property record for all parcels that make up the site.

- (b) The inspection and maintenance agreement shall identify by name or official title the person(s) serving as the point of contact for carrying out the owner's obligations under the inspection and maintenance agreement. The owner shall update the point of contact from time to time as needed and upon request by the City of Dunwoody. Upon any sale or transfer of the site, the new owner shall notify the City of Dunwoody in writing within 30 days of the name of official title of the new person(s) serving as the point of contact for the new owner. Any failure of an owner to keep the point of contact up to date shall, following 30 days' notice, constitute a failure to maintain the stormwater management system.
- (c) The inspection and maintenance agreement shall run with the land and bind all future successors-in-title of the site. If there is a future sale or transfer of only a portion of the site, then:
- (1) The parties to such sale or transfer may enter into and record an assignment agreement designating the owner responsible for each portion of the site and associated obligations under the inspection and maintenance agreement. The parties shall record and provide written notice and a copy of such assignment agreement to the City of Dunwoody.
 - (2) In the absence of a recorded assignment agreement, all owners of the site shall be jointly and severally liable for all obligations under the inspection and maintenance agreement regardless of what portion of the site they own.
 - (3) As part of the inspection and maintenance agreement, a schedule must be developed for when and how often routine inspection and maintenance will occur to ensure proper function of the stormwater management facility or practice. The agreement must also include plans for annual inspections to ensure proper performance of the facility between scheduled maintenance and include remedies for the default thereof.
 - (4) The city, in lieu of an inspection and maintenance agreement, may accept dedication of any existing or future stormwater management facility for maintenance, provided such facility meets all the requirements of this division and includes adequate and perpetual access and sufficient area, by easement or otherwise, for inspection and regular maintenance.

(Ord. No. 2013-10-14, 1(Exh. A § 16-7.20), 10-14-2013; Ord. No. 2015-01-04, § 1, 1-26-2015)

Sec. 16-97. - Design.

- (a) *Detention designs.* Detention designs may be rejected if they incorporate structures and facilities that will demand considerable maintenance or will be difficult to maintain or will utilize numerous small structures if other alternatives are physically possible.
- (b) *Discharge velocities.* Discharge velocities from detention facilities must be reduced to provide a nonerosive velocity flow from a structure, channel, or other control measure as set forth in the approved Georgia Stormwater Management Manual.
- (c) *Design storm.* The drainage system being developed must have adequate capacity to accommodate the flow from all upstream areas for a 100-year storm event.

- (d) *Drainage outfalls.* The drainage system from a proposed development must discharge into an outfall that has adequate capacity to accommodate the runoff from the development. If the connecting downstream system is not able to accommodate the allowable design flow from the site, then the design engineer must design on-site drainage facilities that result in no exacerbation of existing downstream conditions.
- (e) *Detention storage.*
- (1) The live detention storage to be provided must be calculated on the basis of the 100-year frequency rainfall as published in the Georgia Stormwater Management Manual. The detention system must be adequate for the runoff of a 100-year rainfall, for any and all durations from the post-development, with a release rate that does not exceed the pre-development release rate during the same duration storm. Detention control structures and other drainage improvements must be located and designed to prevent erosion damage to adjacent property owners.
 - (2) Detention and sedimentation control facilities may not be placed in any of the following:
 - a. Transitional buffer zones as defined by the city zoning ordinance.
 - b. Floodplains.
 - c. Wetlands.
 - d. Stream buffer zones.
 - e. State buffer zones.
 - (3) Perforated standpipes or a French drain, in accordance with published design standards available from the community development department, or other methods which will achieve equal performance to prevent standing water and inadequate drainage, must be installed within all the detention and sedimentation control facilities.
- (f) *Combined detention.* When the applicant requests and the community development director, or designee, determines that development and construction projects are too small, or that engineering and economic factors make combined detention or other stormwater management facilities more practical, the city may authorize the joint construction of these facilities to serve two or more properties by two or more applicants.
- (g) *Fencing.*
- (1) Permanent fencing at least four feet in height is required around all stormwater and sedimentation control facilities designed for temporary storage of stormwater if they have a water storage depth of greater than four feet or they are designated by the city or board of health as a public health hazard.
 - (2) Required fencing must be designed, installed and maintained to allow the free flow of runoff and sediment into the facility. Fencing must be established on the outside edge of a facility. The fence must include a gate of sufficient size to permit entrance of equipment necessary to allow periodic maintenance activities. The gate must be placed in a manner such that the gate does not obstruct reasonable access or become obstructive. The community development director, or designee, may waive fencing in nonresidential areas where a pond is more than 500 feet from a residential zoning district and in residential zoning districts when detention is provided in natural areas such as stream channels and

fencing in the opinion of the community development director, or designee, would damage the environment or affect stream flow.

- (h) *Special flood hazard area elevation contours.* In residential districts, not less than 70 percent of the minimum lot area, as established by applicable zoning district development standards, must be above the special flood hazard area elevation contours with the exception that lots in the R-150 district must conform to requirements of the R-100 district.
- (i) *Street centerline elevations.* The profile elevation of the centerline of all public streets must be constructed a minimum of one foot above special flood hazard area elevation contours. The community development director, or designee, may grant exceptions to this provision in cases where construction of the street elevation is within a special flood hazard area and elevation contours would improve drainage or reduce the effects of flooding.

(Ord. No. 2013-10-14, 1(Exh. A § 16-7.30), 10-14-2013; Ord. No. 2015-01-04, § 1, 1-26-2015)

Sec. 16-98. - Inspections and maintenance.

- (a) Inspections **to Ensure Compliance** During Construction.

- (1) Periodic inspections of the stormwater management system **during** construction must be conducted by the community development department or conducted and certified by a professional engineer approved by the community development director, or designee. Inspections must **use** the approved stormwater management plan for establishing compliance. All inspections must be documented with written reports that contain the following information:

- a. The date and location of the inspection;
- b. Whether **the stormwater management system** is in compliance with the approved stormwater management plan;
- c. Variations from the approved **stormwater management plan**; and
- d. Any other variations or violations of the conditions of the approved stormwater management plan.

- (b) Final Inspection.

- (1) **As-Built Drawings; Delivery of Inspection and Maintenance Agreement.** Upon completion of development, the applicant is responsible for:

- a. Certifying that the **stormwater management system is functioning properly and was constructed in conformance with** the approved stormwater management plan **and associated hydrologic analysis,**
- b. **Submitting as-built drawings showing** the final design specifications for all **components of the** stormwater management **system as** certified by a professional engineer.
- c. **Certifying that the landscaping is established and installed in conformance with the BMP landscaping plan, and**

d. Delivering to the City of Dunwoody a signed inspection and maintenance agreement that has been recorded by the owner in the property record for all parcels that make up the site.

1. *Specific Certification Requirements.* In order to ensure each component is functioning as designed and built according to the design specifications in the approved stormwater management plan, a certification of volume, or other performance test applicable to the type of stormwater management system component, must be performed by a qualified person.

2. *Final Inspection.* The certification and required performance tests shall be submitted to the City of Dunwoody with the request for a final inspection. The City of Dunwoody shall perform a final inspection with the applicant to confirm applicant has fulfilled all applicable responsibilities. A final inspection by the city is required before the release of any performance bonds or financial guarantees.

(c) *Violations and Enforcement.* Any violation of the approved stormwater management plan during construction, failure to submit as-built drawings, failure to submit a final BMP landscaping plan, or failure of the final inspection shall constitute and be addressed as violations of, or failures to comply with, the underlying land disturbance permit pursuant to Sec. 16-60 or the underlying building permit pursuant to Sec. 16-29. To address a violation of this division, the City of Dunwoody shall have all the powers and remedies that are available to it for other violations of building and land disturbance permits, including without limitation the right to issue notices and orders to ensure compliance, stop work orders, and penalties as set forth in the applicable ordinances for such permits.

(d) *Long-term maintenance and inspections.*

- (1) Stormwater management facilities and practices included in a stormwater management plan which are subject to an inspection and maintenance agreement must undergo ongoing inspections to document maintenance and repair needs and ensure compliance with the requirements of the agreement, the plan and this division.
- (2) A stormwater management facility or practice must be inspected on a periodic basis by the responsible person in accordance with the approved inspection and maintenance agreement. In the event that the stormwater management facility has not been maintained and/or becomes a danger to public safety or public health, the public works director must notify the person responsible for carrying out the maintenance plan by registered or certified mail to the person specified in the inspection and maintenance agreement. The notice must specify the measures needed to comply with the agreement and the plan and must specify the time within which such measures must be completed. If the responsible person fails or refuses to meet the requirements of the inspection and maintenance agreement, the city may pursue all available enforcement actions and penalties.
- (3) Inspection programs by the city may be established on any reasonable basis, including but not limited to: routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to: reviewing maintenance and repair records; sampling discharges, surface

water, groundwater, and material or water in stormwater management facilities; and evaluating the condition of stormwater management facilities and practices.

(e) *Right-of-entry.*

Maintenance Agreements. The terms of the inspection and maintenance agreement must provide for the right of entry for authorized city or city contracted officials for the purpose of maintenance inspections and other specified purposes. If a site was developed before the requirement to have an inspection and maintenance agreement or an inspection and maintenance agreement was for any reason not entered into, recorded, or has otherwise invalidated or deemed insufficient, the City of Dunwoody shall have the right to enter and make inspections pursuant to the City of Dunwoody's general provisions for right of entry in Chapter 8 of the Dunwoody Code of Ordinances.

(f) *Maintenance responsibilities.*

- (1) Except as otherwise provided in this section, commercial and/or multifamily residential property owner is responsible for the maintenance of the stormwater management facilities during grading, construction, and following final approval of the completed project. This maintenance and certification obligation is binding on all future owners, successors and assigns of the property.
- (2) Stormwater management facilities in single-family residential subdivisions constructed under permits issued prior to the adoption of the city ordinance assigning maintenance responsibility will not be accepted for city maintenance unless individually approved by and at the discretion of the public works director and suitable access easements are provided. The public works director shall make a decision within 30 days of submittal of the request. The applicant shall be empowered to appeal the decision of the public works director to the mayor and city council, which shall hear the appeal within 30 days of receipt of the appeal.

(g) *Owner's Failure to Maintain the Stormwater Management System.* The terms of the inspection and maintenance agreement shall provide for what constitutes a failure to maintain a stormwater management system and the enforcement options available to the City of Dunwoody. If a site was developed before the requirement to have an inspection and maintenance agreement or an inspection and maintenance agreement was for any reason not entered into, recorded, or has otherwise been invalidated or deemed insufficient, then:

- (1) An owner's failure to maintain the stormwater management system so that it performs as it was originally designed shall constitute and be addressed as a violation of, or failure to comply with, owner's property maintenance obligations pursuant to Sec. 8-1 (State Minimum Standard Codes) and
- (2) To address such a failure to maintain the stormwater management system, the City of Dunwoody shall have all the powers and remedies that are available to it for other violations of an owner's property maintenance obligations, including without limitation prosecution, penalties, abatement, and emergency measure.

If a responsible person fails or refuses to meet the requirements of the inspection and maintenance agreement, the public works director, after 30 days' written notice (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24-hour notice is deemed sufficient), may correct a violation of the design standards or maintenance requirements by performing the necessary work to place the facility or practice in proper working

condition. The city may assess the owners of the facility for the cost of repair work, which will be a lien on the property, and may be placed on the ad valorem tax bill for such property and collected in the ordinary manner for such taxes.

(h) *Special drainage system maintenance requirements.*

- (1) Pursuant to all applicable city and county law, trash, garbage, construction materials, construction by-products or other debris may not be deposited in any part of the drainage system.
- (2) No restriction or barriers, including fences, may be placed in the drainage system or special flood hazard areas without first obtaining a development permit. When on-site or off-site debris has accumulated within a special flood hazard area in such a manner as to interfere with the free flow of water so as to increase the risk of hazardous inundation of upstream properties adjacent to special flood hazard areas, the community development director, or designee, must require the owner of the property where this debris was generated, if its source can be identified, to clear and remove the debris so as to permit the free flow of water.
- (3) No impoundment of water which retains in excess of 0.5 acre-foot of runoff may be removed without first obtaining a development permit, which may only be issued after competent engineering studies provided by the applicant show that this removal will not adversely affect downstream properties.

(Ord. No. 2013-10-14, 1(Exh. A § 16-7.50), 10-14-2013; Ord. No. 2015-01-04, § 1, 1-26-2015; Ord. No. 2019-01-01, § I, 1-28-2019)

Secs. 16-99—16-104. - Reserved.

APPENDIX B

Revisions to Chapter 16, Article II, Division 2 Glossary of Terms (changes highlighted)

DIVISION 2. - DEFINITIONS

Sec. 16-301. - Terms defined.

Definitions. For this division, the terms below have the following meanings:

The words and terms expressly defined in this division have the specific meanings assigned, unless the context clearly indicates another meaning.

Other terms used but not defined in this division shall be interpreted based on how such terms are defined and used in the GSMM and the City of Dunwoody's MS4 Permit.

(a) *Terms beginning with "A."*

Accessory structure means a structure, the use of which is customarily incidental and subordinate to that of the principal building of the same lot, such as a detached garage, toolshed or gazebo.

Accessory use means a use customarily incidental and subordinate to the principal use of the principal building or to the principal use of the premises.

Addition (to an existing building) means any walled and roofed expansion to the perimeter of a building in which the addition is connected to a common load-bearing wall other than a firewall. Any walled and roofed addition that is connected by a firewall or is separated by independent perimeter load-bearing walls is considered new construction.

Adjacent to the future-conditions floodplains means those areas located within the defined horizontal distance from the future-conditions floodplain boundary that are at or lower in elevation than either three feet above the base flood elevation or one foot above the future-conditions flood elevation, whichever is higher, unless the area is hydraulically independent (meaning absolutely no connection to the flooding source such as through pipes, sewer laterals, down drains, foundation drains, ground seepage, overland flow, gated or valved pipes, excavated and backfilled trenches, etc. with no fill or other manmade barriers creating the separation).

Administrator means the person appointed to administer and implement this division on Post-Construction Stormwater Management for New Development and Redevelopment in accordance with Sec. 16-91(b)(4).

Aggrieved person means a person whose property is the subject of the action appealed from or a person who has a substantial interest in the action appealed from, who is in danger of suffering special damage or injury not common to all property owners similarly situated.

Agricultural operations means those practices involving the establishment, cultivation or harvesting of products of the field or orchard; the preparation and planting of pasture land and farm ponds; dairy operations; livestock and poultry management practices; and the construction of farm buildings.

Alley means a minor way that is used primarily for vehicular service access to the back or side of properties otherwise fronting on a street.

Applicant means a person **submitting a land development application for approval.**

Area of shallow flooding means a designated AO or AH zone on the flood insurance rate map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

Area of special flood hazard. See "special flood hazard area."

Arterial (street) means a street, road or highway shown as an arterial in the City of Dunwoody Comprehensive Transportation Plan.

As-built drawings means amended site plans specifying the location, dimensions, elevations, capacities and operational capabilities of public improvements, including water, sewer, road and drainage structures and stormwater management facilities as they have been constructed.

(b) *Terms beginning with "B."*

Bank (stream bank) means as measured horizontally from that point where vegetation has been wrested by normal stream flow or wave action.

Base flood means a flood that has a 1 percent chance of being equaled or exceeded in any given year (also called the 100-year flood).

Base flood elevation means the highest water surface elevation anticipated at any given point during the base flood.

Basement means any area of a building having its floor below ground level on three or more sides.

Best management practice (BMP) means both structural devices to store or treat stormwater runoff and non-structural programs or practices which are designed to prevent or reduce the pollution of the waters of the State of Georgia.

BMP landscaping plan means a design for vegetation and landscaping that is critical to the performance and function of the BMP including how the BMP will be stabilized and established with vegetation. It shall include a layout of plants and plant names (local and scientific).

Bicycle lane means that part of a street or highway adjacent to the roadway, designated by official signs or markings for use by persons riding bicycles.

Block means a piece or parcel of land entirely surrounded by public highways or streets, other than alleys. In cases where the platting is incomplete or disconnected, the community development director may delineate the outline of the block.

Breakaway wall means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or the supporting system.

Buffer area means that portion of a lot set aside for open space and/or visual screening purposes, pursuant to the applicable provisions of this Code and all conditions of zoning, to separate different use districts or to separate uses on one property from uses on another property of the same use district or a different use district.

Buffer, stream, means the portion of a lot and/or area of land immediately adjacent to the banks of streams as regulated by the land development regulations of this Code.

Buffer zone, state, means the area of land immediately adjacent to the banks of state waters in its natural state of vegetation that facilitates the protection of water quality and aquatic habitat.

Buildable area means the area of a lot remaining after all applicable zoning and land development regulations have been met (i.e., that portion of a lot where a building may be located).

Builder means a person who constructs a structure or dwelling for residential occupancy by humans.

Building. See "structure".

Building, elevated. See "elevated building."

Building permit means required written permission issued by the community development director or a building inspector for the construction, repair, alteration or addition to a structure.

Building setback line means the minimum horizontal distance required between the public right-of-way or the utility easement abutting a private street and the principal building or structure on a lot or any projection thereof, except projections that are authorized exceptions to building setback line requirements in the city zoning ordinance and any zoning conditions approved by the city council pursuant thereto. The size of the utility easement for a private street is equal to the required size of the public right-of-way and may not be any smaller in width or length than what would be required for a public right-of-way.

(c) *Terms beginning with "C."*

Caliper means the diameter of a tree trunk, taken six inches above the ground for up to and including four-inch caliper size, and 12 inches above the ground for larger sizes.

Certified arborist means an individual who has been certified as an arborist by the International Society of Arboriculture and maintains the certification in good standing.

Channel means a natural or artificial watercourse with a definite bed and banks that conveys continuously or periodically flowing water.

Channel protection means the protection of stream channels, in accord with the Georgia Stormwater Management Manual, from bank and bed erosion and degradation by preserving or restoring the applicable stream buffer, by providing extended detention and by integrating erosion prevention measures such as energy dissipation and velocity control.

City arborist means the community development director or the community development director's designee having primary administration and enforcement responsibilities for landscaping and tree regulations.

City manager means the city manager of the City of Dunwoody.

City of Dunwoody Stormwater Management Manual means the Georgia Stormwater Management Manual.

Collector street means a street or road designated as a collector street in the City of Dunwoody Comprehensive Transportation Plan.

Commission means the Georgia Soil and Water Conservation Commission (GSWCC).

Comprehensive plan means the comprehensive plan adopted by the city council, as it may be amended from time to time, that divides the city into land use categories and that constitutes the official policy of the city regarding long-term planning and use of land.

Construction means any alteration of land for the purpose of achieving its development or changed use, including particularly any preparation for, building of or erection of a structure.

Construction waste means waste building materials and rubble resulting from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings and other structures. Such waste includes, but is not limited to, asbestos-containing waste, wood, tree stumps, tree tops, bricks, metal, concrete, wall board, paper, cardboard, glass, wire, plastics and other typical construction waste products and refuse.

CPESC means certified professional in erosion and sediment control with current certification by EnviroCert, Inc. which is also referred to as CPESC or CPESC, Inc.

Critical root zone means a circular region measured outward from a tree trunk representing the essential area of roots that must be maintained or protected for the tree's survival. The critical root zone encompasses one foot of radial distance for every one inch of the tree's DBH, with a minimum radius of eight feet.

Crosswalk means a right-of-way within a block dedicated to public use, ten feet or more in width, intended exclusively for pedestrians and nonmotorized transportation and that is designed to improve or provide access to adjacent roads or lots.

Crown reduction pruning means a method of pruning to reduce the height or spread of a tree by performing appropriate pruning cuts.

Cut means a portion of land surface or area from which earth has been removed or will be removed by excavation or the depth below original ground surface to excavated surface. Also known as "excavation."

(d) *Terms beginning with "D."*

DBH (diameter at breast height) means the diameter of a tree trunk measured in inches at a height of four and one-half feet above the ground. If a tree splits into multiple trunks below four and one-half feet, then the trunk is measured at its most narrow point beneath the split.

Density factor means a unit of measurement used to calculate the required tree coverage on a site.

Design professional means a professional licensed by the State of Georgia in the field of: engineering, architecture, landscape architecture, forestry, geology, or land surveying; or a person that is a certified professional in erosion and sediment control (CPESC) with a current certification by EnviroCert, Inc. Design professionals shall practice in a manner that complies with applicable Georgia law governing professional licensure.

Detached means being separated from a principal structure by a minimum of three feet.

Detention means the temporary storage of stormwater runoff in a stormwater **detention** facility for the purpose of controlling the peak discharge.

Detention facility means a **structure designed** for **the storage and gradual release** of stormwater runoff **at controlled rates**.

Development means **new or redevelopment**.

Development permit means a permit issued by the City of Dunwoody that authorizes the commencement of development on a specific parcel of land.

District means the DeKalb Soil and Water Conservation District.

Division means the Environmental Protection Division (EPD) of the Department of Natural Resources.

DNR means the Georgia Department of Natural Resources.

Drainage means the removal of surface or subsurface water from a given area, either by gravity or by pumping, commonly applied herein to surface water.

Drainage plan means a plan prepared using appropriate and commonly accepted engineering standards that specifies the means for alteration or development of a drainage system.

Drainage structure means a device composed of a virtually non-erodible material such as concrete, steel, plastic or other such material that conveys water from one place to another by intercepting the flow and carrying it to a release point for stormwater management, drainage control or flood control purposes.

Drainage system means the surface and subsurface system for the removal of water from the land, including, but not limited to, both the natural elements of streams, marshes, swales and ponds, whether of an intermittent or continuous nature and the manmade element that includes culverts, ditches, channels and detention facilities that comprise the storm drainage system.

(e) *Terms beginning with "E."*

Elevated building means a non-basement building built to have the lowest floor of the lowest enclosed area elevated above ground level by means of fill, solid foundation perimeter walls, pilings, columns, piers or shear walls that are adequately anchored so as not to impair the structural integrity of the building during a base flood event.

Encroachment means the advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain that may impede or alter the flow capacity of a floodplain.

EPD means the Environmental Protection Division of the Georgia Department of Natural Resources.

Erosion means the process by which land surface is worn away by the action of wind, water, ice or gravity.

Existing construction means any structure for which the "start of construction" commenced before October 14, 2009 the effective date of floodplain management regulations adopted by this community.

Existing manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads) is completed before October 14, 2009, the effective date of floodplain management regulations adopted by this community as a basis for community participation in the National Flood Insurance Program.

Expansion to an existing manufactured home park or subdivision means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads).

Extended detention means the detention of stormwater runoff for an extended period of time.

Extreme flood protection means measures taken to prevent adverse impacts from large low-frequency storm events with a return frequency of 100 years or more.

(f) *Terms beginning with "F."*

Fill means a portion of land surface to which soil or other solid material has been added; the depth above the original ground surface or an excavation.

Final stabilization means all soil disturbing activities at the site have been completed, and that for unpaved areas and areas not covered by permanent structures, 100 percent of the soil surface is uniformly covered in permanent vegetation with a density of 70 percent or greater, or landscaped according to the plan (uniformly covered with landscaping materials in planned landscape areas), or equivalent permanent stabilization measures as defined in the manual (excluding a crop of annual

vegetation and seeding of target crop perennials appropriate for the region). Final stabilization applies to each phase of construction.

Finished grade means the final elevation and contour of the ground after cutting or filling and conforming to the proposed design.

Flooding means a volume of surface water that exceeds the banks or walls of the BMP or channel; and overflows onto adjacent lands.

Flood hazard boundary map (FHBM) means the official map on which the Federal Emergency Management Agency or Federal Insurance Administration has delineated the special flood hazard areas as Zone A.

Flood insurance rate map (FIRM) means an official map on which the Federal Emergency Management Agency has delineated both the special flood hazard areas and the risk premium zones applicable to the community.

Flood insurance study means the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, as well as the flood boundary floodway map and the water surface elevation of the base flood.

Floodplain means any land area susceptible to flooding.

Floodplain coordinator means the individual appointed to administer and enforce the flood protection regulations of article II, division 8.

Floodproofing means any combination of structural and nonstructural additions, changes or adjustments to structures that reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

Floodway means the channel of a river or other watercourse and the adjacent areas of the floodplain that is necessary to contain and discharge the base flood flow without cumulatively increasing the base flood elevation more than one foot; sometimes referred to as the "regulatory floodway."

Floor means the top surface of an enclosed area in a building, including basement (i.e., the top of slab in concrete slab construction or top of wood flooring in wood frame construction). The term does not include the floor of a garage used solely for parking vehicles.

Frontage, lot means the distance for which the front boundary line of the lot and the street line are coincident.

Functionally dependent use means a use that cannot perform its intended purposes unless it is located or carried out in close proximity to water.

Future-conditions flood means the flood having a one-percent chance of being equaled or exceeded in any given year based on future-conditions hydrology. Also known as the 100-year future-conditions flood.

Future-conditions flood elevation means the flood standard equal to or higher than the base flood elevation. The future-conditions flood elevation is defined as the highest water surface anticipated at any given point during the future-conditions flood.

Future-conditions floodplain means any land area susceptible to flooding by the future-conditions flood.

Future-conditions hydrology means the flood discharges associated with projected land-use conditions based on a community's zoning map, comprehensive land-use plans and/or watershed study

projections, and without consideration of projected future construction of flood detention structures or projected future hydraulic modifications within a stream or other waterway, such as bridge and culvert construction, fill and excavation.

(g) *Terms beginning with "G."*

Grading means altering the shape of ground surfaces to a predetermined condition; this includes stripping, cutting, filling, stockpiling and shaping or any combination thereof and includes the land in its cut or filled condition.

Ground elevation means the original elevation of the ground surface prior to cutting or filling.

GSMM means to latest edition of the Georgia Stormwater Management Manual, Volume 2: Technical Handbook, and its Appendices.

(h) *Terms beginning with "H."*

Hardwood tree means a tree that does not bear either needles or cones. The term hardwood is based on the colloquialism and does not reflect any true qualities of the tree.

Highest adjacent grade means the highest natural elevation of the ground surface, prior to construction, next to the proposed foundation of a building.

Historic structure means any structure that is:

- (1) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary of the Interior to qualify as a registered historic district;
- (3) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or
- (4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either by an approved state program as determined by the Secretary of the Interior or directly by the Secretary of the Interior in states without approved programs.

Hydrologic soil group (HSG) means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and produce much more runoff.

Hotspot means a land use or activity on a site that has the potential to produce higher than normally found levels of pollutants in stormwater runoff. As defined by the administrator, hotspot land use may include gasoline stations, vehicle services and maintenance areas, industrial facilities (both permitted under the Industrial Stormwater General Permit and others), material storage sites, garbage transfer facilities, and commercial parking lots with high-intensity use.

(i) *Terms beginning with "I."*

Impervious surface means a surface composed of any material that significantly impedes or prevents the natural infiltration of water into the soil.

Industrial Stormwater General Permit means the National Pollutant Discharge Elimination System (NPDES) permit issued by Georgia Environmental Protection Division to an industry for stormwater discharges associated with industrial activity. The permit regulates pollutant levels associated with industrial stormwater discharges or specifies on-site pollution control strategies based on Standard Industrial Classification (SIC) Code.

Infiltration means the process of percolating stormwater runoff into the subsoil.

Inspection and maintenance agreement means a written agreement providing for the long-term inspection, operation, and maintenance of the stormwater management system and its components on a site.

(j) *Terms beginning with "J."*

(k) *Terms beginning with "K."*

RESERVED

(l) *Terms beginning with "L."*

Land development application means the application for a land development permit on a form provided by the City along with the supporting documentation required in Sec. 16-94(b).

Land development permit...means the authorization necessary to begin construction-related, land-disturbing activity.

Land disturbing activity means any activity which may result in soil erosion from water or wind and the movement of sediments into state water or onto lands within the state, including, but not limited to, clearing, dredging, grading, excavating, and filling of land, but not including agricultural practices as described in Sec. 16-58 or Silvicultural land management activities as described O.C.G.A. 12-7-17(6) within areas zoned for these activities.

Landscape plan means a plan that identifies areas of tree preservation and methods of tree protection within the protected zone, as well as all areas or replanting. Within replanting areas, the common and botanical names of the proposed species, the number of plants of each species, the size of all plants, the proposed location of all plants and any unique features of the plants.

Larger common plan of development or sale means a contiguous area where multiple separate and distinct construction activities are occurring under one plan of development or sale. For the purposes of this definition, the term "plan" means an announcement; piece of documentation such as a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request or computer design; or physical demarcation such as boundary signs, lot stakes or surveyor markings indicating that construction activities may occur on a specific plot.

Linear feasibility program means a feasibility program developed by the City and submitted to the Georgia Environmental Protection Division, which sets reasonable criteria for determining when implementation of stormwater management standards for linear transportation projects being constructed by the City is infeasible.

Linear transportation projects means construction projects on traveled ways including but not limited to roads, sidewalks, multi-use paths and trails, and airport runways and taxiways.

Live detention means that quantity of water capable of being effectively contained by a designated facility for stormwater storage for a specified period of time.

Local issuing authority means the governing authority of the city that is certified pursuant to O.C.G.A. §12-7-8(a).

Local street means a street used primarily for access to abutting properties in residential, industrial or other developments.

Lot means a designated parcel, tract or area of land legally established by plat, subdivision, or as otherwise permitted by law, to be separately owned, used, developed or built upon.

Lot, corner, means a lot abutting upon two or more streets at their intersection or upon two parts of the same street forming an interior angle of less than 135 degrees.

Lot, double-frontage, means a lot that abuts two parallel streets or that abuts two streets that do not intersect at the boundaries of the lot. A double-frontage lot may also be referred to as a through lot.

Lot, flag, means a lot that sits behind lots which face directly onto a street with access provided to the bulk of the lot by means of a narrow corridor, whether providing the minimum amount of street frontage and width or not.

Lowest floor means the lowest floor of the lowest enclosed area, including basement. An unfinished or flood-resistant enclosure below the lowest floor that is usable solely for parking or vehicles, building access or storage in an area other than a basement area, is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of other provisions of these land development regulations.

(m) *Terms beginning with "M."*

Maintenance of detention facility means preserving the enclosed walls or impounding embankments of the detention facility in good condition; ensuring structural soundness, functional adequacy and freedom from excessive sediment; removing obstructions affecting operation of outlet device; and rectifying any unforeseen erosion problems.

Manufactured home means a structure, transportable in one or more sections, built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. The term includes any structure commonly referred to as a "mobile home" regardless of the date of manufacture. The term also includes parked trailers, travel trailers and similar transportable structures placed on a site for 180 consecutive days or longer and intended to be improved property.

Manufactured home park or subdivision means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

Market value means (1) the appraised value of the structure prior to the start of the initial repair or improvement, or (2) in the case of damage, the value of the structure prior to the damage occurring. This term includes structures that have incurred "substantial damage" regardless of the actual amount of repair work performed.

Mean sea level means the average height of the sea for all stages of the tide. It is used as a reference for establishing various elevations within the floodplain. It is used as a reference for establishing various elevations within the floodplain. For purposes of these regulations, the term is synonymous with National Geodetic Vertical Datum (NGVD) and/or the North American Vertical Datum (NAVD) of 1988.

MS4 Permit means the NPDES permit issued by Georgia Environmental Protection Division for discharges from the City's municipal separate storm sewer system.

Multiphase residential development means any development undertaken by a single developer or a group of developers acting in concert to develop lots for sale in a residential subdivision where such land is developed pursuant to multiple preliminary or final plats and such land is contiguous or is known, designated or advertised as a common unit or by a common name.

Multi-use trail means a recreation corridor intended for the use of nonmotorized forms of transportation such as, but not limited to, walking, wheelchairs, running, bicycles and inline skates, as identified in the Parks, Recreation and Greenspace Master Plan, the Comprehensive Transportation Plan or other plan adopted by the city council.

(n) *Terms beginning with "N."*

National Geodetic Vertical Datum (NGVD), as corrected in 1929, means a vertical control used as a reference for establishing varying elevations within the floodplain.

Natural ground surface means the ground surface in its original state before any grading excavation or filling.

Nephelometric turbidity units (NTUs) means numerical units of measure based upon photometric analytical techniques for measuring the light scattered by finely divided particles of a substance in suspension. This technique is used to estimate the extent of turbidity in water in which colloiddally dispersed particles are present.

New construction means any structure for which the permitted date of construction commenced after adoption of this chapter, October 14, 2009. For the purposes of interpreting and administering the flood damage prevention regulations of article II, division 8, "new construction" means structures for which the start of construction commenced on or after the effective date of floodplain management regulations adopted by this community as a basis for community participation in the NFIP.

New Development means land disturbing activities, structural development (construction, installation or expansion of a building or other structure), and/or creation of impervious surfaces on a previously undeveloped site.

New manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads) is completed on or after October 14, 2009, the effective date of floodplain management regulations adopted by this community.

Nonpoint source pollution means a form of water pollution that does not originate from a discrete point such as a wastewater treatment facility or industrial discharge, but involves the transport of pollutants such as sediment, fertilizers, pesticides, heavy metals, oil, grease, bacteria, organic materials and other contaminants from land to surface water or groundwater via mechanisms such as precipitation, stormwater runoff and leaching. Nonpoint source pollution is a by-product of land use practices such as agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

North American Vertical Datum (NAVD), as corrected in 1988, means a vertical datum used as a reference for establishing varying elevations within the floodplain.

(o) *Terms beginning with "O."*

100-year floodplain means land in the floodplain subject to a one-percent or greater statistical occurrence probability of flooding in any given year.

Operator means the party that has:

- (1) Operational control of construction project plans and specifications, including the ability to make modifications to those plans and specifications; or
- (2) Day-to-day operational control of those activities that are necessary to ensure compliance with a stormwater pollution prevention plan for the site or other permit conditions, such as a person authorized to direct workers at a site to carry out activities required by the stormwater pollution prevention plan or to comply with other permit conditions.

Ornamental trees means small growing trees, attaining a mature height of less than 40 feet, grown primarily for aesthetic purposes, i.e., flowers, fruit, etc.

Overbank flood protection means measures taken to prevent an increase in the frequency and magnitude of out-of-bank flooding (i.e., flow events that exceed the capacity of the channel and enter the floodplain).

Overstory tree means those trees that compose the top layer or canopy of vegetation and will generally reach a mature height of greater than 40 feet.

Owner means the legal or beneficial owner of a site, including but not limited to, a mortgagee or vendee in possession, receiver, executor, trustee, lessee or other person, firm or corporation in control of the site.

(p) *Terms beginning with "P."*

Person means any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county, or other political subdivision of the State, any interstate body or any other legal entity.

Planning commission means the planning commission of the city.

Post-construction stormwater management means stormwater best management practices that are used on a permanent basis to control and treat runoff once construction has been completed in accordance with a stormwater management plan.

Post-development means the conditions anticipated to exist on a site immediately after completion of the proposed development.

Potential purchaser means a person purchasing property in a residential subdivision or a multiphase residential development from a developer and/or builder for occupancy as a residence or as a residence to be rented or leased to others.

Practicability Policy...means the latest edition of the Metropolitan North Georgia Water Planning Districts Policy on Practicability Analysis for Runoff Reduction.

Pre-development means the conditions that exist on a site immediately before the implementation of the proposed development. Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time before the first item being approved or permitted shall establish pre-developed conditions. *Pre-development hydrology* means (a) for new development, the runoff curve number determined using natural conditions hydrologic analysis based on the natural, undisturbed condition of the site immediately before implementation of the proposed development; and (b) for redevelopment, the existing conditions hydrograph may take into account the existing development when defining the runoff curve number and calculating existing runoff, unless the existing development causes a negative impact on downstream property.

Previously developed site means a site that has been altered by paving, construction, and/or land disturbing activity.

Protected zone means all areas of a parcel required to remain in open space, including all areas required as yard or setback areas, buffer areas, stream buffers, state buffer zones or landscaped areas in accordance with provisions of the city zoning ordinance or by conditions of zoning or variance approval.

Public facilities means the roads, water, sewer, schools, traffic control devices and electrical service.

(q) *Terms beginning with "Q."*

RESERVED

(r) *Terms beginning with "R."*

Reach means a longitudinal segment of a stream or river measured along specified points on the stream or river.

Reasonable access means a 15-foot wide access easement from the public right-of-way to the stormwater management facility and a drainage and maintenance easement encompassing the stormwater management facility and extending ten feet outside the pond's 100-year water ponding elevation.

Recreation areas mean those portions of open space designed and intended for active recreational use, such as sports fields and other play areas.

Recreational vehicle means a vehicle that is:

- (1) Built on a single chassis;
- (2) Four hundred square feet or less when measured at the largest horizontal projection;
- (3) Designed to be self-propelled or permanently towable by a light-duty truck; and
- (4) Not designed primarily for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use.

Redevelopment means structural development (construction, installation, or expansion of a building or other structure), creation or addition of impervious surfaces, replacement of impervious surfaces not as a part of routine maintenance, and land disturbing activities associated with structural or impervious development on a previously developed site. Redevelopment does not include such activities as exterior remodeling.

Residential has the same meaning as given in the city zoning ordinance except that it does not include apartments.

Revegetation means replacement of trees and landscape plant materials into the minimum required landscape areas, as determined by the zoning ordinance, conditions of zoning approval or applicable tree preservation or protection regulations.

Roadway drainage structure means a device such as a bridge, culvert or ditch, composed of a virtually nonerodible material such as concrete, steel, plastic or other such material that conveys water under a roadway by intercepting the flow on one side of a traveled way consisting of one or more defined lanes, with or without shoulder areas and carrying water to a release point on the other side.

Rock outcropping means a single, contiguous piece of exposed rock that has a horizontal surface area equal to or greater than 200 square feet.

Runoff means stormwater runoff.

Runoff coefficient means the ratio of runoff to rainfall.

Routine Maintenance means activities to keep an impervious surface as near as possible to its constructed condition. This includes ordinary maintenance activities, resurfacing paved areas, and exterior building changes or improvements which do not materially increase or concentrate stormwater runoff, or cause additional nonpoint source pollution.

(s) *Terms beginning with "S."*

Sediment means solid material, both organic and inorganic, that is in suspension, is being transported or has been moved from its site of origin by air, water, ice or gravity as a product of erosion.

Sediment basin means a detention facility specifically developed for the purpose of allowing the deposit of sediment resulting from the land development process that may be constructed as part of or separately from a detention facility.

Sedimentation means the process by which eroded material is transported and deposited by the action of water, wind, ice or gravity.

Seller means a builder or developer.

Significant tree means any existing, healthy, living tree eight inches DBH or greater in size.

Site means an area of land where development is planned, which may include all or portions of one or more parcels of land. For subdivisions and other common plans of development, the site includes all areas of land covered under an applicable land development permit.

Site plan means that plan required to acquire a development, construction or building permit that shows the means by which the applicant will comply with applicable provisions of this chapter and other applicable ordinances.

Softwood tree means any coniferous (cone-bearing) tree.

Soil and water conservation district approved plan means an erosion, sedimentation and pollution control plan approved in writing by the DeKalb Soil and Water Conservation District.

Special flood hazard area (SFHA) means an area in the floodplain subject to a one-percent or greater chance of flooding in any given year. This includes areas shown on an FHBM or FIRM as zone A, AO, A1-A30, AE, A99, AE, AO, AH or AR; all floodplain and floodprone areas at or below the future-conditions flood elevation; and all other floodprone areas as referenced in section 16-136. All streams with a drainage area of 100 acres or greater must have the special flood hazard area delineated.

Special tree means any tree that qualifies for special consideration for preservation due to its size, type, and condition.

Specimen tree means any tree that has been determined by the city arborist to be of high value because of its type, size, age, and/or of historical significance, or other professional criteria, and has been so designated in administrative standards established by the city. This is usually a plant with desirable form, foliage, fruit or flower that can be emphasized although isolated.

Spite strip means a piece of land used to separate a street or road rights-of-way from adjoining property and whose primary purpose is to preclude access to such rights-of-way.

Stabilization means the process of establishing an enduring soil cover of vegetation by the installation of temporary or permanent cover for the purpose of reducing to a minimum the erosion process and the resulting transport of sediment by wind, water, ice or gravity.

Standards and specifications means construction and technical requirements that govern construction and installation of streets and other public improvements in the City of Dunwoody.

Start of construction means the initial disturbance of soils associated with clearing, grading or excavating activities or other construction activities. The term "construction activities" means the disturbance of soils associated with clearing, grading, excavating, filling of land or other similar activities that may result in soil erosion. For the purposes of interpreting and administering the flood damage prevention regulations of article II, division 8, "start of construction" means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement was within 180 days of the date of the permit. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab for footings, the installation of piles, the construction of columns or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation of accessory buildings or structures appurtenant to the principal structure, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

State general permit means the national pollution discharge elimination system general permit for stormwater runoff from construction activities as is now in effect or as may be amended or reissued in the future pursuant to the state's authority to implement the same through federal delegation under the federal Water Pollution Control Act, as amended, 33 USC 1251 et seq. and O.C.G.A. § 12-5-30(f).

State waters means any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, and other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the state that are not entirely confined and retained completely upon the property of a single individual, partnership or corporation.

Stormwater better site design means a nonstructural site design approach and technique that can reduce a site's impact on the watershed and can provide for nonstructural stormwater management. The term "stormwater better site design" includes conserving and protecting natural areas and greenspace, reducing impervious cover and using natural features for stormwater management.

Stormwater Concept Plan means an initial plan for post-construction stormwater management at the site that provides the groundwork for the stormwater management plan including the natural resources inventory, site layout concept, initial runoff characterization, and first round stormwater management system design.

Stormwater management means the collection, conveyance, storage, treatment and disposal of stormwater runoff in a manner intended to prevent increased flood damage, streambank channel erosion, habitat degradation and water quality degradation and to enhance and promote the public health, safety and general welfare.

Stormwater management manual means the Georgia Stormwater Management Manual.

Stormwater management plan means a plan for post-construction stormwater management at the site that meets the requirements of Sec. 16-92(d) and is included as part of the land development application.

Stormwater Management Standards means those standards set forth in Sec. 16-91(e).

Stormwater management system means the entire set of nonstructural site design features and structural BMPs for collection, conveyance, storage, infiltration, treatment, and disposal of stormwater runoff in a manner designed to prevent increased flood damage, streambank channel erosion, habitat degradation and water quality degradation, and to enhance and promote the public health, safety and general welfare.

Stormwater runoff means flow on the surface of the ground, resulting from precipitation.

Stream means natural, running water flowing continuously or intermittently in a channel on or below the surface of the ground. Field verification must be performed to make a final determination as to the existence of a stream where a dispute exists. Such field verification must be performed under the direction of the community development director.

Streambank means a sloping land that contains a stream channel in the normal flows of the stream.

Stream channel means the portion of a watercourse that contains the base flow of the stream.

Stream, ephemeral (stormwater), means a feature that carries only stormwater in direct response to precipitation with water flowing only during and shortly after large precipitation events. An ephemeral stream may or may not have a well-defined channel, the aquatic bed is defined always above the water table, and stormwater runoff is the primary source of water. An ephemeral stream typically lacks the biological, hydrological and physical characteristics commonly associated with the continuous or intermittent conveyance of water.

Stream, intermittent, means a well-defined channel that contains water for only part of the year, typically during winter and spring when the aquatic bed is below the seasonally high water table. The flow may be heavily supplemented by stormwater runoff. An intermittent stream often lacks the biological and hydrological characteristics commonly associated with the conveyance of water.

Stream, perennial, means a well-defined channel that contains water year round during a year of normal rainfall with the aquatic bed located below the water table for most of the year. Groundwater is the primary source of water for a perennial stream, but it also carries stormwater runoff. A perennial stream exhibits the typical biological, hydrological and physical characteristics commonly associated with the continuous conveyance of water.

Street, private, means an access way similar to and having the same function as a public street, providing access to more than one property but held in private ownership. Private streets, when authorized, must be developed in accordance with the specifications for public streets established in this chapter.

Street, public, means any right-of-way set aside for public travel dedicated to the city and any right-of-way that has been accepted for maintenance as a street by the city.

Street right-of-way line means the dividing line between a lot, tract or parcel of land and a street right-of-way.

Structural erosion, sedimentation and pollution control measures means measures for the stabilization of erodible or sediment-producing areas by utilizing the mechanical properties of matter for the purpose of either changing the surface of the land or storing, regulating or disposing of runoff to

prevent excessive sediment loss. Examples of structural erosion and sediment control practices are riprap, sediment basins, dikes, level spreaders, waterways or outlets, diversions, grade stabilization structures, sediment traps and land grading. Such measures can be found in the Manual for Erosion and Sediment Control in Georgia.

Structure means a walled and roofed building (including a gas or liquid storage tank), that is principally above ground, or a manufactured home.

Subdivision means any division of a tract or parcel of land resulting in one or more new lots or building sites for the purpose, whether immediately or in the future, of sale, other transfer of ownership or land development, and includes divisions of land resulting from or made in connection with the layout or development of a new street or roadway or a change in an existing street or roadway.

Substantial building permit means a nonresidential building permit issued by the city with a total value in excess of 50 percent of the county tax assessor's 100 percent assessed value of the existing improvements only. The aggregate value of all building permits issued to the property over the previous 12 months must be included in this calculation (see appendix E).

Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial improvement means any combination of repairs, reconstruction, alteration or improvements to a building, taking place during a ten-year period, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. For the purposes of this definition, "substantial improvement" is deemed to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the building. The term does not, however, include those improvements of a building required to comply with existing health, sanitary or safety code specifications which are solely necessary to assure safe living conditions, which have been pre-identified by code enforcement officials, and not solely triggered by an improvement or repair project.

Substantially improved existing manufactured home parks or subdivision is where the repair, reconstruction, rehabilitation or improvement of the streets, utilities and pads equals or exceeds 50 percent of the value of the streets, utilities and pads before the repair, reconstruction or improvement commenced.

(t) *Terms beginning with "T."*

Tree means any living, self-supporting, woody perennial plant that has a trunk caliper of two inches or more measured at a point six inches above the ground and that normally attains a height of at least ten feet at maturity, usually with one main stem or trunk and many branches.

Tree harvesting means the felling, loading, and transporting of timber products done pursuant to a special exception issued by the zoning board of appeals.

Tree replacement means the replacement of trees and landscape plant materials in the minimum required landscape areas, as determined by the zoning regulations or the tree protection ordinance.

Tree save area means the boundaries of the area surrounding trees wherein it is essential that they remain undisturbed in order to prevent damage and loss of trees that are to be retained on-site during the development and building process.

Tree topping means the removal of tree limbs, branches, or stems by cutting at the internodes and resulting in the failure of the tree to assume apical dominance.

(u) *Terms beginning with "U."*

Understory tree means those trees that grow beneath the overstory trees and will generally reach a mature height of less than 40 feet.

Used for includes the terms "arranged for," "designed for," "intended for," "maintained for" and "occupied for."

(v) *Terms beginning with "V."*

Vegetation means all plant growth, especially trees, shrubs, vines, ferns, mosses and grasses.

Vegetative erosion, sedimentation and pollution control practices means practices for the stabilization of erodible or sediment-producing areas by covering the soil with:

- (1) Permanent seeding, sprigging or planting, producing long-term vegetative cover;
- (2) Temporary seeding, producing short-term vegetative cover; or
- (3) Sodding, covering areas with a turf of perennial sod-forming grass.

Such practices can be found in the Manual for Erosion and Sediment Control in Georgia published by the state soil and water conservation commission.

(w) *Terms beginning with "W."*

Water quality protection means the requirement that all developments must improve the quality of storm runoff from the development site.

Watercourse means any natural or artificial waterway, stream, river, creek, channel, ditch, canal, conduit, culvert, drain, waterway, gully, ravine, or wash in which water flows either continuously or intermittently and that has a definite channel, bed and banks and including any area adjacent thereto subject to inundation by reason of overflow or floodwater.

Wetlands means those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Width, lot, means the distance between the side lot lines, measured along a line drawn parallel to the front lot line at a distance from the front lot line equal to the minimum street yard setback. For lots with curvilinear frontage and setback lines (e.g.: cul-de-sac lots), the width shall be measured as a straight line through the points that intersect the side lot lines at a distance from the front lot line equal to the minimum street yard setback.

(x) *Terms beginning with "X."*

RESERVED

(y) *Terms beginning with "Y."*

RESERVED

(z) *Terms beginning with "Z."*

RESERVED

(Ord. No. 2013-10-14, 1(Exh. A § 16-18.10), 10-14-2013; Ord. No. 2015-01-04, § 1, 1-26-2015; Ord. No. 2017-03-06, § 2, 3-27-2017; Ord. No. 2018-10-16, § I, 10-8-2018)

APPENDIX C

Runoff Reduction Feasibility Policy

Policy on Practicability Analysis for Runoff Reduction

Introduction

Runoff reduction practices are stormwater Best Management Practices (BMPs) used to disconnect impervious and disturbed pervious surfaces from the storm drainage system. The purpose is to reduce post-construction stormwater runoff rates, volumes, and pollutant loads. Runoff reduction is more than simple infiltration. The Runoff Reduction Volume (RR_v) is the retention volume calculated to infiltrate, evapotranspire, harvest and use, or otherwise remove runoff from a post-developed condition to more closely mimic the natural hydrologic conditions.

Certain conditions, such as soils with very low infiltration rates, high groundwater, or shallow bedrock, may lead a local jurisdiction to waive or reduce the runoff reduction requirement for proposed site development on a case-by-case basis. If any of the stormwater runoff volume generated by the first 1.0” of rainfall cannot be reduced or retained on the site, due to site characteristics or constraints, the remaining volume shall be increased by a multiplier of 1.2 and shall be intercepted and treated in one or more best management practices that provide at least an 80 percent reduction in total suspended solids.

The Policy on Practicability Analysis for Runoff Reduction (practicability policy) was developed to provide guidance about the site conditions and supporting documentation that could justify a “Determination of Infeasibility” for the runoff reduction requirement. This practicability policy does not address infeasibility for linear transportation projects being constructed by the local jurisdiction, other local governments, or authorities.

The practicability policy is based on the following principles:

- It is designed to help administrators implement a process for granting a Determination of Infeasibility that supports efficient review of land development applications.
- It applies to new development and redevelopment projects for public and private post-construction stormwater BMPs. It is referenced in the *Model Ordinance for Post-Construction Stormwater Management for New Development and Redevelopment* (Model Ordinance) developed by the Metropolitan North Georgia Water Planning District (Metro Water District).
- It aligns with requirements for runoff reduction in the Georgia Environmental Protection Division’s (EPD’s) permit to discharge from the municipal separate storm sewer system (MS4) permit. The MS4 permit states that the stormwater management system shall be designed to retain the first 1.0 inch of rainfall on the site to the maximum extent practicable. Most Georgia Stormwater Management Manual (GSMM) BMPs include a runoff reduction component.
- It is focused on the typical site conditions and regulatory environment in the Metro Water District and may not be applicable for all of Georgia.
- It requires a pre-submittal meeting when pursuing a Determination of Infeasibility to ensure all attempts to provide 100% RR_v on site have been exhausted.

The local jurisdiction is responsible for the review of land development applications and determination that it is infeasible to apply the runoff reduction requirement on part or all of a proposed site development. Local jurisdictions may choose to make substantive changes or otherwise customize this

practicability policy. These further changes and customizations are allowable so long as their substance meets the requirements of a local jurisdiction's MS4 permit. EPD is responsible for evaluating MS4 permit and District Plan compliance, which includes verifying whether changes and customizations are "at least as effective." EPD has reviewed this document and their comments have been incorporated.

Conditions that may warrant a Determination of Infeasibility

The GSMM provides broad guidance about conditions that may lead a local jurisdiction to waive or reduce the runoff reduction requirement. The following conditions may warrant a Determination of Infeasibility.

- **Soil Infiltration Rate:** The soil infiltration rate is less than 0.5 inch per hour as measured over a meaningful portion of the site. Consideration should be given to infiltration rates throughout the soil profile.
- **Water Table:** The seasonal high-water table is less than two feet from the bottom of an infiltration practice.
- **Shallow Bedrock:** Material that cannot be excavated except by drilling or blasting AND is less than two feet from the bottom of an infiltration practice.
- **Extreme Topography:** In the proposed final condition, as shown on the Stormwater Concept Plan with the proposed post-development condition, anything steeper than 3:1 slope for more than 50% of the site.
- **Karst Topography:** Any of the existing condition is karst.
- **Hotspots/ Contamination:** Reasonable suspicion that previous uses of the site have resulted in soil contamination.
- **Historic Resources:** Buildings, structures, or historic sites included in the Georgia Historic Preservation Division's Historic Resources Survey or listed in the National Register of Historic Places or that has been recommended as a historic resource by a Preservation Professional.
- **Site Constraints:** Sites where the density or nature of the proposed redevelopment would create irreconcilable conflicts for compliance between the on-site runoff reduction requirement and other requirements such as zoning, floodplains, stream buffers, or septic fields.
- **Economic Hardship:** The cost of retaining the first 1.0 inch of rainfall onsite using runoff reduction practices is a minimum of three times greater than the cost of providing water quality practices. This condition must be present with another site condition for a Determination of Infeasibility. Additionally, a Determination of Infeasibility for economic hardship may only be allowed for up to 50% runoff reduction volume.

Supplemental Materials

The District has prepared supplemental materials to support the implementation of this practicability policy. *Appendix A* is meant for internal use and provides an overview of the steps a local jurisdiction could take to implement the practicability policy and issue a Determination of Infeasibility. *Appendix B* has a template the local jurisdiction could use as a runoff reduction infeasibility form.

Appendix A:

Overview of Processing a Determination of Infeasibility

Overview of Processing a Determination of Infeasibility

Obtaining a Determination of Infeasibility

Determination of Infeasibility is not an all or nothing proposition. Designers must demonstrate that they have explored all avenues to meet the runoff reduction standard. If this is determined to be infeasible, they must attempt to provide the maximum percentage of RRV on site as feasible. Only after all attempts to provide any RRV on site are exhausted will the local jurisdiction consider a Determination of Infeasibility. The following process is recommended to:

1. identify conditions early,
2. provide flexibility,
3. support efficient land development application review, and
4. protect water quality to the maximum extent practicable.

Does the Site Qualify for a Determination of Infeasibility?

Answering “NO” to any of the following questions may indicate that the site qualifies for a Determination of Infeasibility:

1. Can GSMM runoff reduction BMPs fully meet the runoff reduction volume?
2. Does the site analysis show the conditions are supportive for managing the calculated runoff reduction volume needed for the site?
3. Can better site design practices (see GSMM, Volume 2, Section 2.3) be used to avoid challenging site conditions or constraints?
4. Can BMPs, such as green roofs and rainwater harvesting techniques, be used in ways that do not require infiltration into subsurface soils, but rather rely on evapotranspiration and reuse?
5. Can the installation of multiple runoff reduction BMPs, such as installing runoff reduction BMPs at higher elevations or in multiple sub watersheds, manage the calculated runoff reduction volume needed for the site?

Prior to Construction

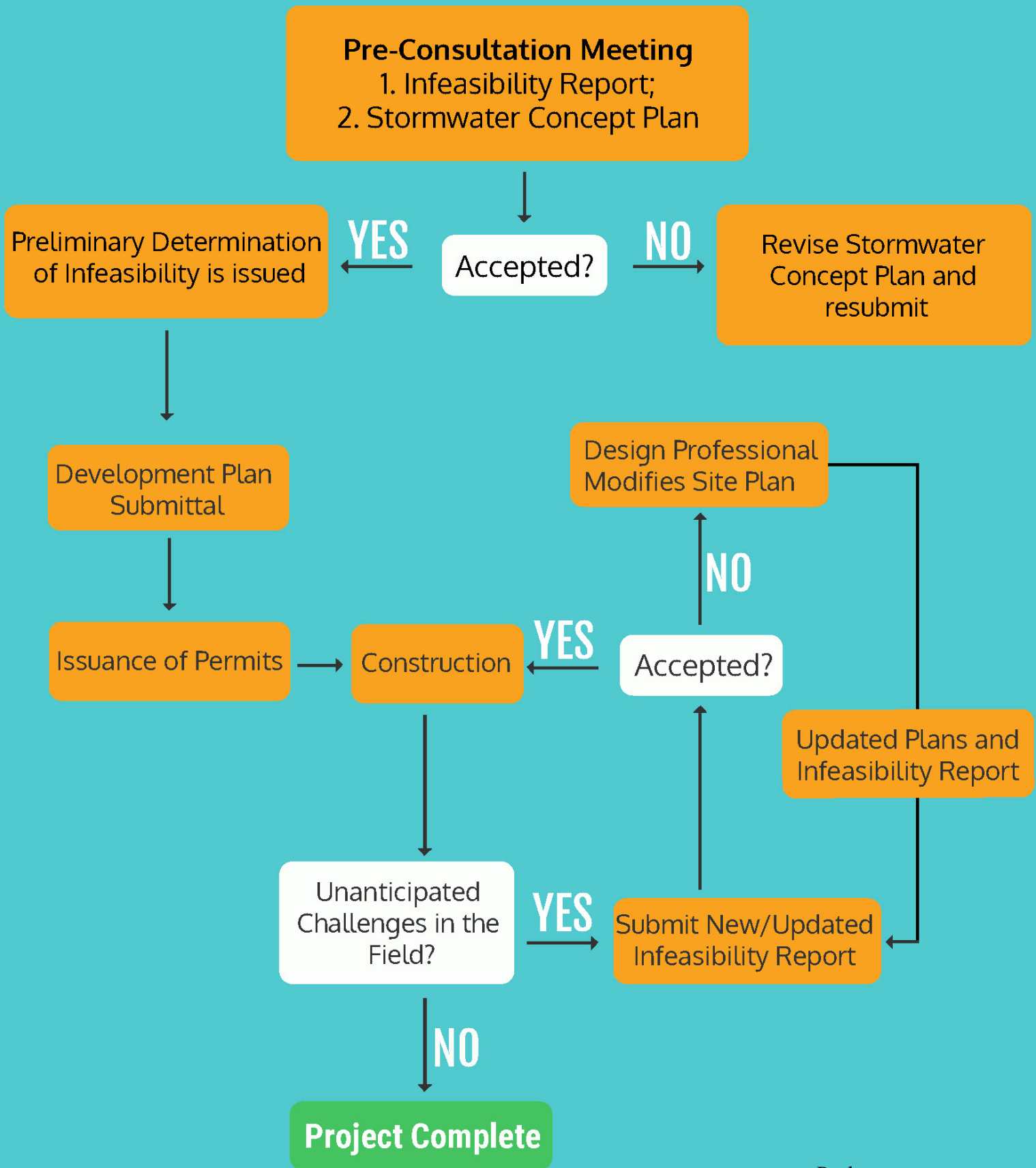
- 1) The design professional identifies conditions that limit using runoff reduction methods to retain 100% of the first 1.0 inch of rainfall onsite and initiates a pre-submittal meeting with the plan reviewer prior to submittal of the land development permit application. During the meeting, the following information will be reviewed:
 - Runoff Reduction Infeasibility Form to initiate the request and provide basic project information, confirmation that supporting documentation was submitted, and documentation of pre-submittal meeting outcomes.
 - Stormwater Concept Plan that has been developed based on site analysis, and natural resources inventory (including impracticability) in accordance with Section 2.4.2.5 of the GSMM.
- 2) The plan reviewer will evaluate the pre-submittal information on a case-by-case basis; coordinate with the design professional to understand site-specific issues; and (if possible) explore potential design strategies to achieve 100% RRV in compliance with the standards and specifications of the Post-Construction Stormwater Management Ordinance and GSMM.

- 3) Based on the pre-submittal information and meeting, the plan reviewer will provide one of the following determinations to the design professional:
 - Approval – preliminary Determination of Infeasibility issued
 - Approval with conditions – preliminary Determination of Infeasibility issued with conditions to incorporate plan reviewer comments into the Stormwater Concept Plan
 - Denial - revise the Stormwater Concept Plan to obtain 100% RRv
- 4) Design professional may either:
 - Submit the land development application with the Stormwater Management Plan and preliminary Determination of Infeasibility (as applicable).
 - Appeal the “denial” or “conditions” following the appeals process outlined in the local jurisdiction’s regulations.

During Construction

- 1) During the development process, the owner encounters a site condition that would prevent building stormwater BMPs as specified in the Stormwater Management Plan. The design professional will complete a Runoff Reduction Infeasibility Form and initiate a meeting with the local jurisdiction plan reviewer to discuss the findings. The designer must evaluate modifications to the proposed BMPs or installation of alternative BMPs that will provide some or all RRv in an alternative method.
- 2) The plan reviewer will evaluate the Runoff Reduction Infeasibility Form on a case-by-case basis; coordinate with the design professional to understand site-specific issues; and (if possible) explore potential design strategies to keep the stormwater BMPs identified in the Stormwater Management Plan.
- 3) Based on the Runoff Reduction Infeasibility Form and meeting, the plan reviewer will provide one of the following determinations to the design professional:
 - Approval – Determination of Infeasibility is issued and attached to the land development permit
 - Approval with conditions – preliminary Determination of Infeasibility issued with conditions to either:
 - i) Revise the design of runoff reduction methods (e.g. adding soil amendments or an underdrain to maximize runoff reduction volume) to retain the first 1.0 inch of rainfall onsite.
 - ii) Meet the stormwater runoff quality/reduction standard through a combination of Runoff Reduction and Water Quality.
- 4) Design professional may either:
 - Continue construction as outlined modified Stormwater Management Plan under the Permit Revision with approved Determination of Infeasibility.
 - Appeal the “conditions” following the appeals process as outlined in the local jurisdiction regulations.

Determination of Infeasibility Process



Appendix B:

Template for a Runoff Reduction Infeasibility Form

Date (submitted): _____

City of Dunwoody
Runoff Reduction Infeasibility (RRI) Form for
Determination of Infeasibility

Design Professional Primary Contact (Name/Email/Phone): _____

Description of Site/Land Development Application Number: _____

Address: _____

Size (acres): _____

Maximum Practicable Runoff Reduction Volume*: _____

**If any of the stormwater runoff volume generated by the first 1.0" of rainfall cannot be reduced or retained on the site, due to site characteristics or constraints, the remaining volume shall be increased by a multiplier of 1.2 and shall be intercepted and treated in one or more best management practices that provide at least an 80 percent reduction in total suspended solids.*

GENERAL SUPPORTING DOCUMENTATION

All General Supporting Documentation must be included with this RRI Form for the submittal for a Determination of Infeasibility to be considered complete. Please check each item below to confirm it has been included in the submittal package.

- Stormwater Concept Plan that has been developed based on site analysis, and natural resources inventory (including impracticability) in accordance with Section 2.4.2.5 of the GSMM
- GSMM Stormwater Quality Site Development Review Tool for the Stormwater Concept Plan
- Please include justification that the site cannot accommodate best management practices that rely on evapotranspiration and reuse such as rainwater harvesting or green roofs

SITE CONDITION APPLICABILITY

(descriptions are in *Policy on Practicability Analysis for Runoff Reduction*)

Please check each applicable item below and confirm the supporting documentation has been included in the submittal for a Determination of Infeasibility.

| Site Condition | Supporting Documentation |
|---|---|
| <input type="checkbox"/> Soil Infiltration Rate | Infiltration test(s), Soil Boring Log(s), and Report of results as interpreted by a Professional Engineer, Professional Geologist, or Soil Scientist licensed in Georgia |
| <input type="checkbox"/> Water Table | Soil Boring Log(s) and Report with results of the seasonal high-water table assessment as interpreted by a Professional Engineer, Professional Geologist, or Soil Scientist licensed in Georgia |
| <input type="checkbox"/> Bedrock | Soil Boring Log(s) and Report with results of the shallow bedrock assessment as interpreted by a Professional Engineer, Professional Geologist, or Soil Scientist licensed in Georgia |
| <input type="checkbox"/> Extreme Topography | Site survey showing 50% of the site is steeper than 3:1 slopes as interpreted by a Professional Engineer or Land Surveyor licensed in Georgia AND Stormwater Concept Plan showing the proposed post-development condition will not change from the site survey |
| <input type="checkbox"/> Karst Topography | Report developed by a Professional Engineer, Professional Geologist, or Soil Scientist licensed in Georgia |
| <input type="checkbox"/> Hotspots/ Contamination | Phase I Environmental Assessment Report |
| <input type="checkbox"/> Historic Resources | Documentation of the NAHRGIS listing OR Report of assessment from a Preservation Professional (including Archaeologist, Architectural Historian, Historian, Historic Preservationist, or Historic Preservation Planner) |
| <input type="checkbox"/> Site Constraints | Site Plan identifying all development requirements (e.g. zoning side/front setbacks, build-to-lines, stream buffers, floodplains, septic fields) that are creating irreconcilable conflicts with on-site runoff reduction |
| <input type="checkbox"/> Economic Hardship* | An estimated cost comparison of proposed runoff reduction practices compared to the proposed water quality practices must be included to demonstrate an economic hardship and must show the cost of providing runoff reduction is a minimum of three times greater than the cost of providing water quality practices |

* *Note: A Determination of Infeasibility cannot be granted solely for economic hardship and must be present with another site condition. Additionally, a Determination of Infeasibility for economic hardship may only be allowed for up to 50% runoff reduction volume.*

STORMWATER RUNOFF QUALITY/ REDUCTION SUMMARY

Maximum Practicable Runoff Reduction Volume*: _____

Remainder of Volume treated by Water Quality Best Management Practice: _____

**If any of the stormwater runoff volume generated by the first 1.0" of rainfall cannot be reduced or retained on the site, due to site characteristics or constraints, the remaining volume shall be increased by a multiplier of 1.2 and shall be intercepted and treated in one or more best management practices that provide at least an 80 percent reduction in total suspended solids.*

Design Professional Printed Name _____

Design Professional Signature _____

FOR CITY OF DUNWOODY USE ONLY

APPROVED

APPROVED with conditions _____

DENIED _____

Reviewer: _____

(Print Name)

(Signature)

(Date)

APPENDIX D

Runoff Reduction/Feasibility Criteria Timeline

Runoff Reduction Volume (RRv) BMP Selection Guide

(Source: 2016 Georgia Stormwater Management Manual)

SAMPLE – Design Guidance for Bioretention Cell

(Source: 2016 Georgia Stormwater Management Manual)

Runoff Reduction Volume (RR_v) & Feasibility Criteria Timeline

| Year | Regulatory Update | RR _v /Feasibility Criteria Included? | Mandatory Adoption for Georgia Municipalities? |
|---------|---|---|--|
| 1972 | Clean Water Act | No | No |
| 1979-83 | National Urban Runoff Program | No | No |
| 1990 | Municipal SW Permits Issued (Large Communities) | No | Yes |
| 1999 | Municipal SW Permits Issued (Small Communities) | No | Yes |
| 2001 | Georgia Stormwater Management Manual 1st Edition | No | Yes |
| 2007 | Metro North Georgia Water Planning District (MNGWPD) Model Post Development Ordinance 1st Edition | No | Yes |
| 2008 | Center for Watershed Protection Technical Memo 1st Edition | Yes | No |
| 2009 | Georgia Stormwater Management Manual Coastal Supplement | Yes | No |
| 2013 | City of Atlanta updates Stormwater Ordinances | Yes | No |
| 2016 | Georgia Stormwater Management Manual 2nd Edition | Yes | No |
| 2017 | 2017-2022 NPDES Phase II Permit goes into effect | Yes | Yes |
| 2019 | MNGWPD Model Post Development Ordinance 2nd Edition | Yes | Yes |
| 2020 | Feasibility Policy for Runoff Reduction (approved by MNGWPD, EPA/EPD, and local stakeholder groups) | Yes | Yes |

Runoff Reduction Volume (RR_v) BMP Selection Guide

(source: 2016 Georgia Stormwater Management Manual)

Table 4.1.3-2 BMP Runoff Reduction Credits

| BMP | Runoff Reduction RR (%) * | BMP | Runoff Reduction RR (%) * |
|---|------------------------------|--|------------------------------|
| Bioretention Area (w/o underdrain) ¹ | 100% | Permeable Paver System (w/underdrain) ¹ | 50% |
| Bioretention Area (w/upturned underdrain) ¹ | 75% | Pervious Concrete (w/o underdrain) ¹ | 100% |
| Bioretention Area (w/underdrain) ¹ | 50% | Pervious Concrete (w/upturned underdrain) ¹ | 75% |
| Bioslopes (A & B hydrologic soils) ¹ | 50% | Pervious Concrete (w/underdrain) ¹ | 50% |
| Bioslopes (C & D hydrologic soils) ¹ | 25% | Porous Asphalt (w/o underdrain) ¹ | 100% |
| Downspout Disconnects (A & B hydrologic soils) ² | 50% | Porous Asphalt (w/upturned underdrain) ¹ | 75% |
| Downspout Disconnects (C & D hydrologic soils) ¹ | 25% | Porous Asphalt (w/underdrain) ¹ | 50% |
| Dry Detention Basins | 0% | Porous Asphalt (OGFC, PEM) ³ | 0% |
| Dry Extended Detention Basins | 0% | Proprietary Systems ³ | Varies |
| Dry Wells 1 | 100% | Rainwater Harvesting ³ | Based on Demand |
| Enhanced Dry Swales (w/underdrain) ¹ | 50% | Regenerative Stormwater Conveyance | 0% |
| Enhanced Dry Swales (w/o underdrain) ¹ | 100% | Sand Filters ² | 0% |
| Enhanced Wet Swales ² | 0% | Site Reforestation/Revegetation ¹ | 0% |
| Grass Channels (A & B hydrologic soils) ² | 25% | Soil Restoration (Can be used to remediate C & D Soils) ¹ | 0% |
| Grass Channels (C & D hydrologic soils) ¹ | 10% | Stormwater Planters / Tree Boxes ¹ | 50% |
| Gravity (oil-grit) Separators ¹ | 0% | Stormwater Ponds ² | 0% |
| Green Roofs ¹ | 60% | Stormwater Wetlands – Level 1 ² | 0% |
| Infiltration Trenches ¹ | 100% | Stormwater Wetlands – Level 2 ² | 0% |
| Multi-Purpose Detention Basins | 0% | Submerged Gravel Wetlands ² | 0% |
| Organic Filters ² | 0% | Underground Detention (Not including infiltration) ² | 0% |
| Permeable Paver System (w/o underdrain) ¹ | 100% | Vegetated Filter Strips (A & B hydrologic soils) ² | 50% |
| Permeable Paver System (w/upturned underdrain) ¹ | 75% | Vegetated Filter Strips (C & D hydrologic soils) ¹ | 25% |

BMP pollutant removal rates and other BMP specific design criteria are listed in Table 4.1.3-1 (BMP Selection Guide)

* Runoff reduction percentages listed are maximum allowable credit values. These values, similar to other pollutant removal rates, are based on the performance and operating efficiency of the BMP.

¹Runoff reduction percent removals are based on values from the former Georgia Stormwater Management Manual's Coastal Stormwater Supplement, 2009.

²Runoff reduction percent removals are based on values from the Center for Watershed Protection, 2008.

³Runoff reduction percent removals are not available

Design Guidance for Bioretention Cell

(Source: 2016 Georgia Stormwater Management Manual)

4.2 Bioretention Areas



Description: Shallow stormwater basin or landscaped area that utilizes engineered soils or native, well-draining soil and vegetation to capture and treat runoff.

LID/GI Consideration: Low land requirement, adaptable to many situations, and often a small BMP used to treat runoff close to the source.

! KEY CONSIDERATIONS

DESIGN CRITERIA

- Maximum contributing drainage area of 5 acres
- Treatment area consists of ponding area, organic/mulch layer, planting media, and vegetation
- Requires landscaping plan
- Standing water has a maximum drain time of 24 hours
- Pretreatment recommended to prevent clogging of underdrains or native soil
- Ponding depth should be a maximum of 12 inches, preferably 9 inches

ADVANTAGES / BENEFITS

- Applicable to small drainage areas
- Effective pollutant removals
- Appropriate for small areas with high impervious cover, particularly parking lots
- Natural integration into landscaping for urban landscape enhancement
- Good retrofit capability
- Can be planned as an aesthetic feature and meet local planting requirements

DISADVANTAGES / LIMITATIONS

- Requires landscaping
- Not recommended for areas with steep slopes
- Medium to high capital cost
- Medium cost maintenance burden
- Soils may clog over time (may require cleaning or replacing)

MAINTENANCE REQUIREMENTS

- Inspect and repair or replace treatment area components such as mulch, plants, and scour protection, as needed
- Ensure bioretention area is draining properly so it does not become a breeding ground for mosquitos
- Remove trash and debris
- Ensure mulch is 3-4 inches thick in the practice
- Requires plant maintenance plan

POLLUTANT REMOVAL

- 85% Total Suspended Solids
- 95% Metals - Cadmium, Copper, Lead, and Zinc removal
- 80/60% Nutrients - Total Phosphorus / Total Nitrogen removal
- 90% Pathogens – Fecal Coliform

STORMWATER MANAGEMENT SUITABILITY

- ✓ Runoff Reduction
- ✓ Water Quality
- ★ Channel Protection
- ★ Overbank Flood Protection
- ★ Extreme Flood Protection
- ✓ suitable for this practice
- ★ may provide partial benefits

IMPLEMENTATION CONSIDERATIONS

- L Land Requirement
 - M/H Capital Cost
 - M Maintenance Burden
- Residential Subdivision Use: Yes
 High Density/Ultra-Urban: Yes
 Roadway Projects: Yes
- Soils: *Engineered soil media is composed of sand, fines, and organic matter*
- Other Considerations: Use of native plants is recommended
- L=Low M=Moderate H=High

RUNOFF REDUCTION CREDIT

- 100% of the runoff reduction volume provided (no underdrain)
- 75% of the runoff reduction volume provided (upturned underdrain system)
- 50% of the runoff reduction volume provided (underdrain)

4.2.1 General Description

Bioretention areas are structural stormwater controls that capture and infiltrate, or at least temporarily store the water quality volume (WQ_v) using soils and vegetation in shallow basins or landscaped areas.

Bioretention areas are engineered controls that convey runoff to the "treatment area," which consists of a ponding area, organic or mulch layer, planting soil, and vegetation. If the native soils are adequate, the captured stormwater runoff will infiltrate into the surrounding soils. If not, the filtered runoff is typically collected and returned to the conveyance system, through an underdrain system. Bioretention areas slightly differ from rain gardens in that they are an engineered structure that has a larger drainage area and may include an underdrain. For additional information of designing a Rain Garden in a residential lot, see the following website: <https://www.atlantawatershed.org/greeninfrastructure/atlanta-residential-gi-nov-2012022013/>

There are numerous design applications for bioretention areas including along highway and roadway drainage swales, within larger landscaped pervious areas, and as landscaped islands in impervious or high-density environments. A variety of bioretention areas are shown **Figure 4.2-1 through Figure 4.2-4.**



Left: **Figure 4.2-1** Landscaped Bioretention Area



Middle Left: **Figure 4.2-2** Landscaped Island

Bottom: **Figure 4.2-3** Bioretention Area near Parking Lot

Middle Right: **Figure 4.2-4** Bioretention Area after Storm



4.2.2 Stormwater Management Suitability

Bioretention areas can be designed for water quantity and quality, i.e. the removal of stormwater pollutants, depending upon the native soils. Bioretention areas can provide runoff quantity control, particularly for smaller runoff volumes such as those generated by the water quality storm event (1.2 inches). These facilities may sometimes be used to partially or completely meet channel protection requirements on smaller sites. However, bioretention areas will typically need to be used in conjunction with another control to provide channel protection, as well as overbank flood protection. Bioretention areas need to be designed and maintained to safely bypass higher flows.

- **Runoff Reduction**

Bioretention areas are one of the most effective low impact development (LID) practices that can be used in Georgia to reduce post-construction stormwater runoff and improve stormwater runoff quality. Like other LID practices, they become even more effective with a higher infiltration rate of native soils. A bioretention area, with no underdrain, can be designed to provide 100% of the runoff reduction volume, if properly maintained. In order to provide runoff reduction for a bioretention area that is designed without an underdrain, a soils test or other reliable resource must indicate that the ponding area of the bioretention area will drain within 24 hours and entire bioretention area will drain

within 72 hours. A bioretention area can be designed with an upturned underdrain to provide 75% of the runoff reduction volume, if properly maintained. An upturned underdrain is recommended in decent subsoils due to the clogging potential created during construction. Finally a bioretention area can be designed with an underdrain to provide 50% of the runoff reduction volume, if properly maintained.

- **Water Quality**

A bioretention area is an excellent stormwater treatment practice due to its variety of pollutant removal mechanisms. Each of the components of the bioretention area is designed to perform a specific function. The grass filter strip (or grass channel) pre-treatment component reduces incoming runoff velocity and filters particulates from the runoff. The ponding area provides for temporary storage of stormwater runoff prior to its evaporation, infiltration, or uptake and provides additional settling capacity. The organic or mulch layer provides filtration as well as an environment conducive to the growth of microorganisms that degrade hydrocarbons and organic material. The planting soil in the bioretention area acts as a filtration system, and clay in the soil provides adsorption sites for hydrocarbons, heavy metals, nutrients and other pollutants. Both woody and herbaceous plants in the ponding area provide vegetative uptake of runoff and pollutants and also serve to stabilize surrounding soils.

- **Channel Protection**

For smaller sites, a bioretention area may be designed to capture the entire channel protection volume (CP_v). Given that a bioretention area facility is typically designed to completely drain over 48-72 hours, the requirement of extended detention for the 1-year, 24-hour storm runoff volume will be met. For larger sites, or where only the WQ_v is diverted to the bioretention area, another control must be used to provide CP_v extended detention.

- **Overbank Flood Protection**

Another control in conjunction with a bioretention area will likely be required to reduce the post-development peak flow of the 25-year storm (Q_p) to pre-development levels (detention).

- **Extreme Flood Protection**

Bioretention areas must provide flow diversion and/or be designed to safely pass extreme storm flows and protect the ponding area, mulch layer and vegetation.

Credit for the volume of runoff reduced in the bioretention area may be taken in the overbank flood protection and extreme flood protection calculations. If the practice is designed to provide Runoff Reduction for Water Quality compliance, then the practice is given credit for Channel Protection and Flood Control requirements by allowing the designer to compute an Adjusted CN (see [Subsection 3.1.7.5](#) for more information).

4.2.3 Pollutant Removal Capabilities

Bioretention areas are presumed to be able to remove 85% of the total suspended solids (TSS) load in typical urban post-development runoff when sized, designed, constructed, and maintained in accordance with the recommended specifications. Other pollutants bioretention areas can remove include Phosphorus, Nitrogen, metals (such as Cadmium, Copper, Lead, and Zinc), and Pathogens (such as Fecal Coliform). A bioretention area that is undersized, poorly designed, or maintained improperly can have reduced pollutant removal performance. Proper design of the bioretention area is critical to ensure that pollutants can be properly removed from stormwater that drains into the ground or storm sewer system. Proper designs improve the quality of our environment. One of the benefits of using an Upturned Underdrain (see **Figure 4.2-6**) is that this particular type of design will increase the removal of nitrogen in the soil.

For additional information and data on pollutant removal capabilities for bioretention areas, see the National Pollutant Removal Performance Database (3rd Edition) available at www.cwp.org and the National Stormwater Best Management Practices (BMP) Database at www.bmpdatabase.org.

4.2.4 Application and Site Feasibility Criteria

Bioretention areas are suitable for many types of development, from single-family residential to high-density commercial projects. Because of its ability to be incorporated in landscaped areas, the use of bioretention areas is extremely flexible whether they are placed along roadways or in areas undergoing development or re-development. Bioretention areas are an ideal stormwater control for use as roadway median strips and parking lot islands and are also good candidates for the treatment of runoff from pervious areas, such as a golf course. Bioretention areas can also be used to retrofit existing development with stormwater quantity and quality treatment capacity. Curbs are not required for this type of practice.

Because of the many design constraints including limited ponding depths and inlet velocities, bioretention areas generally have a maximum drainage area of 5 acres or less. The size of the bioretention area is generally 3-6% of the contributing drainage area but varies significantly depending on each component of the bioretention area's ability to capture and infiltrate stormwater runoff and the percent imperviousness of the drainage area.

The following criteria should be evaluated to ensure the suitability of a bioretention area for meeting stormwater management objectives on a site or development.

General Feasibility

- Suitable for Residential Subdivision Usage – YES
- Suitable for High Density/Ultra Urban Areas – YES
- Regional Stormwater Control – NO

Physical Feasibility - Physical Constraints at Project Site

- **Drainage Area** – 5 acres or less. If the drainage area is greater than 5 acres, the drainage area can be divided up into multiple areas with each drainage area having a bioretention area.
- **Space Required** – Rough rule of thumb of 3-6% of the contributing drainage area
- **Site Slope** – Slopes should be a maximum of 20%, 5% preferred
- **Minimum Depth to Water Table** – A separation distance of 2 feet is recommended between the bottom of the bioretention area and the elevation of the seasonally high water table.
- **Soils** – Native soils if they have at least 0.5 inch/hr infiltration ability. Otherwise engineered media is needed including coarse sand, silt, clay, and other organic matter. The recommended standard media depth is 36 inches, with a minimum depth of 18 inches and a maximum depth of 48 inches. A qualified, licensed professional should test the soils to determine the best depth of soil for the practice.

Other Constraints / Considerations

- **Hot spots** – Do not use for hot spot runoff.
- **Damage to existing structures and facilities** – Consideration should be given to the impact of water exfiltrating the bioretention areas on nearby road bases.
- **Proximity** – The following is a list of specific setback requirements for the location of a bioretention area:
 - » 10 feet from building foundations
 - » 100 feet from private water supply wells
 - » 200 feet from public water supply reservoirs (measured from edge of water)
 - » 1,200 feet from public water supply wells
- **Trout Stream** – Evaluate for stream warming when an underdrain system is used.

In addition, careful consideration should be given to the potential of perched or raised groundwater levels. Provide adequate distance from building foundations or use impermeable liner on side of excavated area nearest to structure.

Challenges and Potential Solutions for Coastal Areas

- **Poorly Drained Soils**—This condition minimizes the ability of bioretention areas to reduce stormwater runoff rates and volumes. One solution would be to include an underdrain system. An alternative would be to use a small stormwater wetlands or wet swales to intercept and treat stormwater runoff.

- **Flat Terrain**—May be difficult to provide adequate drainage so multiple smaller bioretention areas may be needed.
- **Shallow Water Table**—This can prevent the provision of 2 feet of clearance between the bottom of the bioretention area and the top of the water table which may cause stormwater runoff to pond in the bioretention area. Possible solutions are to minimize the depth of the planting media, or consider using stormwater ponds, wetlands, or wet swales to intercept and treat stormwater runoff.
- **Karst topography**—This condition usually warrants the use of an underdrain or impermeable liner to avoid infiltration into karst subsoils.

4.2.5 Planning and Design Criteria

Before designing the bioretention area, the following data is necessary:

- Existing and proposed site, topographic and location maps, and field reviews.
- Impervious and pervious areas. Other means may be used to determine the land use data.
- Roadway and drainage profiles, cross sections, utility plans, and soil report for the site.
- Design data from nearby storm sewer structures.
- Water surface elevation of nearby water systems as well as the depth to seasonally high groundwater.

- Infiltration testing of native soils at proposed elevation of bottom of bioretention area.

The following criteria are to be considered minimum standards for the design of a bioretention area. Consult with the local review authority to determine if there are any variations to these criteria or additional standards that must be met.

4.2.5.1 LOCATION AND LAYOUT

Bioretention areas vary based on site constraints such as proposed and existing infrastructure, soils, existing vegetation, contributing drainage area, and utilities. Bioretention area systems are designed for intermittent flow and must be allowed to drain and reaerate between rainfall events. They should not be used on sites with a continuous flow from groundwater, sump pumps, or other sources. Bioretention area locations should be integrated into the site planning process and aesthetic and maintenance considerations should be taken into account in their siting and design. Elevations must be carefully worked out to ensure that the desired runoff flow enters the facility with no more than the maximum design depth and velocity.

4.2.5.2 GENERAL DESIGN

- A bioretention area consists of the following:
 1. A pretreatment area, usually consisting of a grass filter strip between the contributing drainage area and the ponding area or a forebay to ease maintenance of the mulch, sand, or soil layers.
 2. Ponding area containing vegetation with an engineered planting media.
 3. Organic/mulch layer to protect planting media.
 4. Native soils to infiltrate the treated runoff, (see description of infiltration trenches, [Section 4.12](#), for infiltration criteria).
 5. Where native soils have low infiltration rates include gravel and perforated pipe underdrain system to collect runoff that has filtered through the soil layers and pipe it to the storm sewer system. An upturned underdrain system can be used, however, the system should be 12-18" below the bottom of the planted area to reduce saturated conditions in root zone.
 6. Overflow, diversion or bypass structure to safely route larger storms through or around the bioretention area.
- A bioretention area design may include some of the following:
 - » Optional level spreader to spread and filter runoff.
 - » For curbed pavements use an inlet deflector to direct flow into the practice.
 - » A splash/erosion prevention pad at the inlet to the practice.

See **Figure 4.2-5** and **Figure 4.2-6** for an overview of the various components of a bioretention area.

4.2.5.3 PHYSICAL SPECIFICATIONS/GEOMETRY

- Recommended minimum dimensions of a bioretention area are 3-6% of the total drainage area, though modeling is recommended to accurately size the area.
- The maximum recommended ponding depth of the bioretention areas is 12 inches.
- A grass filter strip or channel can be used for pretreatment. The length of the grass channel or width of the grass filter strip depends on the drainage area, land use, and channel slope. Design guidance on grass channels for pretreatment can be found in [Section 4.9](#) (Grass Channel) and filter strips can be found in [Section 4.29](#) (*Vegetated Filter Strip*). A pea gravel diaphragm flow spreader can also be used.
- The mulch layer should consist of 3 to 4 inches of triple-shredded hardwood mulch. This provides additional benefits such as removing sediment and metals and retaining soil moisture.
- If the native soils cannot suffice for the planting media used within the bioretention area planting beds, then an engineered soil mix should be provided that meets the following specifications:
 - » **Texture:** Sandy loam or loamy sand
 - » **Sand Content:** Soils should contain 35%-60% clean, washed sand

- » **Topsoil Content:** Soils should contain 20%-30% topsoil
- » **Organic Matter Content:** Soils should contain 10%-25% organic matter
- » **Clay:** Soils should contain less than 15%
- » **Infiltration Rate:** Soils should have an infiltration rate of at least 0.50 inches per hour (in/hr), although an infiltration rate of between 2 and 4 in/hr is preferred
- » **Phosphorus Index (P-Index):** Soils should have a P-Index of less than 30
- » **Exchange Capacity (CEC):** Soils should have a CEC that exceeds 10 milliequivalents (meq) per 100 grams of dry weight
- » **pH:** Soils should have a pH of 6-8

For additional information on the soils for a Bio-retention Area, refer to [Appendix D](#).

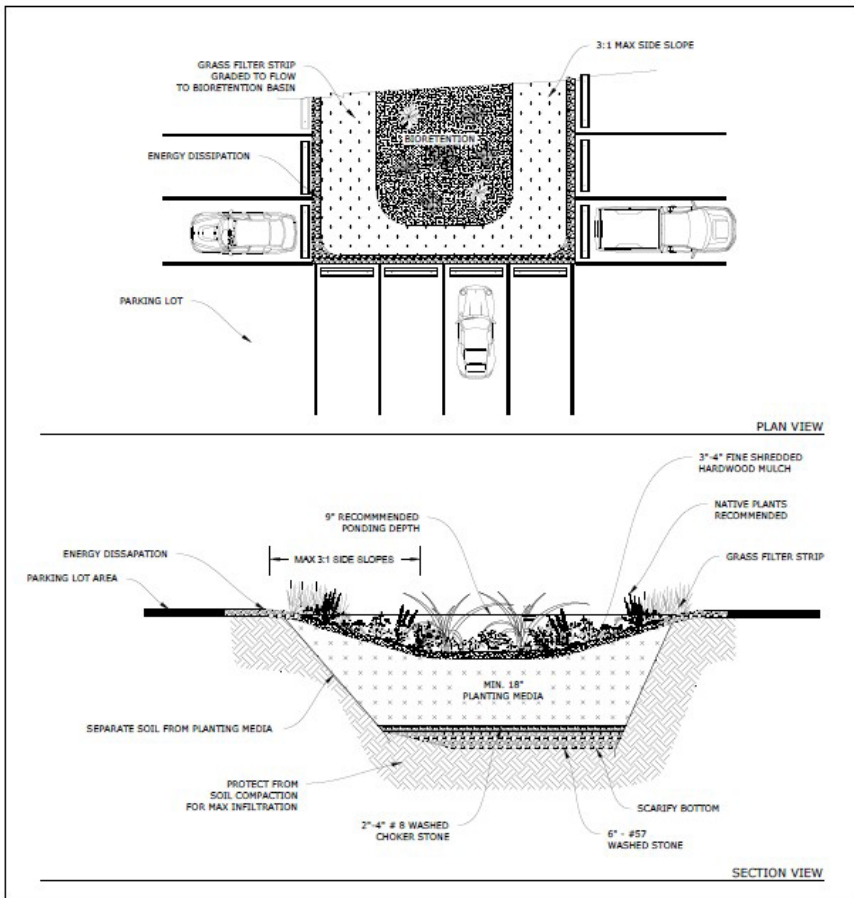


Figure 4.2.-5 Schematic of Typical Bioretention Area Without an Underdrain (Source: AECOM 2015)

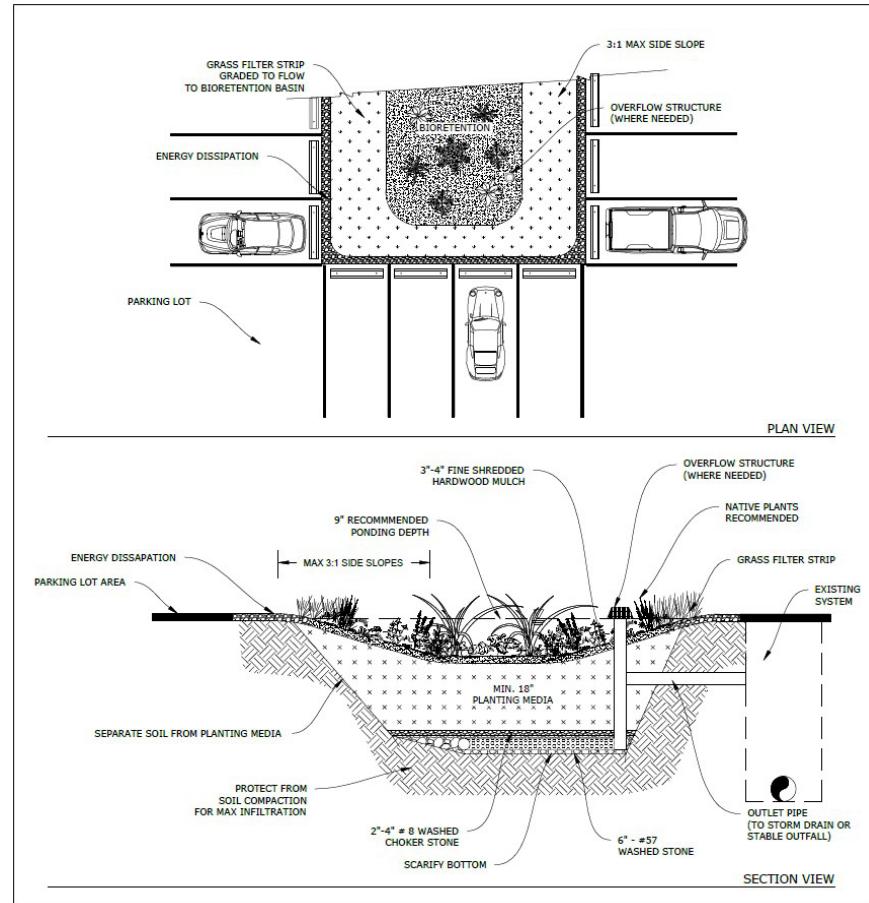


Figure 4.2.-6 Schematic of a Typical Bioretention Area with an Uprturned Underdrain (Source: AECOM, 2015)

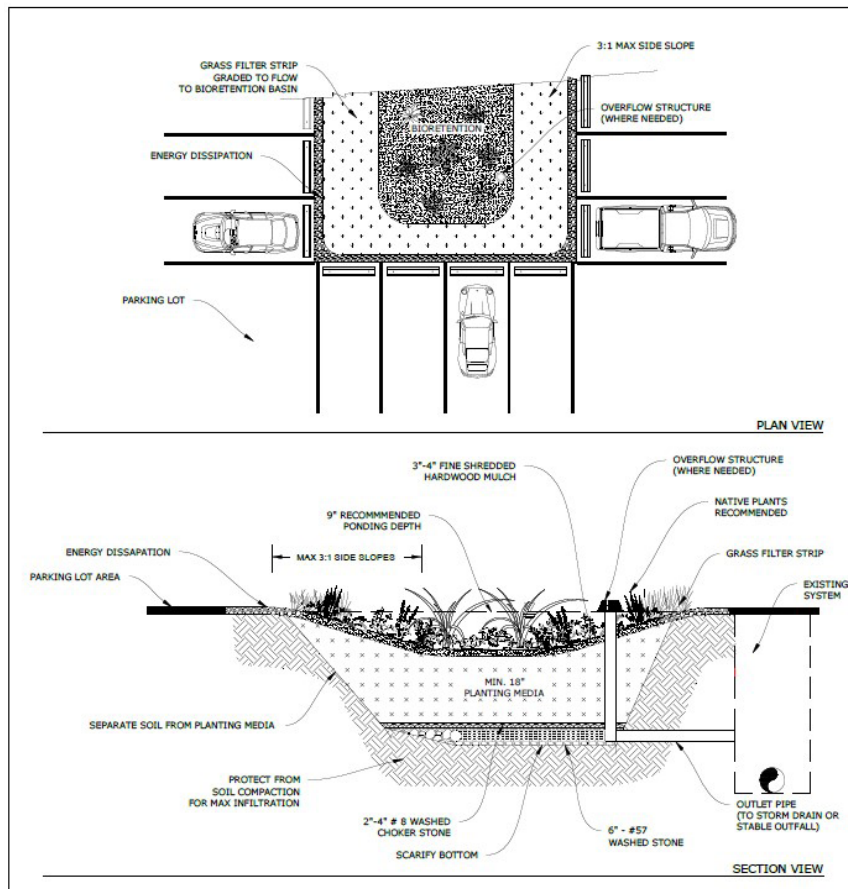


Figure 4.2-7 Schematic of a Typical Bioretention Area with Underdrain
(Source: AECOM, 2015)

It is recommended that the underdrain collection system, to monitor the internal water levels, should be equipped with a 4-6-inch perforated PVC pipe (AASHTO M 252) in an 8-inch gravel layer. The pipe should have 3/8-inch perforations, spaced at a minimum of 6-inch centers, with a minimum of 4 holes per row. The pipe is spaced at a maximum of 10 feet on center and a minimum grade of 0.5% must be maintained. Should the size of the pipe need to be bigger, a qualified licensed professional should model the area to ensure the size of the pipe is sufficient. It is recommended to separate the stone and the soil in the practice. This can be done by placing a permeable geotextile fabric between the gravel layer and the planting media. Alternatively, a stone choker layer 2-3 inches deep of #89 stone could be used to separate the practice from the soil. It is recommended that a qualified licensed professional be consulted to determine how this should be done based on the native soils and other physical properties around the practice.

4.2.5.4 PRETREATMENT/INLETS

- Adequate pretreatment is provided when a forebay, grass filter strip, or grass channel is provided.
- Inlet protection should be designed to reduce the velocity and energy of stormwater entering the practice and prevent scour of the mulch and plantings. Inlet protection may include splash blocks, a stone diaphragm, a level spreader or another similar device.

4.2.5.5 OUTLET STRUCTURES

- Outlet structures should be included in the design of a bioretention area configuration to ensure that larger storms can be bypassed without damaging the practice. Exceptions include small bioretention areas with flow bypass structures. Outlet configurations can include riser boxes and/or emergency spillway channels.

4.2.5.6 SAFETY FEATURES

- Bioretention areas generally do not require any special safety features, provided side slopes are maintained at 3:1 or flatter. Fencing of bioretention area facilities is not generally desired.

4.2.5.7 LANDSCAPING

- Landscaping is critical to the performance and function of bioretention areas; the vegetation filters and transpires runoff and the root systems encourage infiltration.
- Vegetation should be selected to match the look and maintenance effort desired by locals and those responsible for maintaining the facility.
- The bioretention area should be vegetated to resemble a terrestrial forest ecosystem, with a mature tree canopy, subcanopy of understory trees, shrub layer, and herbaceous ground cover. Three species each of trees, shrubs, and grass/herbaceous species should be planted to avoid creating a monoculture. When determining what trees should be planted in the bioretention area, remember that tree leaves can clog the bioretention area. Consider using trees that only drop their leaves once in the fall.
- Woody vegetation should not be specified at inflow locations.
- Plants should be installed prior to mulch.

- Choose plants based on factors such as whether they are native or not, resistance to drought and inundation, cost, aesthetics, maintenance, etc. Planting recommendations for bioretention area facilities are as follows:
 - » Native plant species should be preferred over non-native species.
 - » Vegetation should be selected based on a specified zone of hydric tolerance.
 - » A selection of trees with an understory of shrubs and herbaceous materials should be provided.
- Additional information and guidance on the appropriate woody and herbaceous species appropriate for bioretention areas in Georgia, and their planting and establishment, can be found in [Appendix D](#).

4.2.5.8 CONSTRUCTION CONSIDERATIONS

- Construction equipment should be restricted from the bioretention area to prevent compaction of the native soils.
- A dense and vigorous vegetative cover should be established over the contributing pervious drainage areas before runoff can be accepted into the facility. Otherwise the sediment from the stormwater runoff will clog the pores in the planting media and native soils.

4.2.5.9 CONSTRUCTION AND MAINTENANCE COSTS

- A budget level construction cost estimate is between \$3.00 and \$10.00 per square foot.
- A budget level maintenance cost estimate is between \$1.50 and \$3.50 per square foot annually.