

ORIGINAL  
STAMPED IN RED

**ORDINANCE NO.: 2014-040**

*Authorizing the City Manager to execute a Fifth Amendment to Purchase Agreement between the City of Columbia and Bright-Meyers 2001 LLC for the sale of 5.97 +/- acres (Capital City Stadium), Richland County TMS #11204-02-02*

BE IT ORDAINED by the Mayor and City Council this 20th day of May, 2014, that the City Manager is authorized to execute the attached Fifth Amendment to Purchase Agreement, or on a form approved by the City Attorney, between the City of Columbia and Bright-Meyers 2001 LLC for the sale of 5.97 acres +/- (Capital City Stadium), Richland County TMS #11204-02-02.

Requested by:

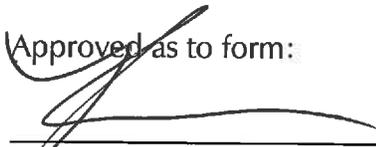
Assistant City Manager Gentry

  
\_\_\_\_\_  
Mayor

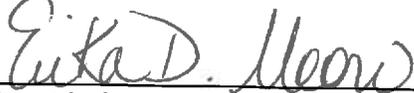
Approved by:

  
\_\_\_\_\_  
City Manager

Approved as to form:

  
\_\_\_\_\_  
City Attorney

ATTEST:

  
\_\_\_\_\_  
City Clerk

Introduced: deferred 4/29/2014; 5/6/2014  
Final Reading: 5/20/2014

## FIFTH AMENDMENT TO PURCHASE AGREEMENT

This Fifth Amendment to Purchase Agreement entered into this \_\_\_ day of \_\_\_\_\_, 2014, by and between The City of Columbia, hereinafter referred to as "Seller", and Bright-Meyers 2001 LLC, hereinafter referred to as "Purchaser".

### WITNESSETH:

WHEREAS, Seller and Purchaser have entered into a Purchase Agreement ("Agreement") dated August 27, 2012 ("Agreement"), which gives Purchaser the exclusive right to purchase the property described in the Agreement under the terms and conditions of the Agreement; and,

WHEREAS, the Seller and Purchaser previously amended the Purchase Agreement; and,

WHEREAS, Seller and Purchaser mutually desire to further modify and amend said Agreement; NOW, THEREFORE

IT IS HEREBY AGREED, for and in consideration of the sum of an additional Two Hundred Thousand and NO/100 (\$200,000.00) DOLLARS as earnest money, the receipt and sufficiency of which is hereby acknowledged, the Agreement is hereby amended as follows:

Paragraph 2(a) is hereby amended to allow for One Hundred Thousand and NO/100 (\$100,000.00) Dollars of the Earnest Money to be refundable to Buyer in the event Buyer terminates this contract for any reason before May 20, 2015. The remaining Earnest Money of One Hundred and Twenty-Nine Thousand and NO/100 (\$129,000.00) Dollars is refundable as set forth in paragraph 21 Contingencies. Notwithstanding the prior provision providing for a refund of a portion of the Earnest Money prior to May 20, 2015 for any reason, all earnest money paid herewith (\$229,000.00) shall be non-refundable in the event the Buyer fails to close by the later of May 30, 2015 or within 30 days of issuance of the last required final permit necessary to construct the proposed development. In that event the prior provision providing for a refund of the Earnest Money for any reason prior to May 20, 2015 shall be null and void and of no legal effect.

Paragraph 2(b) is hereby amended to read: Upon delivery of the deed, Buyer shall pay to Seller Seven Hundred and Seventy-One Thousand and NO/100 (\$771,000.00) Dollars by cashier's check or certified check.

Paragraph 14 is hereby amended to allow for the closing date to take place not later than May 30, 2015.

Paragraph 21 is hereby amended to read:

CONTINGENCIES. This contract is contingent upon the following:

(a) The property shown in Exhibit F must be annexed into the City of Columbia and have a zoning classification that permits the intended use. If such zoning is not currently in place, Buyer shall be permitted to take steps necessary to rezone the property to such a designation. Seller agrees to cooperate with the rezoning at no cost to the seller.

(b) Buyer must be able to place the adjacent property owned by SCE&G under contract. Buyer agrees to make its best effort to place said property under contract.

(c) Buyer must be able to obtain acceptable title insurance.

(d) Buyer must be able to obtain from the City or any other permitting entity, the permits and/or waivers necessary to construct the proposed development and improvements within Rocky Branch and its impoundments necessary to reduce flooding.

(e) Buyer must meet the following milestone dates, which commence at the execution of this amendment, if any of these milestones are not achieved, One Hundred and Twenty-Nine Thousand and NO/100 (\$129,000.00) Dollars of the Earnest Money is forfeited by the Buyer:

1. Within 30 days deliver Phase I and II environmental report, boundary and topographic survey, geotechnical report, and grading plan;
2. Within 45 days deliver flood modeling;
3. Within 90 days make application to the Army Corps of Engineers for wetlands permitting, complete flood study and have LOMAR application to the City of Columbia, and complete downstream design work for the railroad embankment and bridge under Olympia;
4. Within nine (9) months deliver complete civil engineering for permitting.

Buyer must deliver to the Seller a document certifying that these contingencies have been satisfied or this contract shall terminate should the Buyer fail to deliver such certifying document. In that event, Seller shall refund any remaining Earnest Money to Buyer and the parties shall have no further obligations to each other.

Paragraph 24 is hereby amended to delete the following section:

The Seller shall fund Five Hundred Thousand and No/100 (\$500,000.00) Dollars for additional improvements to Rocky Branch from Assembly Street to the Congaree River. These funds shall be used to reduce flooding, rehabilitate and improve stream and stream bank conditions, as well as, improve water quality. The Buyer, Seller, and hired engineers and consultants shall decide how to best use these funds. The Seller shall assist Buyer with acquiring any easements that may be required and to use its best efforts obtain Richland County's participation and cooperation in making improvements to Rocky Branch.

Exhibits B and E are replaced with amended Exhibits dated April 24, 2014.

Except as modified and amended hereby, all the terms, covenants and conditions of said Purchase Agreement shall continue and remain in full force and effect.

IN WITNESS WHEREOF, the parties have caused this Fifth Amendment to Purchase Agreement to be executed this day and year first above written.

WITNESSES:

*Ashley R. Spalens*  
*B. M. Daniels*

SELLER: CITY OF COLUMBIA

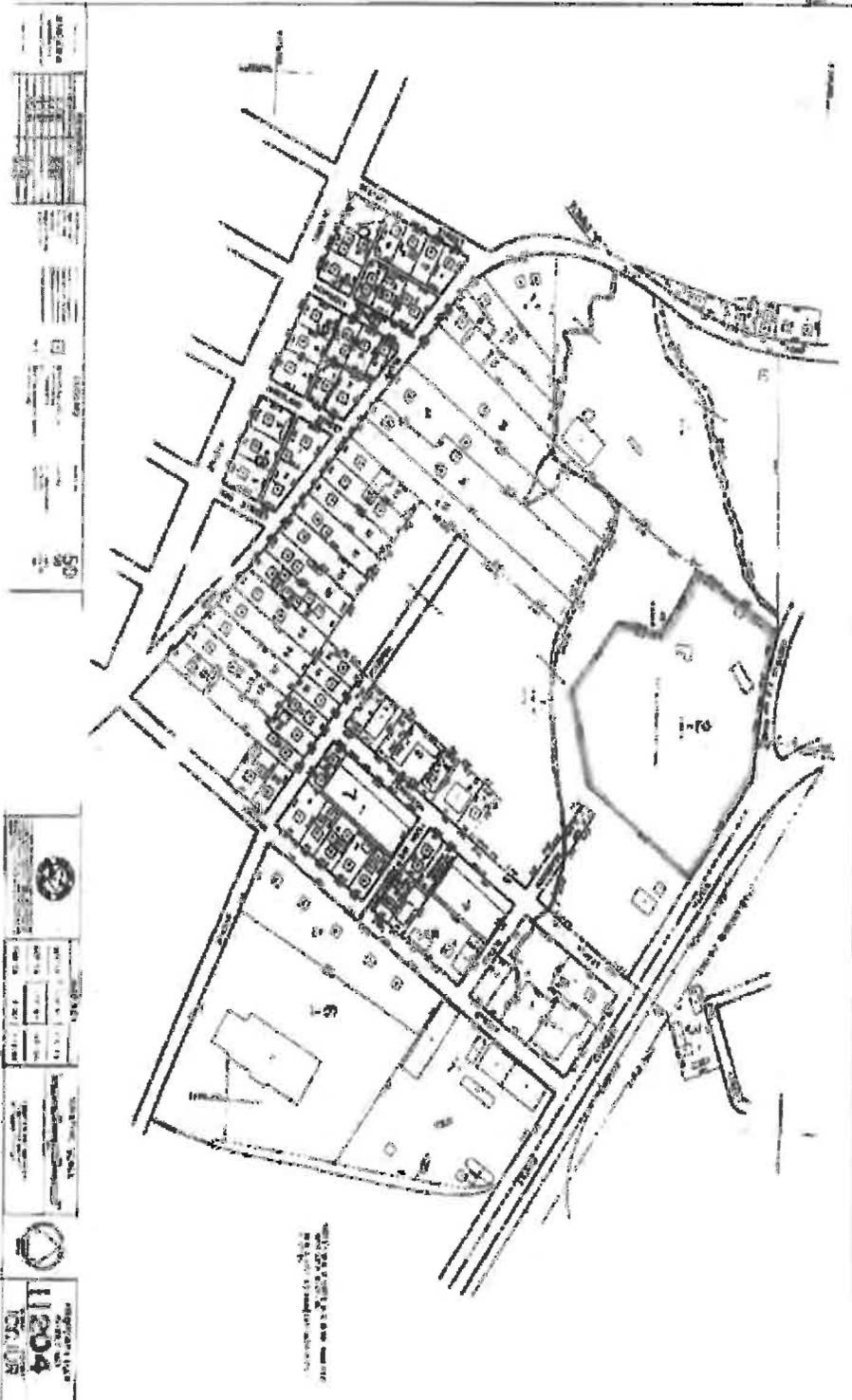
BY: *Teresa B. Wilson*  
 Teresa B. Wilson  
 ITS: City Manager

PURCHASER: BRIGHT-MEYERS 2001 LLC

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

EXHIBIT "A" - PLAT OF PROPERTY



LR 7/27/2012  
12010079 x-ref 11071112

I. Introduction

A. Intent. The intent of these guidelines is to provide for a coordinated development with regard to site planning, architecture, building materials, landscaping, and associated improvements. In addition, the intent of these guidelines is too provide for a pedestrian friendly and multi modal development that allows for connectivity to the city and surrounding neighborhoods through pedestrian, cycling, and vehicular access. These guidelines also address environmental planning. These guidelines have been developed with the concept that the uses and buildings will consist of an anchor tenant of 100,000SF to 115,000SF, medium commercial development (0 0 to 40,000 sf), inline retail ), a fueling center, and mixed use residential development with associated site amenities.

B. Review. Review of site, building and overall design of the project shall occur by a committee of city staff consisting of the Director of Planning and Development Services, Planning Administrator, and the City Storm Water Manager.

C. Interpretation. At times, the guidelines of this document may require interpretation or variation due to unforeseen site conditions. The interpretation of the guidelines shall be made by the Planning Administrator, and confirmed by the review committee. The committee may consult with various professionals beyond the committee for expert advice.

D. Appeal. If for any reason there is an issue which can not be resolved between the review team and the developer, project engineer, architect, etc. Than the issue shall be forwarded to the City Managers office by either party for a formal decision from the City Manager after hearing each groups concern.

E. As noted in item A. above the uses anticipated for the development have been commercial and residential, creating mixed use development. It is possible through existing zoning or future rezoning that other development types, uses, typologies, massing, densities, could be considered for the project. These uses could consist of manufacturing, warehousing, and/or office. In addition, approvals such as rezoning, special exceptions, etc. additional uses such as residential, office, drive-thru facilities, day cares, etc. could potentially occur. When these additional uses, building typologies, building forms, building massing, building materials, etc. are considered then additional standards shall be required. These additional standards shall be developed by all parties and mutually agreed upon, such additional standards shall meet the intent listed in I. A. and Aesthetic Character listed in II. A. of these guidelines.

II. Aesthetic Character

A. Architectural Style: The context, form, layout and design features of the development shall consider urban forms as well as mill structures, and mill villages. Consideration of context shall be considered in relationship to architectural detailing, and materials. Standard suburban and/or marketing/branding Architecture and site design is not acceptable. The entire development shall be designed as unified whole.

- B. Exterior Walls and Facades – Large Retail Stores Exceeding 40,000 SF.**
- 1. Primary facades of structures shall be substantially similar to Attachments 1 of this document as well as local architectural context.**
  - 2. Primary facades (facades with the main entrance or facing entry/ access roads) shall incorporate wall plane projection or recess, windows or other architectural detailing. . No uninterrupted length of any façade shall exceed 50 horizontal feet.**
  - 3. Primary facades shall have arcades, display windows, entry areas, awnings, pergolas, projecting canopies, or other such feature at a rhythm similar to Attachments 1 of this documents.**
  - 4. Side and rear facades.**
    - a) Side and rear facades when planned to be screened by on site landscaping from adjacent properties shall only require the use of the primary building material for at least 50% of the elevation in locations that will be visible prior to on site landscaping being mature. Emphasis shall be on the upper portions of facades such as the cornice and detailing at the upper portion of the wall.**
    - b) Side and rear facades that are visible from adjoining properties that are greater than 100 feet in length, measured horizontally shall incorporate wall plane projects or recess having a depth of at least 6 inches or other architectural detailing. No uninterrupted length of any façade shall exceed 100 horizontal feet.**

C. Exterior Walls and Facades – Small Retail Stores less than 40,000 SF:

1. Facades more than 100 feet in length shall incorporate wall plane projections and recesses along all four sides of the building. Projections and recess may occur no less than every 80' through the inclusion of projecting the wall plan or through the use of architectural features such as pilasters, porches, entry canopies, and similar features.
2. All front facades shall have awnings, pergolas, windows, arcades, or other such architectural features along the façade no less than 50% of the horizontal length of the façade.
3. Four-sided Architecture. When buildings are accessible on all four sides by the general public and/or patrons, the architecture of the building shall be four-sided. Specifically, all elevations of the building shall be equally treated as a main façade. When service areas are required, additional landscaping, screen walls and other architectural treatments shall be used to minimize the appearance of the service area.
4. When a retail structure is located on the site in a manner that does not allow for additional landscaping screening or becomes difficult to treat equally to the main façade, due to site constraints or internal design requirements, the architecture shall employ faux architectural devises that mimic designs of the primary facade. Such faux architectural devises may include, but are not limited to spandrel glass windows rather than vision glass, pilasters rather than columns, arcaded screen walls rather than pergolas, or other similar architectural substitutions. Faux elements shall only be used when all other attempts to treat the façades equally have been explored.
5. Service areas. When a retail building has a service area that extends the entire length of a building, creating a distinct back; and this back of building is adjacent to a public right of way and/or parking area/circulation drive, the service area shall be screened by a dense landscape screen, which at the time of installation, will allow a minimum of 50% the façade to be visible from the right of way. This landscape screen shall at the time of maturity provide 100% screening of the service area. This requirement may require additional plantings beyond the general landscaping requirements of the Zoning Code of the City of Columbia.

D. Architectural Details: The architectural details of a building provide the greatest level of visual interest and scale. Building to a human scale, reducing massive aesthetic effects, will allow for local and regional architectural character to be recognized.

1. The following architectural details shall occur on each façade of the building, and details shall be coordinated with the overall design and character of the structure.
  - Color Change
  - Texture change
  - Material module bay changes
2. The following architectural details are required.
  - a) Entry doors for commercial buildings shall have a functioning primary entry from the public and/or private sidewalk.

**E. Gas Stations and Fueling Stations.** *Gas Stations and Fueling Stations are a particular type of building typology that is automotive intensive, and can result in adverse effects on surrounding properties. Where gas stations are permitted the following guidelines are applicable:*

**1. Site Design**

- a. The retail building shall be designed, so that one side of the building can be considered the rear where loading, dumpster, storage, and similar activities can occur.
- b. Loading and dumpsters areas must be screened from adjoining properties and rights of way.
- c. When a retail use is located in the same building or on the same property as the service station there shall be distinct parking areas for each use to allow for separation between fueling areas and parking.
- d. Fueling areas shall be positioned to be at the side or back of the structure allowing for the primary visual image of the station to be the building and retailing structure and not the service canopy and service vehicular access area.
- e. **Payment/Attendant Facility.** If a fueling station is not going to have a retail building a payment/attendant facility may be provided. If provided the structure shall be designed as four sided architecture and shall be located under or within close proximity to the canopy structure. Materials and detailing shall coordinate with the principal building on the site. If pedestrian access is intended to the payment/attendant facility than pedestrian amenities such as sidewalks, a defined waiting area etc. shall be provided. Pedestrian space shall be larger enough to prevent a queue from occurring within automobile service and drive areas.

**2. Building and Overall Design.**

- a. The design elements of the building and canopy or property shall be aesthetically compatible. The overall design of the facility shall be aesthetically compatible with the surroundings and II A. above.
- b. All station amenities such as lighting fixtures, trash receptacles, and other features shall be coordinated in design with the building and the district in which it is located.
- c. Vision glass on the building must provide unobstructed views in and out of the building.
- d. Striping, neon, and illuminated panels are not permitted on buildings or canopy.

**3. Canopy Design**

- a. All canopy supports shall be clad in brick masonry construction or material associated with the main structure of the property.
- b. Architectural metal supports may be appropriate in certain instances and architectural styles.

- c. A maximum of twenty five percent of the cladding of the supports may be constructed of architectural accent material such as precast concrete, stone etc.
- d. Standard concrete block canopy and supports are not permitted.
- e. The cladding of the columns must be proportioned to the height and scale of the canopy.
- f. All canopy downspouts and related hardware shall be integrated into the structure.
- g. The canopy structure shall relate to the main component of the building with respect to materials, massing, and overall design.
- h. The canopy is encouraged to be integrated with the overall roof structure.
- i. Building details may be used to create the architectural relationship between the principal building and the canopy.
- j. The fascia of the canopy shall be finished to match the building material and color.

**4. Canopy Lighting.**

- a. Lighting luminaries mounted under the canopy structures shall be shielded such that the lamp source is not visible and glare is not created.
- b. Striping, neon, and illuminated panels are not permitted on the canopy.

**5. Signs.**

- a. All signage shall comply with all municipal regulations.
- b. In addition to municipal regulations the following shall apply to signage related to Gas and Fueling Stations.
  - 1.) Canopy Signage shall be limited to 2 signs with a maximum of 60 square feet each.
  - 2.) Building Signage shall be limited to 2 signs with a maximum of 60 Square feet each.
  - 3.) Window Signs shall be limited to a size of 25% of the window area.
  - 4.) No striping, logos, or other branding elements are permitted on site fixtures, pumps and other site or building elements unless counted towards number and square footage of municipal regulations.
  - 5) Free Standing signage is indicated in Section V. D. of this document.

**F. Retaining Walls** Retaining walls often can be a strong visual presence within the landscape. The design and integration of such walls are important to the overall design of a site.

1. **Retaining Walls Higher than 3 feet.**
  - Retaining walls with a height higher than three feet shall be screened by vegetation that at the time of maturity will screen 65% of the retaining wall. The landscape design shall be integrated with the overall landscaping of the site. Landscape plantings shall be a mixture of evergreen and deciduous trees and shrubs, with a variety of shapes and sizes. Grasses, ground covers, ivies, and other plants are also encouraged to provide color and texture difference.
2. **Retaining Wall Materials Visible from Rights of Way and other Public or Semi Public Areas.**
  - Retaining walls shall be constructed out of brick veneer with block or cast in place structural back up, cast in place concrete, natural stone. Retaining walls constructed out of architectural cast in place concrete shall have a natural finish. When architectural cast in place concrete is used the upper 2 feet of such concrete wall shall have some articulation consisting of reveals, score liens, or cast in place architectural features. Other materials may be considered on a case by case basis.
3. **Retaining Wall Materials – Not Visible from right of way.**
  - In service areas, under parking decks, and other areas not visible to the public may use materials listed in section F.2. Above. In addition retaining walls may be constructed out of spilt face or decorative concrete block retain wall systems when located within these designated areas and when not visible from the public right of way or designated pedestrian walkway.
4. **Retaining Wall Location:**
  - Retaining walls may be located within the setback requirements of the base zoning classification. If retaining walls are to be located within the setback area they shall not have a height greater than 3 feet at the property line and shall step back from the property 2.5 feet for every additional foot of height.
5. **Retaining Walls in Natural and restored areas.**
  - Retaining walls located in natural areas or restored natural areas shall use a material that complements the natural area or restored area. Such material shall not draw attention to itself but blend into the natural or restored landscape.

**G. Roofs**

1. Variations in the roof line shall be used to add interest, and reduce the massive scale of larger buildings. Roof features shall complement the character of adjoining neighborhoods and be complementary to regional vernacular massing, style and design.
2. Roofs that employ the use of a parapet shall be designed to conceal the flat portion of the roof. If a sustainable green roof is to be used, and there is a desire to provide a view of the green roof element, a parapet shall not be required.
3. Parapet designed roofs on buildings with a horizontal length of greater than 100 linear feet shall vary the parapet not less than one (1) foot, and not more than ten (10) feet for each architectural building element/projection.
4. Parapet caps and cornices. The use of a parapet cap or a cornice shall be used to finish off parapet designed roofs. The selection of a cap or cornice shall be determined by the architectural style of the building.
5. Roof mounted HVAC equipment shall be screened from public view, and from the view of surrounding properties. The method of screening shall be architecturally integrated with the structure in terms of materials, color, shape, and size. It is preferred that roof-mounted equipment is screened by solid architectural elements such as a parapet, rather than after-the-fact add-on systems. If enclosure systems are to be used, it is preferred that multiple units be grouped and screened rather than multiple units with multiple screening elements. If a water cooled system is not used sound buffering for the HVAC system shall be provided.

**H. Materials and Colors**

1. Preferred Materials. The following materials are considered appropriate for buildings within the proposed development. When a specific material is not listed, the City of Columbia review committee shall make an interpretation as to the acceptability based upon general descriptions and similarities to those listed.
  - a) Buildings Over 40,000 SF
    - (1) Primary and Secondary Façades
      - (a) Clear Glass (tinted or energy coatings acceptable)
      - (b) Glass Block
      - (c) New or Used Face Brick
      - (d) Cut Stone or Cast Stone
      - (e) Quick Brick or similar
      - (f) Integral colored architectural split face block.
      - (g) Architectural Metal Panel Systems
    - (2) Secondary Materials
      - (h) EFIS, when used above (four) 4 feet from directly adjacent surface grade, not located near service areas.
      - (i) EFIS, when used as a wall cladding material shall not be the predominate material of any wall or façade. Generally EFIS shall be keep to a minimum and not exceed 1/3 of any façade.

(j) EFIS when used for architectural elements (cornices, window hoods, accent panels), sign bands, and other accents elements.

(2) Rear Facades. In addition to the materials that are allowed for main façade the following additional materials are acceptable on rear and side facades.

- (a) Integral colored architectural split face block.
- (b) EFIS, when used above ten (10) feet of grade.
- (c) Precast Concrete tilt up panels, when such panels have architectural details
- (d) TRESPA
- (e) Painted split face block – when not visible from public rights of ways or public parking or pedestrian areas.
- (f) Smooth face block – when painted or integral color, - located in rear utility areas, loading areas, truck docks, and similar service areas.

(3) Building located adjacent to right of way or entry drive location. Facades that are visible from rights of way or the first 250 feet of public entry drives shall be considered a primary or secondary façade due to its exposure to a public right of way.

b) Buildings under 40,000 SF

(1) Primary and Secondary Façades

- (a) Clear Glass (tinted or energy coatings acceptable)
- (b) Glass Block
- (c) New or Used Clay Face Brick
- (d) Cut Stone or Cast Stone
- (e) Cultured Stone Products
- (f) Quick Brick or similar
- (g) Architectural Cast in Place Concrete
- (h) Architectural Metal Panel Systems
- (i) Trespa panel system (or similar)
- (j) EFIS, when used as a wall cladding material located a minimum 6 feet above from directly adjacent surface grade, and shall not be the predominate material of any wall or façade. Generally EFIS shall be keep to a minimum and not exceed 1/3 of any façade.
- (k) EFIS when used for architectural elements (cornices, window hoods, accent panels), sign bands, and other accents elements.

(2) Rear Facades. In addition to the materials that are allowed for main façades the following additional materials are acceptable on rear facades.

- (a) Integral colored architectural split face block.
- (b) EFIS, when used above six (6) feet of grade
- (c) Precast Concrete tilt up panels, when such panels have architectural details and located on buildings have architectural details and located on buildings larger than 40,000 SF, and consisting of not more than 50% of the visible façade material.

(d) Spandrel Glass as an alternative to vision glass when vision glass is cannot be used.

(e) Smooth face block – when painted or integral color, - located in rear utility areas, loading areas, truck docks, and similar service areas.

*(3) Buildings located adjacent to right of way or entry drive location. Facades that are visible from rights of way or the first 250 feet of public entry drives shall be considered a primary or secondary façade do to its exposure to a public right of way.*

c) Accessory Structures. Building materials for accessory structures such as monument signs, towers, pergolas, etc shall be constructed of high quality materials and coordinate with other materials within the development.

2. Disallowed Materials. The following materials are not permitted.

- a) Vinyl
- b) Reflective or Opaque Glass
- c) Spandrel glazing located on main facades
- d) Used brick with no fired face
- e) Imitation wood siding
- f) Plastic panels
- g) Vertical Siding
- h) Smooth faced concrete block – when painted or integral color, - located in rear utility areas, loading areas, truck docks, and similar service areas.
- i) Pre-fabricated steel panels
- j) Imitation Masonry
- k) Coarsely finished “rough sawn” or rustic materials (e.g. wood shakes, barn wood, board and batten, or T-111 siding)

3. Material Appropriation:

- a.) Building materials provide the visual interest, identity, to a building and the overall character of the city. Building elevations in general shall use one primary material for facades with secondary materials related to cornices, windows, awnings, and other architectural elements similar to Attachments 1 of this document.

4. **Building colors.** Façade colors shall be low reflectance, subtle, neutral or earth tone colors. Colors that are traditional to Columbia and the Midlands region are encouraged. Building trim and accent areas may feature brighter colors when coordinated with the overall color palette of the structure.

I. **Sustainable Features for all structures.** Sustainable features can provide both long term benefits to the property owner, lease holders, the overall community, and the environment. Sustainable features are strongly encouraged. Specific standards are not specified; however, thought and consideration shall be placed upon water quality, light pollution, building materials, regional and native plantings, and general livability design elements.

J. **Awnings and Canopies**

1. Awnings and canopies provide the opportunity to add color and visual relief to buildings, as well as serving a functional purpose by protecting windows from intense direct sunlight.
2. Where the façade is divided into distinct structural bays (sections defined by vertical architectural elements, such as masonry piers) awnings should be placed within the vertical elements rather than overlapping them. The awning design should respond to the scale, proportion and rhythm created by the structural bay.
3. Fabric awnings, if used, should be of durable, commercial grade fabric, canvas or similar materials having a matte finish.
4. Permanent awnings of a material integral to the building architecture are strongly encouraged.
5. Awning frames and supports should be of painted or coated metal or other non-corroding material.
6. Glossy or shiny plastic or similar awning material is not recommended.
7. Awnings should be well-maintained, washed regularly, and replaced when faded or torn.
8. Awnings should have a single color or two primary-color stripes..

K. **Mixed Use Structures with Residential Development and Residential Development**

1. **Site Planning.** The manner in which a building and its accessory uses are arranged on a site is critical to how the building contributes to the overall quality of the built environment. This section outlines a series of site planning guidelines that will help establish a human scale, pedestrian-friendly quality.
2. **Parking Facilities, Locations, Landscaping and Screening.**
  - a. Location and design treatment of the parking needed to serve residential developments will have significant influence on the area's physical structure and visual character. One of the most difficult issues in urban development is providing an adequate amount of convenient parking without allowing parking structures and surface lots to dominate the urban setting.

- b. **Parking Quantities.** .75 automobile parking spaces shall be provided per bedroom and .25 parking spaces for bikes shall be provided or as prescribed in the City's Zoning Ordinance.
- c. **Parking principles.** The following principals shall apply to all parking facilities
  - 1.) Structured parking is preferred. 50% of required parking should be within a structure.
  - 2.) Shared surface parking with other uses is encouraged.

### **3. Structured Parking**

- a. **The location and design of both public and private parking structures should be governed by the following guidelines:**
  - 1.) Parking structures shall be located within the block core, with actively programmed building space fronting on all streets
  - 2.) Where location of parking within the block core is not feasible, parking structures should be located to the rear of the principal-use building oriented to front on the address street. The ground floor of the parking structure shall be actively programmed on streets with an active commercial front-age.
  - 3.) Any parking structure which is located adjacent to a street should be set back a minimum of 6 feet and a maximum of 10 feet from the sidewalk. This setback shall be landscaped with trees, shrubs, and ground cover to soften views of the structure, provide visual interest, and establish a sense of human scale.
  - 4.) Any parking structure facing a natural area or a naturalized stream area shall be designed to minimize its appearance and not detract from the natural area. Landscaping adjacent to the parking garage shall be required to be provided and designed to complement the natural environment of the location.
  - 5.) The parking structure shall be compatible in quality, form, materials, colors and a texture with the structure's being served.
  - 6.) Parking structure roof lines which are visible from the street shall be level; ramping should occur within the structure or on the interior of the block where it is screened from the street.
  - 7.) Light sources within parking structures shall be screened, architecturally or otherwise, from the street.

### **4. Building Design**

#### **a. Street Orientation**

- 1.) The way in which a structure is oriented to the public or private street plays a major role in establishing the overall feeling of the street. As a general rule, buildings

shall be oriented to engage the pedestrian, not only visually, but functionally. This section provides specific directions on how this can be accomplished.

2.) Storefronts shall be designed to orient to the major public or private pedestrian street frontage.

3.) The ground floor of buildings shall be located at the same level as the open space or sidewalk to emphasize the physical and visual connection with the public or private pedestrian street/area.

4.) Residential buildings shall provide for an entrance to the lobby or common area addressing the public sidewalk.

**b. Open Space**

1.) Open space with the development shall fall into the following four categories; Natural, Pedestrian and Screening. Pedestrian areas shall be designed to be activated by various uses. In general they shall take the form of a mill village green, urban plaza, or urban park. Open space that is designed to screen is intended to provide for visual elimination of areas of a development such as loading areas and refuse and recycling areas that are needed, but not necessarily seen.

**c. Architectural Style or Theme**

1.) Architectural Style or Theme shall reference section II. A. of this document.

**d. Height**

1.) The height of residential structures shall be limited to seven stories.

**e. Proportion of Openings**

1.) Door and window openings shall be recessed. Typically this recess shall be generally 3-4 inches.

**f. Wall Articulation**

1.) Long, blank, unarticulated street wall facades shall not occur. Facades shall instead be divided into a series of structural bays (e.g. masonry piers which frame window and door elements).

2.) Monolithic street wall facades shall be "broken" by vertical and horizontal articulation (e.g., sculpted, carved, or penetrated wall surfaces defined by recesses and reveals). These features are characterized by breaks in the surface of the wall itself, placement of window and door openings, or the placement of balconies, awnings, and/or canopies.

3.) Large, unbroken façade surfaces shall be avoided, especially at the storefront level.

**g. Roofs and Upper Story Details.** Roof mounted mechanical or utility equipment shall be screened. The method of screening

shall be architecturally integrated with the structure in terms of materials, color, shape, and size.

- h. **Exterior Materials.** The design elements for exterior walls involves two aspects- color and texture. If the building's design is complicated with many design features, the wall texture shall be simple and subdued. If the building design is simple (perhaps more monolithic) a finely textured material, such as a patterned masonry, can greatly enrich the building's overall character.

**Recommended Materials**

Building materials shall be high-quality, commercial grade materials, to ensure long wear and minimal maintenance. The following materials are considered appropriate for buildings within the development.

**Building Walls:**

- Clear glass or glass with energy efficient tint that has an appearance of being clear, glass block (storefront only)
- Glass block (Transom)
- Stucco/ exterior plaster (smooth trowled)
- New or used face brick
- Cut stone, rusticated block (cast stone)

**Roofs (where visible)**

- Standing seam metal roofs (avoid bright colors)
- Class A composition shingles (limited to refurbishment of residential structures)
- Tile of neutral color.

**Discouraged Materials**

The following building materials are considered inappropriate and are not allowed.

**Building walls:**

- Imitation masonry (e.g. imitation, rusticated block) of any kind, especially at street-level
- Reflective or opaque glass (at the street level)
- Vinyl products
- Metal siding, as in the case of pre-fabricated butler buildings
- Imitation stone or flagstone parquet
- Rough sawn or "natural" (unfinished) wood
- "Pecky" cedar
- Used brick with no fired face (salvaged from interior walls)
- Imitation wood siding
- Coarsely finished "rough sawn" or rustic materials (e.g. wood shakes, barnwood, board and batten or T-111 siding)
- Plastic panels
- Vertical siding
- EFIS or other synthetic/imitation stucco Storefront

Roofs:

- Crushed stone
  - Shake
  - Brightly colored tile( orange, blue, etc. )
  - Corrugated fiberglass
- i. Awning and Canopies. Shall comply with section II J of this document.

III. Site Design and Relationship to Surrounding Community

A. Connectivity to street.

1. Pedestrian accessibility allows for the development to interconnect to the surrounding neighborhoods, allow for alternative modes of travel, and creates a safer and friendlier site design for all, once they have left their vehicles. Pedestrian connectivity and access to, and through, the site creates a more positive and inviting impression of the development.

- a) The entire site shall be designed for pedestrian connectivity.
- b) A minimum of one pedestrian connection to the site from each public right of way shall be provided for each vehicular access point. Pedestrian connections that are adjacent to a vehicular access points or parking areas shall be separated by an average of six (6) feet of green space to be planted with trees. .
- c) Internal pedestrian connections shall interconnect with one another, and shall provide continental painted crosswalks at each point of crossing of vehicular areas.
- d) Pedestrian areas to rear support functions and other non semi public areas are not required.
- e) Pedestrian connections to Bluff Road shall be provided.

2. Cyclist accessibility allows for the development to interconnect to the surrounding neighborhoods, student housing areas, the university, and neighborhoods beyond pedestrian accessibility. Bicycle connectivity and access to and through the site creates a more positive and inviting impression of the development.

a) Bicycle facilities shall be provided at a rate of one connection for each vehicular access point provided. Facilities shall be limited to interior circulation routes and not the general parking areas for vehicles. Appropriate facilities may include but are not limited to dedicated bike lane adjacent to the vehicular travel lane route, a separated facility, or driving lanes with clearly marked sharrow markings. (sharred lane marking).

b) Bike facilities shall be provided along Assembly Street per section V. e. below.

c) Bike facilities and pavement markings shall be analyzed for the intersection of Assembly and Main Entry and shall be based upon final circulation layout and overall design.

d) A bike trail connection shall be provided from Bluff Road to Assembly Street and shall comply with best practices for trails providing for two way traffic.

e) Bike parking layout and racks shall comply with the Association of Pedestrian and Bicycle Professionals Bicycle Parking Guidelines 2<sup>nd</sup> Edition or later.

f) All bike facilities on public and private streets and on access roads adjacent to or within the development shall comply with the national Association of City Transportation Officials Urban Street Design Guide and Urban Bikeway Design Guidelines

**B. Pedestrian zone adjacent to retail structures.**

1. Pedestrian areas for structures over 40,000 SF shall provide the following minimum standards:

a) The total width of the pedestrian walkway shall project a minimum of 10 feet from the main entry door towards the driving lane and/or parking area.

b) One (1) bench per each 75 feet or fraction of the total linear length of the front façade. Benches shall be located near entrances and areas of pedestrian activity.

c) One (1) shade tree shall be provided for every 60 feet or fraction of the total linear length of the front facade. Trees shall be planted in tree wells with or without grates and/or within larger landscape area. Trees do not need to occur at intervals of 60 feet but may be integrated with the design features of the building and pedestrian areas. Trees may be grouped. Tree species shall provide shade/canopy, trees shall not be

topped. See environmental section for additional requirements. The locations of the trees shall be balanced with their purpose of providing shade to pedestrians while shopping during days when the temperature is hot.

d) Pedestrian areas located along the main façade of the building that are greater than 10 feet in width shall be treated as plaza areas, and shall have a mixture of pergolas, landscaping, low knee walls, awnings, benches and similar elements.

e) Pedestrian zones shall be paved with concrete, pavers, or sustainable paving products. Pavement shall provide an interesting pattern, scoring or similar treatment.

f) In addition to standard parking lot lighting, front façade sidewalks shall be illuminated with pedestrian scaled fixtures. Pole distance and quantity shall be determined based an average of 80 ft. and upon site design and standard illumination levels. Alternative sustainable lighting is encouraged over standard illumination.

2. Pedestrian areas for multi tenant structures under 40,000SF shall provide the following minimum standards:
  - a) The total width of the pedestrian walkway shall project a minimum of ten (10) feet from the main entry door towards the driving lane or parking area.
  - b) One (1) bench per each 75 feet or fraction of the total linear length of the front façade. Benches shall be located near entrances and areas of pedestrian activity.
  - c) One (1) shade tree shall be provided for every 80 feet or fraction of the total linear length of the front façade. Trees shall be planted in tree wells, or parking lot islands that are adjacent to walkways. Trees may be grouped. The locations of trees shall be balanced with their purpose of providing shade to pedestrians while shopping during days when the temperature is hot.
  - d) Pedestrian areas located along the main façade of the building that are greater than ten (10) feet in width shall be treated as plaza areas, and shall have a mixture of pergolas, landscaping, low knee walls, benches, awnings and similar elements.
  - e) Pedestrian zones shall be paved with concrete, pavers, or sustainable paving products. Pavement shall provide an interesting pattern, scoring or similar treatment.
  - f) In addition to standard parking lot lighting, front façade sidewalks shall be illuminated with pedestrian scaled fixtures. Pole distance and quantity shall be determined based an average of 80 ft and upon site design and standard illumination levels. Alternative sustainable lighting is encouraged over standard illumination.
3. Pedestrian areas around freestanding buildings or structures located on the upper level of a parking structure under 40,000SF shall provide the following minimum standards:
  - a) The minimum width of pedestrian walkways shall be five (5) feet, and shall comply with all ADA requirements.
  - b) Two (2) benches per each entry. Benches shall be located near entrances and areas of pedestrian activity.
  - c) Freestanding buildings (single tenant) (not located on a parking structure) shall provide One (1) shade tree shall be provided for every 60 feet or fraction of the total linear length of the front façade. Trees shall be planted in tree wells, or parking lot islands that are adjacent to walkways. Trees may be grouped. The locations of trees shall be balanced with their purpose of providing shade to pedestrians while shopping during days when the temperature is hot.
  - d) Retail Structures located on top of parking structures shall provide groupings of planters. Generally one group of planters shall be provided for every 1,000 sf of retail space. One-Third of the planters shall contain a small ornamental tree. Planters shall contain a variety of deciduous and evergreen foliage to provide seasonal interest. Seasonal plantings and color is strongly encouraged. Appropriate irrigation shall be provided. Container sizes shall be varied in size. Installation of planters shall not interfere with pedestrian circulation or ADA compliance.

- e) When structures are located at upper levels of parking structures and trees are not feasible architectural elements such as pergolas shall be provided to provide shade. The location and quantity of such elements shall be determined based up site design. Such devises may double as outdoor gathering or dining elements.
- f) Pedestrian zones shall be paved with concrete, pavers, or sustainable paving products. Pavement shall provide an interesting pattern, scoring, or similar treatment.
- g) In addition to standard parking lot lighting, front façade sidewalks shall be illuminated with pedestrian scaled fixtures. Pole distance and quantity shall be determined based an average of 80 ft and upon site design and standard illumination levels. Alternative sustainable lighting is encouraged over standard illumination.

4. Pedestrian Area along Trails. Trail systems throughout the development shall consider pedestrian resting locations a various intervals. Resting areas may consist of a bench, knee wall, and other elements or amenities.

**C. Parking -Pedestrians**

- 1. Parking Lots and Decks shall be designed for efficiency in parking as well as for pedestrians. Regardless of whether a person arrives to the development via transit, auto, cycling, or walking; at some point each person will be a pedestrian as they enter and exit the parking area from their given mode of transportation. Therefore, care shall be given to the overall design of a parking deck and parking lots with pedestrian facilities being provided.
- 2. Parking decks and lots that contain more than 50 spaces shall be designed to provide internal pedestrian walkways through the parking lot or deck. Walking areas shall be paved with a hard surface and meet all ADA standards, Walking areas shall be designed to be located near green space, parking islands and similar landscape areas or planting beds when located within parking lots, and complimented by green roof greenescapes or prefabricated planters when located on the upper levels of a parking garage.

**D. Bicycle Parking**

- 1. One (1) space shall be provided for every 10 parking spaces via some mechanism of bicycle storage/racks or Bike Corrals. A Minimum of 25% of total bicycle parking must be within 100 feet of store entrances.
- 2. Substitution by bicycle parking. Four (4) bicycle parking spaces above the minimum number required may be substituted for one (1) required automobile parking space, provided that parking is not reduced by more than minimum required under the Zoning Code and applicable overlays.

**E. Parking Deck**

- 1. Parking Decks shall comply with applicable set back requirements of the City of Columbia Municipal Code. Areas between the property line and the structure shall be landscaped with trees, shrubs, and ground cover designed to soften views of the structure, provide visual interest, and establish a sense of human scale for pedestrians.
- 2. The parking structure shall be compatible in quality, form, colors and textures with the structures being served.

3. Stair and elevator towers shall be integrated architecturally into the overall design of the structure.
4. Parking structure floor plate and roof plates which are visible from the street shall be level.
5. Lighting sources within the parking structure shall be screened with architectural or otherwise from the street to prevent light pollution.
6. Upper levels of parking decks shall provide greenspace through the use of green roof technology or prefabricated planters adjacent to internal pedestrian walkways.

#### IV. Site amenities and Improvements

##### A. Outdoor Storage, Trash Collection, and Loading Area.

1. Loading areas and outdoor storage areas exert visual and noise impacts onto the surrounding neighborhoods. These areas when visible from adjoining properties and/or public streets, shall be screened.
2. Non-enclosed areas for storage and sale of seasonal inventory shall be permanently defined and screened within walls and fences. Materials colors and the design of the screen wall and/or fences shall conform to those used as predominate materials and colors of the building. In such areas that are to be covered, the covering shall conform to those used as permanent materials, and colors on the building. When inventory is visible from outside the storage area a semi transparent screening devised, such as a wind screen, shall be utilized on the inside of the fence.

##### B. Lighting. In addition to lighting criteria located within other sections of this document the following lighting guidelines shall apply:

1. Alternative sustainable lighting is strongly encouraged. Energy efficient lighting is required.
2. All lighting shall be full cut off style fixtures to reduce light pollution.
3. No pole mounted light within the main tenant parking field shall be higher than 35 feet from its mount. The developer shall provide lower poles within smaller parking fields and access drives.
4. Pedestrian style lighting shall be provided along the entry facades of each structure as well as multi-use paths and sidewalk areas that are not illuminated by parking lot lighting. Pedestrian lighting within the site shall coordinate with the City of Columbia Standard for the downtown area and be full cut off when appropriate.
5. Architectural and Landscape accent lighting is encouraged.

C. Landscaping. Landscaping shall comply with the City of Columbia municipal ordinance and other portions of this document where landscaping is specifically required or noted.

1. Stormwater Basins and Associated Facilities. Landscaping shall be required in and around all stormwater management basins according to the following:

- a.) All areas of stormwater management basins include basin floors, side slopes, berms, impoundment structure, or other earth structure shall be planted with cover vegetation such as lawn, grass, or naturalized plantings specifically suited for stormwater basins.
- b.) Lawn areas shall be sodded or hydro-seeded to minimize erosion during the establishment period, and once established, these areas shall be maintained at a height of not more than six inches.
- c.) Naturalized cover plantings, such as wildflowers, meadows, and nonaggressive grasses specifically designed for the permanently wet, intermittently wet, and usually dry areas of stormwater basins may be planted as an alternative to lawn grass given:
  - 1.) The plantings provide continuous cover to all areas of the basin.
  - 2.) The plantings do not interfere in the safe and efficient function of the basin as determined by the municipal stormwater engineer
- d.) Trees and shrubs shall be allowed in and around stormwater basins given they do not interfere in the proper function of the basin and no trees are planted on or within 30 feet of an impoundment structure outlet/drain structure, emergency spillway, or dam. A minimum planting of two trees and ten shrubs per 100 linear feet of basin perimeter shall be planted in and around the basin.
- f.) Basin shape shall incorporate curvilinear feature that blend with the surrounding topography and shall have a naturalized appearance.
- g. *Care shall be giving to screen stormwater basins from adjacent properties or when a basin is raised adjacent to a major or minor arterial road a buffer of at least 25 feet shall be provided to include 1 canopy tree, 2 ornamental trees, 3 evergreen trees, and 5 shrubs per each 100 linear feet of buffer.*
- h.) Engineers, Landscape Architects, and Architects shall in addition to these guidelines consult the adopted stormwater management regulations for the City of Columbia.

2. Woodland Edge Treatments. A newly created edge of existing woodland, often created by new land development, has a raw open character. Due to the removal of adjacent trees, the trees remaining in on the new edge are subject to wind, throw, sun scaled, and root damage from construction activities grading and drainage changes. A woodland edge buffer of 10 feet shall be designed and installed in instances where woodland has been modified. A

combination of canopy trees and understory trees shall be prepared in a detailed plan and approved prior to installation, Canopy trees shall count towards the overall landscaping requirements for tree coverage within a development.

- a.) Plantings that tolerate the combination of sun and shade and that have a naturalizing character are the best candidate for planting in these areas.
- b.) The addition of canopy trees can serve to fill the open space in the woodland canopy edge reducing the impacts of the newly create woodland edge.
- c.) Under story trees can serve to fill the open space in the woodland canopy edge reducing the impacts of the newly created woodland edge.
- d.) Woodland edge shrubs shall be incorporated into the planning.

3. Streams, Creeks, and Ditches. When streams, creeks and ditches and similar are modified, the portions that are day-lit shall be designed in a naturalized fashion with land formations, rocks, and landscaping elements that create a naturalized ecosystem.

## V. Environmental.

**A. Stream Buffers.** The development shall exceed the BMP manual to utilize state of the art techniques to insure water quality improved not just not impaired, while also complying *with the City's Low Impact Development BMP Manual and Stream Buffer language when proposing site design with respect to quality and quantity. Both attached in Attachments 3 and 4, 5. State guidelines for all other aspects of the review are established in the City's Stormwater Management Code of Ordinances and Land Disturbance checklist.*

**B. Relocations of Streams** shall create relocated stream into a stream that is naturalize with regard to meandering, topography, plant life, stabilization, etc. *The design shall create a stream that when established would be undetectable as a relocated stream.*

**C. Bioswales and Raingardens.** *Bioswales and RainGardens shall follow low impact development (LID) design for stormwater management best practices as determined by the City Stormwater manager. Bioswales, rain gardens shall be required within the development and . Other low impact development options such as filter boxes and constructed wetlands may be considered appropriate as determined by the City Stormwater manager.*

### D. Signage

- 1. A Master Sign Plan shall be developed and approved by the review committee prior to issuance of any signs. Modifications of the master sign

program may be made at any time by the developer or upon request by all future property owners.

2. The following guidelines shall apply:

a) **Main Tenant Freestanding:** The main tenant shall be permitted two monument signs. One Monument sign shall be permitted along Assembly Street. Such sign shall have a masonry base to match masonry in the development. The base shall not be taller than 3 feet. Sign area to have a maximum area of 80 sf per sign face with a maximum of two sign faces. Sign face to be aluminum cabinet with aluminum face with push through acrylic letters or a design that reflects the mill/industrial past of Columbia as approved by the review committee. Illumination may be internally illuminated. Maximum height of 15 ft. A secondary monument sign shall be permitted along Ferguson Street. Such sign shall have a masonry base to match masonry in the development. The base shall not be taller than 1' (one foot). Sign area to have a maximum area of 60 sf per sign face with a maximum of two sign faces. Sign face to be aluminum cabinet with aluminum face with push through acrylic letters. Illumination may be internally illuminated. Maximum height of 10 ft.

b) **Commerical Out Lot.** One sign shall be permitted for all commercial outlots within the development. Such sign shall have a masonry base to match masonry in the development. The base shall not be taller than 3 feet. Sign area to have a maximum area of 60 sf per sign face with a maximum of two sign faces. Sign face to be aluminum cabinet with aluminum face with push through acrylic letters or a design that reflects the mill/industrial past of Columbia as approved by the review committee. Illumination may be internally illuminated. Maximum height of 10 ft.

c) **Residential Developments.** One sign shall be permitted for all residential uses within the development. Such sign shall have a masonry base to match masonry in the development. The base shall not be taller than 3 feet. Sign area to have a maximum area of 60 sf per sign face with a maximum of two sign faces. Sign face to be aluminum cabinet with aluminum face with push through acrylic letters or a design that reflects the mill/industrial past of Columbia as approved by the review committee. . Illumination may be internally illuminated. Maximum height of 10 ft.

3. Group development signage:

a) At the discretion of the developer a freestanding monument style group development sign may be provided. If provided than individual signage as listed in section 2 above may not be provided. Such sign shall have a base of masonry to match the masonry of the development. Base to be not taller than 4 feet. Sign area to be a maximum of 180 sf, with space to be divided among tenants. Maximum height 15 feet. Sign face to be an aluminum cabinet with aluminum face with push through acrylic letters or a design that reflects the mill/industrial past of

Columbia as approved by the review committee. . Illumination may be internally illuminated.

4. Architectural Feature. When the main commercial anchor provides an architectural feature such as a “Mill Tower” or “Water Tower” than an additional signage option may be considered to be placed on the element. The element shall be integrated to the architectural element, such as applied letters for a “Mill Tower”, or painted letters for a “Water Tower”. Lighting shall be indirect. The sign shall not exceed 200 SF.

5. Wall Signs:

a) Size, number, and height shall follow municipal zoning code for the parcel’s zoning. Illumination may be internal using either an aluminum cabinet with aluminum face with push through acrylic letters, or channel letters with aluminum face with reverse-lit halo illumination or a design that reflects the mill/industrial past of Columbia as approved by the review committee. . If exterior raceways are to be used raceways shall match the color of the adjoining building material.

6. On Site directional signage.

a) All on site directional signage shall comply with the City of Columbia municipal code.

b) All on site directional signage shall have a common design and theme.

E. Improvements to the Public Right of way

1. One standard pedestrian/ road street light, shall be provided parallel to Assembly Street and Dreyfus rights of way per 80 feet of right of way, or as determined by the City Traffic Engineering Department. Lighting style, color, installation and all other specifications shall comply with all City Requirements and coordinate with downtown acorn fixture design or other approved design.

2. Curb and Gutter shall be provided along Assembly Street and Dryfus Road and turn the corner at the Ferguson Street intersection.

3. All sidewalks shall comply with all ADA regulations. Crosswalks shall be provided at all intersections meeting requirements by the City Engineer.

4. A pedestrian sidewalk shall be provided along the rights of way of Assembly Street and Dreyfus Road adjacent to the parcel. Walkways shall have a minimum width of 8 feet

5. Shade trees shall be provided as single row of trees within a 5 foot-7foot (7ft max. 5 foot min.) tree lawn. Shade trees shall be provided as a single row of trees between the separated bike facility and the pedestrian sidewalk. Trees shall be at an average rate of one tree per 40 linear feet of sidewalk with an

alternating pattern. Flexibility as to location do to entries and site conditions may require wider or tighter spacing.

6. Sidewalk pavement shall consist of a combination of scored concrete paving, and concrete pavers.

7. Sidewalk areas located near development entrances and intersections shall be paved with concrete pavers and have detailing substantially similar to detailing located at the southwest corner of Assembly Street and Whaley Street.

8. Tree species shall be of a type that will at maturity canopy approximately 75% of the sidewalk area as shade during summer months.

9. A separated dedicated bike lane shall be provided parallel to Assembly Street and Dreyfus and shall be designed to allow future north south connections; such bike way shall connect to the Rocky Branch Creek Greenway. Refer to Attachments 2. Pavement of bike lanes may be of asphalt with clean edges and appropriate bike markings and signage. The separated dedicated bike lane shall have clearly identifiable crossings at intersections or transitions to on road lanes or sharrow. Alternatively a series of bike lanes, Cycle Tracks, or other bike amenities may be considered by the review committee and the developer at the time of construction or as indicated in the City of Columbia Pedestrian and Bicycle Master Plan draft or adopted document. All bike facilities within the right of way shall comply with NACTO Urban Bikeway Design Guide.





## **Proposed Language for Chapter 21, Article II, Storm Water Quantity and Quality Control**

### **ARTICLE IV. Storm Water Quantity and Quality Control**

#### **Division 1 Generally**

- Sec. 21-31. Findings and Purpose**
- 21-32. Authority and Applicability**
- 21-33. Definitions**
- 21-34. Severability**
- 21-35. Conflicting Provisions**

#### **Division 2 Organization and Administration**

- Sec. 21-36. Regulations**
- 21-37. Coordination with Other Agencies**
- 21-38. Cooperation with Other Governments**
- 21-39. Storm Water Division**

#### **Division 3 Storm Water Quality Control**

- Sec. 21-40. Permitting Requirements and Exemptions**
- 21-41. Storm Water Management Program**
- 21-42. Design/Engineering Standards; Storm Water BMP Design Manual**
- 21-43. Land Disturbance Permit Application Process**
- 21-44. Maintenance, Construction, Inspection, and Notice of Termination (NOT)**
- 21-45. Ownership and City Participation**
- 21-46. Watercourse Protection**
- 21-47. Notification of Spills**

#### **Division 4 Detection and Removal of Illicit Discharges and Improper Disposal**

- Sec. 21-48. Illicit Connections, Illicit Discharges and Improper Disposal**
- 21-49. Detection of Illicit Connections and Improper Disposal**
- 21-50. Waste Disposal Prohibition**
- 21-51. Industrial or Construction Discharges**
- 21-52. Monitoring of Discharges and Inspections**

#### **Division 5 Enforcement, Penalties and Abatement**

- Sec. 21-53. Violations**
- 21-54. Civil Penalties**
- 21-56. Corrective Action**
- 21-64. removed**
- 21-57. Stop Work**
- 21-58. Permit Suspension and Revocation**
- 21-59. Criminal Penalties**
- 21-60. Variances and Appeals**

#### **Division 6 Charges and Fees**

- Sec. 21-61. Field Inspection and Plan Review**

**ARTICLE IV. STORM WATER QUANTITY AND QUALITY CONTROL**

**DIVISION 1 – GENERALLY**

**Sec. 21-31. Findings and Purpose.**

The City Council of the City of Columbia finds that:

(a) Uncontrolled storm water runoff may have a significant, adverse impact on the health, safety and general welfare of the City of Columbia and the quality of life of its citizens by transporting pollutants into receiving waters and by causing erosion or contributing to conditions which may increase the incidence and severity of flooding.

(b) Proper management of storm water runoff will minimize damage to public and private property, promote a functional drainage system, reduce the effects of development on land and stream channel erosion, attain and maintain water quality standards, enhance the local environment associated with the drainage system, reduce local flooding, reduce pollutant loading to the maximum extent practicable and maintain to the extent practicable the pre-development runoff characteristics of the area, and facilitate economic development while mitigating associated pollutant, flooding and drainage impacts.

(c) Non-storm water discharges to a Municipal Separate Storm Sewer System (“MS4”) can contribute to the pollution of the waters of the State.

(d) The City of Columbia is required by federal and state law [33 U.S.C 1342, 40 CFR 122.26, S.C. Code Ann. §§ 48-1-10 *et seq.*, and S.C. Regulation 61-9.122.26] to obtain a National Pollutant Discharge Elimination System (“NPDES”) permit from the South Carolina Department of Health and Environmental Control (“DHEC”) for storm water discharges to the waters of the State from the City of Columbia Municipal Separate Storm Sewer System (“City of Columbia MS4”). The NPDES MS4 Permit requires the City to develop and implement a comprehensive Storm Water Management Program to effectively prohibit the discharge of non-storm water into the MS4 and to reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable.

(e) Certain facilities that discharge storm water associated with an industrial activity, including land disturbing activities, are required to obtain NPDES permits. Also, the South Carolina Storm Water Management and Sediment Reduction Act [S.C. Code Ann. §§ 48-14-10 *et seq.*] requires a state permit for certain land disturbing activities.

It is the purpose of this Article to protect, maintain, and enhance the environment of the City of Columbia and the short-term and long-term public health, safety, and general welfare of the citizens of the City of Columbia by establishing requirements and procedures designed to:

(a) control the potential adverse effects of increased storm water runoff associated with both future development and existing development;

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(b) reduce the discharge of pollutants to the City of Columbia MS4 and its receiving waters to the maximum extent practicable using management practices, control techniques and system, design and engineering methods and such other programs and controls as are required by the NPDES MS4 Permit.

(c) control and reduce the contribution of pollutants to the NPDES MS4 Permit and receiving waters of the State by storm water discharges associated with residential, commercial, industrial and related facilities activity; and

(d) assure compliance with federal and state NPDES regulations and the NPDES MS4 Permit.

**Sec. 21-32. Authority and Applicability.**

This Article is adopted pursuant to S.C. Code Ann. §§ 48-14-10 *et seq.*, S.C. Code Ann. §5-7-30, S.C. Regulation 61-9.122.26, and S.C. Regulation 72-300 *et seq.*

This Article applies to all areas within the City of Columbia corporate boundaries and within any municipality or other governmental entity that chooses to participate as a co-permittee with the City in the NPDES MS4 Permit.

The application of this Article, the provisions expressed herein, and the Federal and State storm water regulations shall be minimum storm water management requirements and shall not be deemed a limitation or repeal of any other ordinances of City of Columbia or powers granted to City of Columbia by the State of South Carolina statutes, including, without limitation, the power to require additional or more stringent storm water management requirements as necessary to meet the requirements of the NPDES MS4 Permit.

The Storm Water Division shall be primarily responsible for the coordination and enforcement of the provisions of this Article, the City of Columbia Storm Water Management Program, and the NPDES MS4 Permit.

**Sec. 21-33. Definitions.**

Definitions contained in South Carolina regulations 61-9.122.2 and 72-301 are incorporated herein by reference unless a term is given a different meaning by the definition of that term in this Section. Where the same words are defined in both the aforementioned regulations, but are not the same, the definitions contained in S.C. Regulation 61-9.122.2 shall be used for the purposes of this Article. Additional terms, phrases and words shall have the meaning given in this article, except where the context clearly indicates a different meaning. All other words shall have their customary meanings. Words used in the singular shall include the plural, and the plural shall include the singular; words used in the present tense shall include the future tense. The word "shall" is mandatory and not discretionary. The word "may" is permissive.

**Accidental discharge** means a discharge prohibited by this Article into the City of Columbia MS4 or a community water, which occurs by chance and without planning or consideration prior to occurrence.

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**Best Management Practices** means a wide range of management procedures, schedules of activities, prohibitions on practices and other management practices which have been demonstrated to effectively control the quality and/or quantity of stormwater runoff and which are compatible with the planned land use (S.C. Regulation 72-301(5)).

**City** means the City of Columbia, South Carolina.

**City Council** means the city council of the City of Columbia, South Carolina.

**City of Columbia MS4** is the Municipal Separate Storm Sewer System, as defined by S.C. Regulation 61-9.122.26(b), which is owned and operated by the City.

**Clean Water Act** means the Federal Water Pollution Control Act, as amended, codified at 33 U.S.C §1251 *et seq.*

**Develop Land** means to change the runoff characteristics of a parcel of land in conjunction with residential, commercial, industrial, or institutional construction or alteration (S.C. Regulation 72-301(12)).

**Development** means any of the following actions undertaken by any person, including, without limitation, any public or private individual or entity:

- (a) the construction, installation, or alteration of a structure, impervious surface or drainage facility;
- (b) clearing, scraping, grubbing or otherwise significantly disturbing the soil, vegetation, mud, sand or rock of a site; or
- (c) adding, removing, exposing, excavating, leveling, grading, digging, burrowing, dumping, piling, dredging, or otherwise disturbing the soil, vegetation, mud, sand or rock of a site.

**Director** means the City of Columbia Director of Utilities and Engineering or any duly authorized representative of the Director.

**Discharge** means any discharge or discharge of any sewage, industrial wastes or other wastes into any of the waters of the State, whether treated or not (S.C. Regulation 61-9.122.2).

**Entitled Property** means any property that, prior to the adoption of this Article, has been subject to either Permitted Development Activity or a Valid Governmental Approval. If a Permitted Development Activity or Valid Governmental Approval has occurred with respect to any tract and such tract was subsequently subdivided, or in the future is subdivided, by an approved subdivision plat, than all subdivided parcels that were part of the original tract shall be considered entitled property.

**Illicit connection** means any man-made conveyance connecting a non-storm water discharge directly to the City of Columbia MS4 which results in a discharge that is not composed entirely of storm water runoff except discharges to the City of Columbia MS4 pursuant to an NPDES permit (other than the NPDES permit for the City of Columbia MS4).

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**Illicit discharge** means any discharge to the City of Columbia MS4 or receiving waters that is not composed entirely of storm water except (a) discharges pursuant to an NPDES permit (other than the NPDES for the City of Columbia) and (b) other discharges listed Sec. 21-48(d) of this Article.

**Improper disposal** means any discharge other than through an illicit connection that results in an illicit discharge, including, but not limited to, the disposal of used oil and toxic materials or other hazardous liquids or substances resulting from the improper management of these materials.

**Industrial Activity** means activity associated with an industrial facility subject to an NPDES permitting requirements for storm water discharge associated with industrial activity as defined in S.C. Regulation 61-9.122.26(b)(14) or any other industrial facility which the Storm Water Division determines has a potential to contribute substantial pollutant loadings to the City of Columbia MS4.

**Land Disturbance Permit** means written approval issued by the City pursuant to Section 21-43 of this Article, authorizing land-disturbing activities in accordance with a SWPPP approved by the Director.

**Land disturbing activities** means any use of the land by any person that results in a change in the natural cover or topography that may cause erosion and contribute to sediment and alter the quality and quantity of storm water runoff. (S.C. CODE ANN. § 48-14-20(8)).

**Maintenance** means any action necessary to preserve storm water controls in proper working condition, in order to serve the intended purposes set forth in this Article and to prevent structural failure of such structures or controls.

**NPDES Program** means the National Pollutant Discharge Elimination System program as defined in S.C. Regulation 61-9.122.2.

**NPDES MS4 Permit** means the NPDES permit for storm water discharges issued to the City of Columbia pursuant to the Clean Water Act and the state storm water discharge regulations (S.C. Regulation 61-9.122.26).

**Permitted Development Activity** means the property owner has commenced construction of a building or of any portion of a potable water distribution or transportation system, a sanitary sewer distribution or transportation system, a storm drainage system or a public road; or the property owner has commenced grading or other land disturbance activities in conformance with valid permits issued by the City of Columbia.

**Person** means any individual, public or private corporation, political subdivision, association, partnership, corporation, municipality, State or Federal agency, industry, co-partnership, firm, trust, estate, any other legal entity whatsoever, or an agent or employee thereof. (S.C. Regulation 61-9.122.2).

**Pollutant** means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 *et seq.*)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. Pollutant does not mean: (i) Sewage from vessels; or (ii) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal

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purposes is approved by authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources. (S.C. Regulation 61-9.122.2).

**Receiving waters** means the waters into which the City of Columbia MS4 discharges and which are located within the jurisdictional boundaries of the City of Columbia and include, without limitation, the lakes, rivers, streams, ponds, wetlands, and groundwater of the City of Columbia.

**Runoff** means direct response of a watershed to precipitation and includes the surface and subsurface runoff that enters a ditch, stream, storm sewer, or other concentrated flow during and following the precipitation. (S.C. CODE ANN. § 48-14-20(13)).

**Storm Water Division** means the City of Columbia Stormwater Management staff.

**Storm water** means storm water runoff, snow melt runoff and surface runoff and drainage (S.C. Regulation 61-9.122.26(b)(13)).

**Storm water management** means for: (a) quantitative control, a system of vegetative or structural measures, or both, that control the increased volume and rate of storm water runoff caused by manmade changes to the land; (b) qualitative control, a system of vegetative, structural, or other measures that reduce or eliminate pollutants that might otherwise be carried by storm water runoff (S.C. CODE ANN. § 58-14-30(11)).

**Storm water management systems and facilities** means those natural and man-made channels, swales, ditches, swamps, rivers, streams, creeks, branches, reservoirs, ponds, drainage ways, inlets, catch basins, pipes, head walls, storm sewers, lakes, and other physical works, properties, and improvements which transfer, control, convey or otherwise influence the movement of storm water runoff.

**Storm Water Best Management Practices (BMP) Design Manual** means the most recent compilation of design, performance and review criteria for storm water management practices developed by the Director pursuant to Section 21-42 of this Article.

**SWMP** means the storm water management program as required pursuant to the NPDES MS4 Permit.

**Storm Water Pollution Prevention Plan or SWPPP** means a set of drawings and other documents which describe the Best Management Practices and activities to be implemented by a person or business to eliminate or reduce storm water discharges to the maximum extent possible. The SWPPP shall include all of the information and specifications required by S.C. Regulation 72-300 *et seq.*, the current Storm Water BMP Design Manual developed pursuant to Section 21-42 of this Article, and any applicable State general permit.

**Surface water** means all water, which is open to the atmosphere and subject to surface runoff which includes lakes, streams, ponds, and reservoirs. (S.C. CODE ANN. § 49-4-20(10)).

**Unavoidable discharge** means an emergency discharge required to prevent imminent threat to human health or prevent severe property damage for which reasonable and prudent measures are taken to minimize the impact of the discharge.

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**Valid Government Approval** means the issuance of a permit by City of Columbia to commence a Permitted Development Activity; or approval by the City of Columbia of subdivision of the property, of planned development district zoning for the property, or of a sketch plan for development of the property.

**Variance** means the modification of the minimum storm water management requirements contained in this Article or the SWMP for specific circumstances where strict adherence of the requirements would result in unnecessary hardship and would not fulfill the intent of this Article. [this taken from SW Regulation Definition]

**Watercourse** means a stream or other body of water, either natural or man-made, with a permanent or intermittent flow.

**Water quality** means those characteristics of storm water runoff that relate to the physical, chemical, biological or radiological integrity of water.

**Water quantity** means those characteristics of storm water runoff that relate to the rate and volume of the storm water runoff.

**Waters of the State** means lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial limits of the State, and all other bodies of surface or underground water, natural or artificial, public or private, inland or coastal, fresh or salt, which are wholly or partially within or bordering the State or within its jurisdiction. (S.C. Regulation 61-9.122.2).

**Waters of the United States** means "Waters of the United States" or "waters of the U.S." as defined at S.C. Regulation 61-9.122.2.

**Sec. 21-34. Severability.**

Should any word, phrase, clause or provision of this article be declared invalid or unconstitutional by a court of competent jurisdiction, such declaration shall not affect this article as a whole or any part hereof except that specific provision declared by such court to be invalid or unconstitutional.

**Sec. 21-35 Conflicting provisions.**

All ordinances or parts of ordinances in conflict with the provisions of this Article are hereby repealed. This Article shall prevail in any and all conflicts with guidelines, manuals or other publications within the City as it pertains to storm water management.

**DIVISION 2 – ORGANIZATION AND ADMINISTRATION**

**Sec. 21-36. Regulations.**

Federal regulations governing storm water management, as specified in 40 C.F.R. 122.26, and State regulations, as specified in S.C. Regulation 61-9.122.26 adopted pursuant thereto, and S.C. Regulation 72.300 *et seq.* are adopted as the minimum requirements for all measures established in any regulations adopted by the City to implement and enforce this Article.

Pursuant to Section 2-151 of this Code, the City may, in its discretion, adopt regulations to implement this Article, comply with the NPDES MS4 Permit, implement the SWMP or to otherwise further the goal of protecting the quality of the waters into which the City of Columbia MS4 discharges.

**Sec. 21-37. Coordination with Other Agencies.**

The Director shall coordinate the City's activities with other federal, state and local agencies, which manage and perform functions relating to the protection of receiving waters. Authority not expressly reserved for other agencies or restricted by statute is placed with the Director for the protection and preservation of receiving waters. The Director shall coordinate with state and federal agencies having jurisdiction.

The Director will consult with agencies with responsibility for the construction, operation and maintenance of roads within the City of Columbia MS4 and shall advise said agencies of its recommendations for the conduct of such activities with respect to storm water management.

**Sec. 21-38. Cooperation with Other Governments.**

The City may enter into agreements with other governmental and private entities to carry out the purposes of this Article. These agreements may include, but are not limited to, enforcement, resolution of disputes, cooperative monitoring and cooperative management of MS4s and cooperative implementation of storm water management programs.

Nothing in this Article or in this Section shall be construed as limitation or repeal of any ordinances of these local governments or of the powers granted to these local governments by the South Carolina Constitution or South Carolina statutes including, without limitation, the power to require additional or more stringent storm water management requirements within their jurisdictional boundaries.

**Sec. 21-39. Storm Water Division.**

The Storm Water Division shall be responsible for day-to-day coordination, implementation and enforcement of this Article and the SWMP. This includes responsibility for, but is not limited to, the SWMP's monitoring program and the SWMP's storm water management programs for commercial and residential activities, construction site runoff, industrial runoff control program, and control of

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contribution of pollutants from illicit discharges and improper disposal. Without limitation of the foregoing, the Storm Water Division shall have the following specific powers and duties:

- (1) To issue any permit, certification or license that may be required by the SWMP or this Article.
- (2) To deny a facility connection to the City of Columbia MS4 or discharge to Waters of the State if the requirements of State and Federal Storm Water Regulations and this Article are not met.
- (3) To approve SWPPPs and to require as a condition of such approvals structural or non-structural controls, practices, devices or operating procedures required under the SWMP.
- (4) To require performance bonds of any person to secure that person's compliance with any SWPPP, permit, certificate, license or authorization issued or approved by the Storm Water Division pursuant to the SWMP.
- (5) To enforce all Federal and State regulatory requirements promulgated or imposed pursuant to the Clean Water Act and the South Carolina Stormwater Management and Sediment Reduction Act, applicable to the management of storm water discharges to or from the City of Columbia MS4.
- (6) To conduct all activities necessary to carry out the SWMP and other requirements included in the NPDES MS4 Permit and this Article and to pursue the necessary means and resources required to properly fulfill this responsibility.
- (7) To enter into agreements with other governmental entities or private persons or entities to provide or procure services to conduct and carry out storm water management activities.
- (8) To direct, review and recommend for approval by the City Council the storm water management operating budget.
- (9) To take any and all actions necessary to enforce this Article or collect any fee or penalty as provided for herein.
- (10) To develop and conduct training programs required under the NPDES MS4 Permit.
- (11) To develop design standards and Best Management Practices.

**DIVISION 3 – STORM WATER QUALITY CONTROL**

**Sec. 21-40. Permitting Requirements and Exemptions.**

(a) No person shall (1) develop land, (2) engage in any industry or enterprise, (3) construct, operate or maintain any landfill, hazardous waste treatment, disposal or recovery facility, or any other industrial or related facility without a permit as required by this Article.

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(b) The following development activities are exempt from the provisions of this Article:

(1) Land disturbing activities undertaken on forestland for the production and harvesting of timber and timber products.

(2) Land disturbing activities on agricultural land for production of plants and animals including, but not limited to, forages and sod crops, grains and feed crops, tobacco, cotton, and peanuts; dairy animals and dairy products; poultry and poultry products; livestock, including beef cattle, sheep, swine, horses, ponies, mules or goats, including the breeding and grazing of these animals; bees, fur animals and aquaculture. The construction of an agricultural structure that requires the disturbance of one acre or more of land, such as, but not limited to, broiler houses, machine sheds, repair shops, coops, barns and other major buildings shall require the submittal and approval of a Land Disturbance permit prior to the start of the land disturbing activity.

(3) Activities undertaken by persons who are otherwise regulated by the provisions of Chapter 20 of Title 48, the South Carolina Mining Act.

(4) Construction or improvement of single family residences or their accessory buildings which are separately built and not part of multiple construction in a subdivision development.

(5) Any of the following land disturbing activities undertaken by any person who provides gas, electrification, or communications services, subject to the jurisdiction of the South Carolina Public Service Commission, or corporations organized and operating pursuant to Section 33-49-10 et seq.:

(a) land disturbing activities conducted pursuant to a certificate of environmental compatibility and public convenience and necessity issued pursuant to Title 58, Chapter 33, of the South Carolina Code, or land disturbing activities conducted pursuant to any other certification or authorization issued by the Public Service Commission;

(b) land disturbing activities conducted pursuant to a federal environmental permit, including Section 404 of the Federal Clean Water Act, and including permits issued by the Federal Energy Regulatory Commission;

(c) land disturbing activities associated with emergency maintenance or construction of electric, gas, or communications facilities, when necessary to restore service or when the Governor declares the area to have sustained a disaster and the actions are undertaken to protect the public from a threat to health or safety;

(d) land disturbing activities associated with routine maintenance and/or repair of electric, gas, or communications lines;

(e) land disturbing activities associated with the placement of underground lines for distribution or transmission of electric energy or of gas or communications services; or

(f) land disturbing activities conducted by a person filing environmental reports, assessments or impact statements with the United States Department of Agriculture, Rural Electrification Administration in regard to a project.

(6) Entitled Property. All entitled property shall comply with the Stormwater regulations that were in effect prior to the adoption of this Article.

**Sec. 21-41. Storm Water Management Program.**

The Storm Water Division shall develop a SWMP to meet the requirements of Part II of the NPDES MS4 Permit and shall submit the SWMP to DHEC for approval. The Storm Water Division shall implement the SWMP in accordance with the deadlines established in Part III of the NPDES MS4 Permit. During the life of the NPDES MS4 Permit, all modifications of the SWMP will conform to the procedures set forth in Part II.H.2 of the NPDES MS4 Permit.

**Sec. 21-42. Design/Engineering Standards; Storm Water BMP Design Manual.**

Minimum requirements and guidance shall be established for processes regarding the evaluation and implementation of land disturbing or pollutant discharging activities and the design of storm water management systems and facilities within the City. The Storm Water Division is authorized to develop and adopt additional policies, criteria, processes, specifications and standards for the proper implementation of the requirements of this Article, Federal and State laws and the SWMP in the Storm Water BMP Design Manual. The Manual shall include design standards, procedures and criteria for conducting hydrologic, hydraulic and pollutant load evaluations, and downstream impact for all components of the storm water management system. Although the intention of the Manual is to establish uniform design practices, it neither replaces the need for engineering judgment nor precludes the use of information not presented. Other accepted engineering procedures may be used to conduct hydrologic, hydraulic and pollutant load studies if approved by the Storm Water Division.

The Manual may be updated periodically by the Storm Water Division to reflect the advances in technology and experience gathered with time.

These design and engineering standards for land disturbing activities shall be set forth in the Storm Water BMP Design Manual. These design and engineering standards establish the required level of quality and performance for storm water management systems on all land disturbance projects and the technical basis for the achieving storm water management, including water quantity and quality objectives. The design and engineering standards set forth in the Storm Water BMP Design Manual establish the minimum technical requirements for compliance with this Article, federal and state law, and the SWMP.

The Storm Water BMP Design Manual shall establish two categories of design and engineering standards for land disturbing activities:

- (a) land disturbing activities with a disturbed area equal to or greater than 5,000 square feet but less than one (1) acre which are not part of a larger common plan of development or sale with a planned disturbance of equal to or greater than one (1) acre; and

(b) land disturbing activities with a disturbed area which is:

(i) equal to or greater than one (1) acre; or

(ii) less than one (1) acre part of a larger common plan of development or sale with a planned disturbance of equal to or greater than one (1) acre.

An applicant for a Land Disturbance Permit must meet the standards set forth in the version of the Storm Water BMP Design Manual in effect at the time a complete Land Disturbance Permit Application is submitted to the Storm Water Division.

**Sec. 21-43. Land Disturbance Permit Application Process.**

Unless exempted under Section 21-40(b) of the Article, all construction activities that result in land disturbing activities with a disturbed area equal to or greater than 5,000 square feet or part of a larger common plan of development or sale with any proposed disturbance cumulatively equal to or greater than 5,000 sq.ft. shall require a Land Disturbance Permit issued by the Director. An applicant for a Land Disturbance Permit shall submit a Land Disturbance Permit Application, Notice of Intent, SWPPP, and checklist for review by the Storm Water Division. If the City feels it necessary, a jurisdictional determination issued by the US Army Corps of Engineers and approved mitigation plan may be required for project approval. The SWPPP must meet the requirements of S.C. Regulation 72-300 *et seq.* and standards specified in the Storm Water BMP Design Manual.

It shall be the responsibility of the applicant (property owner, lessee or person responsible for land disturbing activities) to provide a complete Land Disturbance Application Package that meets all the requirements of this Article, the SWMP, the Storm water BMP Design Manual, and State and Federal regulations. The Land Disturbance Application Package shall include proof of any required training or certification. The Land Disturbance Permit Application Package and review requirements can be found on the City's storm water website. A Land Disturbance Permit must be issued prior to any grading, construction, or land disturbing activities. The City may require bonds or performance securities, at their discretion, for all applications of land disturbance. No Land Disturbance Permit will be issued until DHEC grants coverage under the NPDES General Permit for Large and Small Construction Activities, if applicable.

**Sec. 21-44. Maintenance, Construction, Inspection, and Notice of Termination (NOT) for Activities Authorized under a Land Disturbance Permit**

Proposed installation and long-term maintenance of a storm water management system is critical for the achievement of its purpose of controlling storm water runoff quantity and quality and the short-term and long-term public health, safety and general welfare of the citizens of the City.

(a) A permanent maintenance agreement and plan for the storm water management system shall be included in the SWPPP. As part of the maintenance plan, the property owner or lessee of such structure or control shall specifically agree to be responsible for permanent maintenance. In order to transfer maintenance responsibility, a letter of acceptance by the

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new owner(s) accepting permanent maintenance responsibility shall be filed, along with any proof of required training or certification, with the Storm Water Division.

- (b) As part of the Land Disturbance Permit Application, the applicant shall submit construction and BMP maintenance and inspection schedules. Required and recommended schedules for BMP maintenance and inspection shall be provided in the Storm Water BMP Design Manual.
- (c) If the construction is to be phased, no construction stage work of a phase which includes the installation of storm water management structures or controls shall commence until the preceding phase of work is completed in accordance with the approved Land Disturbance Permit and SWPPP.
- (d) The permittee shall notify the Director before commencing any work to implement the approved Land Disturbance Permit and SWPPP and upon completion of any phase or designated component of the site. The contractor and/or owner shall hold a pre-construction conference with Storm Water Division staff a minimum of 48-hrs prior to the commencement of work as outlined in permit approval. All self-inspections, maintenance actions, BMP replacements, co-permittee agreements and changes to the approved Land Disturbance Permit and SWPPP shall be documented and maintained on-site from the commencement of any work until such time as the NOT is processed.
- (e) The permittee shall notify the Storm Water Division when the site or portion of the site is sufficiently stabilized to begin the NOT process. If portions of the site are to be completed prior to others (e.g., phased construction), a proposed schedule shall be included in the approved Land Disturbance Permit. The NOT process shall at a minimum require:
  - (1) a final plat showing the location of all storm water easements and responsible party for the maintenance of the system. The plat shall also show conflicts with other new or existing easements and tracking of GPS coordinates for all storm water structures. References shall be made to any and all owners and lessees. Any covenants established to ensure the maintenance and long-term functioning of the storm water system must be recorded with the Register of Deeds for Richland County;
  - (2) documentation of project completion from the owner of the approved Land Disturbance Permit, including any revisions and as-built construction drawings, inspection reports and storm water system ownership transfers;
  - (3) verification that all components of the storm water management system meet the approved Land Disturbance Permit and SWPPP specifications or achieve the function for which they were designed. In addition, the site shall be cleared of all construction trash and debris from the storm water system and the site as a whole;
  - (4) a maintenance plan and maintenance agreement accepting responsibility for permanent maintenance of post-construction storm water control measures, if different from the agreement submitted during the review process;
  - (5) the permittee to pay in full all outstanding fees, penalties, fines, judgments, awards, and/or costs, if incurred pursuant to this Article; and

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- (6) a final inspection conducted by the Storm Water Division.
- (f) Permit Notice of Termination (NOT) procedures shall be developed by the Storm Water Division and shall include inspection procedures to assure that the work has been carried out in accordance with the permit and this Article. The project NOT process may include phasing so that portions of a project can be closed out at various time periods, provided that the necessary documentation is submitted for approval. This process and required documentation are detailed in the storm water website.
- (g) The NOT process must be finalized by the Storm Water Division prior to:
  - (1) the use or occupancy of any newly constructed components of the site.
  - (2) final acceptance of any road for maintenance or designation of road owner and associated storm water management system.
  - (3) release of any bond held by the City in connection with the Development or any construction on the site.
  - (4) approval and/or acceptance for recording of a final plat for a subdivision of property pursuant to Section 17-492 of the City Code.

**Sec. 21-45. Ownership and City Participation.**

- (a) Unless City ownership is established prior to the amendment of this Article, all storm water management systems and facilities located on any property within the City's jurisdiction shall be privately owned and maintained unless the Director accepts the controls or structures for City ownership and maintenance. The City of Columbia owns or has legal access for purposes of operation, maintenance, and improvement of those systems and facilities which:
  - (1) Are located within public streets, rights-of-way, and easements;
  - (2) Are subject to easements, rights-of-entry, rights-of-access, rights-of-use, or other permanent provisions for adequate access for operation, maintenance, and/or improvement of systems and facilities; or
  - (3) Are located on public lands to which the city has adequate access for operation, maintenance, and/or improvement of systems and facilities.
- (b) The City reserves the right to accept or refuse ownership and maintenance of all or part of a storm water system on any property not owned by the City.
- (c) Privately-owned storm water management systems and facilities shall be maintained in accordance with the design and procedures set forth in the approved land disturbance plans.
- (d) A property owner or lessee may hire or contract others to perform necessary maintenance actions, but the City will hold the property owner or lessee as the responsible party should

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legal actions be necessary. The person(s) performing said work must be able to produce proof of any required trainings meeting NPDES MS4 Permit conditions.

- (e) The City shall have the right, pursuant to the authority of this Article, for its designated officers and employees to enter upon private property and public property owned by other than the City, upon reasonable notice to the owner thereof, to inspect the property and conduct surveys and engineering tests thereon in order to assure compliance with this Article.
- (f) When the Storm Water Division determines that additional storage capacity or pollution reduction for on-site storm water management is necessary in order to meet NPDES MS4 Permit conditions, to enhance or provide for the public health, safety and general welfare, to correct existing water quantity and quality problems or to provide protection for future development, the City may require additional storm water controls that may include additional storage or treatment capacity.
- (g) It is the express intent of this Article to protect the public health, safety, and welfare of all properties and persons in general, but not to create any special duty or relationship with any individual person or to any specific property within or outside the boundaries of the City. The City expressly reserves the right to assert all available immunities and defenses in any action seeking to impose monetary damages upon the City, its officers, employees and agents arising out of any alleged failure or breach of duty or relationship as may now exist or hereafter be created.
- (h) To the extent any permit, plan approval, inspection or similar act is required by the City as a condition precedent to any activity or change upon property not owned by the City, pursuant to this or any other regulatory ordinance, regulation, or rule of the City or under federal or state law, the issuance of such permit, plan approval, or inspection shall not be deemed to constitute a warranty, express or implied, nor shall it afford the basis for any action, including any action based on failure to permit or negligent issuance of a permit, seeking the imposition of money damages against the City, its officers, employees, or agents.

**Sec. 21-46. Watercourse Protection**

Every person owning property through which a watercourse passes, or such person's lessee(s), shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation (other than that which is required by water quality buffers), and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner(s) or lessee(s) shall maintain existing privately owned structures within or directly adjacent to a watercourse, so that such structures will not become a hazard to the use, function or physical integrity of the watercourse.

Impaired waters are those waters not meeting State water quality standards as defined by Section 303(d) of the Federal Clean Water Act. Every two years, states are required to submit a list of impaired waters to the United States Environmental Protection Agency (U.S. EPA) for approval. These waters are then added to the 303(d) List of Impaired Waters. For sites that have Stormwater

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discharges to a receiving water that is listed as impaired on South Carolina's 303(d) List of Impaired Waters, it shall be determined if your discharge will contain the pollutant(s) of concern and if so, carefully evaluate the selected BMP's and their performance to ensure that Stormwater discharges will not contribute to or cause a violation of water quality standards. If the project disturbs 25 acres or more, the SWPPP must have written quantitative and qualitative assessment that the BMP's selected will control the Stormwater discharges so that they will not contribute to or cause a violation in water quality standards.

To assist in the compliance with State and Federal laws and regulations, the Storm Water Division may develop special protection areas which require additional control of storm water quality and quantity than provided by minimum design standards. Such areas may consist of watersheds corresponding to adopted TMDLs, known flooding problems and pollution impairments, or other areas necessary to protect, maintain, and enhance water quality and the environment of the City and the public health, safety, and general welfare of the citizens of the City. These areas can be expected to change with time as development continues and federal and state law demands.

The City Storm Water Division shall be responsible for the identification and preparation of studies that outline potential problems areas. These studies may result in the implementation of additional requirements to meet or exceed the dynamic needs of the area with respect to water quality. The City shall allow individuals and/or groups to submit a request for consideration of a study for a special protection area. These requests will be weighed against other requests and existing City priorities (watershed requirements, emergency mitigation, priority areas, etc.). As protection areas are identified for study, public input will be included in the process. Once the area has been studied, problems identified, and solutions determined, special provisions may be adopted through the Storm Water Management Design Manual and other means.

New storm water systems created as the result of any new and significant re-development project shall be connected to the existing drainage system in a manner so as not degrade the integrity of the existing system, whether natural or manmade, and shall have demonstrated this to the Storm Water Division prior to issuance of the NOT. Discharge points shall be confined to connections with an existing natural or man-made drainage system. When storm water discharges are to flow into collection systems not owned and maintained by the City, the owners of all such systems, private or public, shall be notified and provided the opportunity to review such plans. The owners of these systems shall maintain the right to disapprove connections to their system. Private systems shall include all those on private property, including private ponds. Ponds built inline with waters of the State are not included as private systems, but instead protected by this Article as any other water of the State.

**Sec. 21-47. Notification of Spills**

Notwithstanding other requirements of law, as soon as any person responsible for a property, facility or its operation and maintenance, or responsible for emergency response for a property, facility or operation has information of any known or suspected release of non-storm water materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the storm drain system or Waters of the State, said person shall take all necessary steps to ensure the discovery, containment and cleanup of such release. The person shall also take immediate steps to

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ensure no recurrence of the discharge. In the event of such a release of materials containing or comprised of pollutants, including but not limited to oils, greases, engine fluids and fuels, chemicals, herbicides and pesticides, and fertilizers, said person shall immediately notify all necessary agencies. This shall include the Columbia Fire Department and Stormwater Hotline. Notifications shall be confirmed by written notice addressed and mailed to the Storm Water Division within five (5) business days of the spill event. In the event of a release of materials regardless of pollutant content, said person shall record an on-site written record of the spill. The owner or operator of such establishment shall retain an onsite written record of any and all spills that will include information on cleanup measures taken and the actions to prevent its recurrence. Such records shall be retained for at least five (5) years. Failure to provide notification of a release as provided above is a violation of this Article.

The owner, operator or other designated responsible party will bear all costs of cleaning up any spills. In the event that the City cleans up a spill, the owner, operator or designated responsible party will be required to reimburse the City for funds used in the clean-up.

Notification under this Section is in addition to any notification required under state or federal law, including, but not limited to, Section 304 of the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. §§ 11001 *et seq.*, and Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601 *et seq.*

**DIVISION 4 – DETECTION AND REMOVAL OF ILLICIT CONNECTIONS AND DISCHARGES AND IMPROPER DISPOSAL**

**Sec. 21-48. Illicit Connections, Illicit Discharges and Improper Disposal**

(a) It shall be unlawful for any person to connect any pipe, open channel or any other conveyance system that discharges anything except storm water or unpolluted water, which is approved by the Storm Water Division, into receiving waters.

(b) It shall be unlawful for any person to continue the operation of any such illicit connection regardless of whether the connection was permissible when constructed. Improper connections in violation of this Ordinance must be disconnected and redirected, if necessary, to the satisfaction of the Storm Water Division and any other federal, state or local agencies or departments regulating the discharge.

(c) It shall be unlawful for any person to throw, drain, run or otherwise discharge to any component of the City of Columbia MS4 or to the Waters of the State or to cause, permit or allow to be thrown, drained, run or allow to seep or otherwise discharge into such system or receiving water all matter of any nature excepting only such storm or surface water as herein authorized.

(d) The following discharges are exempt from the provisions in (a), (b) and (c) above unless the Storm Water Division determines such discharge to be a significant source of pollution:

- (1) Unpolluted industrial cooling water, but only under the authorization and direction of the Storm Water Division and appropriate NPDES permit.

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(2) Water line flushing performed or required by a government agency, diverted stream flows, rising ground waters, unpolluted pumped ground waters, and unpolluted ground water infiltration.

(3) Discharges from portable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual car washing, residential pool backwashing, flows from riparian habitats and wetlands, and street wash water.

(4) Discharges or flows from fire fighting.

(5) Other unpolluted water.

(e) In the event of an accidental discharge or an unavoidable discharge to the City of Columbia MS4 of any pollutant, the person who caused the unanticipated discharge or the owner of the property on which the discharge originated shall inform the Storm Water Division as soon as possible, but not to exceed 24 hours, of the nature, quantity and time of occurrence of the discharge. The person who caused the accidental discharge and the owner of the property on which the discharge originated shall take immediate steps to contain the discharge, properly dispose of the contained material, and take such other actions as necessary to minimize the effects of the discharge on the MS4 and receiving waters. The person who caused the accidental discharge and the owner of the property on which the discharge originated shall also take immediate steps to prevent a recurrence of the discharge.

**Sec. 21-49. Detection of Illicit Connections and Improper Disposal.**

(a) The Storm Water Division shall take appropriate steps to detect and eliminate illicit connections to the City of Columbia MS4, including the adoption of a program to screen illicit discharges and identify their source or sources, perform inspections, and levy fines if not removed.

(b) The Storm Water Division shall take appropriate steps to detect and eliminate illicit discharges and improper disposal into the City of Columbia MS4. These steps may include programs to screen for illicit discharges and programs to provide for public education, public information, and other appropriate activities to facilitate the proper management and disposal of used oil, toxic materials and household hazardous waste.

**Sec. 21-50. Waste Disposal Prohibitions.**

No person shall throw, deposit, leave, maintain, keep or permit to be thrown, deposited, left or maintained in or upon any public or private property, driveway, parking area, street, alley, sidewalk, component of the storm drain system, or water of the U.S., any refuse, rubbish, garbage, litter, yard debris, pet fecal matter, or other discarded or abandoned objects, articles, and accumulations, so that the same may cause or contribute to pollution. Yard debris, including natural foliage, may be deposited in the public right of way but not in or on any storm water conveyance structures, including inlets and gutters, but only if a collection service is available. Wastes in proper waste receptacles may be placed in the street for collection, but again only if collection by or through the City is in place.

**Sec. 21-51. Industrial or Construction Activity Discharges.**

Any person subject to an industrial or construction activity NPDES storm water discharge permit or Land Disturbance Permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Storm Water Division prior to issuance of a building permit and/or allowing discharges to the City of Columbia MS4.

**Sec. 21-52. Monitoring of Discharges and Inspections.**

(a) This section applies to all facilities that have storm water discharges associated with industrial activity, including any construction site subject to an NPDES or Land Disturbance Permit.

(b) The Storm Water Division shall have the right to enter and inspect facilities subject to regulation under this Article as often as may be necessary to determine compliance with this Article. If a discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the Storm Water Division.

(c) Facility operators shall allow the Storm Water Division ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit or Land Disturbance Permit, including those for controlling the contributions of pollutants from industrial facilities and for prohibiting illicit discharges and to verify that industries that are discharging storm water to the City of Columbia MS4 are in compliance with their general or individual NPDES storm water permit at or above standard design criteria requirements.

(d) The Storm Water Division shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the authorized enforcement agency to conduct monitoring and/or sampling of the facility's storm water discharge.

(e) The Storm Water Division has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure storm water flow and quality shall be calibrated to ensure their accuracy.

(f) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the Storm Water Division and shall not be replaced. The costs of clearing such access shall be borne by the operator.

(g) Unreasonable delays in allowing the Storm Water Division access to a permitted facility is a violation of a storm water discharge permit and of this Article. A person who is the operator of a facility with a NPDES permit to discharge storm water associated with industrial activity commits an offense if the person denies the Storm Water Division reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this Article.

(h) Upon refusal by any property owner to permit an inspector to enter or continue an inspection, the inspector shall terminate the inspection or confine the inspection to areas concerning which no objection is raised. The inspector shall immediately report the refusal and the grounds to the Director.

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(i) If the Storm Water Division has been refused access to any part of the premises from which storm water is discharged and is able to demonstrate probable cause to believe that there may be a violation of this Article, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this Article or any permit issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the Storm Water Division may seek issuance of a search warrant from a court of competent jurisdiction. In the event that the Storm Water Division reasonably believes that discharges from the premises into the City of Columbia MS4 may cause an imminent and substantial threat to human health or the environment, the inspection may take place at any time and without notice to the owner of the property or a representative on site. The inspector shall present proper credentials upon reasonable request by the owner or representative.

(j) At any time during the conducting of an inspection or at such other times as the Storm Water Division may request information from an owner or representative, the owner or representative may identify areas of its facility or establishment, material or processes which contains or which might reveal a trade secret. If the Storm Water Division has no clear and convincing reason to question such identification, all material, processes and all information obtained within such areas shall be conspicuously labeled "CONFIDENTIAL – TRADE SECRET." The trade secret designation shall be freely granted to any material claimed to be such by the owner or representative so long as there is clear and convincing evidence for such a designation. In the event the Storm Water Division does not agree with the trade secret designation, the material shall be temporarily designated a trade secret and the owner or representative may request an appeal of the Storm Water Division's decision in the manner in which all such appeals are handled in this Article. Designation as trade secret shall not be grounds for denying inspection, but all information gathered during such an inspection will be treated as per Sec. 21-52(k).

(k) All trade secret material which are prepared or obtained by or for the Storm Water Division shall be marked as such and filed in a secure place separate from regular files and documents. Reports from samples prepared or obtained by or for the Storm Water Division or submitted for laboratory analysis shall be marked as such and treated in the same manner as other trade secret material. Trade secret material shall not be divulged by the Storm Water Division to anyone other than (1) other employees of the City or employees of the State or Federal governments engaged in an inspection or enforcement proceeding involving the designated material and (2) to administrative or judicial courts upon order to so divulge the material to the court.

**DIVISION 5 – ENFORCEMENT, PENALTIES, AND ABATEMENT**

**Sec. 21-53. Violations.**

(g) Upon determination that a violation of any of the provisions of this Article has occurred, the Storm Water Division may give written notice to the violator within five (5) business days. This notice shall specify: the nature of the violation, the findings of fact, and the deadline within which to correct deficiencies and/or restore the affected property, if appropriate. It shall be sufficient notification to deliver the notice to the property owner and/or operator via the United States Mail, properly stamped, certified and addressed to the address used for notice of taxes on the subject property by the Richland County Auditor or Lexington County Auditor.

(b) Pursuant to the authority conferred upon the City by the South Carolina Constitution, the South Carolina General Assembly and in compliance with the requirements of the NPDES MS4 Permit, the Storm Water Division is authorized to develop and adopt additional policies, criteria, and processes for enforcement procedures as outlined in the Storm Water Enforcement Manual. The Manual may be updated periodically by the Storm Water Division. The most current version shall be used by the City of Columbia for enforcement procedures.

**Sec. 21-54. Civil Penalties.**

Any person violating any of the provisions of this Article, or any rule or regulation, permit or condition, final determination or order of the Storm Water Division, shall be subject to a civil penalty not more than one thousand dollars (\$1,000) for each violation. Each separate day of a violation constitutes a new and separate violation. If payment is not received or equitable settlement reached within 30 days after demand for payment is made, a civil action may be filed on behalf of the city in the circuit court to recover the full amount of the penalty.

**Sec. 21-56. Corrective Action.**

(a) In the event that a violation of this Article has not been corrected within the applicable time period for correction, the City, or its contractor, may enter upon the lot or parcel of land and correct the violation, and the costs incurred as a result of such action (including inspection, administration, labor and equipment costs) shall be collected either from the performance security, if in place and sufficient to cover such costs, from the property owner, or shall become a lien upon the property and shall be collected in the same manner as City taxes are collected.

(b) The Storm Water Division is authorized to develop and adopt additional policies, criteria, and processes for alternative enforcement procedures as outlined in the Storm Water Enforcement Manual.

**Sec. 21-57. Stop Work.**

(a) Any person who shall proceed with any work which requires a Land Disturbance Permit hereunder without first submitting a SWPPP and obtaining a Permit or who is operating under an expired Permit, where applicable, shall have automatically placed on the subject property a stop work order, pay to City double the normal amount of applicable performance securities and fees, and payment of any other applicable penalties, prior to lifting of the stop work order.

(b) Any person found in violation of the terms of this Article shall also be subject to a stop work order as deemed necessary by the Storm Water Division. In addition to any requirements from Sec. 21-57(a), such persons shall be required to correct such violations as required by Sec. 21-57(c).

(c) The stop work order may allow or require work necessary for the correction of violations, but no other activities related to the project. Any person in violation of a stop work order is subject to impoundment of any and all equipment on the property, and payment of all fees, performance securities, penalties and payment of impoundment charges prior to retrieving such equipment.

**Sec. 21-58. Permit Suspension and Revocation.**

A Land Disturbance Permit may be suspended or revoked if one or more of the following violations have been committed:

- (1) violations of the conditions of any site development plan approval issued by the City;
- (2) land-disturbing activities not in accordance with the approved SWPPP;
- (3) non-compliance with the potential for notice(s) of violation or stop work order(s); or
- (4) non-compliance resulting in an immediate danger in a downstream area in the judgment of the Storm Water Division.

**Sec. 21-59. Criminal Penalties.**

In addition to any applicable civil penalties, any person who negligently, willfully or intentionally violates any provision of this Article or who knowingly makes any false statement, representation or certification in any application, record, report, plan or other document or files required to be maintained pursuant to this Article or any permit issued pursuant to this Article shall be deemed guilty of a misdemeanor, punishable, upon conviction, in accordance with section 1-5. Each day of a violation shall constitute a new and separate offense.

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**Sec. 21-60. Variances and Appeals**

(a) The Storm Water Division shall have the authority to grant variances and exceptions to any of the provisions of this division in response to an application showing undue hardship. Such variance or exception must be in harmony with the general purpose and intent of this division.

(b) Any person aggrieved by any decision of the Storm Water Division under this Article may appeal to the City Engineer. An appeal under the provision must be filed in writing with the City Engineer within 30 days of the decision being mailed or delivered to the person aggrieved and must state the reasons for the appeal.

(c) Using information provided by the appellant, the City Engineer (or his or her designee) shall conduct a technical review of the decision and respond to the appeal in writing within 30 days.

(d) A decision of the City Engineer that is adverse to an appellant may be further appealed to the City Manager or his or her designee within 30 days of the adverse decision. Notice of the appeal shall be delivered to the City Manager or his or her designee by the appellant, stating the grounds for further appeal. The City Manager or his or her designee shall issue a written decision on the appeal within 30 days. All decisions by the City Manager or his or her designee shall be served on the appellant personally or by registered or certified mail.

**DIVISION 6 – CHARGES AND FEES**

**Sec. 21-61. Field Inspection and Plan Review.**

Fees associated with the plan review of land development construction documents and inspections will be assessed via the schedule below. The revision of such fees shall be approved by the City Council.

Area of Land Disturbance	Fee
5,000 square feet – 1 acre	\$150 flat fee + \$50/month inspection fee <sup>1</sup>
1 – 10 acre(s)	\$300 flat fee + \$50/month inspection fee <sup>1</sup>
10+ acres	\$500 flat fee + \$50/month inspection fee <sup>1</sup>
Linear	\$150 flat fee + \$50/month inspection fee <sup>1</sup>
Project Modifications <sup>2</sup>	\$100 flat fee per modification submittal

<sup>1</sup> \$50 every month beginning the second month of land disturbance activities and ending on the date a Notice of Termination (NOT) is approved in accordance with Sec. 21-44. One invoice shall be sent to the permittee for all monthly fees, following NOT approval. For the purpose of invoicing, one month shall equal 30 days, and any remainder less than 30 days shall not be invoiced.

<sup>2</sup> For Major Project Modifications that will affect hydrology calculations, a change or addition in point discharge location, and/or the addition of impervious or disturbed area.

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**City of Columbia**  
**Best Management Practice (BMP)**  
**Design Manual**

**Prepared for:**



The City of Columbia, Utilities and Engineering Department  
Columbia, South Carolina

**Prepared by:**



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**720 Gracern Road**  
**Columbia, SC 29210**

**Date Revised:**  
**January 10 2014**

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**A. Design Aids**

- Calculation Worksheets
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    - Dry Enhanced Swale
    - Grass Filter Strip
    - Porous Surfaces
- Standard CAD Details and Notes/Specs
  - Bioretention
  - Infiltration Trench
  - Dry Enhanced Swale
  - Grass Filter Strip
  - Micropool Extended Dry Detention Pond
  - Wet Detention Pond

**B. Maintenance Schedules**

## **Chapter 1 – Stormwater Design Requirements**

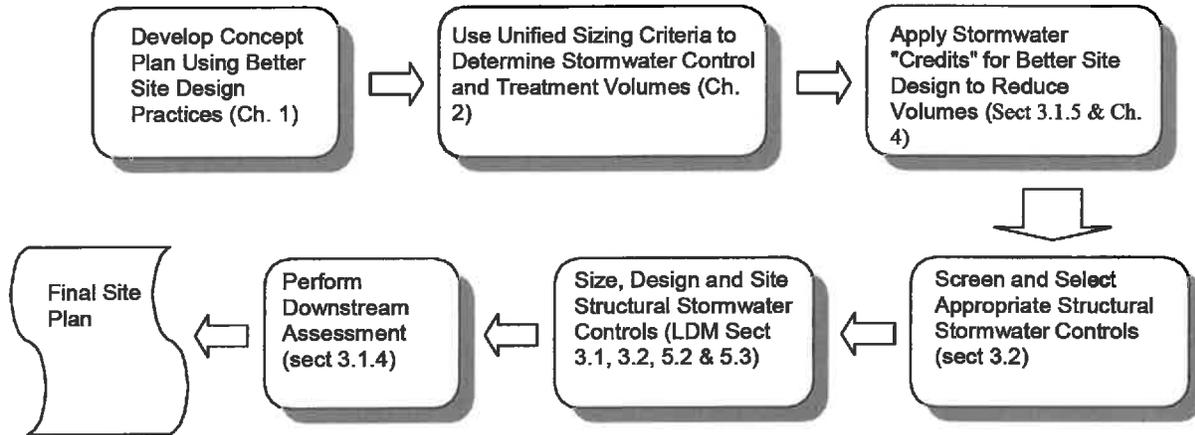
This chapter provides engineers, designers, developers, and others with the necessary information to assist with the development of systems that will control the rate, volume, and pollutants released from a new or re-development project. The City of Columbia Utilities and Engineering Department’s Stormwater Division (SWD) has been authorized by law or agreement to enforce these design requirements. These design requirements are based on Best Management Practices and reference State and Federal regulations, engineering publications, and other municipal and academic guidance.

It is an overall goal of this Manual to provide a set of design standards that will result in effective stormwater management. The goal is to mitigate the impact of land development on existing/natural hydrologic and hydraulic processes, as well as attempt to prevent further degradation of the water resources in the City of Columbia through proper planning and design. The design professional is encouraged to use all means necessary to develop land in a manner consistent with City Ordinances, Engineering Regulations, and this Manual and to ensure the safety of the general public. Specific methods and applications not covered in this section must be discussed with the SWD for applicability.

**NOTE:** In addition to the content included in this manual, the Georgia Stormwater Management Manual (GSMM) will also be utilized, which uses the same methodology – specific GSMM sections to be used are cited with links to those specific sections throughout the document.

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The following process (Figure 1.1) will be described in detail throughout this Manual, and will be the basis for compliance with the City of Columbia stormwater requirements:



**Figure 1.1 – Stormwater Compliance Process**

## **1.1 General Requirements**

General requirements for all stormwater systems will include, but not limited to the following:

1. The Uniform Sizing Criteria (USC) will be used as described in this Manual to address:
  - a. The Water Quality Volume (WQv)
  - b. The Channel Protection Volume (CPv)
  - c. Impacts from overbank and extreme flooding events (2- through 100-year)
  - d. Avoiding downstream water quality or quantity impacts
  - e. Applying proper volume “credits” to a site design
  - f. The specific design and performance requirements for each allowable BMP
2. All privately owned stormwater facilities shall have a maintenance agreement. This notarized covenant is to be recorded with the Register of Deeds in the City of Columbia.
3. Re-development is typically governed by the same design criteria as new developments, however the SWD reserves the right to alter (increase or decrease) the requirements for redevelopment to address specific conditions of the site or the receiving watershed.
4. All post-development BMPs must be protected from erosion and sedimentation during the construction phases; a final inspection by the City will be required to determine if additional action is needed to remove sediment deposits from post-construction BMPs. See Section 21-44 of the Stormwater Quantity and Quality Control Ordinance for further maintenance, construction, inspection and Notice of Termination (NOT) requirements for activities under a land disturbance permit. In cases where other City or SCDHEC sediment prevention and erosion control regulations are applicable, the most restrictive requirements will be adhered to.
5. An assessment of the presence/absence of wetlands/Waters of the State shall be performed on all sites by a qualified professional. If wetlands/Waters of the State are suspected to exist on a property, they shall be investigated and delineated by a qualified professional. If wetlands are to be impacted, the City will not issue a Land Disturbance Permit without a confirmation or denial letter from the US Army Corps of Engineers (USACE).
6. All stormwater management and sediment control practices shall be designed, constructed, and maintained with consideration for the proper control of mosquitoes and other vectors.
7. The entire watershed that drains to a particular design point shall be included in determining the appropriate design storm. All drainage systems regardless of size or classification (see sections 1.1.7 a-d below and the City of Columbia’s Utilities and Engineering Regulations for their Drainage Ordinance ) shall be analyzed and designed as necessary to safely pass the 100-year storm event to avoid the likelihood of dwelling flooding, property damage or public access and/or utility interruption.

Example 1: a residential stormwater drainage system is required to collect and convey flows from a 10-year event. However, the designer estimated the depth of flow across roadways and other surfaces during a 100-year event, which were in excess of those that catch basins and inlets could collect and convey, but would ultimately be

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directed to the receiving stormwater pond (or waterway). Those depths of flow, for the entire site, were determined to be below those that would cause flooding (or other damages) to neighboring/adjacent properties or cause an impediment to public access and/or utility interruption. Therefore, this system safely passes the 100-year storm event.

All computations shall be based on the contributing watershed, not just the project area or disturbed area. Classification of stormwater systems are as follows according to Part 4 of the City's Utilities and Engineering Regulations' Drainage Ordinance (Sec. 6-5004), and will be addressed in addition to satisfying the Unified Stormwater Sizing Criteria:

a. Minor Drainage Systems: 0 - <40 Acres

All drainage systems, excluding ponds that carry less than 40 acres of stormwater runoff shall be designed to carry flows resulting from a ten (10) - year storm event. Ditches and channels shall be provided to carry the runoff from a rain of fifty (50) year frequency with protection against channel erosion.

b. Collector Systems: 40 - <500 Acres

All drainage systems, excluding ponds, that carry at least 40 acres but less than 500 acres shall be designed to carry flows resulting from a twenty-five (25) - year storm event.

c. Major Drainage Systems: 500 and more Acres

All drainage systems, excluding ponds, that carry at least 500 and more acres shall be designed to carry a flow resulting from a fifty (50)-year storm event. Encroachment upon Major Drainage Channels and the adjacent overflow land shall be avoided to the maximum extent possible.

d. City or FEMA Floodplains: 640 and more Acres

Bridges and culverts being constructed in natural channels, creeks, or rivers draining more than 640 acres, shall be designed to carry a flow resulting from a one-hundred (100)-year storm event. Bridges and culverts shall be sized to accommodate a 50-year frequency rain fall, without increasing the depth of flow in the channel. Design of bridges and culverts shall conform to the current South Carolina State Highway Department construction specifications. Encroachment upon these channels shall be avoided to the maximum extent practicable, and new encroachments into an established floodway (excluding bridge piers) shall be avoided.

The Floodplain provisions in Part 22 of the City Utility and Engineering Regulations Manual shall apply, where applicable, to drainage systems which drain 640 or more acres.

## **1.2 Special Protection Areas**

In an effort to address some of the most critical water resource problems that exist in the City, Special Protection Areas can be established. Those wishing to develop or redevelop lands within these protected areas will be required to comply with the minimum standards listed in the preceding sections (i.e. The Unified Stormwater Sizing Criteria) as well as a more stringent set of design criteria detailed below. These generally focus on either a water quantity or a water quality problem. For more information on areas to be considered as Special Protection Areas, contact Richland County.

### **1.2.1 Flooding Problem Areas**

Flooding problem areas exist in locations around the City where development densities have increased to the point that stormwater controls have become overwhelmed, or where controls were never adequately designed or installed to control runoff (see map located at in Appendix C). In an effort to relieve existing flooding problems, the following list of design criteria will be required in designated areas. These areas are expected to change with time. The requirement in conjunction with the enforcement of other design criteria listed in the sections above, are expected to assist in reducing these problem areas.

1. The post-development, peak discharge rates is restricted to  $\frac{1}{2}$  the pre-development rates for the 2, 5, 10 and 25-year storm events or to the downstream system capacity, whichever is less.
2. When deemed appropriate, the City's SWD can require that the limits of flooding under a 100-year event be established on the site, regardless of drainage area. If such a requirement is enacted by the SWD, a hydraulic modeling methodology consistent with FEMA studies will be used.
3. When deemed appropriate, the City's SWD can require that a downstream hydrologic (and/or hydraulic) analysis be performed to assess potential impacts to receiving properties and stormwater systems under a 100-year event, due to altered timing of released stormwater discharges (See Section 3.1.4). If such a requirement is enacted by the SWD, a hydrologic (and/or hydraulic) modeling methodology consistent with FEMA studies will be used. A more detailed discussion of this analysis is provided in Section 2.1.9 of the GSMM.

Additional criteria may be established on a case by case basis.

### **1.2.2 Areas Associated with TMDLs and Impaired Waterbodies**

In conjunction with the NPDES permitting program, SCDHEC, through delegated responsibility from EPA, must identify and mitigate impaired waterbodies. Impaired waterbodies are identified through a monitoring program, the results of which are compared against water quality standards developed to protect designated uses of individual waterbodies. Waterbodies that are not meeting water quality standards cannot be designated as fishing, swimming, recreation, and/or aquatic life areas. In accordance with Section 303 of the Clean Water Act states must release a

bi-annual report of impaired waterbodies. Waters listed on the 303(d) list will eventually have a TMDL developed, which represents the daily amount of a particular pollutant that a waterbody can receive and still meet the water quality standard for its designated use(s).

City of Columbia's 303(d) listed waters can be found at:  
[http://www.scdhec.gov/environment/water/tmdl/docs/tmdl\\_10-303d.pdf](http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_10-303d.pdf)

For projects discharging to a 303(d) listed water the pollutant load reduction required along with the structural and non-structural BMPs that will be utilized to achieve that load reduction will be required to prevent further degradation. Water quality calculations must be provided to show that discharges from the site will not further degrade water quality. Procedures can be found in Section 2.4.3.

If a waterbody has an established TMDL the SWD will require that a plan be implemented that uses structural and nonstructural BMPs to reduce the current loading to either a certain total load or by a percentage. The plans to address the TMDLs will contain provisions for both existing and future land uses. TMDL waters in City of Columbia can be found at:  
[http://www.scdhec.gov/environment/water/tmdl/docs/tmdl\\_10-303d.pdf](http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_10-303d.pdf).

Those areas affected will change as additional TMDLs are adopted, and it is the designer's responsibility to check for updated information from SCHDEC.

TMDL and 303(d) requirements listed in Section 2.4.3 only apply if the development project discharges a pollutant of concern based on the land use. For residential properties the applicable pollutants of concern include bacteria, sediment, dissolved oxygen and nutrients. For commercial properties the applicable pollutants of concern include, heavy metals, bacteria, dissolved oxygen and sediment.

Note: while dissolved oxygen (DO) is not considered a "pollutant", it is a measure of stream health/impairment. If a stream is impaired for low DO, the specific pollutants that can lead to low DO levels will be addressed.

### **1.2.3 Critical Water Bodies**

Rocky Branch Creek, Smith Branch, Gills Creek, and Pen Branch are vital water resources for the City of Columbia, providing a vast habitat for aquatic life. Criteria listed below, in addition to the requirements detailed in this Manual, will be enforced for all new development and re-development projects near these water bodies. These design requirements shall specifically apply to stormwater runoff from all new development and re-development projects that is discharged to these water bodies.

The specific design requirements are as follows:

1. Water Quality:
  - a. All sites which disturb greater than one acre shall have a permanent water quality BMP in place to treat at least the runoff from the entire site for a 1.2-inch rainfall event. The Unified Stormwater Sizing Criteria method shall be used to determine the

water quality volume (WQv), as described in Chapter 2. This volume shall be released for a minimum period of 24-hours when a detention pond is used. For other BMPs that address water quality, the design criteria provided in Sections 3.2-3.4 of the GSMM will be followed.

- b. All sites which disturb greater than one acre shall have a permanent water quality BMP in place to treat the Channel Protection Volume, which is associated with the 1-year storm event. The Unified Stormwater Sizing Criteria method shall be used to determine the channel protection volume CPv), as described in Chapter 2. This volume shall be released for a minimum period of 24-hours when a detention pond is used. For other BMPs which have the ability to address the channel protection volume, the design criteria provided in Sections 3.2-3.4 of the GSMM will be followed.
  - c. Due to lake boundary topography, it may be impractical to route all impervious areas to a water quality BMP. In such cases, exemptions for roof area and sidewalks may be allowed with documentation that every effort was made to route impervious areas to water quality BMPs to the maximum extent technically feasible. However, the water quality volume in the BMP must reflect that from the disturbed portion of the site (i.e. runoff from a 1.2-inch rainfall event). In no cases are roads and parking areas exempt. Area-weighting will be used to determine the net treatment for the water quality and channel protection volumes. Specific examples on how to qualify for credits that reduce the WQv and CPv requirements are provided in Chapter 4 of this document.
  - d. A pretreatment device such as a forebay, micro-pool, filter strips or vault, to remove debris and large sediments shall be constructed either as part of the water quality BMP or as a separate device. Specific sizing requirements, as provided in the GSMM, shall be followed.
  - e. Developments with a commercial land use or a parking lot which exceeds 2,000 ft<sup>2</sup> must include the ability to capture hydrocarbons either in pretreatment or in the main BMP(s).
2. Erosion Prevention:

All discharge points shall include energy dissipation features which reduce velocity to a non-erosive state of 5 fps for clay and 2.5 fps for sand unless site conditions warrant further evaluation. The use of level spreaders to dissipate energy and create a sheet flow discharge pattern is preferred over a single, large discharge pipe/channel. All energy dissipation measures shall be installed above the 360-foot elevation contour.

### 1.3 Better Site Planning

Through stormwater better site design practices and techniques, it is possible to reduce the amount of runoff and pollutants generated. Better site design concepts can be viewed as both water quantity and water quality management tools and can reduce the size and cost of required structural stormwater controls. The site design approach can better mimic the natural hydrologic conditions of the site, have a lower maintenance burden and provide for more sustainability. Better site design includes:

- Conserving natural features and resources
- Using lower impact site design techniques
- Reducing impervious cover
- Utilizing natural features for stormwater management

For each of the above categories, there are a number of practices and techniques that aim to reduce the impact of urban development and stormwater runoff from the site. These better site design practices are described in detail in Section 1.3.

For several of the better site design practices, there is a direct economic benefit to their implementation for both stormwater quality and quantity through the application of site design “credits.” In terms of the unified stormwater sizing criteria, Table 1.1 shows how the use of nonstructural site design practices can provide a reduction in the amount of stormwater runoff required to be treated and/or controlled through the application of site design credits.

<b>Table 1.1 Reductions or “Credits” to the Unified Stormwater Sizing Criteria through the Use of Better Site Design Practices</b>	
Sizing Criteria	Potential Benefits of the Use of Better Site Design Practices
Water Quality (WQ <sub>v</sub> )	<ul style="list-style-type: none"> <li>• Better site design practices that reduce the total amount of runoff will also reduce WQ<sub>v</sub> by a proportional amount.</li> <li>• Certain site design practices will allow for a further reduction to the Water Quality Volume. The site design credits are discussed in Section 3.8.</li> </ul>
Channel Protection, Overbank Flood Protection, and Extreme Flood Protection (CP <sub>v</sub> , Q <sub>FP</sub> , Q <sub>100</sub> )	<ul style="list-style-type: none"> <li>• The use of better site design practices that reduce the total amount of runoff will also reduce CP<sub>v</sub>, Q<sub>FP</sub>, and Q<sub>100</sub> by a proportional amount.</li> <li>• Floodplain preservation may allow waiving of overbank flood and/or extreme flood protection requirements.</li> </ul>

### **1.3.1 Stormwater Better Site Design**

The first step in addressing stormwater management begins with the site planning and design process. By implementing a combination of these nonstructural approaches (aka: better site design practices), it is possible to reduce the amount of runoff and pollutants a site generates from a site and provide for some nonstructural on-site treatment and control of runoff. The goals of better site design include:

- Managing stormwater (quantity and quality) as close to the point of origin as possible and minimizing collection and conveyance
- Preventing stormwater impacts rather than mitigating them
- Utilizing simple, nonstructural methods for stormwater management that are lower cost and lower maintenance than structural controls
- Creating a multifunctional landscape
- Using hydrology as a framework for site design

The aim of better site design is to reduce the environmental impact “footprint” of the site while retaining and enhancing the owner/developer’s purpose and vision for the site. Many of the better site design concepts can reduce the size and cost of necessary drainage infrastructure and structural stormwater controls while maintaining or even increasing the value of the property.

Several of the site design practices described in this section provide a calculable reduction or site design “credit” which can be applied to the unified stormwater sizing criteria requirements. The use of stormwater better site design can also have a number of other ancillary benefits including:

- Reduced construction costs
- Increased property values
- More open space for recreation
- More pedestrian friendly neighborhoods
- Protection of sensitive forests, wetlands and habitats
- More aesthetically pleasing and naturally attractive landscape
- Easier compliance with wetland and other resource protection regulations

### **1.3.2 List of Stormwater Better Site Design Practices and Techniques**

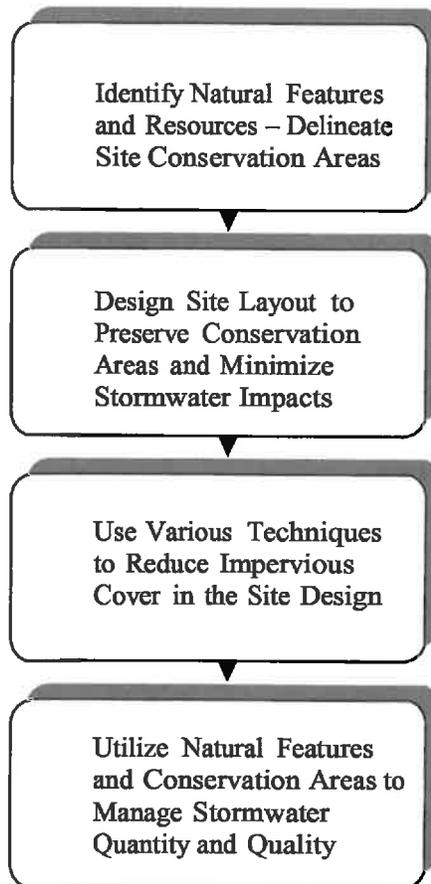
The stormwater better site design practices and techniques allowed for in this Manual are grouped into four categories and are listed below:

- Conservation of Natural Features and Resources
  - Preserve Undisturbed Natural Areas
  - Preserve Riparian Buffers
  - Avoid Floodplains

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- Avoid Steep Slopes
- Minimize Siting on Porous or Erodible Soils
  
- Lower Impact Site Design Techniques
  - Fit Design to the Terrain
  - Locate Development in Less Sensitive Areas
  - Reduce Limits of Clearing and Grading
  - Utilize Open Space Development
  - Consider Creative Development Design
  
- Reduction of Impervious Cover
  - Reduce Roadway Lengths and Widths
  - Reduce Building Footprints
  - Reduce the Parking Footprint
  - Reduce Setbacks and Frontages
  - Use Fewer or Alternative Cul-de-Sacs
  - Create Parking Lot Stormwater "Islands"
  
- Utilization of Natural Features for Stormwater Management
  - Use Buffers and Undisturbed Areas
  - Use Natural Drainage ways Instead of Storm Sewers
  - Use Vegetated Swale Instead of Curb and Gutter
  - Drain Rooftop Runoff to Pervious Areas

More detail on each site design practice is provided in the Stormwater Better Site Design Practice Summary Sheets in subsection 1.4.2 of the GSMM. These summaries provide the key benefits of each practice, examples and details on how to apply them in site design. Site design should be done in unison with the design and layout of stormwater infrastructure in attaining stormwater management goals. Figure 1.2 illustrates the stormwater better site design process that utilizes the four better site design categories.



**Figure 1.2 - Stormwater Better Site Design Process**

## **1.4 Water Quality Control Requirements**

Water quality control is an integral and required component of overall stormwater management systems to preserve the water resources of City of Columbia. New development and re-development projects must include controls that treat or otherwise limit the discharge of pollutants. These requirements are due to State and Federal requirements. Because this is a requirement of stormwater design, this section provides background information, references, and design standards addressing water quality. This section will utilize the better site design methods described in Section 1.3, as well as the credits described in Chapter 4, to reduce the volumes that must be treated.

Note: The designer must also comply with the buffer requirements described in Section 21-46. - Watercourse Protection of the City's Stormwater Ordinance where the City buffer requirements may differ from those required by SCDHEC in the NPDES Construction General Permit (CGP), the more restrictive buffer requirements (i.e. larger) will be required.

### **1.4.1 Design Requirements**

The following design criteria are established for water quality control and shall be incorporated by the use of BMPs for a given project area unless a specific water quality waiver is granted by the City's SWD. Incorporation of these requirements shall constitute adequate control of the discharge of the pollutants of concern.

1. All projects requiring a land disturbance permit, as defined in the City Stormwater Ordinance (Section 21-40/43), shall have permanent water quality BMPs installed according to the criteria listed in Chapter 2. Stormwater discharges to special protection areas with sensitive resources are subject to additional performance criteria (See Section 1.2).
2. Permanent water quality ponds and water quality structures having a permanent pool elevation shall be designed to store the runoff from the contributing area of the site from a 0.6-inch rainfall event, and release the accumulated water quality volume (WQv) over a minimum period of 24-hours.
3. Permanent water quality structures not having a permanent pool elevation shall be designed to store the runoff from the contributing area of the site from a 1.2-inch rainfall event, and release the accumulated WQv over a minimum period of 24-hours.
4. Engineered devices that are designed to treat the runoff volume from a project area may be substituted for a permanent water quality pond, if appropriate.
5. BMPs used for water quality shall have a pretreatment device as part of the BMP or treatment system. Options include forebays, vaults, or other devices that remove debris and coarser sediments from the drainage system.
  - a. Forebays shall be placed inside the main pond area or upstream of the main storage pond area.

- b. Unless a separate vault is to be used for the forebay, the forebay shall be separated from the larger detention area by barriers or baffles that may be constructed of earth, stones, riprap, gabions, or geotextiles. The barrier and/or baffles act as a trap for coarse sediments and minimize their movement into the main pond.
  - c. Maintenance of forebays will be needed more frequently than the main storage area and all designs, maintenance schedules must consider this need.
  - d. Forebays shall be sized to provide a volume for 0.1-inches of runoff from impervious surfaces,
6. Projects that discharge either directly or indirectly into an impaired waterbody as determined by the existence of an adopted TMDL by SCDHEC or through SCDHEC's listing of the waterbody on the latest 303(d) list shall be required to reduce pollutant loads so as to meet applicable water quality standards or other criteria listed in an adopted TMDL, such as percent reductions. More background information is covered in Section 1.2.2. This will require the installation and implementation of measures which are expected to adequately reduce pollutant loads to levels required by the TMDL or prevent future impairments as required by the current 303(d) list.
    - a. If the site disturbs less than 25 acres, an evaluation of the BMPs chosen to control the release of pollutants must be provided. Such evaluations may reference published values on BMP effectiveness or provided in Appendix A.
    - b. If greater than 25 acres, a comprehensive quantitative and qualitative analysis shall be provided, and include at a minimum calculations that show:
      - A site's pollutant load for all pollutants of concern (see Table 1.2),
      - The trapping effectiveness of the chosen BMPs based on City rainfall statistics and soil types, and
      - The runoff discharged through the last water quality BMP shall have a water quality level equal to or better than the in-stream standard. Standards are listed in the table below. If an adopted TMDL is in place for the receiving water, calculations must show pre- and post-BMP loads and percent reduction achieved.
  7. All BMPs must have a maintenance plan. Example maintenance agreements are included in the appendix.
  8. A credit system is available from the SWD that offers alternatives on how a site meets these water quality requirements (Chapter 4). However, S.C. DHEC minimum stormwater criteria must be met.
  9. The SWD reserves the right to require specific effluent limits for any pollutant from a site if necessary to ensure the water quality standards and other local, State, and Federal water quality regulations are met. The SWD also reserves the right to not allow credits at certain sites.

10. Annual groundwater recharge rates must be maintained to the maximum extent practical by promoting infiltration through the use of structural and non-structural methods.
11. Literature, signage, or other documentation shall be provided to owners and HOAs to educate and train themselves on the impact they can have on water quality and the activities necessary to maintain structural controls, as appropriate. These efforts are particularly critical in LID designs.

**Table 1.2: SCDHEC/USEPA Water Quality Standards**

Pollutant	Standard
*Bacteria	200 CFU/100-mL
Total Nitrogen	1.5 mg/L
Total Phosphorus	0.06 mg/L
TSS	80% reduction or 0.5 mg/L
Metals	See SCDHEC Reg. 61-68

\*Impairment is based on 10%-exceedances of 400 CFU/100-mL

### 1.4.2 General Design Procedures

If the proposed project does **not** discharge to a receiving water that is either impaired (303(d) listed) or has an adopted TMDL, stormwater treatment is achieved through addressing the USC. Use Table 1.2 to determine the pollutants of concern based on the proposed land use or disturbing activity. Then use Appendix A to help select BMPs to treat the pollutants of concern. The design of all BMPs must follow the process described below:

1. Calculate the water quality volumes using the USC equations in Chapter 2
2. Look for opportunities to reduce runoff through better site design (See Section 1.3)
3. Identify crediting opportunities for reduced volumes identified in Step 2 (See Chapter 4)
4. Review BMP suitability (See Section 3.2.7)
5. Perform BMP sizing calculations (See GSMM Section 3.2-3.4)
6. Compute stage-storage and stage-discharge relationships of the outlet control structure(s).
7. Repeat Steps 2-6 until initial design criteria is met
8. Check for treatment train (i.e. a series of BMPs) efficiency as needed (See Section 3.2.8)
9. Check for downstream impacts (See Section 3.1.4), revise the design as needed
10. Check for opportunities to reduce peak discharges due to WQv (See Section 3.1.5)
11. Repeat Steps 5-10, as needed, until final criteria is met
12. Design off-line diversions as needed (See Section 3.2.9)

**Note:** For engineered devices, alternative calculations other than detailed here must be provided. SCDHEC has accepted some such devices as providing adequate treatment.

### 1.4.3 Design Procedures for Impaired Waters and TMDLs

If the receiving water of the project is impaired (303(d) listed) or has an adopted TMDL, in addition to the design procedures in Section 1.4.2, the applicant must show some additional calculations of the BMPs to treat stormwater runoff. For 303(d) listed impaired waters, water quality calculations must be provided that show that discharges from the site will not further degrade water quality. This analysis must be quantitative and qualitative. The most up to date information in impaired water and adopted TMDLs is available from SCDHEC's website. The appropriate steps include:

Determine if the site discharges to a receiving water that is impaired (303(d) list) or has an adopted TMDL(s). A list of the City's 303(d) listed waters and TMDLs can be found at:

[http://www.scdhec.gov/environment/water/tmdl/docs/tmdl\\_10-303d.pdf](http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_10-303d.pdf)

- A waterbody may be listed on the 303(d) list and have an approved TMDL. It is important that both the 303d list and TMDL listing are both checked to determine if there is more than one impairment
- Determine all the pollutants causing the impairments or listed in the TMDL(s). The percent reduction provided in the TMDL is the default level of treatment needed from the permanent BMPs on the site. City of Columbia SWD may reduce this requirement to a lower percentage on a case by case basis.
- If the receiving water is on the 303(d) list, calculate the post construction load for the pollutant(s) of concern. A possible equation is the Schuler Simple Method (Schueler 1987). This method is based on an extensive database obtained in Washington, D.C. for the National Urban Runoff Program (NURP). The Simple Method estimates pollutant loads from urban development by the following equation:

$$L = 0.227(Q P_j R_v C A) \quad \text{Equation 1}$$

Where:

**L** =Pollutant load in pounds per desired time interval,

**Q** =Rainfall depth,

0.6-inch for wet ponds, some wetlands,

1.2-inch for all other BMPs,

**P<sub>j</sub>** =Fraction of rainfall events over the time interval that produce runoff

**P<sub>j</sub>** = 1 for a single event

**P<sub>j</sub>** = 0.9 for larger time intervals (months, years),

**R<sub>v</sub>** =Volumetric runoff coefficient expressing the fraction of rainfall converted to runoff (See Equation 2),

**C** = Event mean pollutant concentration in mg/l (See Table 3.3),

**A** = Total area of site in acres (areas < 640 acres are recommended for this method).

$$R_v = 0.05 + 0.09(I) \quad \text{Equation 2}$$

Where: **I** = percent impervious cover (i.e. I = 30 for 30% impervious cover)

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- If the receiving water is on the 303(d) list only (no TMDL), calculate the allowed load to meet water quality standards using equation 1. Replace variable C with the concentration of the water quality standard for the pollutant of concern listed in Table 1.2. Then compute the percent needed to reduce the post construction pollutant load from the allowed load.
- Use Appendix A to help select BMPs to treat the pollutants of concern. The last table in Appendix A provides an estimate of how effective a given BMP will be. The BMPs chosen must be able to achieve the required percent reductions in the TMDL or the required load reduction calculated for 303(d) listed waters computed in the previous step.
- If the receiving water is listed on the 303(d) list and has an approved TMDL calculate the load reduction for the pollutant of concern for the water way on the 303(d) list. Compare the percent reduction required to the percent reduction listed in the TMDL. Select BMPs for the pollutant that has the highest percent reduction requirement (i.e. TMDL or 303(d) reduction requirement whichever is highest).
- Revise chosen BMPs until required percent reductions are achieved.
- Provide all calculations in submittal package in a cohesive, easy to follow organization.

Table 1.3 Event Mean Concentration (EMC) Pollutant Loading for Various Land Uses (mg/l)												
Land Use	EMC Pollutant Loading (mg/l)											
	BOD	COD	TSS	TDS	TP	DP	TKN	NO <sub>2</sub> / NO <sub>3</sub>	Pb	Cu	Zn	Cd
Forest Rural Open	3	27	51	415	0.11	0.03	0.94	0.80	0.000	0.000	0.000	0.000
Urban	3	27	51	415	0.11	0.03	0.94	0.80	0.014	0.000	0.040	0.001
Agricultural/Pasture	3	53	145	415	0.37	0.09	1.92	4.06	0.000	0.000	0.000	0.000
Low Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.057	0.026	0.161	0.004
Medium Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.180	0.047	0.176	0.004
High Density Residential	14	79	97	189	0.24	0.08	1.17	2.12	0.041	0.033	0.218	0.003
Commercial	21	80	77	294	0.33	0.17	1.74	1.23	0.049	0.037	0.156	0.003
Industrial	24	85	149	202	0.32	0.11	2.08	1.89	0.072	0.058	0.671	0.005
Highways	24	103	141	294	0.43	0.22	1.82	0.83	0.049	0.037	0.156	0.003
Water/Wetlands	4	6	6	12	0.08	0.04	0.79	0.59	0.011	0.007	0.003	0.001

Adapted from NURP (1983), Horner et. al (1994), and Cave et. Al. (1994)

- |                                 |  |
|---------------------------------|--|
| BOD = Biochemical Oxygen Demand | TKN = Total Kjeldahl Nitrogen                          |
| COD = Chemical Oxygen Demand    | NO <sub>2</sub> /NO <sub>3</sub> = Nitrates / Nitrites |
| TSS = Total Suspended Solids    | Pb = Lead  |
| TDS = Total Dissolved Solids    | Cu = Copper  |
| TP = Total Phosphorus           | Zn = Zinc  |
| DP = Dissolved Phosphorus       | Cd = Cadmium   |
| BIO = Macroinvertebrates        |  |

Fecal coliform (FC) concentrations were not provided in the table above due to the large variability. Guidance from SCHDEC, Beaufort County (2010, Manual for Stormwater Best Management Practices) and Harper (2007, Evaluation of Current Stormwater Design Criteria Within the State of Florida) should be sought when estimating existing and post-development bacteria loads and the reduction requirements.

## Chapter 2 – Unified Sizing Criteria

This section presents an integrated approach for meeting the stormwater runoff quality and quantity management requirements by addressing the key adverse stormwater runoff impacts from site development and redevelopment. The purpose is to provide a design framework, which will be required for all sites, to:

- Remove stormwater runoff pollutants and improve water quality
- Prevent downstream streambank and channel erosion
- Reduce downstream overbank flooding
- Safely pass or reduce the runoff from extreme storm events

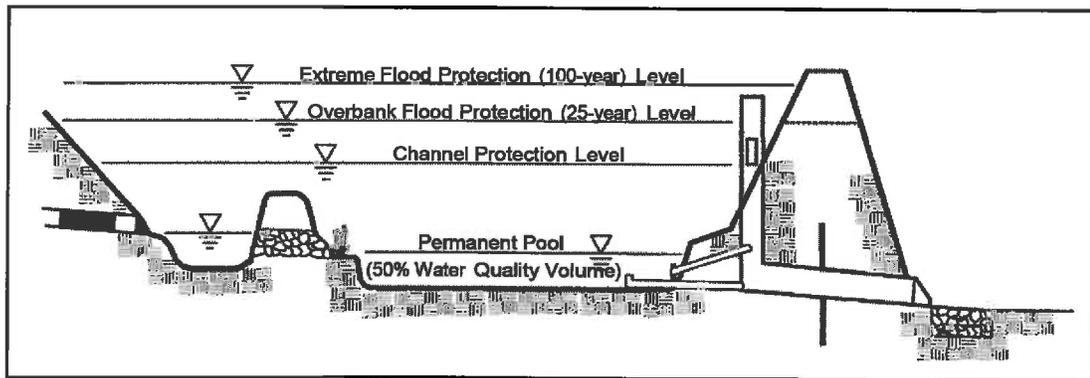
For these objectives, an integrated set of engineering criteria, known as the Unified Stormwater Sizing Criteria, have been developed to size and design structural stormwater controls. More detailed discussions on the Unified Sizing Criteria can be found in Section 1.3 of the GSMM. Table 2.1 below briefly summarizes the criteria. An example problem, with detailed solution, is provided in Appendix B. Calculation tools can be found in Appendix C.

<b>Table 2.1 Summary of the Unified Sizing Stormwater Sizing Criteria for Stormwater Control and Mitigation</b>	
<b>Sizing Criteria</b>	<b>Description</b>
Water Quality	Treat the runoff from the vast majority of the storms that occur in an average year. For the City, this equates to providing water quality treatment for the runoff (from an entire site) from 1.2 inches of rainfall.
Channel Protection	Provide extended detention of the 1-year storm event released over a period of 24 hours to reduce bank-full flows and protect downstream channels from erosive velocities and unstable conditions.
Overbank Flood Protection	Provide peak discharge control of the 25-year storm event such that the post-development peak rate does not exceed the predevelopment rate to reduce overbank flooding (2-, 5-, 10- and 50-yr events are also detained/retained to meet pre-development rates.)
Extreme Flood Protection	Evaluate the effects of the 100-year storm on the stormwater management system, adjacent property, and downstream facilities and property. Manage the impacts of the extreme storm event through detention controls and/or floodplain management.

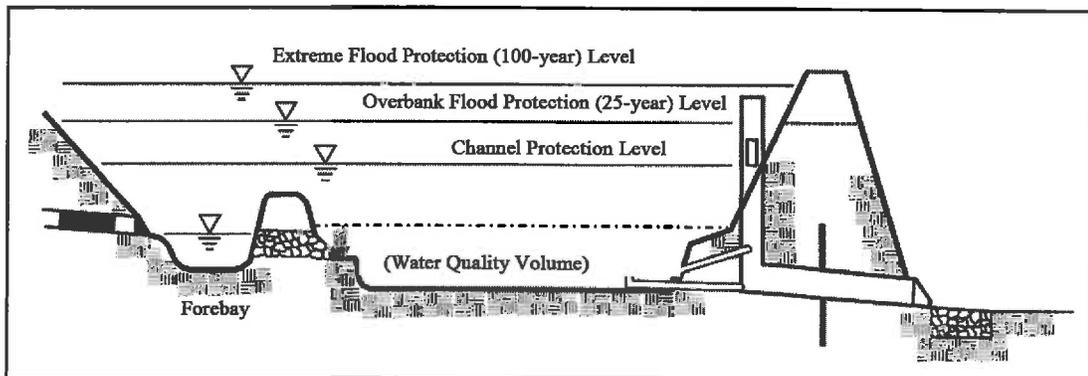
Each of the unified stormwater sizing criteria are intended to be used in conjunction with the others to address the overall stormwater impacts from a development site, for the entire range of critical hydrologic events. Figure 2.1 graphically illustrates that the criteria are "stacked" upon one another. For example, the extreme flood protection volume requirement also contains the channel protection volume and the water quality treatment volume. Figures 2.2a and 2.2b show how these volumes would be stacked in a typical stormwater wet or dry pond designed to handle all four criteria. Figure 2.2c provides additional details on a typical outlet structure configuration.



**Figure 2.1: Representation of the Unified Stormwater Sizing Criteria**



**Figure 2.2a: Unified Sizing Criteria Water Surface Elevations in a Wet Pond**



**Figure 2.2b: Unified Sizing Criteria Water Surface Elevations in a Dry Pond**

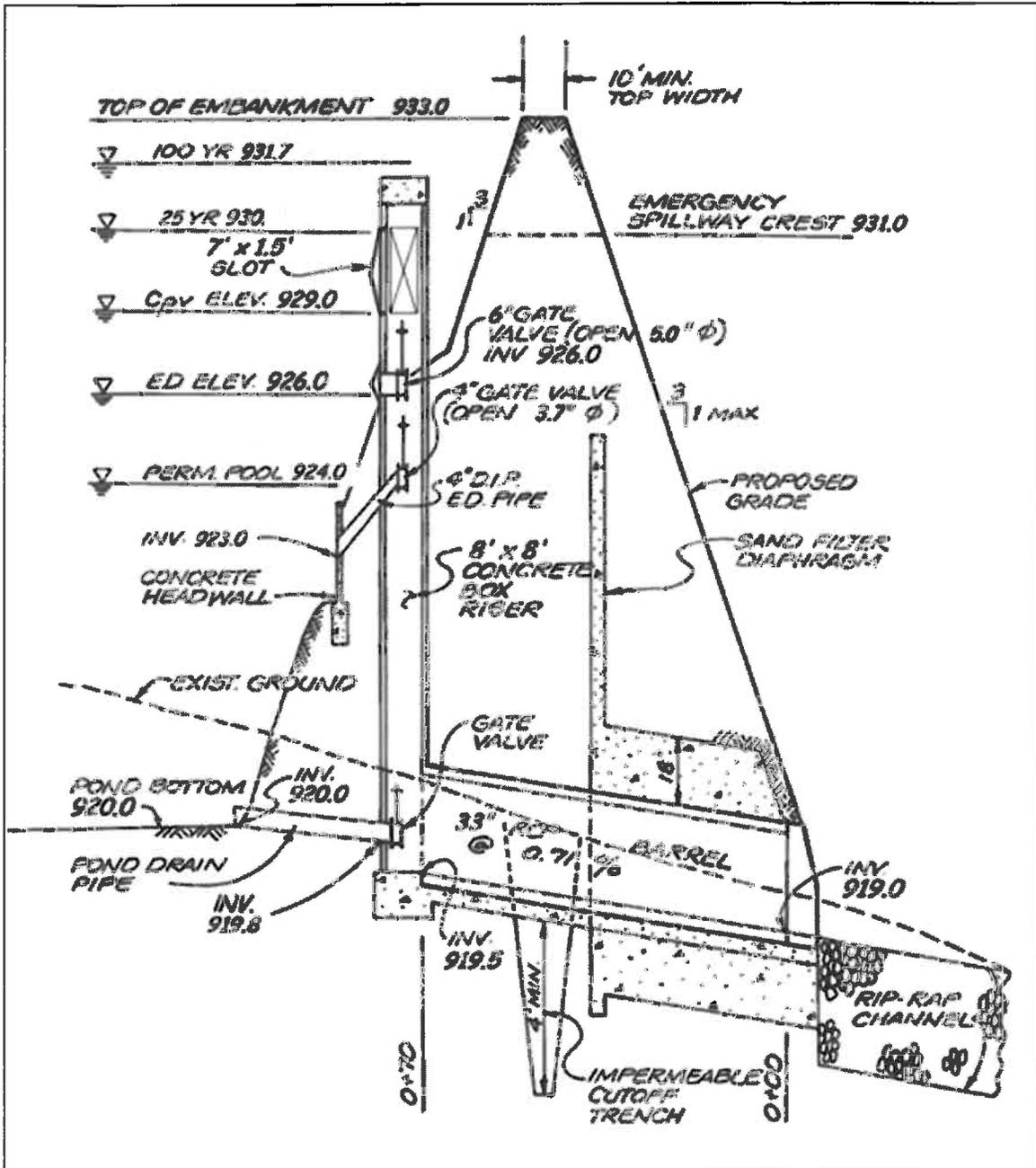


Figure 2.2c: Example of Unified Sizing Criteria Outfall Structure Details

The following pages describe the four sizing criteria in detail and present guidance on how to properly compute and apply the required storage volumes.

## 2.1 Water Quality (WQv)

The Water Quality sizing criterion, denoted WQv, specifies a treatment volume required to remove a significant percentage of the total pollution load inherent in stormwater runoff. This is done by intercepting and treating the runoff from approximately 85% of the storms that are expected to occur during the course of a “typical” year. It is also expected that a portion of the runoff from all storms greater than 1.2 inches can also be treated. WQv is a runoff volume that is directly related to the amount of impervious cover at a site.

The volumetric runoff coefficient (R<sub>v</sub>) and the site area are the key factors used in this calculation, as shown in the formula below:

$$WQ_V = \frac{1.2R_v A}{12} \quad \text{where:}$$

WQ<sub>v</sub> = water quality volume 1.2-inch rainfall (in acre-feet)

A = site area in acres

R<sub>v</sub> = 0.05 + 0.009(I) where:

I is entered as percent impervious cover (i.e. I = 30 for 30% impervious cover)

### Pollutant Reduction Goal

This Unified Sizing Criteria, and other supporting elements of the BMP Manual, follows the philosophy of removing pollutants to the “maximum extent practicable” (MEP) or the “maximum extent technically feasible” (METF) through the use of a percentage removal performance goal. The approach taken by the City is to require treatment of the WQv from a site to reduce post-development total suspended solids (TSS) loadings by 80%, as measured on an average annual basis. This performance goal is based upon U.S. EPA guidance and has been adopted nationwide by many local and statewide agencies. This method has also been shown to address other pollutants of concern to the MEP/METF, as both runoff volume reduction and sediment loads, which pollutants can be bound to, are addressed. Furthermore, when coupled with the Channel Protection sizing criterion, which detains and treats even greater flows, the goals of SCDHEC Regulation 72-300 will be met.

### Determining the Water Quality Volume (WQv)

- **Measuring Impervious Area:** The area of impervious cover can be taken directly off a set of plans or appropriate mapping. Where this is impractical, NRCS TR-55 land use/impervious cover relationships can be used to estimate impervious cover. **I is expressed as a percent value not a fraction (e.g., I = 30 for 30% impervious cover)**
- **Multiple Drainage Areas:** When a development project contains or is divided into multiple drainage areas, WQv must be calculated and addressed separately for each drainage area.
- **Off-site Drainage Areas:** Off-site existing impervious areas may be excluded from the calculation of the WQv volume.
- **Credits for Site Design Practices:** The use of certain better site design practices may allow the WQv volume to be reduced through the subtraction of a site design “credit.” These site design credits are described in Chapter 4.

Attachment 4 Determining the Peak Discharge for the Water Quality Storm: When designing off-line structural control facilities, the peak discharge of the water quality storm (Q<sub>wq</sub>) can be determined using the method provided later in this Chapter.

- Extended Detention of the Water Quality Volume: The water quality treatment requirement can be met by providing a 24-hour drawdown of a portion of WQv in a stormwater pond or wetland system. Referred to as water quality ED (extended detention), it is different than providing extended detention of the 1-year storm for the channel protection volume (CPv). The ED portion of the WQv may be included when routing the CPv.
- WQv can be expressed in cubic feet by multiplying by 43,560.
- WQv can also be expressed in watershed-inches by removing the area (A) and the “12” in the denominator.

## 2.2 Channel Protection (CPv)

The Channel Protection sizing criterion specifies that 24 hours of extended detention be provided for runoff generated by the 1-year, 24-hour rainfall event to protect downstream channels.

- CPv control is not required for sites with minimal areas or imperviousness which result in post-development discharges less than 2.0 cfs.
- The use of nonstructural site design practices that reduce the total amount of runoff will also reduce the channel protection volume by a proportional amount.
- The channel protection criteria may be waived by a local jurisdiction for sites that discharge directly into larger streams, rivers, wetlands, or lakes where the reduction in the smaller flows will not have an impact on streambank or channel integrity.

The increase in the frequency and duration of bank-full flow conditions in stream channels due to urban development is the primary cause of streambank erosion and the widening and down-cutting of stream channels. Therefore, channel erosion downstream of a development site can be significantly reduced by storing and releasing stormwater runoff from the channel-forming runoff events (which correspond approximately to the 1-year storm event) in a gradual manner to ensure that critical erosive velocities and flow volumes are not exceeded.

### Determining the Channel Protection Volume (CPv)

- Rainfall Depths: The rainfall depth of the 1-year, 24-hour storm is 3.1 inches.
- Multiple Drainage Areas: When a development project contains or is divided into multiple drainage areas, CPv may be distributed proportionally to each drainage area.
- Off-site Drainage Areas: Off-site drainage areas must be modeled as “present condition” for the 1-year storm event. If there are adequate upstream channel protection controls, then the
- Off-site area can be modeled as “forested” or “natural” condition. A structural stormwater control located “on-line” will need to safely bypass any off-site flows.
- Routing/Storage Requirements: The required storage volume for the CPv may be provided above the WQv storage in stormwater ponds and wetlands with appropriate hydraulic control structures for each storage requirement.
- Control Orifices: Orifice diameters for CPv control of less than 3 inches are not recommended without adequate clogging protection.

Specific Methodology: Attachment 4

1. Compute Initial Abstraction divided by rainfall, ( $I_a/P$ ) for given hydrologic parameters:
  - o  $P = 3.1$  inches
  - o  $I_a = 0.2*(1000/CN-10)$
  - o  $T_c =$  as per TR-55
2. From Chart 2.1, read Unit Peak Discharge ( $q_u$ ) for given post developed time of concentration ( $t_c$ ) and computed  $I_a/P$  (in csm/inch).
3. From attached Chart 2.2, read ratio of Outflow to Inflow ( $q_o/q_i$ ) for 24-hr detention or from the equation:

$$q_o/q_i = 12.03 q_u^{-0.9406}$$

4. Compute the ratio of the volume of storage divided by the volume of runoff ( $v_s/v_r$ ) from Chart 3.3 or by equation where:

$$v_s/v_r = 0.683 - 1.43(q_o/q_i) + 1.64 (q_o/q_i)^2 - 0.804(q_o/q_i)^3$$

5. Estimate Channel Protection Volume ( $Cp_v$ );

$$Cp_v = v_r(v_s/v_r)(A)/12 \text{ in acre-feet.}$$

Where:  $v_r =$  the post-developed volume of runoff depth for the 1-yr 24-hr storm in inches  
 $A =$  the drainage area in acres, and  
 $12 =$  a conversion factor.

Or

$$Cp_v = v_r(v_s/v_r) \text{ in acre-feet.}$$

Where:  $v_r =$  the post-developed volume of runoff volume for the 1-yr 24-hr storm in acre-feet

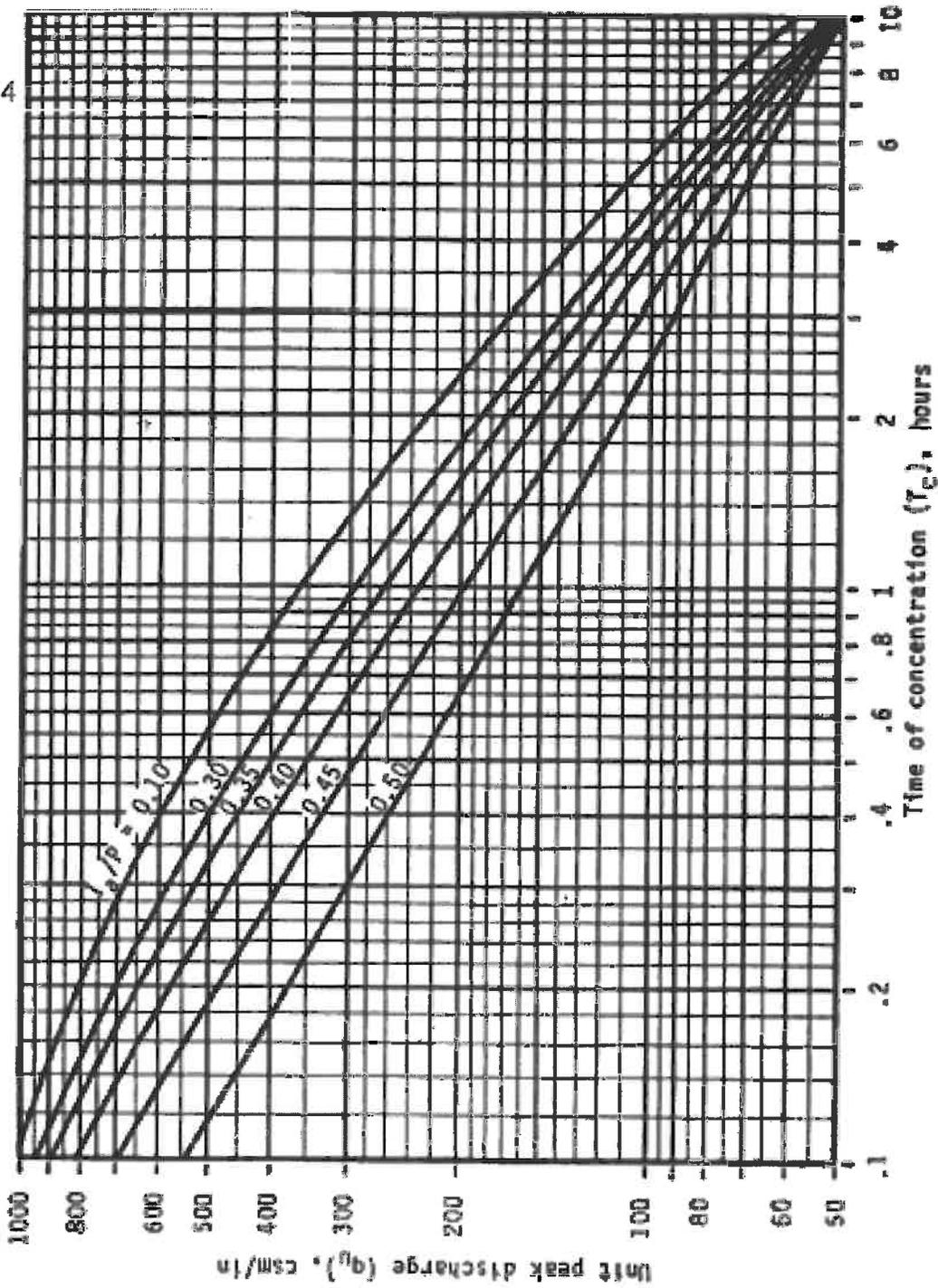


Figure 2.1.5-6  
SCS Type II Unit Peak Discharge Graph  
(Source: SCS, TR-55, Second Edition, June 1996)

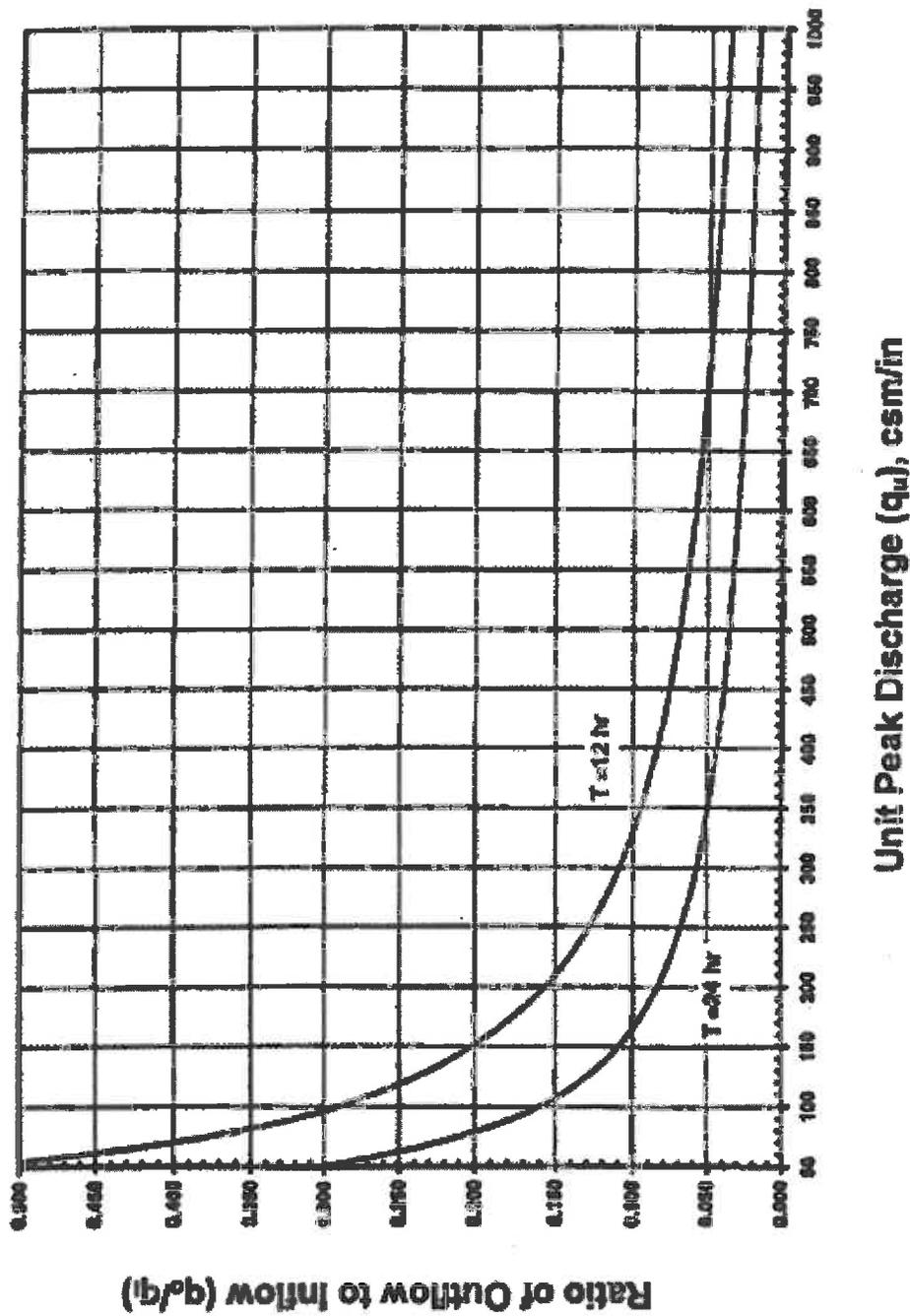
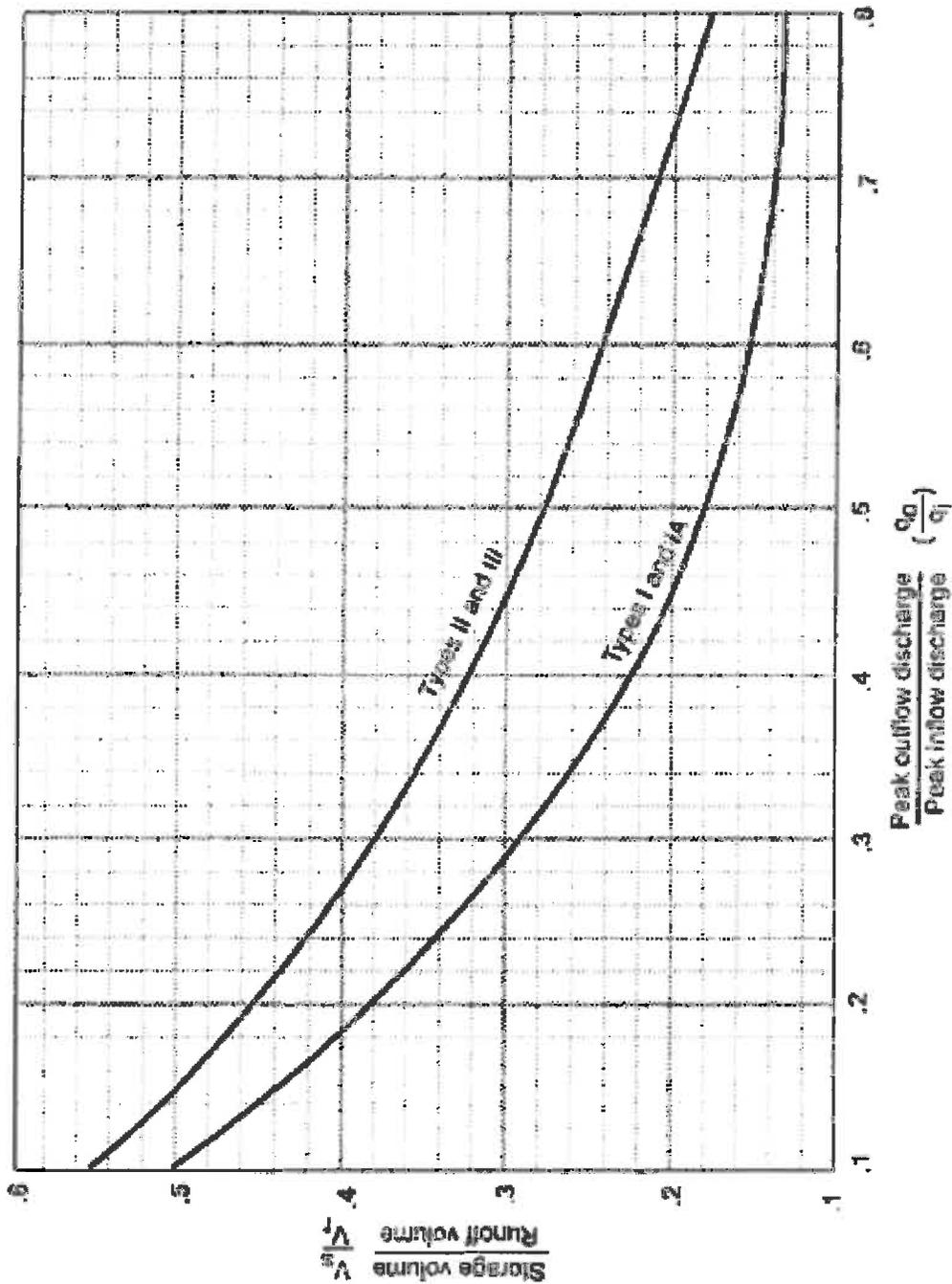


Chart 2.1  
 SCS Type II Unit Discharge Graph  
 (Source: SCS, TR-55, Second edition, June 1986)



**Chart 2.3**  
**Approximate Detention Basin Routing for Rainfall Types I, IA, II and III**  
 (Source: TR-55, 1986)

## 2.3 Overbank Flood Protection ( $Q_{FP}$ )

The Overbank Flood Protection criterion specifies that the post-development 2-year and 10-year (also 25-year for site 40 acres and larger), 24-hour storm peak discharge rates not exceed the pre-development (or undisturbed natural conditions) discharge rate. This is achieved through detention of runoff from these events.

- The use of nonstructural site design practices that reduce the total amount of runoff will also reduce  $Q_{FP}$  by a proportional amount.
- When the City has designated a watershed to have existing flooding problems that require increased detention and flood control requirements (See Section 1.2.1), the  $Q_2$ ,  $Q_{10}$ , and  $Q_{FP}$  flows must be reduced to less than the existing flows as determined by the City.

Note: This portion of the Unified Sizing Criteria is required in ADDITION to all other hydrologic and hydraulic analyses required by the City (i.e. 2-, 5-, 10- and 50-year events).

### Determining the Overbank Flood Protection Volume ( $Q_{FP}$ )

- **Peak-Discharge and Hydrograph Generation:** The SCS TR-55 hydrograph method will be used to compute the peak discharge rates and runoff volumes for the all analyzed storm events. Apply the methodology for estimating the required storage volume provided below.
- **Rainfall Depths:** The rainfall depth of the 2-year, 24-hour storm will be 3.6 inches. The rainfall depth of the 10-year 24-hour storm will be 5.3 inches. The rainfall depth of the 25-year, 24-hour storm will be 6.4 inches.
- **Off-site Drainage Areas:** Off-site drainage areas must be modeled as “present condition” for the design storm events and do not need to be included in  $Q_{FP}$  estimates, but can be routed through a structural stormwater control.
- **Downstream Analysis:** Downstream areas must be checked to ensure there is no peak flow increase above pre-development conditions to the point where the site area is 10% of the total drainage to that point. See Section 3.1.4 for the full details on this method.

### Estimated Volume Requirement Methodology:

1. Run typical site hydrology
2. Compute the ratio of the post-developed design storm discharge to the pre-developed discharge ( $q_o/q_i$ ).
3. Read the volume of storage divided by the volume of runoff ( $v_s/v_r$ ) from Chart 2.3
4. Estimate the volume of storage required for the overbank flood ( $V_s$ ).  
 $V_s = v_r(v_s/v_r)$  in acre-feet,  
Where:  $v_r$  = the post-developed volume of runoff for the selected overbank storm converted to acre-feet
5. Experience shows that multi-outlet volumes are at least 15% low so actual  $Q_{25}$  storage estimate is

$$VS = V_s * 1.15$$

## 2.4 Extreme Flood Protection ( $Q_{100}$ )

The Extreme Flood Protection criterion specifies that all stormwater management facilities and associated grading plans and site layouts be designed to protect buildings, ponds, roads, and other permanent structures from the 100-year, 24-hour return frequency storm event, denoted  $Q_{100}$ . This is accomplished either by:

1. Controlling  $Q_{100}$  through on-site or regional structural stormwater controls to maintain the existing 100-year floodplain. This is done where residences or other structures have already been constructed within the 100-year floodplain fringe area; or
2. By designing the on-site conveyance system, site grading, and building layout to safely pass  $Q_{100}$  without impacting buildings, ponds, roads, or other permanent structures and allowing it to discharge into a receiving water.

Note: Flows can be conveyed without retention or detention to a receiving floodplain if it can be shown that the floodplain is sufficiently sized to account for extreme flow increases from the site without causing damage; or

3. When the City has designated a watershed to have existing flooding problems that require increased detention and flood control requirements (See Section 3.2.1), the  $Q_{100}$  must be reduced to less than the existing 100-year flows as determined by the City.

Local flood protection (levees, floodwalls, flood proofing, etc.) and/or channel enlargements may be offered as a substitution as appropriate, as long as adequate conveyance and structural safety is ensured through the measure used, and stream environmental integrity is adequately maintained. The City reserves the right to reject such substitutions.

### Determining the Extreme Flood Protection Criteria ( $Q_{100}$ )

- **Peak-Discharge and Hydrograph Generation:** The SCS TR-55 hydrograph method will be used to compute the peak discharge rate and runoff for the 100-year, 24-hour storm. Apply the methodology for estimating the required storage volume provided below
- **Rainfall Depths:** The rainfall depth of the 100-year, 24-hour storm will be 8.3 inches.
- **Off-site Drainage Areas:** Off-site drainage areas must be modeled as “full build-out condition” for the 100-year storm event to ensure safe passage of future flows.
- **Downstream Analysis:** If  $Q_{100}$  is being detained, downstream areas must be checked to ensure there is no peak flow increase above pre-development conditions to the point where the site area is 10% of the total drainage to that point. See Section 3.1.4 for more details on how to properly perform a Downstream Analysis.

Estimated Volume Requirement Methodology:

1. Run typical site hydrology
2. Compute the ratio of the post-developed 100-year discharge to the pre-developed discharge ( $q_o/q_i$ ).
3. Read the volume of storage divided by the volume of runoff ( $v_s/v_r$ ) from Chart 2.3
4. Estimate the volume of storage required for the overbank flood ( $V_s$ ).

$$V_s = v_r(v_s/v_r) \text{ in acre-feet,}$$

Where:  $v_r$  = the post-developed volume of runoff for the selected overbank storm converted to acre-feet

5. Experience shows that multi-outlet volumes are at least 15% low so actual  $Q_{100}$  storage estimate is

$$VS = V_s * 1.15$$

## 2.5 Water Quality Volume Peak Flow Calculation

The peak rate of discharge for the water quality design storm ( $Q_{wq}$ ) is needed for the sizing of off-line diversion structures, such as for sand filters, bioretention, grass filter strips, grassed swales, and infiltration trenches.

The following procedure can be used to estimate peak discharges for small storm events. It relies on the Water Quality Volume and the simplified peak flow estimating method above. A brief description of the calculation procedure is presented below.

1. Using  $WQ_v$ , a corresponding Curve Number (CN) is computed utilizing the following equation:

$$CN = 1000/[10 + 5P + 10Q_{wv} - 10(Q_{wv}^2 + 1.25 Q_{wv}P)^{1/2}]$$

Where,  $P$  = rainfall, in inches (use 1.2 inches for the Water Quality Storm)

$Q_{wv}$  = Depth of Water Quality Volume is expressed in inches (1.2 $R_v$ )

$$R_v = 0.05 + 0.009(I) \text{ where:}$$

$I$  is entered as percent impervious cover (i.e.  $I = 30$  for 30% impervious cover)

2. Once a CN is computed, the time of concentration ( $t_c$ ) is computed (based on SCS methodology).

3. Using the computed CN, time of concentration (Tc) and drainage area (A), in acres; the peak discharge (Qwq) for the water quality storm event is computed using a slight modification of the Simplified SCS Peak Runoff Rate Estimation technique, using Type II rainfall distribution:

- Read initial abstraction (Ia), compute Ia/P
- Read the unit peak discharge (qu) for appropriate Tc
- Using WQv, compute the peak discharge (Qwq)

$$Qwq = qu * A * Qwv$$

where Qwq = the water quality peak discharge (cfs)  
qu = the unit peak discharge (cfs/mi<sup>2</sup>/inch)  
A = drainage area (mi<sup>2</sup>)  
Qwv = Depth of Water Quality Volume, in inches (1.2Rv)

## Chapter 3 – Best Management Practices (BMPs)

### 3.1 Water Quantity Control Requirements

#### 3.1.1 General Requirements

Water quantity control is an integral component of overall stormwater management. Its purpose is to negate the effects of stormwater runoff associated with land use changes due to development during storm events. The following design criteria are established for water quantity control, and when applied properly will meet or exceed the requirements of SCDHEC Regulation 72-300.

1. Post-development peak discharge rates shall not exceed pre-development peak discharge rates for the 2, and 10-year frequency 24-hour duration storm events. For developments 40 acres and larger, post-development peak discharge rates shall not exceed pre-development peak discharge rates for the 25-year frequency 24-hour duration storm event. The same hydrologic procedures shall be used in determining both the pre-development and post-development peak flow rates.
2. Post-development discharge velocities shall be reduced to provide non-erosive flow velocities from structures, channels or other control measures, or equal the pre-development 10-year 24-hour storm event flow velocities, whichever is less.
3. For post construction, the detention volume from all controls shall be drained from the structure within 72 hours. During construction, detention volumes can be temporarily stored to allow settling of particles. Upon project finalization pond elevations must be per the approved plans.
5. In addition to being allowed for water quality purposes, infiltration devices shall be required on those sites which do not currently discharge stormwater runoff or have no existing outlet. In such cases, in the post-development condition, devices shall be designed to infiltrate the runoff volume equivalent to the 5-year storm event. For evaluating storm events with a return interval greater than 5 years, the discharge rate from the site shall be limited to (not exceed) that of a site of equivalent size and slope with a SCS Curve Number equal to 39. See Section 5.2.6.L.v for more information, as well as Section 3.2.5 of the GSMM, for detailed selection, design, performance and operation & maintenance details on infiltration basins.

Note: An alternative design for infiltration basins can be found in Appendix O.

6. Watersheds with documented water quantity problems may have more stringent or modified design criteria determined by the SWD or as dictated by State and Federal Regulations. Some examples of variable criteria include but are not limited to:
  - a. Post-development discharge volumes from the entire development area not exceeding pre-development discharge volumes for storm frequencies smaller than the 2-year storm event,
  - b. Reduction of peak flow rates below pre-development levels,
  - c. Downstream channel, culvert, or property improvements.
7. Water quantity/volume waivers may be granted on a case-by-case basis. Final approval of a waiver request will be given at the discretion of the SWD. A water quantity/volume

waiver does not excuse water quality considerations. A project may be eligible for a waiver from the stormwater management requirements for water quantity/volume control if the applicant can justly verify the following items;

- a. The proposed project's peak flow rate or volume control for stormwater management would not create, aggravate, or accelerate downstream flooding or cause a detrimental impact to the downstream ecosystem, the receiving storm water system, or downstream property.
  - b. The design engineer shall sign the following statement, "The increased flows will not have a significant adverse impact on the downstream and adjacent properties".
  - c. Calculations shall be provided that demonstrate the site has addressed the Unified Stormwater Sizing Criteria, including the Water Quality (WQv) and Channel Protection (CPv) volumes, to the maximum extent practical, or to the level specific by the SWD.
    - It is recommended that a designer consult with the SWD at the earlier conceptual stages of a project to discuss water quality performance requirements for sites that may be more challenging.
8. An analysis shall be required for all development sites disturbing more than 2 acres to determine the impacts on downstream areas based on the 10-and 100-year 24-hour storm events unless a waiver or variance is granted. Downstream analysis shall determine whether the design storm events of interest cause or increase flooding, pollution, or erosion impacts to downstream properties, road crossings, and others areas as directed by the SWD. Applications for permit coverage must discuss this impact, the degree of the impact, and potential solutions. Analysis criteria shall include, but not be limited to:
- a. Existing land use curve numbers shall be used for developed areas outside of the project area.
  - b. The weighted curve number for the developed portion of the site shall be used for all undeveloped upstream areas.
  - c. Flows must be routed using an accepted hydrologic and hydraulic method.
  - d. Hydraulic step-backwater calculations (Corps of Engineer's HEC-2 or HEC-RAS models or equivalent) may be required by the SWD based on several factors, such as the severity of potential impact and location of project.
  - e. The discussions must include the severity of impact on any upstream and proposed storm water quantity or quality structure.
    - If the downstream analysis determines that the development of a particular site does contribute to flooding, pollution, or erosion problems, then appropriate controls shall be implemented:
9. All quantity controls that are also used for water quality control shall have a forebay, mirco-pool, screening vault, or skimmer/debris deflector for removal of debris and coarse sediments. The benefit of the forebay is that it inhibits the main pond from filling up with large particles, therefore allowing the main pond to maintain its original design volume.
10. Documentation on the design, installation, and maintenance of stormwater quantity facilities can be found in Sections 3.2-3.4 of the GSMM.

### 3.1.2 Accepted Quantity Controls

Detention structural controls are used for providing water quantity control and are typically used downstream of other minor structural controls. These structures are designed to provide channel protection, overbank flood protection, and protection against adverse downstream impacts that are related to the increase in peak flow rates and flow volumes from land disturbing activities. Detention structural stormwater controls accepted by SWD are shown in Table 3.1.

**Table 3.1: Accepted quantity controls**

General Structural Control	Description
<b>Dry Detention/Dry Extended Basins</b>	Dry detention basins and dry extended detention basins are surface storage facilities intended to provide temporary storage of stormwater runoff and releasing it at a designed flow rate to reduce downstream water quantity impacts. These structures are designed to completely drain to a dry condition within 72 hours.
<b>Wet Storm Water Detention Basins</b> <ul style="list-style-type: none"> <li>• Wet Pond</li> <li>• Wet Extended Detention Pond</li> <li>• Micropool Extended Detention Pond</li> <li>• Multiple Pond System</li> </ul>	Wet detention basins are constructed stormwater basins that have a permanent pool or micropool of water. Runoff from each rain event is detained above the permanent pool and released at a designed flow rate to reduce downstream water quantity impacts. Permanent pool depths must be $\geq 4$ feet to reduce mosquito breeding.
<b>Multi-purpose Detention Areas</b>	Multi-purpose detention areas are used for one or more specific activities such as parking areas and rooftops. These areas are used to provide temporary storage of runoff. Some of the multi-purpose area such as infiltration trenches or bio-retention areas may also be used for water quality purposes.
<b>Underground Detention</b>	Underground detention is used as an alternative to surface dry-detention basins. They are used in areas that are space-limited where there is not enough adequate land to provide the required detention volume. The underground storage utilizes tanks, vaults, and buried pipes to supply the required storage volume.
<b>Infiltration Basins</b>	Infiltration basins are used to remove runoff from the flow path into the ground. They are used in areas that currently do not discharge stormwater or create runoff only during large storm events.

### 3.1.3 Design Procedures

This section provides the general procedures for the design of stormwater quantity structures. The following items shall be required for the design of these structures and routing flows through them:

1. Compute the inflow hydrograph for the structure for the 2, 10, 25, 50 and 100-year 24-hour storm events for both the existing and proposed conditions. From this, determine peak flow rates for each storm.
2. Compute a stage-storage relationship for the proposed structure. A stage storage-curve defines the relationship between the depth of water and storage volume within the detention facility. Stage-storage and stage-discharge calculations must be included in the engineering calculations.

3. Compute stage-discharge relationship of the outlet control structure(s). A stage-discharge curve defines the flow capacity of a structure at a given stage or elevation. Also compute outlet barrel capacity and discharge velocity for energy dissipation design.
4. Perform routing calculations for the 2, 10, 25, 50 and 100-year storm events.
5. The peak discharge rate from the pond must be less than or equal to the peak discharge rate for the pre-development conditions for the 2 and 10-year storm events (also 25-year storm event for developments 40 acres and larger), unless the SWD allows a tolerance for peak flow matching. Finally, check to make sure the discharge hydrograph from the 100-year storm event provides a minimum of 1-foot of freeboard with the banks of the facility.
6. Evaluate the control structure outlet flow velocity and provide velocity control and channel stabilization. Drawings and details must be provided for outlet structures and basin.
7. Concentrated flow from any discharge point shall be returned to the overland flow condition.

### 3.1.4 Downstream Hydrologic Assessment

The purpose of the overbank flood protection and extreme flood protection criteria is to protect downstream properties from flood increases due to upstream development. These criteria require the designer to control peak flow at the outlet of a site such that post-development peak discharge equals pre-development peak discharge. The reasons for this have to do with (1) the timing of the flow peaks, and (2) the total increase in volume of runoff. Further, due to a site's location within a watershed, there may be very little reason for requiring overbank flood control from a particular site. This section outlines the required procedure, as part of a developer's stormwater management site plan, which is detailed in Section 2.1.9 of the GSMM.

The Ten-Percent Rule: Based on studies and results for a large number of sites, a site's zone of influence is considered to be the point where the drainage area controlled by the detention or storage facility comprises 10% of the total drainage area. For example, if the structural control drains 10 acres, the zone of influence ends at the point where the total drainage area is 100 acres or greater. However, some sites may require that the "zone of influence" be extended further downstream.

Typical steps in the application of the ten-percent rule are:

1. Determine the target peak flow for the site for predevelopment conditions.
2. Using a topographic map determine the lower limit of the zone of influence (aka "10% point").
3. Using a hydrologic model determine the pre-development peak flows and timing of those peaks at each tributary junction beginning at the pond outlet and ending at the next tributary junction beyond the 10% point.

4. Change the land use on the site to post-development and rerun the model.
  - If the undetained post-development peak flow rates are unchanged at the “10% point”, when compared the pre-development model, the lower limit of the zone of influence has been affirmed.
  - If the undetained post-development peak flow rates have increased at the “10% point” when compared the pre-development model, the lower limit of the zone of influence must be extended further downstream until there is no change in flow.
5. Design the structural control facility such that the overbank flood protection (25-year post-development flow does not increase the peak flows at the outlet and the determined tributary junctions.

Even if the overbank flood protection requirement is eliminated, the water quality treatment (WQv), channel protection (CPv), and extreme flood protection ( $Q_{100}$ ) criteria will still need to be addressed.

For a detailed example, see Section 2.1.9 of the GSMM.

### 3.1.5 Routing with WQv Removed

When off-line structural controls such as bioretention areas, sand filters and infiltration trenches capture and remove the water quality volume (WQv), downstream structural controls do not have to account for this volume during design. That is, the WQv may be subtracted from the total volume that would otherwise need to be routed through the downstream structural controls.

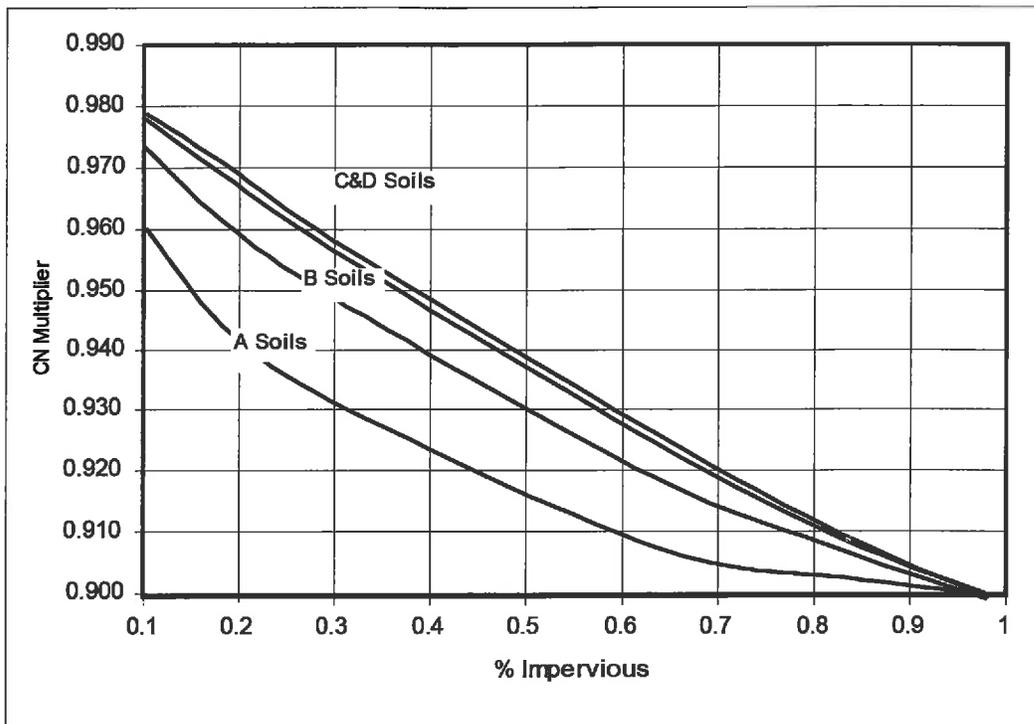
From a calculation standpoint this would amount to removing the initial WQv from the beginning of the runoff hydrograph – thus creating a “notch” in the runoff hydrograph. Since most commercially available hydrologic modeling packages cannot handle this type of action, the following method has been created to facilitate removal from the runoff hydrograph of approximately the WQv:

- Enter the horizontal axis on Chart 3.1 with the impervious percentage of the watershed and read upward to the predominant soil type (interpolation between curves is permitted)
- Read left to the factor
- Multiply the curve number for the sub-watershed that includes the water quality basin by this factor – this provides a smaller curve number

The difference in curve number will generate a runoff hydrograph that has a volume less than the original volume by an amount approximately equal to the WQv.

#### Notes:

1. This method should be used only for bioretention areas, filter facilities and infiltration trenches where the drawdown time is  $\geq 24$  hours.
2. This method can only be applied to catchments with a homogenous soil class (i.e. A, B, C, D), or are dominated significantly by a single soil class.
3. This method also assumed that 100% of the required WQv for the catchment area being analyzed is stored in upland BMPs



**Chart 3.1 - Curve Number Adjustment Factor**

**Example**

A site design employs an infiltration trench for the WQv and has a curve number of 72, is B type soil, and has an impervious percentage of 60%, the factor from Chart 3.1 is 0.92. The curve number to be used in calculation of a runoff hydrograph for the quantity controls would be:

$$(72 * 0.92) = 66$$

**3.2 Accepted Water Quality BMPs**

In selecting a BMP(s), it is most important to know what pollutants need to be treated to meet water quality goals. With proper planning, installation, and maintenance, BMPs are expected to reduce pollutant loads to receiving waters, reduce erosion, and provide health and safety benefits. Structural stormwater controls (aka BMPs) are constructed stormwater management facilities designed to treat stormwater runoff and/or mitigate the effects of increased stormwater runoff peak rate, volume, and velocity due to urbanization.

This Manual allows for a number of structural stormwater controls for meeting unified stormwater sizing criteria. The recommended controls are divided into three categories: general application, limited application, and detention structural controls. These categories of BMPs have varying abilities to address downstream channel protection (CPv), overbank flood protection (Q<sub>25</sub>) and/or extreme flood protection (Q<sub>100</sub>).

### 3.2.1 General Application Controls

General application structural controls are recommended for use with a wide variety of land uses and development types. These structural controls have a demonstrated ability to effectively treat the Water Quality Volume (WQv) and are presumed to be able to remove 80% of the total annual average TSS load in typical post-development urban runoff when designed, constructed and maintained in accordance with recommended specifications.

The allowable types of general application controls are summarized below. Detailed descriptions of each structural control along with design criteria and procedures are provided in Section 3.2 of the GSMM.

Table 3.2 lists and briefly describes the general application structural stormwater control practices. These structural controls are recommended for use in a wide variety of applications. A detailed discussion of each of the general application controls, as well as design criteria and procedures can be found in Section 3.2 of the GSMM.

<b>Table 3.2 General Application Structural Controls</b>	
<b>Structural Control</b>	<b>Description</b>
<p style="text-align: center;"><b>Stormwater Ponds</b></p> <ul style="list-style-type: none"> <li>• Wet</li> <li>• Wet Extended Detention</li> <li>• Micropool Extended Detention</li> <li>• Multiple Pond Systems</li> </ul>	<p>Wet detention basins are constructed stormwater basins that have a permanent pool or micropool of water. Runoff from each rain event is detained above the permanent pool and released at a designed flow rate to reduce downstream water quantity impacts. Permanent pool depths must be ≥ 4 feet to reduce mosquito breeding.</p>
<p style="text-align: center;"><b>Bioretention Areas</b></p>	<p>Bioretention areas are shallow stormwater basins or landscaped areas which utilize engineered soils and vegetation to capture and treat stormwater runoff. Runoff may be returned to the conveyance system, via underdrain, or allowed to partially infiltrate into the soil.</p>
<p style="text-align: center;"><b>Infiltration Trench/Basin</b></p>	<p>An infiltration trench is an excavated trench filled with stone aggregate used to capture and allow infiltration of stormwater runoff into the surrounding soils through the bottom and sides of the trench. An infiltration basin allows infiltration of stormwater runoff into the surrounding soils through the bottom and sides of the trench.</p>

Table 3.2 General Application Structural Controls	
Structural Control	Description
Enhanced Swales <ul style="list-style-type: none"> <li>• Dry Swale</li> <li>• Wet Swale/Wetland Channel</li> </ul>	Enhanced swales are vegetated open channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry or wet cells formed by check dams or other means.

### 3.2.2 Limited Application Controls

Table 3.3 lists the limited application structural stormwater control practices, along with the rationale for limited use. These structural controls are recommended for use with particular land uses and densities, to meet certain water quality requirements, for limited usage on larger projects, or as part of a stormwater treatment train. A detailed discussion of each of the limited application controls, as well as design criteria and procedures can be found in Section 3.3 of the GSMM.

Table 3.3 Limited Application Structural Controls	
Structural Control	Description and Rationale for Limited Use
Biofilters <ul style="list-style-type: none"> <li>• Filter Strip</li> <li>• Grass Channel</li> </ul>	Both filter strips and grass channels provide “biofiltering” of stormwater runoff as it flows across the grass surface. However, by themselves these controls cannot meet the performance goal. Consequently, both filter strips and grass channels should only be used as pretreatment measure or as part of a treatment train approach. They are also acceptable for use as a site design credit (see Chapter 4).
Hydrodynamic Devices <ul style="list-style-type: none"> <li>• Gravity (Oil-Grit) Separator</li> </ul>	Hydrodynamic controls use the movement of stormwater runoff through a specially designed structure to remove target pollutants. They are typically used on smaller impervious commercial sites and urban hotspots. These controls typically do not meet the 80% TSS removal performance goal and therefore should only be used as a pretreatment measure and as part of a treatment train approach.
Porous Surfaces <ul style="list-style-type: none"> <li>• Porous Concrete</li> <li>• Porous Asphalt</li> <li>• Modular Porous Paver Systems</li> </ul>	Porous surfaces are permeable pavement surfaces with an underlying stone reservoir to temporarily store surface runoff before it infiltrates into the subsoil. Porous concrete is the term for a mixture of coarse aggregate, portland cement and water that allows for rapid infiltration of water. Modular porous paver systems consist of open void paver units laid on a gravel subgrade. Both porous concrete and porous paver systems provide water quality and quantity benefits, but have high workmanship and maintenance requirements, as well as high failure rates. <p><b>Note:</b> Porous asphalt surfaces have a higher tendency to be clogged by clays, silts and oils resulting in a potentially high maintenance burden to maintain the effectiveness of this structural control. Further, summer heat in South Carolina can cause the asphalt to melt, destroying the porous properties of the surface. Therefore, the specific application of this BMP must be reviewed for both sediment and heat issues, as well as the traffic load that it is intended to carry, before allowing the application of this BMP.</p>

<b>Table 3.3 Limited Application Structural Controls (Cont.)</b>	
<b>Structural Control</b>	<b>Description and Rationale for Limited Use</b>
<ul style="list-style-type: none"> <li>• Media Filter Inserts</li> </ul>	<p>Media filter inserts, such as catch basin inserts and filter systems, are easily clogged and require a high degree of regular maintenance and replacement to achieve the intended water quality treatment performance and should not be used for areas of new development or redevelopment. These structural controls may serve a potential use in stormwater retrofitting. Before using this BMP, the designer must justify the anticipated performance for the constituent of concern, and receive approval from the City before included this BMP in any designs or construction activities.</p>
<ul style="list-style-type: none"> <li>• Proprietary Systems</li> <li>• Commercial Stormwater Controls</li> </ul>	<p>Proprietary controls are manufactured structural control systems available from commercial vendors designed to treat stormwater runoff and/or provide water quantity control. Proprietary systems often can be used on small sites and in space-limited areas, as well as in pretreatment applications. However, proprietary systems are often more costly than other alternatives, may have high maintenance requirements, and often lack adequate independent performance data, particularly for use in Georgia conditions.</p>

### 3.2.3 Detention Structural Controls

Table 3.4 lists the detention structural stormwater control practices. These structural controls are recommended only for providing water quantity control, i.e. channel protection, overbank flood protection and/or extreme flood protection in a stormwater treatment train. A detailed discussion of each of the detention controls, as well as design criteria and procedures can be found in [Section 3.4 of the GSMM](#).

Due to the potential for pollutant resuspension and outlet clogging, detention structural controls are not intended to treat stormwater runoff and should be used downstream of other water quality structural control in a treatment train (forebay, micro-pool, filter strip, etc.)

<b>Table 3.4 Detention Structural Controls</b>	
<b>Structural Control</b>	<b>Description</b>
Dry Detention / Dry Extended Detention Basins	Dry detention basins and dry extended detention (ED) basins are surface facilities intended to provide for the temporary storage of stormwater runoff to reduce downstream water quantity impacts.
Multi-Purpose Detention Areas	Multi-purpose detention areas are site areas used for one or more specific activities, such as parking lots and rooftops, which are also designed for the temporary storage of runoff.
Underground Detention	Underground detention tanks and vaults are an alternative to surface dry detention for space-limited areas where there is not adequate land for a dry detention basin or multi-purpose detention area.

### 3.2.4 Not Recommended Structural Controls

The following structural controls in Table 3.5 are not recommended for use in the City of Columbia to meet stormwater management objectives, as they fail to demonstrate an ability to meet the majority of the water quality treatment goals and/or present difficulties in operation and maintenance.

<b>Table 3.5 Not Recommended Structural Controls</b>	
<b>Structural Control</b>	<b>Rationale for Lack of Recommendation</b>
Stormwater Wetlands <ul style="list-style-type: none"> <li>• Shallow Wetland</li> <li>• Extended Detention Shallow Wetland</li> </ul>	Stormwater wetlands consist of a combination of shallow marsh areas, open water and semi-wet areas above the permanent water surface. In order to keep them alive and functioning, proper hydroperiods must be maintained. Creating a wetland near development is likely to have difficulty in maintaining the hydroperiod due to the lack of baseflow and distance from the water table.

### **3.2.5 Using Other or New Structural Stormwater Controls**

Innovative technologies may be allowed, providing there is sufficient documentation as to their effectiveness and reliability. The City will not allow any such technologies without independently derived information concerning performance, maintenance, application requirements and limitations.

More specifically, new structural stormwater control designs will not be accepted for inclusion in the Manual until independent pollutant removal performance monitoring data determine that the practice can meet the TSS and other selected pollutant concentration removal targets, and that the structural control conforms with local and/or State criteria for treatment, maintenance, and environmental impact.

### **3.2.6 Structural Stormwater Control Pollutant Removal Capabilities**

General and limited application structural stormwater controls are intended to provide water quality treatment for stormwater runoff. Though each of these structural controls provides pollutant removal capabilities, the relative capabilities vary between structural control practices and for different pollutant types.

Pollutant removal capabilities for a given structural stormwater control practice are based on a number of factors including the physical, chemical and/or biological processes that take place in the structural control and the design and sizing of the facility. In addition, pollutant removal efficiencies for the same structural control type and facility design can vary widely depending on the tributary land use and area, incoming pollutant concentration, rainfall pattern, time of year, maintenance frequency and numerous other factors.

To assist the designer in evaluating the relative pollutant removal performance of the various structural control options, Appendix J provides design removal efficiencies for each of the general and limited application control practices. It should be noted that these values are conservative average pollutant reduction percentages for design purposes derived from sampling data, modeling and professional judgment. A structural control design may be capable of exceeding these performances, however the values in the table are minimum reasonable values that can be assumed to be achieved when the structural control is sized, designed, constructed and maintained in accordance with recommended specifications in this Manual.

Where the pollutant removal capabilities of an individual structural stormwater control are not deemed sufficient for a given site application, additional controls may be used in series in a “treatment train” approach. More detail on using structural stormwater controls in series is provided in Section 3.2.8.

For additional information and data on the range of pollutant removal capabilities for various structural stormwater controls, the reader is referred to the National Pollutant Removal Performance Database (2nd Edition) available at:

[www.cwp.org](http://www.cwp.org)  
[www.bmpdatabase.org](http://www.bmpdatabase.org)

### 3.2.7 Structural Stormwater Control Selection

#### General Application Control Screening Process

Outlined below is a screening process for General Application structural stormwater controls. This process is intended to assist the site designer and design engineer in the selection of the most appropriate structural controls for a development site, and provides guidance on factors to consider in their location.

In general the following four criteria must be evaluated in order to select the appropriate structural control(s) or group of controls for a development:

- Stormwater Treatment Suitability
- Water Quality Performance
- Site Applicability
- Implementation Considerations

In addition, for a given site, the following factors must be considered and any specific design criteria or restrictions need to be evaluated:

- Physiographic Factors
- Soils
- Special Watershed or Stream Considerations

Finally, environmental regulations that may influence the location of a structural control on site, or may require a permit, need to be considered.

Section 3.1.3 of the GSMM provides a detailed selection process for comparing and evaluating various general application structural stormwater controls using two screening matrices and a list of location and permitting factors. Those tools can assist the design engineer in selecting the subset of structural controls that will meet the stormwater management and design objectives for a development site or project.

### 3.2.8 Using Structural Stormwater Controls in Series

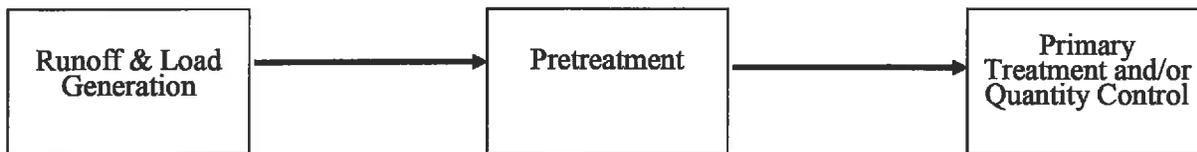
The following subsections provide a general description of how BMPs in series can be used to meet water quality goals, and the appropriate manner in which to calculate their cumulative effect on removing pollutants.

#### 3.2.8.1 General Methodology

##### Stormwater Treatment Trains

The minimum stormwater management standards are an integrated planning and design approach, sometimes called a stormwater “treatment train”. A treatment train consists of all the design concepts and nonstructural and structural controls that work to attain water quality and quantity goals. This is illustrated in Figure 3.1.

**Figure 3.1: Generalized Stormwater Treatment Train**



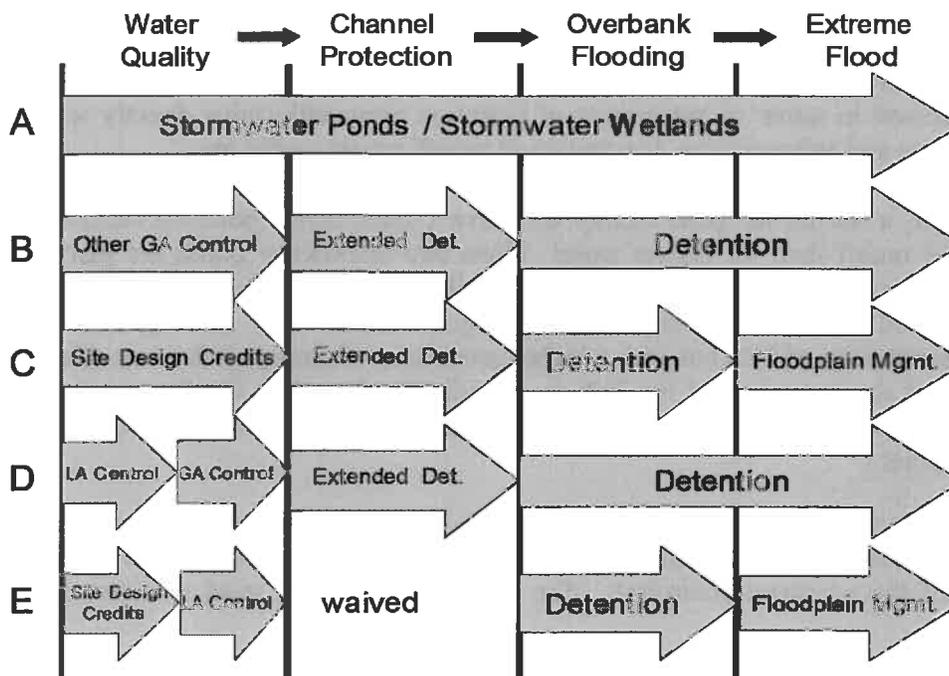
**Runoff and Load Generation** – The initial part of the “train” is located at the source of runoff and pollutant load generation, and consists of better site design and pollution prevention practices that reduce runoff and stormwater pollutants.

**Pretreatment** – The next step in the treatment train consists of pretreatment measures. These measures typically do not provide sufficient pollutant removal to meet the 80% TSS reduction goal, but do provide calculable water quality benefits that may be applied towards meeting the WQv treatment requirement.

**Primary Treatment and/or Quantity Control** – The last step is primary water quality treatment and/or quantity (channel protection, overbank flood protection, and/or extreme flood protection) control.

Many combinations of structural controls in series may exist for a site. Figure 3.2 provides a number of hypothetical examples of how the unified stormwater sizing criteria may be addressed by using structural stormwater controls.

**Figure 3.2 Examples of Structural Controls Used in Series**



Referring to Figure 3.2 by line letter:

A. Two general application (GA) structural controls, stormwater ponds and stormwater wetlands, can be used to meet all of the unified stormwater sizing criteria in a single facility.

B. The other general application structural controls (bioretention, sand filters, infiltration trench and enhanced swale) are typically used in combination with detention controls to meet the unified stormwater sizing criteria. The detention facilities are located downstream from the water quality controls either on-site or combined into a regional or neighborhood facility.

C. Line C indicates the condition where an environmentally sensitive large lot subdivision has been developed that can be designed so as to waive the water quality treatment requirement altogether. However, detention controls may still be required for downstream channel protection, overbank flood protection and extreme flood protection.

D. Where a limited application (LA) structural control does not meet the 80% TSS removal criteria, another downstream structural control must be added. For example, urban hotspot land may be fit or retrofit with devices adjacent to parking or service areas designed to remove petroleum hydrocarbons. These devices may also serve as pre-treatment devices removing the coarser fraction of sediment. One or more downstream structural controls is then used to meet the full 80% TSS removal goal, and well as water quantity control.

E. In line E site design credits have been employed to partially reduce the water quality volume requirement. In this case, for a smaller site, a well designed and tested Limited Application structural control provides adequate TSS removal while a dry detention pond handles the overbank flooding criteria. For this location, direct discharge to a large stream and local downstream floodplain management practices have eliminated the need for channel protection volume and extreme flood protection structural controls on site.

### **3.2.8.2 Calculation of Pollutant Removal for Structural Controls in Series**

For two or more structural stormwater controls used in combination, it is often important to have an estimate of the pollutant removal efficiency of the treatment train. Pollutant removal rates for structural controls in series are not additive. For pollutants in particulate form, the actual removal rate (expressed in terms of percentage of pollution removed) varies directly with the pollution concentration and sediment size distribution of runoff entering a facility.

For example, a stormwater pond facility will have a much higher pollutant removal percentage for very turbid runoff than for clearer water. When two stormwater ponds are placed in series, the second pond will treat an incoming particulate pollutant load very different from the first pond. The upstream pond captures the easily removed larger sediment sizes, passing on an outflow with a lower concentration of TSS but with a higher proportion of finer particle sizes. Hence, the removal capability of the second pond for TSS is considerably less than the first pond. Recent findings suggest that the second pond in series can provide as little as half the removal efficiency of the upstream pond.

To estimate the pollutant removal rate of structural controls in series, a method is used in which the removal efficiency of a downstream structural control is reduced to account for the pollutant removal of the upstream control(s). The following steps are used to determine the pollutant removal:

- For each drainage area list the structural controls in order, upstream to downstream, along with their expected average pollutant removal rates from Appendix J for the pollutants of concern.

- For cases where a limited application control is sited upstream from a general application control in the treatment train, the downstream general application structural control is given full credit for removal of pollutants.
- For any general application structural control located downstream from another general application control or a limited application structural control that has TSS removal rates equivalent to 80%, the designer should use half (i.e. 40% removal rate) of the normal pollutant removal rate for the second control in series. The reason for reducing the downstream BMP removal rate to half of its normal rate is that:
  - The larger particles, which are easier to trap, were removed by the upstream BMP
  - The remaining particles, which are smaller and harder to trap, remain for the downstream BMP and thereby reduce its effective removal rate
- For a general application structural control located downstream from a limited application structural control that cannot achieve the 80% TSS reduction goal the designer should use 75% of the normal pollutant removal rate for the second control in series.

Example:

TSS is the pollutant of concern and a stormwater pond is designed at the site outlet. A second stormwater pond is located downstream from the first one in series. If each pond has a normal removal rate of 80%, what is the total TSS removal rate? The following information is given:

- Control 1 (Stormwater Pond 1) = 80% TSS removal (use 1.0 x design removal rate)
- Control 2 (Stormwater Pond 2) = 40% TSS removal (use 0.5 x design removal rate)

Then applying the controls in order and working in terms of “units” of TSS starting at 100 units:

For Control 1: 100 units of TSS \* 80% removal rate

- 80 units removed; 20 units remaining

For Control 2: 20 units of TSS \* 40% removal rate

- 8 units removed; 12 units remaining

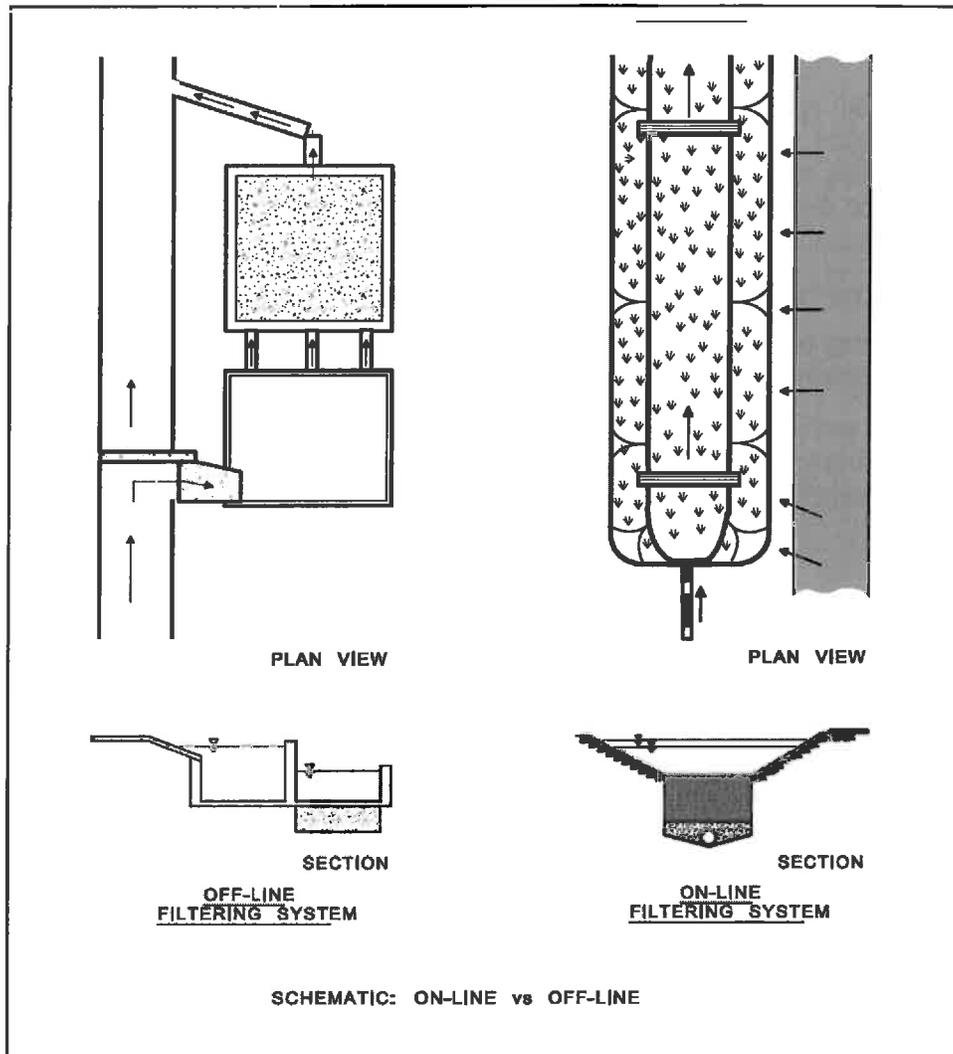
For the treatment train in total:

- We started with 100 units; 12 units remain
- 88 units were removed = 88% removal rate

### 3.2.9 On-Line Versus Off-Line Structural Controls

Structural stormwater controls are designed to be either “on-line” or “off-line.” On-line facilities are designed to receive, but not necessarily control or treat, the entire runoff volume up to the  $Q_{25}$  or  $Q_{100}$  event. On-line structural controls must be able to handle the entire range of storm flows.

Off-line facilities on the other hand are designed to receive only a specified flow rate through the use of a flow regulator (i.e. diversion structure, flow splitter, etc). Flow regulators are typically used to divert the water quality volume (WQv) to an off-line structural control sized and designed to treat and control the WQv. After the design runoff flow has been treated and/or controlled it is returned to the conveyance system. Figure 3.3 provides an example of an off-line sand filter and an off-line enhanced dry swale.



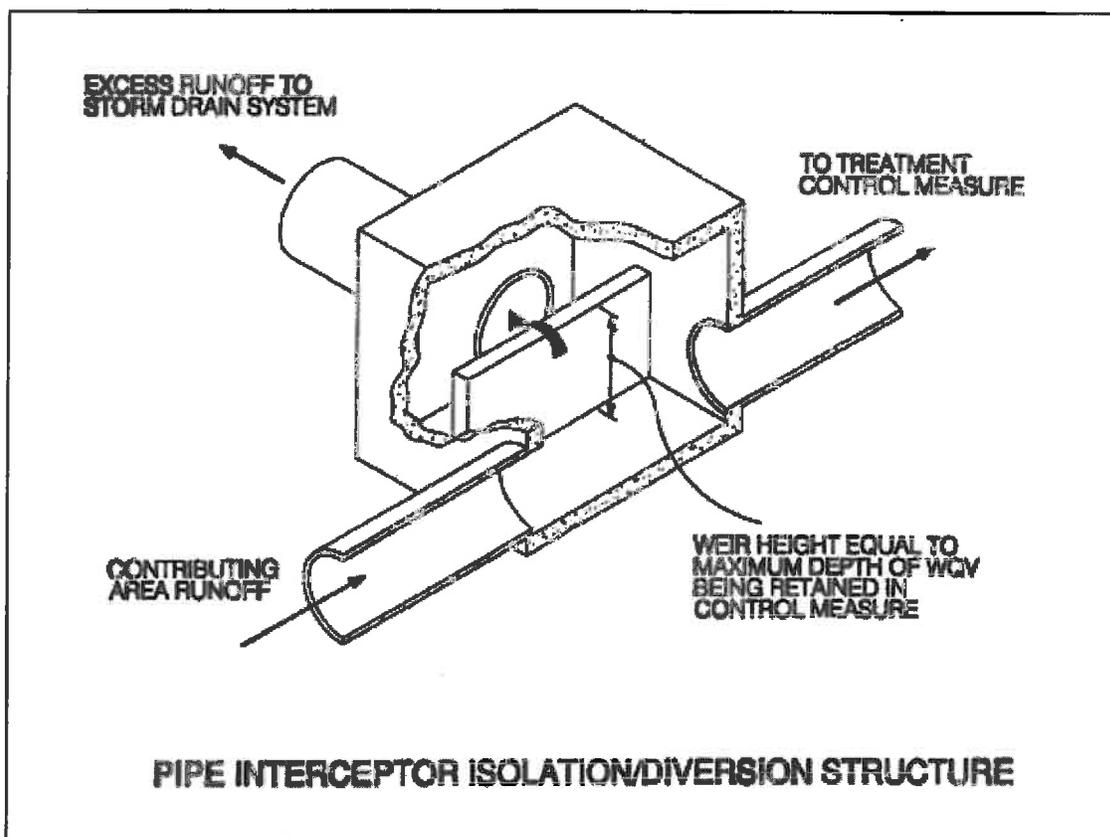
**Figure 3.3 Example of On-Line versus Off-Line Structural Controls**  
(Source: CWP, 1996)

Flow regulation to off-line structural stormwater controls can be achieved by either:

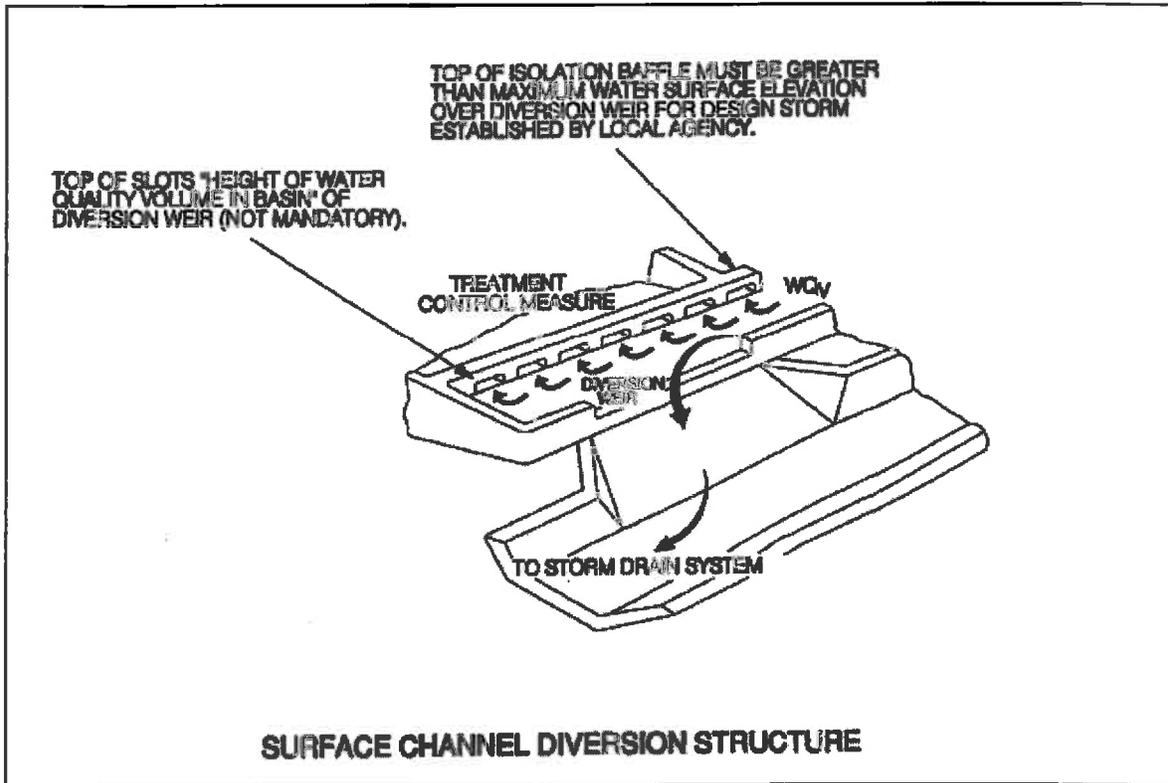
- Diverting the water quality volume or other specific maximum flow rate to an off-line structural stormwater control, or
- Bypassing flows in excess of the design flow rate

The peak water quality flow rate ( $Q_{wq}$ ) can be calculated using the procedure found in Chapter 2.

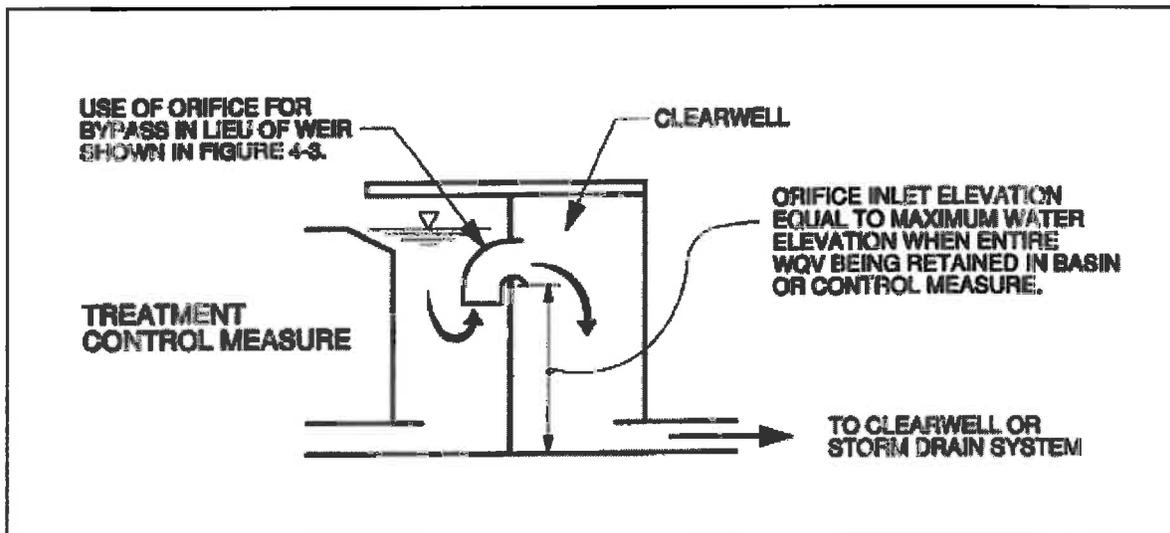
Flow regulators can be flow splitter devices, diversion structures, or overflow structures (See Figures 3.4-3.6).



**Figure 3.4 Pipe Interceptor Diversion Structure**  
(Source: City of Sacramento, 2000)



**Figure 3.5 Surface Channel Diversion Structure**  
(Source: City of Sacramento, 2000)



**Figure 3.6 Outlet Flow Regulator**  
(Source: City of Sacramento, 2000)

### Chapter 4 – Site Design Stormwater Credits

A set of stormwater “credits” has been developed to provide developers and site designers an incentive to implement better site design practices that can reduce the volume of stormwater runoff and minimize the pollutant loads from a site. The credit system directly translates into cost savings to the developer by allowing for a reduction in the water quality treatment volume (WQv). This also reduces the size of structural stormwater control and conveyance facilities for events greater than the water quality treatment (WQv) event.

The better site design practices that provide stormwater credits are listed in Table 4.1. Site-specific conditions will determine the applicability of each credit. For example, stream buffer credits cannot be taken on upland sites that do not contain perennial or intermittent streams.

Note: better site design practices and techniques that reduce the overall impervious area on a site already implicitly reduce the total amount of stormwater runoff generated by a site (and thus reduce WQv) and are not further credited under this system.

<b>Table 4.1 Summary of Better Site Design Practices Providing Stormwater Volume Credits</b>	
<b>Practice</b>	<b>Description</b>
Natural area conservation	Undisturbed natural areas are conserved on a site, thereby retaining their pre-development hydrologic and water quality characteristics.
Stream buffers	Stormwater runoff is treated by directing sheet flow runoff through a naturally vegetated or forested buffer as overland flow.
Use of vegetated channels	Vegetated channels are used to provide stormwater treatment.
Overland flow filtration/infiltration zones	Overland flow filtration/infiltration zones are incorporated into the site design to receive runoff from rooftops and other small impervious areas.

For each potential credit, there is a minimum set of criteria and requirements (e.g., flow length, contributing area, etc.) which identify the conditions or circumstances under which the credit may be applied. Site designers are encouraged to utilize as many credits as they can on a site. Greater reductions in stormwater storage volumes can be achieved when many credits are combined (e.g., disconnecting rooftops and protecting natural conservation areas). However, credits cannot be claimed twice for an identical area of the site (e.g. claiming credit for stream buffers and conservation area over the same site area).

Note: Due to local safety codes, soil conditions, and topography, some of these site design credits may be restricted. Designers are encouraged to consult with the City to ensure if and when a credit is applicable and to determine restrictions on non-structural strategies.

#### 4.1 Stormwater Credits and the Site Planning Process

During the site planning process (see Section 1.5 of the GSMM) the integration of site design credits can be integrated with this process as shown in Table 4.2.

<b>Table 4.2 Integration of Site Design Credits with Site Development Process</b>	
<b>Site Development</b>	<b>Site Design Credit Activity</b>
Feasibility Study	<ul style="list-style-type: none"> <li>• Determine stormwater management requirements</li> <li>• Perform site reconnaissance to identify potential areas for and types of credits</li> </ul>
Site Analysis	<ul style="list-style-type: none"> <li>• Identify and delineate natural feature conservation areas (natural areas and stream buffers)</li> </ul>
Concept Plan	<ul style="list-style-type: none"> <li>• Preserve natural areas and stream buffers during site layout</li> <li>• Reduce impervious surface area through various techniques</li> <li>• Identify locations for use of vegetated channels and groundwater recharge</li> <li>• Look for areas to disconnect impervious surfaces</li> <li>• Document the use of site design credits.</li> </ul>
Preliminary and Final Plan	<ul style="list-style-type: none"> <li>• Perform layout and design of credit areas – integrating them into treatment trains</li> <li>• Ensure unified stormwater sizing criteria are satisfied</li> <li>• Ensure appropriate documentation of site design credits according to local requirements.</li> </ul>
Construction	<ul style="list-style-type: none"> <li>• Ensure protection of key areas</li> <li>• Ensure correct final construction of areas needed for credits</li> </ul>
Final Inspection	<ul style="list-style-type: none"> <li>• Develop maintenance requirements and documents</li> <li>• Ensure long term protection and maintenance</li> <li>• Ensure credit areas are identified on final plan and plat if applicable</li> </ul>

**Site Design Credit #1: Natural Area Conservation**

A stormwater credit can be taken when undisturbed natural areas are conserved on a site, thereby retaining their pre-development hydrologic and water quality characteristics. Under this credit, a designer would be able to subtract conservation areas from total site area when computing water quality volume requirements and adhering to the criteria listed below. An added benefit will be that the post-development peak discharges will be smaller, and hence water quantity control volumes ( $CP_v$ ,  $Q_{25}$ , and  $Q_{100}$ ) will be reduced due to lower post-development curve (CN) numbers.

**Rule:** Subtract conservation areas from total site area when computing water quality volume requirements.

**Criteria:**

- Conservation area cannot be disturbed during project construction
- Shall be protected by limits of disturbance clearly shown on all construction drawings
- Shall be located within an acceptable conservation easement instrument that ensures perpetual protection of the proposed area.
- The easement must clearly specify how the natural area vegetation shall be managed and boundaries will be marked
- Managed turf (e.g., playgrounds, regularly maintained open areas) is not an acceptable form of vegetation management], and shall have a minimum contiguous area requirement of 10,000 square feet
- $R_v$  is kept constant when calculating  $WQ_v$

**Example:** Residential Subdivision  
Area = 38 acres  
Natural Conservation Area = 7 acres  
Impervious Area = 13.8 acres

$$R_v = 0.05 + 0.009 (I) = 0.05 + 0.009 (36.3\%) = 0.37$$

**Credit:**

7.0 acres in natural conservation area  
New drainage area =  $38 - 7 = 31$  acres

**Before credit:**

$$WQ_v = (1.2)(0.37)(38)/12 = 1.40 \text{ ac-ft}$$

**With credit:**

$$WQ_v = (1.2)(0.37)(31)/12 = 1.15 \text{ ac-ft}$$

***(18% reduction in water quality volume)***

**Site Design Credit #2: Stream Buffers**

This credit can be taken when stormwater runoff is effectively treated by a stream buffer. Effective treatment constitutes treating runoff through overland flow in a naturally vegetated or forested buffer. Under the proposed credit, a designer would be able to subtract areas draining via overland flow to the buffer from total site area when computing water quality volume requirements. In addition, the volume of runoff draining to the buffer can be subtracted from the channel protection volume. The design of the stream buffer treatment system must use appropriate methods for conveying flows above the annual recurrence (1-yr storm) event, and adhere to the criteria listed below.

**Rule:** Subtract areas draining via overland flow to the buffer from total site area when computing water quality volume requirements.

**Criteria:**

- The minimum undisturbed buffer width shall be 50 feet, or as required by the City's Buffer Ordinance, whichever is greater.
- The maximum contributing length shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces
- The average contributing slope shall be 3% maximum unless a flow spreader is used
- Runoff shall enter the buffer as overland sheet flow. A flow spreader can be supplied to ensure this, or if average contributing slope criteria cannot be met
- Not applicable if overland flow filtration/groundwater recharge credit is already being taken
- Buffers shall remain unmanaged other than routine debris removal
- $R_V$  is kept constant when calculating  $WQ_V$

**Example:** Residential Subdivision  
Area = 38 acres  
Impervious Area = 13.8 acres  
Area Draining to Buffer = 5 acres

$$R_V = 0.05 + 0.009 (I) = 0.05 + 0.009 (36.3\%) = 0.37$$

**Credit:**

5.0 acres draining to buffer

New drainage area = 38 – 5 = 33 acres

**Before credit:**

$$WQ_V = (1.2)(0.37)(38)/12 = 1.40 \text{ ac-ft}$$

**With credit:**

$$WQ_V = (1.2)(0.37)(33)/12 = 1.22 \text{ ac-ft}$$

***(13% reduction in water quality volume)***

**Site Design Credit #3: Vegetated Channels**

This credit may be taken when vegetated (grass) channels are used for water quality treatment. Under the proposed credit, a designer would be able to subtract the areas draining to a grass channel from total site area when computing water quality volume requirements. A vegetated channel can fully meet the water quality volume requirements for certain kinds of low-density residential development (see low impact development credit). An added benefit will be that the post-development peak discharges will likely be lower due to a longer time of concentration for the site.

This credit cannot be taken if grass channels are being used as a limited application structural stormwater control (i.e. not designed to fully meet the design methodology and criteria) towards meeting the pollutant reduction goal for WQ<sub>v</sub> treatment.

**Rule:** *Subtract the areas draining to a grass channel from total site area when computing water quality volume requirements.*

**Criteria:**

- The credit shall only be applied to moderate or low density residential land uses (3 dwelling units per acre maximum)
- The maximum flow velocity for water quality design storm shall be less than or equal to feet per second
- The minimum residence time for the water quality storm shall be 5 minutes
- The bottom width shall be a maximum of 6 feet. If a larger channel is needed use of a compound cross section is required
- The side slopes shall be 3:1 (horizontal:vertical) or flatter
- The channel slope shall be 3 percent or less
- R<sub>v</sub> is kept constant when calculating WQ<sub>v</sub>

**Example:** Residential Subdivision  
Area = 38 acres  
Impervious Area = 13.8 acres

$$R_v = 0.05 + 0.009 (I) = 0.05 + 0.009 (36.3\%) = 0.37$$

**Credit:**

12.5 acres meet grass channel criteria  
New drainage area = 38 – 12.5 = 25.5 acres

**Before credit:**

$$WQ_v = (1.2)(0.37)(38)/12 = 1.40 \text{ ac-ft}$$

**With credit:**

$$WQ_v = (1.2)(0.37)(25.5)/12 = 0.94 \text{ ac-ft}$$

***(33% reduction in water quality volume)***

**Site Design Credit #4: Overland Flow Filtration/Groundwater Recharge Zones**

This credit can be taken when “overland flow filtration/infiltration zones” are incorporated into the site design to receive runoff from small impervious areas (e.g., driveways, small parking lots, etc). This can be achieved by grading the site to promote overland vegetative filtering or infiltration areas (i.e. rain gardens). If impervious areas are adequately disconnected, they can be deducted from total site area when computing the WQ<sub>v</sub> requirements. An added benefit will be that the post-development peak discharges will likely be lower due to a longer time of concentration for the site.

***Rule: If impervious areas are adequately disconnected (i.e. the receiving area has the appropriate soils, surface area, length and slope to filter and/or infiltrate the calculated runoff volume for the water quality event), they can be deducted from total site area when computing the water quality volume requirements.***

**Criteria:**

- Relatively permeable soils (hydrologic soil groups A and B) must be present
- Runoff shall not come from a designated hotspot
- The maximum contributing impervious flow path length shall be 75 feet
- Downspouts shall be 10+ feet away from impervious surface to discourage “re-connections”
- The disconnection shall drain continuously through a vegetated channel, swale, or filter strip to the property line or structural stormwater control
- The length of the “disconnection” shall be equal to or greater than the contributing length
- The entire vegetative “disconnection” shall be on a slope less than or equal to 3 percent
- The imperviousness area to a discharge location is 5,000 square feet or less.
- If draining directly to a buffer the stream buffer credit cannot also be used
- R<sub>v</sub> is kept constant when calculating WQ<sub>v</sub>

**Example:** Site Area = 3.0  
Impervious Area = 1.9 acres (or 63.3% impervious cover)  
“Disconnected” Impervious Area = 0.5 acres

$$R_v = 0.05 + 0.009 (I) = 0.05 + 0.009 (63.3\%) = 0.62$$

**Credit:**

0.5 acres of surface imperviousness hydrologically disconnected  
New drainage area = 3 – 0.5 = 2.5 acres

**Before credit:**

$$WQ_v = (1.2)(0.62)(3)/12 = 0.19 \text{ ac-ft}$$

**With credit:**

$$WQ_v = (1.2)(0.62)(2.5)/12 = 0.15 \text{ ac-ft}$$

***(21% reduction in water quality volume)***

## **User Fee Crediting Options**

The Unified Sizing Criteria (USC) method is hydrology-based, using imperviousness as the key factor in determining the  $WQ_v$  and associated stormwater burden on the City. The User Fee is the City's primary funding mechanism for managing stormwater quality associated with impervious areas. Mitigating stormwater quality impacts through the use of Better Site Design and Best Management Practices can reduce the burden on the City and will be rewarded by a reduction in the User Fee, where applicable. To calculate the User Fee Credit for Water Quality Volume Reduction, use the following method:

1. Calculate the  $WQ_v$  that is addressed by the site, based on the USC Methodology.
2. Convert the  $WQ_v$  to an area by dividing the  $WQ_v$  by the water quality rainfall depth of 1.2 inches. This is the area of which water quality impacts will be fully mitigated (by infiltration and/or filtration) - this will be referred to as the  $WQ_v$  Impervious Reduction (IR).
3. Identify the amount of physical imperviousness that the site contains, which the User Fee would be based on – this will be referred to as the Impervious Area (IA).
4. Compare the IR and IA values, and generate a % Reduction that is applied to the fee (i.e.  $IR/IA = \% \text{ Reduction}$ ). The % Reduction should be rounded to the nearest whole number. User fee crediting will be capped at a maximum % Reduction of 30%.
5. Multiply the % Reduction by the User Fee (based on Impervious Area) to calculate the final amount of the User Fee.

## **Chapter 5 – Additional BMP Requirements**

### **5.1 Water Surface Dewatering**

When discharging stormwater from temporary sediment basins, sediment ponds, or other similar impoundments, utilize outlet structures that only withdraw water from near the surface of the basin or impoundment, unless infeasible. The outlet structure should be capable of conveying the flow of the 10-year, 24-hour storm event.

Typically referred to as “skimmers,” water surface dewatering devices are designed to improve sediment trapping efficiency by regulating the filling and draining of a stormwater basin or pond. Since these devices float on the water surface, the skimmer orifice has a constant head that allows the basin to drain slowly at a constant rate from the water surface, where sediment concentrations are typically lowest.

Sediment basins and sediment ponds must be designed to consider the specific site conditions, including soil types, drainage area, sediment generated, rainfall, runoff, and potential risk for downstream impacts. When designing a sediment basin or sediment pond, the engineer should provide appropriate supporting calculations for the skimmer. Several manufacturers of these devices offer design guidance, construction details and specifications.

## *Appendices*

### A. Design Aids

- Calculation Worksheets
  - Volume Calculation Tool
  - BMP Sizing Tools for:
    - Bioretention
    - Infiltration Trench
    - Dry Enhanced Swale
    - Grass Filter Strip
    - Porous Surfaces
- Standard CAD Details and Notes/Specs
  - Bioretention
  - Infiltration Trench
  - Dry Enhanced Swale
  - Grass Filter Strip
  - Micropool Extended Dry Detention Pond
  - Wet Detention Pond

### B. Maintenance Schedules

### C. Flood Area Map

Appendix B

4-25-2014

Attachment 4

Appendix C: Flood Area Map



FEMA\_COC  
areas.pdf

## **City of Columbia Stormwater Management BMP Design Manual**

**The City of Columbia Stormwater Management Division currently follows the standards set forth by the State and Federal NPDES Sediment and Erosion Control guidelines with the exception of that listed below. Please visit the SCDHEC website for more information on acceptable design aids and criteria for maximum Stormwater quantity and quality management at <http://www.dhec.sc.gov/environment/water/swater/BMPHandbook.htm>.**

### **Proposed Water Quality Buffer Language for BMP Manual**

Water quality buffers are required along all jurisdictional waters, and non-jurisdictional wetlands as identified by the US Army Corps of Engineers.

A water quality buffer is an area of original or re-established vegetation that borders streams, rivers, ponds, lakes, wetlands and seeps. Buffers are most effective when stormwater runoff is flowing into and through the buffer zone as shallow sheet flow, rather than concentrated flow such as channels, gullies, or wet weather conveyances. Therefore, it is critical that design of all development include management practices, to the maximum extent practical, that will result in stormwater runoff flowing into the buffer zone as shallow sheet flow.

Water quality buffers provide numerous environmental protection and resource management benefits including:

- ✓ Restoring and maintaining the chemical, physical, and biological integrity of the water resources
- ✓ Removing the pollutants delivered in urban Stormwater
- ✓ Reducing erosion and controlling sedimentation
- ✓ Stabilizing stream banks
- ✓ Providing infiltration of Stormwater runoff
- ✓ Maintaining base flow of streams
- ✓ Contributing the organic matter that is a source of food and energy for the aquatic ecosystem
- ✓ Providing tree canopy to shade streams and promote desirable aquatic organisms
- ✓ Providing riparian wildlife habitat
- ✓ Furnishing scenic value and recreational opportunity

### **Applications**

1. This shall apply to all proposed development except for that development which meets exemptions in Section 21-40(b) of the City's Storm Water Quality and Quantity Control Ordinance.
2. Except as provided in Section 21-40(b) of the City's Storm Water Quality and Quantity Control Ordinance, this shall apply to all parcels of land, structures and activities which are causing or contributing to:
  1. Pollution, including non-point pollution, of the waters within the City limits,
  2. Erosion or sedimentation of stream channels, and
  3. Degradation of aquatic or riparian habitat

### **Exemptions**

1. Any existing structure or structures under construction located within the buffer area provided the land owner can document existence or approval prior to ordinance implementation.
2. The addition or expansion to an existing structure provided it does not result in an increase in the total impervious area within the buffer area.
3. Activities associated with emergency operations, such as hazardous materials removal, flood or fire control, evacuations and storm damage clean up.
4. Single family parcels that are less than one acre and not part of a larger common plan for development or sale.

### **Buffers**

Buffers shall be considered a "no disturb zone" along waters and wetlands identified by the USACE. Vegetation cannot be disturbed, removed or replanted unless a buffer restoration plans has been approved by the Storm Water Division

The buffer shall be at least fifty (50) feet from the boundaries of all features identified in this manual.

In areas where a floodway profile has been computed (AE Zone) as part of an approved flood study, the buffer area should be the maximum width listed above or the width of the floodway, whichever is greater. If the width of the floodway is less than 50 feet from top of the bank, the distance to bring the buffer to at least 50 feet shall be added.

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In areas where a floodway study has not been computed (A Zones), the developer shall perform a flood study, determine the floodway and follow the buffer requirements outlined above.

Buffers widths may be reduced to twenty five (25) feet provided:

1. All stormwater runoff is captured and routed to a water quality basin, and
2. There is no sheet flow discharging into the buffer, and
3. This is implemented on small lot sizes with restricted area (1/4 acre or less).

**Buffer Planting/Replanting**

Buffer replanting plans must be submitted to the City for review. The following items must be included in the proposed plan:

1. Appropriate plant species and density,
2. Specific location and total square feet for each buffer zone;
3. Quantity, size, type of existing trees and ground cover;
4. Quantity, size, type and location of proposed vegetation for buffer restoration;
5. Long term maintenance and management plans,
6. Protection plans, and
7. Contingency plans to address vegetation die off.

Restored buffers must include planting new trees to a density of 12 healthy trees per 1000 square feet and these trees must have a minimum caliper of 1 ½ inches measured 6 inches above the rootball. Equivalent combinations of permanent trees, shrubs and ground covers, native and non-native, may be substituted. Invasive species shall be avoided. Shrubs shall be a minimum of 2' tall or 3 gallon size when planted. Temporary mulch and seeding may be used prior to final plantings.

In addition, the plan must provide for the continued protection of this buffer through conservation easement or other acceptable means.

A recommended list of trees, shrubs, perennials and grasses for use in buffer restorations is provided below:

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**SOUTHERN NATIVES FOR SC MIDLANDS**

<i>Botanical Name</i>	<i>Common Name</i>
<b><u>SC NATIVE TREES</u></b>	
<i>Acer barbatum</i>	southern sugar maple
<i>Acer leucoderm</i>	chalk maple
<i>Acer rubrum</i>	red maple
<i>Aesculus pavia</i>	scarlet buckeye
<i>Alnus serrulata</i>	common alder
<i>Amelanchier canadensis</i>	serviceberry
<i>Aralia spinosa</i>	devil's walkingstick
<i>Asimina parviflora</i>	dwarf pawpaw
<i>Betula nigra</i>	river birch
<i>Carpinus caroliniana</i>	American hornbeam
<i>Carya glabra</i>	pignut hickory
<i>Carya ovata</i>	shagbark hickory
<i>Carya tomentosa</i>	mockernut hickory
<i>Cercis canadensis</i>	eastern redbud
<i>Chionanthus virginicus</i>	fringetree
<i>Cornus florida</i>	flowering dogwood
<i>Craetaegus marshallii</i>	parsley hawthorn
<i>Diospyros virginiana</i>	common persimmon
<i>Fagus grandifolia</i>	American beech
<i>Fraxinus americana</i>	white ash
<i>Gordonia lisianthus</i>	gordonia
<i>Halesia diptera</i>	two-winged silverbell
<i>Hamamelis virginiana</i>	witchhazel
<i>Ilex decidua</i>	possumhaw
<i>Ilex opaca</i>	American holly
<i>Ilex vomitoria</i>	yaupon holly
<i>Juglans nigra</i>	black walnut
<i>Juniperus virginiana</i>	eastern redcedar
<i>Liquidambar styraciflua</i>	sweetgum
<i>Liriodendron tulipifera</i>	tulip poplar
<i>Magnolia grandiflora</i>	southern magnolia
<i>Magnolia virginiana</i>	sweetbay
<i>Morus rubra</i>	red mulberry
<i>Myrica cerifera</i>	wax myrtle
<i>Nyssa aquatica</i>	water tupelo
<i>Nyssa biflora</i>	swamp tupelo
<i>Nyssa ogeche</i>	ogeche lime
<i>Nyssa sylvatica</i>	black tupelo

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<i>Ostrya virginiana</i>	hophornbeam
<i>Oxydendron arboreum</i>	sourwood
<i>Persea borbonia</i>	redbay
<i>Pinus echinata</i>	shortleaf pine
<i>Pinus elliotti</i>	slash pine
<i>Pinus glabra</i>	spruce pine
<i>Pinus palustris</i>	longleaf pine
<i>Pinus serotina</i>	pond pine
<i>Pinus taeda</i>	loblolly pine
<i>Pinus virginiana</i>	virginia pine
<i>Platanus occidentalis</i>	American sycamore
<i>Quercus alba</i>	white oak
<i>Quercus coccinea</i>	scarlet oak
<i>Quercus falcata</i>	southern red oak
<i>Quercus laevis</i>	turkey oak
<i>Quercus laurifolia</i>	laurel oak
<i>Quercus lyrata</i>	overcup oak
<i>Quercus marilandica</i>	black jack oak
<i>Quercus michauxii</i>	swamp chestnut oak
<i>Quercus nigra</i>	water oak
<i>Quercus nuttallii</i>	Nuttall oak
<i>Quercus phellos</i>	willow oak
<i>Quercus prinus</i>	chestnut oak
<i>Quercus rubra</i>	northern red oak
<i>Quercus shumardii</i>	shumard red oak
<i>Quercus stellata</i>	post oak
<i>Quercus velutina</i>	black oak
<i>Quercus virginiana</i>	live oak
<i>Robinia pseudoacacia</i>	black locust
<i>Sabal palmetto</i>	cabbage palmetto
<i>Salix nigra</i>	black willow
<i>Sassafras albidum</i>	sassafras
<i>Symplocos tinctoria</i>	sweetleaf
<i>Taxodium distichum</i>	baldcypress
<i>Tilia americana</i>	American linden
<i>Vaccinium arboreum</i>	sparkleberry
<i>Viburnum prunifolium</i>	blackhaw
<i>Viburnum rufidulum</i>	rusty blackhaw
 <u>SC NATIVE SHRUBS</u>	
<i>Agarista populifolia</i>	Florida leucothoe
<i>Ilex glabra</i>	inkberry

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<i>Kalmia latifolia</i>	mountain laurel
<i>Aesculus parviflora</i>	bottlebrush buckeye
<i>Callicarpa americana</i>	American beautyberry
<i>Calycanthus floridus</i>	sweetshrub
<i>Clethra alnifolia</i>	clethra
<i>Euonymus americanus</i>	strawberrybush
<i>Fothergilla gardenii</i>	dwarf fothergilla
<i>Gaylussacia dumosa</i>	dwarf huckleberry
<i>Hydrangea quercifolia</i>	oakleaf hydrangea
<i>Lindera benzoin</i>	spicebush
<i>Rhododendron austrinum</i>	Florida azalea
<i>Rhododendron canescens</i>	piedmont azalea
<i>Rhododendron viscosum</i>	swamp azalea
<i>Rosa palustris</i>	swamp rose
<i>Rosa carolina</i>	Carolina rose
<i>Sabal minor</i>	dwarf palmetto
<i>Sterartia malachodendron</i>	Virginia stewartia
<i>Syrax americana</i>	storax
<i>Vaccinium myrsinites</i>	evergreen blueberry
<i>Viburnum dentatum</i>	arrowwood
<i>Viburnum nudum</i>	possumhaw viburnum
<i>Yucca flaccida</i>	beargrass

SC NATIVE PERENNIALS

<i>Amsonia ciliata</i>	Texas bluestar
<i>Amsonia ludoviciana</i>	sandhill bluestar
<i>Asclepias incarnata</i>	swamp milkweed
<i>Asclepias tuberosa</i>	butterflyweed
<i>Aster oblongifolius</i>	aromatic aster
<i>Baptisia alba</i>	white wild indigo
<i>Baptisia australis</i>	blue false indigo
<i>Boltonia asteroides</i>	boltonia
<i>Coreopsis auriculata</i>	eared coreopsis
<i>Coreopsis major</i>	major coreopsis
<i>Echinacea pallida</i>	pale coneflower
<i>Echinacea purpurea</i>	purple coneflower
<i>Eryngium yuccifolium</i>	eryngo
<i>Eupatorium coelestinum</i>	wild ageratum
<i>Eupatorium fistulosum</i>	Joepyeweed
<i>Hibiscus aculeatus</i>	pineland hibiscus
<i>Hibiscus coccineus</i>	Texas star hibiscus
<i>Monarda fistulosa</i>	wild bergamot

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<i>Oenothera tetragona</i>	sundrops
<i>Penstemon digitalis</i>	Mississippi penstemon
<i>Passiflora incarnata</i>	passionflower
<i>Phlox pilosa</i>	downy phlox
<i>Physotegia virginiana</i>	fall obedient plant
<i>Apityopsis graminifolia</i>	silkgrass
<i>Rudbeckia triloba</i>	brown-eyed Susan
<i>Solidago</i> sp.	goldenrod
<i>Stokesia laevis</i>	Stokes aster
<i>Thermopsis villosa</i>	Carolina bushpea

**SC NATIVE GRASSES**

<i>Andropogon ternarius</i>	splitbeard bluestem
<i>Andropogon virginicus</i>	broomsedge
<i>Aristida stricta</i>	wiregrass
<i>Muhlenbergia capillaris</i>	pink muhly
<i>Sorghastrum nutans</i>	Indiangrass

**Buffer Management and Maintenance**

The function of a buffer is to protect the physical and ecological integrity of the water, to reduce the flooding potential and to filter runoff from all development. The objective of a buffer is undisturbed native vegetation.

Management of buffer includes specific limitations on alteration of the natural conditions. The following practices and activities are restricted within the buffer:

1. Clearing or grubbing of existing vegetation,
2. Clear cutting of vegetation,
3. Soil disturbance by grading, stripping, or other practices,
4. Filling or dumping,
5. Use, storage, or application of pesticides, herbicides, and fertilizers,
6. Conversion of vegetation from native to exotic species, and
7. Motor vehicles are not permitted in stream buffers unless during the installation of certain utilities permitted in the buffer zone.

In order to maintain the functional value of a buffer, indigenous vegetation may be removed as follows:

1. Dead, diseased or dying trees that are in danger of falling and causing damage to dwellings or other structures may be removed with approval from the Storm Water Division,

2. Debris in the buffer area that is caused by storm damage, and
3. Invasive plant species may be removed and replaced by native species that are equally effective in retarding runoff, preventing erosion and filtering non-point source pollution from runoff.

### **Design Requirements**

The buffer plan must be submitted in conjunction with the sediment and erosion control plan, SWPPP document, and all applicable calculations for the land disturbance permit. The Storm Water Division requires that the following steps be taken during the site plan development and site construction process to protect water quality buffers during construction:

1. Water quality buffers must be clearly identified on all stormwater management plans and construction drawings and marked with the statement "Water Quality Buffer. Do Not Disturb",
2. Water quality buffers cannot be encroached upon or disturbed during project construction, unless they are being established, restored, or enhanced as approved,
3. Water quality buffers must be clearly marked with a warning barrier before the pre-construction conference. The marking shall be maintained until completion of construction activities. All contractors and others working on the construction site must be made aware of the existence of the buffer(s) and the restrictions on disturbing the buffer(s),
4. All areas of the water quality buffer, including stream banks, must be left in the existing condition upon completion of construction activities. Should construction activities associated with development cause degradation to stream banks all eroding, bare, or unstable stream banks shall be restored to existing conditions,
5. If any trees are to be removed, show the tree location and provide a note stating that the tree must be hand cleared,
6. The locations of all signage must be clearly shown on the plans,
7. A narrative stating the extent of the buffer areas, including any allowed disturbance in the buffer areas (this should be in the narrative as well as in the SWPPP document) must be included in the plans,
8. Additional sediment and erosion control mechanisms will be required when land disturbing activities occur within 25 feet on the upstream/upland side of a buffer, and
9. The stream buffer shall be shown and labeled on the engineering plans, preliminary, bonded and final plat, and
10. Trails and walking paths may be allowed within the buffer area provided the following criteria are met;
  - (a) No motorized vehicles are allowed on the path,

- (b) The clearing for the path is the minimal necessary for construction of the path,
- (c) If the path is to be constructed of impervious materials, then the width of the path must be compensated through additional buffer width. If the path is constructed of pervious materials, then no additional buffer width is required,
- (d) The nearest edge of the path should be as far from the stream bank as feasible and in no case should it be closer than 20 feet to the top of the stream bank,
- (e) Trees and shrubs removed during construction should be replaced.

### **Water Quality Buffer Width Adjustments**

If the land use or activity involves the storage of hazardous substances or petroleum facilities, the buffer area width must be adjusted to include an additional 20 feet.

If the land use or activity involves solid waste landfills or junkyards, the buffer area width must be adjusted to include an additional 50 feet.

The Storm Water Division has the ability to reduce or increase the buffer width adjustments on a case-by-case basis, as appropriate to address identified water quality issues. Those cases that generally require an increase in width would be classification as a 303(d)-listed water or areas with extreme slopes. In cases of buffer width reduction, additional stormwater treatment measures may be required.

### **Water Quality Buffer Averaging**

Buffer averaging can be utilized to adjust the required buffer width, allowing some flexibility for site development. Using buffer averaging, the width of the buffer can be varied with the criteria stated below, as long as a minimum average width of fifty (50) feet from the jurisdictional line are maintained.

The following criteria must be met in order to utilize buffer averaging on a development site:

1. Buffer averaging is required for water quality buffers that have stream crossings,
2. An overall average buffer width of fifty (50) feet must be achieved within the boundaries of the property to be developed,
3. The average width must be calculated based upon the entire length of the feature that is being buffered,

4. Buffer averaging shall be applied to each side of the feature independently. If the property being developed includes both sides of the feature, buffer averaging can be applied to both sides, but must be applied to each independently, and
5. That portion of buffers in excess of one hundred (100) feet will not be credited toward the buffer averaging formula within the boundaries of the property to be developed. The total width of the buffer shall not be less than twenty-five (25) feet, or the width of the floodway at any location, except at approved crossings. Those areas of the buffer having a minimum width of twenty-five (25) feet (or less at approved crossings) can comprise no more than fifty percent (50%) of the buffer length.

#### **Areas Where Water Quality Buffer Averaging is Prohibited**

Buffer width averaging is prohibited in developments that have, or will have after development, the land uses listed below:

1. Developments or facilities that include on-site sewage disposal and treatment systems, raised septic systems, subsurface discharges from a wastewater treatment plant, or land application of bio-solids or animal waste,
2. Landfills (demolition landfills, permitted landfills, closed-in-place landfills),
3. Junkyards,
4. Commercial or industrial facilities that store and/or service motor vehicles,
5. Commercial greenhouses or landscape supply facilities,
6. Commercial or public pools,
7. Animal care facilities, kennels and commercial/business developments or facilities that provide short-term or long-term care of animals, and
8. Other land uses deemed by the Storm Water Division to have potential to generate higher than normal pollutant loadings.

#### **Variations**

Variations and appeals may be granted under the provisions set forth in Section 21-60 of Article IV. Storm Water Quantity and Quality Control of the City's Code.



## Urban Study

Rocky Branch Watershed  
Columbia, South Carolina



Prepared for:  
**City of Columbia**  
1136 Washington Street  
Columbia, SC 29217

Prepared by:  
**AMEC Environment & Infrastructure, Inc.**  
720 Gracern Road  
Columbia, SC 29210  
(803) 798-1200

June 1, 2012

Project No. 6250-12-0007

EXHIBIT "D" – MINUTES OF JUNE 5, 2012  
CITY COUNCIL MEETING



CITY OF COLUMBIA  
CITY COUNCIL MEETING MINUTES  
TUESDAY, JUNE 5, 2012  
6:00 P.M.  
CITY HALL – COUNCIL CHAMBERS  
1737 MAIN STREET

The Columbia City Council conducted a Regular Meeting and Public Hearings on Tuesday, June 5, 2012 at City Hall, 1737 Main Street, Columbia, South Carolina. The Honorable Mayor Stephen K. Benjamin called the meeting to order at 6:11 p.m. The following members of Council were present: The Honorable Sam Davis, The Honorable Tameika Isaac Devine, The Honorable Daniel J. Rickennann, The Honorable Belinda F. Gergel and The Honorable Leona K. Plough. The Honorable Brian DeQuincey Newman arrived at 6:12 p.m. Also present were Mr. Steven A. Gantt, City Manager and Ms. Erika D. Moore, City Clerk. This meeting was advertised in accordance with the Freedom of Information Act.

**PLEDGE OF ALLEGIANCE**

**INVOCATION**

Chaplain Michael Letts, Columbia Police Department offered the Invocation.

**ADOPTION OF THE AGENDA**

Councilor Plough noted that Item 31 is a large project valued at \$19 million and it would have been an example of local preference had the local vendor completed the appropriate paperwork. Staff will ensure that local contractors understand how this process works.

Upon a motion made by Mr. Davis and seconded by Dr. Gergel, Council voted unanimously to approve the adoption of the agenda, noting that Item 4 will be held.

**PUBLIC INPUT RELATED TO AGENDA ITEMS**

*No one appeared at this time.*

**PRESENTATIONS**

1. Introduction of the May 2012 Employee of the Month – Mr. Joey Jacob, Director of Utilities and Engineering

Mr. Clarence Foxx, Meter Reader Supervisor introduced Ms. Linita A. Loyd, Water Account Specialist as the May 2012 Employee of the Month. As her former supervisor, he described her as an outstanding employee that definitely deserves this award.

Ms. Angela Adams, Water Customer Service Administrator says that Ms. Loyd did a wonderful job while working for Mr. Foxx and she will do a better job in the Customer Service Division.

Mayor Benjamin and Mr. Steven A. Gantt, City Manager presented Ms. Linita A. Loyd with a plaque and a token of appreciation for being selected as the May 2012 Employee of the Month.

2. Introduction of the June 2012 Employee of the Month -- Major Randy Martin, Columbia Police Department

Mr. Leslie Wisner, Deputy Police Chief introduced Ms. Tamara Kelly, Community Safety Officer as the June 2012 Employee of the Month. He described her as an employee who does the kind of things that make a huge difference in our relationships with the community. She works with the Youth Safe Haven Program at Hammond Village Apartments where she cares for 30 children each day. We are very proud of her.

Mayor Benjamin and Mr. Steven A. Gantt, City Manager presented Ms. Tamara Kelly with a plaque and a token of appreciation for being selected as the June 2012 Employee of the Month.

3. National Homeownership Month Proclamation -- Ms. Deborah Livingston, Community Development Director

Ms. Deborah Livingston, Community Development Director said that for years they have recognized their lending partners, but tonight, they will celebrate the Community Development Department. We will celebrate Homeownership Month by hosting a financial literacy seminar on Saturday, June 16<sup>th</sup> at 1225 Lady Street from 9:00 a.m. 12:00 p.m. On Saturday, June 23<sup>rd</sup>, we will host the first Ownership, Maintenance and Gardening "OMG" Workshop at Eau Claire High School from 8:30 a.m. to 12:45 p.m. This is a free workshop that will be taught by City staff with Wells Fargo as the sponsor.

Mayor Benjamin and the members of Council proclaimed June 2012 as National Homeownership Month in the City of Columbia.

Ms. Deborah Livingston, Community Development Director recognized the Columbia Housing Development Corporation as a Partner in Excellence. The CHDC has been providing quality affordable housing and rehabilitating neighborhoods for over 32 years. They have provided great homes to more than 250 people.

Councilor Plaugh announced that the Community Development Department won the 2012 John A. Sasso National Community Development Week Award.

4. South Carolina First Responders Remembrance Memorial -- Mr. Daniel C. Hennigan, Retired, U.S. Army / Founder & Chairman of the South Carolina First Responders Remembrance Memorial -- *This item is scheduled for June 26, 2012.*

5. Fast Forward Update -- Ms. Dee Albritton, Executive Director of Fast Forward

Ms. Dee Albritton, Executive Director provided an end of the year report. She stated that 20 youth are in the Youth Arbitration Program in partnership with the Police Department, the Solicitor's Office and the Sheriff's Department. We have 35 veterans in higher level technology programs and 25 jobs are lined up with DP Professionals and Blue Cross. We have 50 pre-school students visit weekly. We have 20 people coming from the Babecock Center and 6 people from Alders Gate at the Epworth Center. Over the last two years, we have assessed over 500 Veterans with our Department of Labor grant and 200 were hired with an average wage of \$9.90 per hour. Due to the terms of that grant, we are turning down 5-10 Veterans per week, because the grant isn't broad enough. We are applying for another grant to serve the young Veterans that are returning. We've also had the pleasure to teach over 500 City employees this year.

Upon a motion made by Ms. Plough and seconded by Mr. Rickenmann, Council voted unanimously to request that staff develop recommendations for a program that focuses on employing Veterans at the City of Columbia.

6. **EnduringFX: Our Developing Partnership -- Mr. S. Allison Baker, Senior Assistant City Manager and Mr. Jim Stritzinger, EnduringFX**

Mr. S. Allison Baker, Senior Assistant City Manager noted that Item 35 is second reading of an ordinance authorizing the City Manager to enter into an agreement with EnduringFX. I was instructed by the City Manager to meet with Ms. Plough to answer questions, but we ran out of time. We are ready and available to answer questions.

Mr. Jim Stritzinger, EnduringFX sought to answer questions regarding the business relationship with the City of Columbia. We intend to take Riverfront Park and the Drew Wellness Center to the next level. Your exercise at the parks will consist of using an RFID chip to track your workouts. When you finish your workout, we will have a flat panel video wall to highlight the positive things you're doing with your workout. We are building a full website to support the whole application. A mobile application goes along with it. In March, we applied for a major innovation contest sponsored by a large pharmaceutical company called Sanofi. Since then, we've attracted a lot of partners including the American Diabetes Association, JDRB, our 3 major research universities. Mr. Baker was gracious enough to go with us to New York to make a pitch on our behalf. Based on that presentation, we were selected as one of the top two finalists in the United States out of 100 companies. We have to do a community uptake experiment to show how well the community utilizes what we are building from June 6<sup>th</sup> to June 24<sup>th</sup>. We are launching the EFX 500, which is a 500 mile community challenge. We are asking members of the community to work together to walk 500 miles. The winner will be announced on July 16<sup>th</sup>. If you check out a chip during the upcoming Wellness Weekend on June 8<sup>th</sup> - 10<sup>th</sup> you can enter the Wellness Center for free. Our report is due to the judges on June 27<sup>th</sup>. We have an opportunity to win \$100,000 on July 16<sup>th</sup>.

Mayor Benjamin recognized representatives of Welvista, which is an organization that has a successful model committed to health and wellness, particularly, helping to meet the needs of the uninsured and underinsured by giving them access to prescription medications. Welvista also deals with pediatric dental issues.

Councillor Plough recalled her suggestion to not take 20% of EnduringFX's profits. A way to offset that would be for you to provide the Wi-Fi connections. That seems straight forward to me.

Mr. Jim Stritzinger, EnduringFX explained that it may be cost prohibitive, because there are no fiber optic cables at Riverfront Park. We were planning on servicing those locations via the 3G or 4G networks.

Mr. S. Allison Baker, Senior Assistant City Manager said that we already have Wi-Fi access at the Wellness Center, but that doesn't mean that Jim can't pay for it.

Councillor Devine asked that the City strongly push this through the Public Relations Department. We know that there is a huge need for this and it goes with the Lets Move! initiative.

7. **RICH/AKERU Legacy Council Program – Dr. Germon “Mama G” Miller, Founder**

Dr. Germon Miller, Founder of the RICH/AKERU Legacy Council Program thanked Mr. Baker for his support of the program. I met with Mr. Caton and we are looking to continue this program for another year. She said that the new direction is family education. It's great to be in Columbia and we will always be here to support our City.

Miss Angelica Hill, Graduate of Howard University said that she is here to support Dr. Miller and the AKERU Legacy Council. Without the foundation and support that I received from the program and my family, I don't think I would be this far in my successes.

Miss Ambre Hill, Howard University Student said that growing up in a strong family and having the support of individuals such as Dr. Miller and organizations such as AKERU have allowed her to overcome obstacles with maturity. It has allowed me to go on to the next phase in my life without any doubt in being content in all areas of my life.

Miss Asagra Hill, Westwood High School Student said that the AKERU Legacy Council, a strong family unit and guidance have been three of the greatest contributions to her success and her musical aspirations.

Mrs. Christian Flynn Hill attested to all of the contributions that “Mama G” has made to the community. She instills discipline in her students. Her expectations are very high and her programs are needed widely in our community. This program is needed widely in the Columbia community.

8. **Rocky Branch Watershed Urban Development Impact Study – Ms. Dana Higgins, P.E., LEED AP, City Engineer**

Ms. Dana Higgins, P.E., LEED AP, City Engineer introduced Mr. David Brigley, the AMEC consultant that will be presenting the much anticipated Rocky Branch Watershed Urban Study.

Mr. David Brigley, Principal Engineer / AMEC Environmental and Infrastructure, Inc. said that the former studies conducted by PACE and PB Americas were reasonable for their purposes; however, some adjustments were made. He reported that the fill from the site would not cause a rise. He said that the middle of the creek moves a lot of the water and the roadway fill is downstream from that site. Because the site is so far down the watershed, that amount of fill isn't enough to impact the behavior. Neither the obstruction of flow from the site or the loss of storage in that area had any impacts in the modeling that was done. He said that new problems could be created if precautions aren't taken. Moving the railway would have some impacts, but there are ways to mitigate it. The key is to do no harm. He explained that water quality cannot be addressed through storage; however, it can be addressed by reducing the Bluff Road railway culvert velocities. The Congaree River is almost 500 feet wide and when it floods it backs up into the Branch. The 100 year event backs up to Olympia Avenue. More frequent events do not extend so far up and at that point it is what you do to inhibit flows. Removing the railway culvert and upgrading Olympia Avenue can improve the watershed from Assembly Street downstream as long as you look at it as a complete stretch. He recommended that the City consider upgrading the downstream crossings, in the right order (downstream and work your way up) and in a phased approach; integrate stream restoration and greenway features to put less pollutants in the Branch; consider alternative upper watershed improvements; adopt green infrastructure techniques; and leverage local watershed support.

Councilor Rickenmann asked about restoration of the creek from Five Points to the Congaree. Should creek restoration be our number one priority in this overall process?

Mr. David Brigley, AMEC representative said definitely. A Greenway doesn't need to be a part of the near term activities, but treat it as a real plan.

Councilor Newman asked the consultant to discuss his interaction with the potential developer in terms of their plans.

Mr. David Brigley, AMEC representative said that they discussed a plan level review of the site with the City staff. We did not get explicit designs, but it was sufficient for us. We noted in the report that there is a design that could mitigate the impact. That needs to be meshed out in the design process. We have a good idea about what's going on. They need to leverage the studies that are out there and prove there are no impacts and how the benefits are appropriate.

Councilor Newman said that if there are any variables based off of changes in design plans, we want to make sure that you all have taken those into account and that there is something that can be put into place to remedy those changes.

Mr. David Brigley, AMEC representative said that there is a stark difference in how the water stops at the choke point. It comes down to what can be handled at Olympia Avenue. I don't know what utilities are under there or how difficult it would be to widen that. That's probably the area I would look at closest. The railway is out of service and you are fortunate that the railway can be modified. I would say that you should look at Olympia Avenue first.

Councilor Gergel inquired about the study done by PACE Engineering in 2011.

Mr. Steven A. Gantt, City Manager explained that the developer had the study done by PACE Engineering.

Councilor Gergel requested a copy of the study. She said that she was left with a lot of questions after reviewing this study. She asked Mr. Brigley to review the recommendations in layman's terms. What do we need to do to address your concern that we may have management issues to mitigate?

Mr. David Brigley, AMEC representative explained that if they encroach further into the floodway that would cause a bigger rise from the fill, which would mean that they would need to improve a downstream crossing to lower it there and that the fill will not back up water onto Assembly Street. They need to look at Olympia Avenue to ensure that they are not moving a problem to Olympia Park. We are affirming that the burden is still on the developer for whatever they do to follow the rules and do no harm in terms of causing a rise upstream or downstream.

Councilor Gergel inquired about the recommendation for another detailed analysis of the detailed plan.

Mr. David Brigley, AMEC representative said that it's not the City's burden. The developer is not allowed to cause impacts to a floodplain.

Councilor Gergel asked what the developer should be required to do.

Mr. David Brigley, AMEC representative explained that they need to affirm with their own models and detailed plans that their design won't cause a problem. There are two steps with floodplain management: What you plan to do and what you actually do.

Councilor Gergel said that there needs to be a plan for how we are going to do this.

Mr. David Brigley, AMEC representative said that in order to reduce flooding, you need move the water quicker. You have done a lot already. The PB report had a lot of capital improvements in it. The creek bends very sharply and inlet modifications can move water quicker, but that requires an analysis. You should pick out the things that provide a benefit starting downstream.

Councilor Gergel inquired about the FEMA maps. Why would we not wait until we have those new maps?

Mr. David Brigley, AMEC representative said that the new maps represent all of the latest modeling information. The PB report from 2006 provided updated models. There may be additional increases.

Mayor Benjamin recalled that one characterization said that going forward with the proposed fill would be like plopping the super carrier of the USS Nimitz in a floodway. What do you think about that characterization?

Mr. David Brigley, AMEC representative said that size wise, it would be two of them. It's a lot of fill, but that's why you model it. Not all parts of the creek are as sensitive to fill as others. This is not affected by that fill, because it is at the bottom of the watershed and it has a dam. You could have significant flooding if you put that amount of fill in another part of the watershed. That's why you run the numbers. It's not what; it's what and where.

Mayor Benjamin clarified that any developer would have to go through our planning and development guidelines. There are issues that staff will have to deal with and make sure they are approved.

Mr. David Brigley, AMEC representative said that laws are in place that goes beyond city regulations over what you can do for flooding downstream and upstream properties.

Mayor Benjamin said that they've heard many concerns about flooding in Five Points. He clarified that this has zero impact on flooding in Five Points.

Mr. David Brigley, AMEC representative stated that it's too far away. A big issue with Five Points is trying to get water into the pipes and into the creek. You can take away all of the flooding in Assembly Street and you still have the rest of the chokepoints. The water can't get into those pipes. The PACE study was concerned about opening up the railway culvert, because they were afraid of the impact of letting all of that water loose on Olympia Avenue. That rule is the same for Five Points. Where would the water go and can that location handle that much more water?

Councilor Rickenmann asked if there needs to be storage to handle the capacity of water in Five Points. You have a lot of water coming from a lot of different directions into what used to be a swamp. We discussed the need for holding points before and after Five Points, almost creating a floodplain.

Mr. David Brigley, AMEC representative said that in looking at the Five Points area, it's going to be tough to hold the water back. One recommendation was peak shaving where you take some water off of the main area and put it into a holding area and that might require a pump. That's where the Technical Committee can help you to scout locations. In some cases, it may be getting it off the streets and into the pipes. It needs to be a coordinated effort.

Councilor Gergel asked if he has contacted the University of South Carolina. They have been looking at some of the storage places where this needs to go.

Mr. David Brigley, AMEC representative said that some of his teammates have attended the Alliance meetings. We know that they've been looking at that.

Councilor Gergel asked if the University is currently engaged in studies of Rocky Branch.

Ms. Dana Higgins, City Engineer said that the Rocky Branch Watershed Alliance has been good about bringing USC, the City of Columbia, Five Points and all affected parties together. They collected all of the studies. I understand that there are current studies of the Branch underway.

Mayor Benjamin said that this doesn't affect flooding in Five Points and it doesn't exasperate flooding anywhere. Help me understand the issues regarding water quality. They can in fact be improved.

Mr. David Brigley, AMEC representative said yes, in stream. Assuming that the site follows all of the regular site regulations for taking care of its own runoff for water quality, it can prevent the stream erosion that's occurring in the Olympia Park and downstream by slowing down the water that's coming out of the culverts. That's the manner in which it can help with water quality.

Mayor Benjamin said that we've tried very hard not to have any influence on the independent third-party consultant. We've allowed staff to deal with him and we've tried our best to stop everyone else from trying to influence your position and results. We needed someone to take a look and give us something to move forward in addressing the various concerns.

Ms. Ryan Nevius, Executive Director / Sustainable Midlands and Member of the Rocky Branch Watershed Alliance said that the point with the Five Points flooding was to look to make sure that the Assembly Street floodplain wasn't the reservoir that was needed as we moved upstream. Hopefully as we move those chokepoints we might have a chance to utilize the existing floodplain where the ballpark is as a reservoir to clean the water and slow it down before it goes to the river. That was our point. Is this going to affect the long term complete solution for flooding in Five Points?

Dr. Lakshmi Venkat, Chair of the Rocky Branch Watershed Alliance said that you are paving over 400,000 square feet of area. From the common conventional hydrology that I know, when you pave over area you increase surface runoff, because you have no infiltration and this decreases the time it takes for rainfall to create a flood; it's a quick response. In table 5, it shows the base flood elevation pre- and post-project as the same. Obviously they have done the studies. From PB America's estimate it was \$30 million for the whole Rocky Branch. It's more money now. If this becomes a chokepoint because of increased flow, then the flow from Five Points will not reach the river.

Dr. Allen James, River Scientist / University of South Carolina said that the study clearly showed that there would be a lowering of stage if the obstructions are removed at Bluff Road and the railroad crossing below. What happens if you remove the restrictions and put the project in after the restrictions are removed? Does it then raise the water stages? That needs to be studied.

Mr. David Brigley, AMEC representative said that they can't add additional runoff which causes an impact. This will be added to the model and if there is a rise they would need to offset it. The runoff and the change of the behavior in the stream need to be studied.

Mayor Benjamin made a motion to authorize the City Manager to execute the previously approved contract for the sale of the Assembly Street property to Bright-Myers, LLC with the appropriate amendments to require the developer to meet all City of Columbia development, engineering and storm water regulations and all applicable county regulations; to financially assist the City in development of the greenway; to provide connectivity with the Rocky Branch Watershed at a level to be approved by the City Manager; to require the developer to make, at the developer's cost and expense, storm water related improvements outside the property boundary necessary to mitigate any possible development impact in the Rocky Branch Watershed, as outlined in the presentation today.

Councilor Plough said that she doesn't know what is in the previous agreement.

Mayor Benjamin said that the property was sold for \$1 million.

Councilor Rickenmann said that it is a contract with a due diligence period of 12 months. This allows them to move forward and they will have to produce all of the studies before they are issued a permit. These are questions that they have to answer at their expense, not ours. We are at the stage where the developer needs to bear those costs and he may come back and say that he can't do it.

Councilor Gergel said that the motion is premature. We should be making a motion to rescind the agreement that we made before, because it's not the right one to move forward with. We need a new contract. Why would citizens turn out tomorrow night if we approve the contract? I want to hear from the Rocky Branch Watershed Alliance and Dr. Venkat.

Councilor Devine stated that they had lots of questions regarding the environmental issues. We painstakingly went through the process to retain an independent consultant to give us feedback and we have that. It's not good to move forward with tomorrow night's meeting. I think that some people have gotten wrapped around what the proposed development is. We needed answers and we received good answers to give us a direction. We're not finished. It's unfair to the developer and the community if we keep going back and forth. There is additional information we can get from the consultants, but it doesn't stop us from moving forward with seeing where this process goes.

Councilor Davis concurred with Ms. Devine. I've looked at the findings and recommendations and we've had lengthy discussions as to whether or not we should consummate the contract. During the deliberations we received a lot of communications and I didn't see 100% disagreement with the development. It gives me the satisfaction I need to not hold this process up. This gives an opportunity for residents in that area to sit down with the developer and discuss their ideas. For the sake of at least of trying to move forward in concluding this, I don't have a problem with this motion.

The motion was amended by Mr. Rickenmann to allow for the use of a portion of the funds to be put back into creek restoration and leveraging those dollars as we move through, however we deem.

Mayor Benjamin accepted the amendment to the motion.

Councilor Plough asked Mr. Gaines to explain the contingencies in the contract. She asked staff to address how the permitting process would work. How will the development proceed?

Councilor Devine asked the City Attorney to address when the due diligence period ends.

Councilor Gergel asked the City Attorney to outline the process for review of the design guidelines.

Mr. Kenneth E. Gaines, City Attorney said that the property must have commercial zoning that would permit the development of a shopping center. The buyer can take the steps necessary to rezone the property. The buyer has to be able to place the adjacent property owned by SCE&G under contract. The buyer has to deliver to the seller a document certifying that these contingencies have been satisfied within 180 days of the effective date or the contract will terminate. The seller retains design control over the development of the property. The buyer agrees to comply with design requirements and procedures in Exhibit B. He outlined a host of design requirements that were written by Planning and Development Services. The seller has the right to lease the ballpark for the 2012 season, which ends soon. We will also add these other conditions that are contained in the Mayor's motion. We will add a provision that they would agree to an action of specific performance if they did not comply with the provisions of the contract at any time.

Ms. Krista Hampton, Director of Planning and Development Services explained that they will need to annex the portion of the property that is currently in the county and zoned residential. That would generally be processed at the same time when we do the annexation with a map amendment. The adjacent property is M-1, retail would be permitted there. The acreage is large enough to go to C-3 if it was the desire of Council. Both of those permit retail development. Once the annexed parcels are consolidated, it's zoned appropriately and it goes through our permitting process. First, they would need to obtain a land disturbance permit and that's when your storm water utilities and regulations are reviewed. The second permit is a building permit, which is when we review the vertical construction. This is of a size that the Planning Commission would see the site plan for review remembering that it's a technical review and not a discretionary review. If it meets the regulations, the Planning Commission is obligated to approve it prior to the land disturbance permit.

Councilor Devine inquired about the traffic studies.

Ms. Krista Hampton, Director of Planning and Development Services said that traffic impact studies would be submitted for review by the Planning Commission and SCDOT.

Ms. Dana Higgins, City Engineer added that the land disturbance permit is required under the City's storm water ordinance. We would propose opening up downstream and that goes into Richland County where they allow zero foot rise.

Mr. Kenneth E. Gaines, City Attorney noted that the City does not own the railroad trestle. The developer would have to make arrangements to either obtain permission to make the cut or purchase the railroad trestle.

Ms. Dana Higgins, City Engineer explained that AMEC study looked at the feasibility of the proposal, but the developer is required to provide a detailed design of the proposed elevations and how it affects the floodplain.

Councilor Gergel expressed concerns about moving forward without hearing from the public.

Mayor Benjamin asked if there were other offers for alternative uses of this property.

Mr. Steven A. Gantt, City Manager said yes, for student housing.

Mr. Kenneth E. Gaines, City Attorney noted that the buyer can terminate the contract for any reason during the initial 150-days of the contract.

Mayor Benjamin added that the developer is bringing several hundred jobs to a blighted and long neglected community.

Councilor Gergel urged the Council to use all of the proceeds for restoration of Rocky Branch. Mayor Benjamin did not accept Dr. Gergel's amendment.

Upon a motion made by Mayor Benjamin and seconded by Mr. Rickenmann, Council voted six (6) to one (1) to authorize the City Manager to execute the previously approved contract for the sale of the Assembly Street property to Bright-Myers, LLC with the appropriate amendments to require the developer to meet all City of Columbia development, engineering and storm water regulations and any and all applicable county regulations; to financially assist the City in development of the greenway; to provide connectivity within the Rocky Branch Watershed at a level to be approved by the City Manager; to require the developer to make, at the developer's cost and expense, storm water related improvements outside the property boundary necessary to mitigate any possible development impact in the Rocky Branch Watershed, as outlined in the AMEC presentation on June 5, 2012; and at the discretion of the City Manager, use a portion of the proceeds from the sale for watershed restoration. Voting aye were Mr. Newman, Ms. Plough, Mr. Rickenmann, Ms. Devine, Mr. Davis and Mayor Benjamin. Dr. Gergel voted nay.

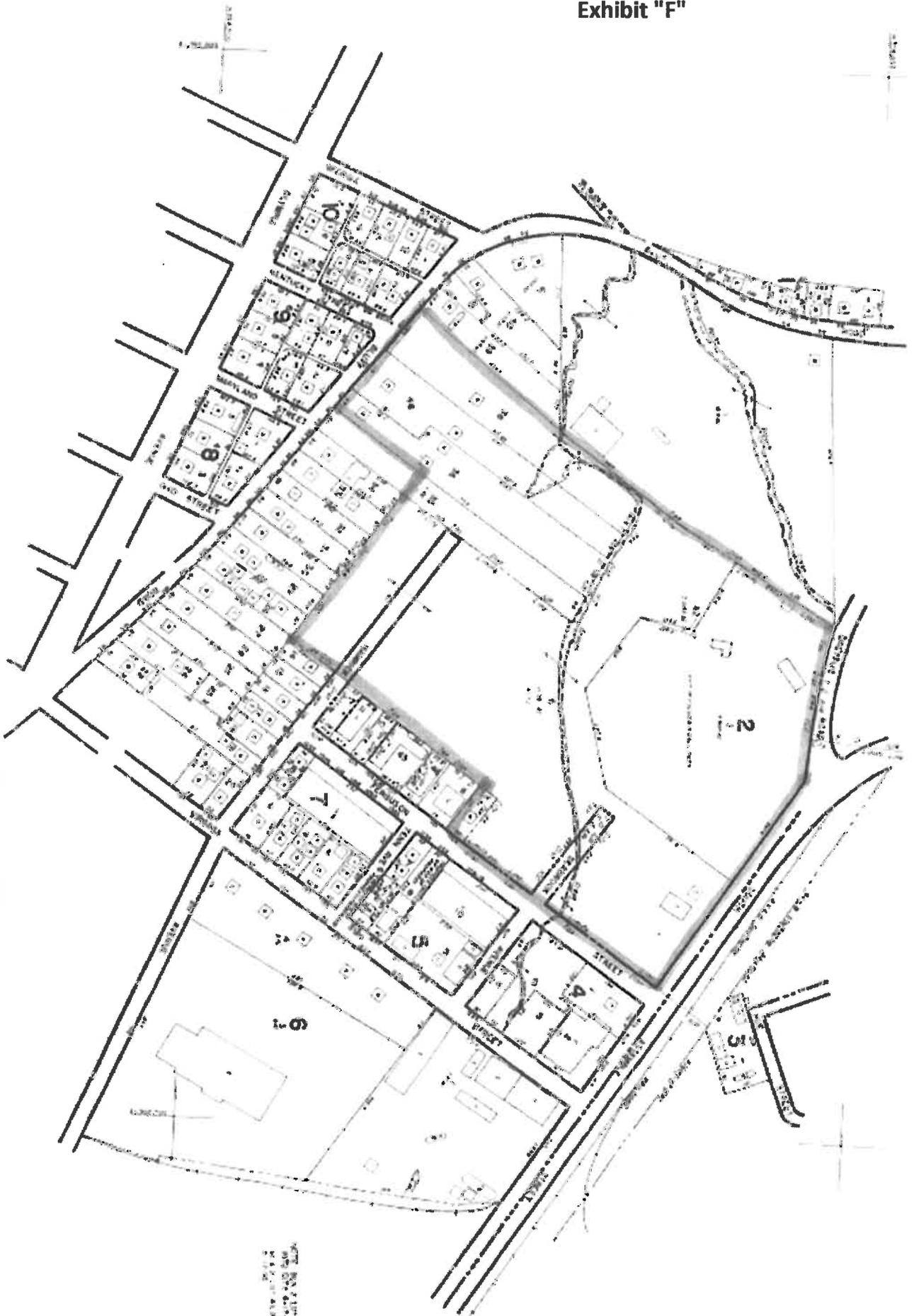
### **BUDGET PUBLIC HEARING**

Ms. Missy Caughman, Budget Director presented the fiscal year 2012/2013 proposed budget. It addresses funding necessary to operate a clean, safe and financially sound city; focuses on funding for City services; continuation of the capital replacement program, and provides funding for capital improvement and major maintenance projects across all funds. We had increases in State Retirement System contributions for regular and sworn employees, increases in health care costs, and fuel and electricity costs. The departmental budgets include a 2% Cost of Living Adjustment (COLA) as well as the related expenses to the COLA. The Police, Fire and Utility Departments are operating at full staff. This also has an impact on the departments' operating budgets. A lot of the focus throughout the budget is on capital maintenance and repairs. The General Fund and the Water and Sewer Fund make up the majority of the City's operating budgets. All operating budgets combined equal \$350 million. The Hospitality Tax Fund is budgeted at \$9.3 million, which is a 7% increase over the current year. We are using \$895,000 for

**EXHIBIT "E" – ADDITIONAL AGREED UPON  
DEVELOPMENT REQUIREMENTS  
April 24, 2014**

1. The development will meet or exceed requirements of the City of Columbia's Stormwater Ordinance. Stormwater and water quality mitigation may include bio-retention, filters and catch basins, pervious surfaces, as well as other approved methods designed to catch floating oils and grease, reduce surface run-off and improve water quality. Riparian and constructed wetlands will be along a majority of the North/North West boundary of the property.
2. Anchor store size will be less than 115,000 square feet. The Development will include a number of other buildings to include additional retail, mixed-use retail/residential, and a fuel center.
3. No Garden Center or Tire Center will be included in the development. Parking lot sales of garden center merchandise will be prohibited.
4. In an effort to limit the noise from HVAC units, air handling will be from roof mounted units and will not include chiller equipment.
5. There will be no truck access from the site to Bluff Road, and the City of Columbia will consider traffic mechanisms that will limit through traffic and use of the area as an alternate route for railroad related traffic. The site will include a driveway and pedestrian access to Bluff Road to integrate the development into the Olympia Community.
6. The Buyer will provide signalization of Ferguson Street and Assembly Street contingent on DOT approval/permitting.
7. The Buyer will work with USC and Comet to facilitate the location of a bus stop at the development.

Exhibit "F"



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