

F. **STORM WATER STANDARDS:**

1. **Purpose** – These storm water standards shall implement the Comprehensive Plan for the physical development of the City by setting the location, character and extent of open spaces and facilities for waterways and storm water runoff, discharge, retention and detention. This design and arrangement shall promote the health, safety and general welfare, and promote safety from inundation and erosion caused by storm water runoff.

These standards shall promote the following goals in the Comprehensive Plan:
(a) plan, provide and maintain efficient and effective infrastructure that promotes orderly growth and environmentally sound practices to meet the future needs of the community and to support land use goals; (b) promote a sustainable future that meets today’s needs without compromising the ability of future generations to meet their needs; and (c) encourage and develop connections between environmental quality and economic vitality.

2. Liability - The design criteria herein establishes minimum elements of design which must be implemented with good engineering and good construction practices. Use of information herein for placement of any structure, for use of any land, or any design basis shall not constitute a representation, guaranty, or warranty of any kind by the City of Fairhope or its agents, officers or employees of the practicability, adequacy or safety of design.
3. Submittal Requirements –
 - a. *Minimum Requirements* - All proposed subdivisions shall demonstrate compliance with this Section F., these Regulations, and all applicable state and federal laws and regulations by submitting a minimum of two (2) copies of the following plans and calculations:
 - (1) A Drainage Plan adequate provision for storm and flood water control by channel, conduit or basins, which takes into account the ultimate or saturated development of the tributary area in which the proposed subdivision is to be located, and which includes but shall not be limited to:
 - (a) Contour map of proposed development areas, with both existing and finish contours at not greater than two-foot intervals;
 - (b) Existing drainage systems, including any structures immediately down stream that may be affected by the project;
 - (c) Proposed drainage system, including onsite and offsite drainage areas;
 - (d) Structure location, type and size, slope, c.f.s., elevations of inlet and outlet, velocity, headwater elevation, tail-water elevation, etc., relative to the overall subdivision and/or staged phase of the subdivision;
 - (e) Differential runoff calculations for pre-development and post-development conditions;
 - (f) The effect of the subdivision on existing upstream and downstream facilities outside the area of the subdivision; and
 - (g) Other pertinent information necessary for review of the drainage plans as may be required by the Commission.
 - (h) A drainage narrative, including but not limited to, the following:
 1. Any and all historical and existing drainage conditions.
 2. Name, location, size of receiving watersheds and any special considerations required by the watershed.
 3. The calculation method and assumptions used.
 4. Discussion of adequacy of volume of retention and drainage design.
 5. Method of discharge.
 6. And how the design takes into account (Section F paragraph 3 b) the potential for *adverse effect*.
 - (2) An Erosion and Sediment Control Plan which includes, but shall not be limited to:
 - (a) Architectural and engineering drawings, maps, assumptions, calculations, and narrative statements as required to accurately describe the development and measures taken to meet the objectives of storm-water management;
 - (b) Data on historical runoff, developed runoff, detention pond details, and method of discharge.

- (3) Operations and Maintenance (O&M) Plan and Agreement for maintenance of detention facilities and other storm water quantity and quality BMPs during development and documents providing for continued inspection and maintenance after completion of development and sale of all lots, such documents running as a covenant with the lands.
 - (a) An Operations and Maintenance (O&M) Agreement signed by the developer or owner for any required detention facilities or other storm water quantity and quality BMPs must be submitted with the proposed plans. The agreement must contain a long-term maintenance plan prepared by the design engineer for each BMP. The maintenance plan must include a description of the storm water conveyance system and its components, inspection priorities, schematics for each BMP, and inspection schedule for each water quantity and quality BMP. The O&M Agreement must be recorded prior to final plans approval. If the final configuration of the storm water system or BMPs differs from the original design on the approved plans, the O&M Agreement must be revised, finalized, and rerecorded. Failure to follow the O&M Agreement could result in enforcement action.
 - (b) The long-term maintenance plan within the O&M Agreement contains the inspection priorities and schedule for the storm water BMPs. The owner is responsible for inspecting the storm water system and BMPs according to the schedule and submitting reports to the Planning Director or his authorized representative every three (3) years to document that inspections have been completed and necessary maintenance has been performed. The first inspection report is due December 31 of the third year after construction has been completed. Inspection reports are then due by December 31 of every third year following submittal of the first report. The Planning Director or his authorized representative must be notified of any change in ownership. Failure to file the three year inspection reports and perform required maintenance activities could result in enforcement action.
 - (c) Prior to the full release of the performance bond for any new or substantially improved storm water facilities, an Alabama registered engineer shall submit to the Planning Director or his authorized representative certification that the proposed storm water management system and BMPs for the development are complete and functional in accordance with the approved plans and shall also provide as-built drawings for the storm water management systems and BMPs.
- (4) Basic Design Data and calculations including routing calculations in legible tabulated form and proof of adequacy of volume of retention and sizing computations for low flow structures.
- (5) Copy of notice of coverage and storm water pollution plan for coverage under the Alabama Department of Environmental Management for issuance of NPDES Permit, and permits from any other agency, where required; and,
- (6) Any additional engineering information the Planning Commission deems necessary to make a decision on subdivisions and other development where adequacy of drainage is reasonably questioned.

- b. *Adverse Effects* - Where it can be reasonably anticipated that additional quantity or velocity of runoff from development of a subdivision will overload existing downstream drainage facilities, approval shall be withheld until there is submitted to the Commission a plan to mitigate damage to downstream property which would or might result from the subdivision under consideration. Downstream drainage structures should be considered when sizing detention outfall structures, with proof of this submitted to the Commission. The hydraulic elevations resulting from channel detention shall not adversely affect adjacent properties.
- c. *Additional Engineering Plans and Calculations* -
 - (1) In every case where new streets are to be constructed, and in cases where subdivisions provide frontage only upon existing right-of-way and there exists in the opinion of the Commission the potential for damage from uncontrolled storm-water runoff, the project engineer shall include in his plans the design and calculations required for adequate control of storm-water.
 - (2) For projects not exceeding 200 acres, routing calculations shall be in legible tabulated form. Proof of adequacy of volume of retention and sizing computations for low flow structures shall be submitted. For projects exceeding 200 acres, the engineer shall provide detailed, documented verification of adequacy of design.
 - (3) No proposals for under-sizing shall be submitted except with plans and profiles of the entire undersized downstream area with convincing evidence that the hydraulic gradients proposed will not adversely affect existing facilities maintained by the City or County.
 - (4) A special design drawing shall be submitted for any single drainage structure of 20 square feet in area, or larger.
- d. *Certifications and Seals* –
 - (1) All plans and design calculations submitted shall bear the seal, original signature, name, address and telephone number and certification of the project engineer, who shall be registered to practice as a Professional Engineer in the State of Alabama and who is qualified by reason of education and experience in the field of storm water design.
 - (2) The engineer shall seal and sign each sheet of the plan assembly.
 - (3) The engineer shall affix his certification to the first sheet of each plan assembly and design calculation, which certificate shall read substantially as follows:

"ENGINEER'S CERTIFICATE

I, the undersigned, a Registered Professional Engineer in the State of Alabama holding Certificate Number _____, hereby certify that I have reviewed the design herein which was done under my direct control and supervision and that, to the best of my professional knowledge and to the best of my belief, conforms to the requirements of the Fairhope Subdivision Regulations and to all other rules, regulations, laws, and ordinances applicable to my design.

Project Engineer

Date

Name of Project to which this Certificate Applies

Plans which are certified consist of Page ____ thru ____, each of which bears my seal and signature."

(4) The calculations, construction plans, and plat shall have the following statement: "A property owners association (POA) is required to be formed. The POA is required to maintain any and all storm water facilities and structures located outside of the publicly accepted right-of-way.

4. Stream Buffers –

- a. An undisturbed streamside buffer (buffer) is an area along a shoreline, wetland, or stream where development and redevelopment is restricted or prohibited. The primary function of the buffer is to physically protect and separate a stream, lake, bay, or wetland from future disturbance or encroachment. Buffers can provide storm water management and sustain the integrity of stream ecosystems and habitats. Buffers can be applied to new developments and redevelopment by establishing specific preservation areas and providing management of the buffers through easements or homeowner’s associations. For existing developed areas, an easement is typically required from adjoining landowners. Waivers in accordance with Article VII may be requested if the developer or landowner can demonstrate hardship or unique circumstances that make compliance with the buffer requirement difficult.
- b. A buffer layer in the City’s GIS system has been developed to show buffer limits along streams within the City’s planning jurisdiction. The following Buffer widths used to develop the buffer layer for streams, are shown in the following table and are measured from the top of bank as defined in Article II of these subregulations. Buffer widths for ponds, Mobile Bay, jurisdictional wetlands as determined by the Alabama Department of Environmental Management and the Army Corps of Engineers, and any lakes, ponds, and isolated wetlands are also shown in the table. The buffer requirement applies to streams beginning at a point where the drainage area is 100 acres or greater.

Feature	Buffer Width (feet)
Fish River	100
Other Watersheds	50
Mobile Bay	50
Wetlands (Jurisdictional and Isolated)	30
Ponds/Lakes/Isolated wetlands	30

- c. The buffer applies to all properties except those properties that are an existing lot of record and/or included on an approved preliminary subdivision plat (as of appropriate date).
- d. Allowable uses in the buffer include: flood control structures; utility easements as deemed necessary and approved by the Planning Director or his authorized representative; natural footpaths; greenways, paved roadways; pedestrian and bikeway crossings perpendicular to the streamside including

approaches, dock and ramp access, and other uses as determined by the Planning Director or his authorized representative. All buffer disturbances associated with allowable uses shall be to the minimal extent practicable and all disturbed areas shall be stabilized as soon as possible.

- e. The vegetated target for the buffer shall be undisturbed natural vegetation. Any of the allowable uses shall be designed and constructed to minimize clearing, grading, erosion, and water quality degradation.
- f. Land in the buffer shall not be used for principal structures and accessories, such as swimming pools, patios, etc. All new platted lots shall be designed to provide sufficient land outside of the buffer to accommodate primary structures. Buffers should be delineated before streets and lots are laid out to minimize buffer intrusion and to assure adequate buildable area on each platted lot. Land within the buffer can serve to meet the minimum lot requirements.
- g. Buffer impacts are inevitable with development. Modification and mitigation of the buffer width are available to landowners or developers of newly platted lots or subdivisions where there are exceptional situations or physical conditions related to the parcel that pose practical difficulty to its development and restrict the application of the buffer requirements. The landowner or his designated representative may prepare and submit for approval a written request and site plan showing the extent of the impact of the buffer on the proposed project and specify a proposed buffer mitigation plan. The Planning Director or his authorized representative will review and render a decision on the buffer encroachment and proposed mitigation within 30 days after receiving the request. In no case shall the reduced width of the buffer be less than 25 feet. Applicants can appeal the decision of the Planning Director or his authorized representative's decision to the Planning Commission.
- h. In order to maintain the functional value of the buffer: dead, diseased, or dying trees that are in danger of falling and causing damage to dwellings or other structures may be removed at the discretion of the landowner; debris in the buffer that is a result of storm damage may be removed; and, invasive plant species may be removed if they are replaced by native species. A buffer restoration plan must be approved by the Planning Director or his authorized representative.
- i. Stream boundaries including each buffer zone must be clearly delineated on all grading plans, subdivision plats, site plans and any other development plans. The outside limit of the buffer must be clearly marked on-site with permanent signs placed every 100 feet prior to any land disturbing activities. Stream and buffer limits must also be specified on all surveys and recorded plats and noted on individual deeds. Buffer requirements must be referenced in property owner's association documents and shall be labeled on the plat.
- j. When a landowner or his representative obtain permits from ADEM or the Army Corps of Engineers that results in impacting the buffer then approved mitigation of these impacts based on the permit conditions supersede the applicable components of the buffer requirements in areas covered by the permit. The buffer requirements for areas not covered by the permit shall be applicable to the remainder of the proposed development site.

5. Flow Control –

- a. *Scope of Design* - All subdivisions or other developments shall be provided with adequate storm water drainage facilities. The project engineer shall provide a design adequate to control storm water peak flows, runoff volume and velocity in accordance with paragraph 7 of this section. In general, the project engineer shall use design storm criteria based on the site-specific conditions that relate to protection of life and property. Culverts shall generally accommodate a 25-year storm frequency under arterial roadways; drainage systems within subdivisions should accommodate a 2 through 25-year storm frequency; bridges shall accommodate a storm frequency of 50 years. When deemed necessary, the Planning Commission may require a storm frequency design as great as 100 years.

(1) There shall be no storm water pumps.

- b. *Design Standards and Calculations* - The method of determining storm water runoff, plans, and designs shall be based on principles of good engineering practice and the following standards:

- (1) Calculations shall be based on the Rational Method ($Q=cia$) for small basins, up to 100 acres, where:

Q=estimated peak discharge in cubic feet per second

c=coefficient of runoff (from table below)

I=rainfall intensity, inches per hour, for a design storm derived from the time of concentration

t_c = time of concentration in minutes, from figure 4-13 of the Alabama Department of Transportation of Hydraulic Manual, attached as Appendix D.

a=drainage area in acres

Recommended values for “c” may be found in table 4-2 of the Alabama Department of Transportation Hydraulics Manual, attached as Appendix E. It is recommended that the intensity, “I” be obtained from the Intensity-Duration-Frequency curve for Mobile produced by the National Weather Service.

- (2) When the proposed development lies within a large watershed where flows from upstream drainage areas are passing through the proposed development, a rainfall-runoff model such as the Soil Conservation Service (SCS) technical release 20 (TR-20) should be used to calculate offsite flow. Flow should be calculated using a 25-year, 24-hour rainfall, the depth of which can be obtained from SCS Technical Release 55 (TR-55). This flow shall be taken into account when designing detention outfall structures if the upstream flow passes through the proposed detention pond. The effects of (and on) upstream and downstream ponds in the watershed shall be analyzed.
- (3) All proposed conduits or channels shall be of sufficient capacity to accommodate potential runoff from developed area, including the entire upstream drainage area. The project engineer shall include in his submittals evidence that he has included in his design the tributary area/s. If an existing channel runs through a proposed development, the engineer must consider this flow when designing detention and outfall structures.
- (4) In general, inlets shall be provided so that surface water is not carried across any intersection, or for a distance of more than 600 feet in the

- gutter. When calculations indicate that gutter capacities are at maximum, catch basins shall be used to intercept the flow at that point.
- (5) Open channels and ditches shall be so designed as not to create a traffic hazard or to cause erosion. The minimum slope for paved ditches shall be 0.5 percent and for non-paved ditches shall be one percent. Maximum design flow velocities shall conform to the current edition of the Alabama Highway Department Hydraulics Manual.
 - (6) Cleanout access shall be provided at a maximum spacing of 300 feet for pipes 24 inches or less in diameter and 400 feet for pipes exceeding 24 inches. Cleanouts shall also be provided at each change in line and grade.
 - (7) Concrete box culverts shall be designed and constructed according to requirements of the Alabama department of Transportation Standard Specifications for Highway Construction, current and the Alabama Department of Transportation Special Standard Highway Drawings..
- c. *Site Facilities* –
- (1) The developer shall be required to carry away, by pipe or open channel, any spring or surface water existing prior to or as a result of the subdivision. Adequate provisions shall be made within each subdivision for drainage facilities required.
 - (2) Where a public storm water system is available, the developer shall be required to connect his facilities thereto. If no public outlet exists, the project engineer shall recommend means to adequately dispose of storm water runoff.
 - (3) The storm and sanitary sewer plans shall be made prior to other utility plans.
 - (4) The storm water system shall be separate from and independent of any sanitary sewer system.
- d. *Conformity with Other Standards* - All drainage facilities shall be constructed in conformity with state specifications and all other state and federal laws and regulations.
- e. *Flood Prone Areas* –
- (1) Low lying lands along watercourses subject to flooding or overflowing shall be included in the drainage and shall not be available for improvements except as specifically authorized by the City's flood control ordinance.
 - (2) Low areas subject to periodic inundation and areas subject to excessive erosion shall not be developed or subdivided unless and until the Planning Commission may establish that: The nature of the land use proposed would not tend to be damaged appreciably by water; The area may be filled or improved in such a manner as to prevent periodic inundation; Minimum floor elevations may be established such as to prevent damage to buildings or structures; There is adequate provision to eliminate such flooding.
- f. *Lands Outside the City* - Within the extra-territorial jurisdiction of the Fairhope Planning Commission, all engineering plans shall be subject to the more restrictive requirement of these provisions or of Baldwin County's Storm Water Management Plan. In those areas, the County Engineer's review shall be completed and his certificate of review shall accompany all plans submitted to the Commission. The following outline is provided to help insure that certain critical elements of design are in compliance with the objectives of design:

- (1) Volume of retention for entire project
 - (2) Tributary (Q) peak runoff to basin
 - (3) Balanced maximum outflow rate from low flow structure
 - (4) Ratios of inflow to outflow (differential rates)
 - (5) Sizing of overflow facilities
 - (6) Stability of dikes
 - (7) Safety features
 - (8) Maintenance features
6. Erosion Control -
- a. Surface water runoff originating upgrate of exposed areas shall be controlled to reduce erosion and sediment loss during period of exposure. All land disturbing activities shall be planned so as to minimize off-site sedimentation damage.
 - b. No grading or earth moving operations shall commence until erosion and sedimentation control measures shall have been implemented.
 - c. All disturbed areas shall be stabilized as quickly as is practicable with permanent vegetation and erosion/sediment control measures. The duration of exposure to erosive elements shall be kept to a minimum.
 - d. Detention ponds shall be stabilized by means of grassing, sodding, erosion control netting, or a combination thereof. Sediment shall be removed from the pond prior to acceptance, and any disturbed areas shall be regrassed. The use of red clay as a means of stabilizing detention ponds is prohibited.
 - e. Temporary vegetation and/or mulching shall be provided to protect exposed high-risk erosion areas during development.
 - f. When the increase in peak rates and velocity of storm water runoff resulting from a land disturbing activity is likely to cause damaging accelerated erosion of the receiving channel, plans shall include measures to control velocity and rate of release so as to minimize damage to the channel.
 - g. No land disturbing activity shall be permitted in proximity to a lake, natural watercourse or adjacent property unless a buffer zone is provided along the boundary thereof to confine visible siltation and to prevent erosion; provided, however, that this prohibition shall not prevent such activity undertaken as a part of the construction of such lake or watercourse channel.
 - h. The angle for graded slopes and fills shall not exceed that which can be retained by vegetation cover or other adequate erosion control methods. Provision shall be made for planting or otherwise protecting slopes within the shortest possible time from exposure thereof.
 - i. Erosion and sedimentation control measures, structures and devices shall provide control from the calculated post-development peak runoff. Runoff rates and computations may be calculated from procedures contained in the "National Engineering Field Manual for Conservation Practices" and shall be based on rainfall data published by the National Weather Service for the area and/or official local records.
 - j. Engineer shall provide for permanent protection of on-site or adjacent stream banks and channels from the erosive effects of increased velocity and volume of storm-water runoff resulting from land disturbing activities.
 - k. Erosion and sediment control plans and details shall be based on the current edition of the "Alabama Handbook for Erosion Control, Sediment Control and Storm water Management on Construction Sites and Urban Areas". Erosion control plans shall be prepared by a

certified professional in erosion and sediment control such as a Certified Professional in Erosion and Sediment Control (CPESC).

7. Detention and Retention Facilities -

- a. The purpose of storm water retention and detention is to protect downstream properties from increases in flood heights due to development. A combination of storage and controlled release of storm water shall be required for road construction, non-residential developments of one acre or more, multi-family residential developments of five acres or more, and single family developments of ten acres or more. (The effective acreage for a project is not limited to a fractional part of the total concept; even though developed in phases, it is the total area of the conceptual plans which governs.) Storage and controlled release facilities may be required on smaller projects if it is determined in the Planning Commissions discretion that the intensity of the development could cause off-site storm water flow impacts during or after development. The retention or detention (whenever detention requirements are addressed by these regulations, requirements also apply to retention facilities) facilities must be designed to control peak flow from the outlet of the site such that post-development flows are equal to or less than pre-developed peak flows for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year design storms. However, detaining the discharge from a site can sometimes exacerbate flooding downstream due to peak flow timing and/or the increased volume of runoff coming from a site. If detention facilities are indiscriminately placed in a watershed and changes to the peak flow timing are not considered, the detention facility may result in an increase of the peak flow downstream. Another impact of new development is an increase in the total runoff volume of flow. Thus, even if the peak flow is effectively attenuated, the longer duration of higher flows due to the increased volume may combine with downstream storm water conveyance systems to increase downstream peak flows. Applicant must demonstrate through hydrologic analyses that the detention facility will not exacerbate flooding downstream.
- b. Such facilities shall be owned, operated and maintained by the development entities and shall not be accepted for inspection and maintenance by the City of Fairhope. The burden shall be on the developer and his engineer to provide evidence in support of any proposal to alter or modify the requirement for detention. Storm water runoff from new development or significant redevelopment must not adversely affect downstream properties. In determining whether runoff from the new development or significant redevelopment causes an adverse impact, the following procedures will be used:
 - (1) Attenuate post-development peak discharges to a level not to exceed the pre-development discharges for the 2-year through 100-year recurrence intervals.
 - (2) Apply the “ten percent” rule. This rule is based on the premise that at a point downstream of a development site where the drainage area above the development is 10 percent or less than the total drainage area at a point downstream of the development; then impacts related to storm water runoff from the development are minimal from this point downstream. This rule recognizes that in addition to controlling the peak discharge from the outlet of a detention facility, these facilities change the timing of the entire outflow hydrograph for the stream or

river in question. Where required, channel routing calculations must proceed downstream to a confluence point where the drainage area being analyzed represents ten percent or less of the total drainage area. At this point, if the effect of the hydrograph routed through the proposed storage facility on the downstream hydrograph is assessed and shown not to increase flows in downstream hydrographs, detention can be waived. If increased flows are found, then backwater calculations and determination of flood elevations for the areas impacted by increased flows, if any, must be prepared. Where downstream increases in peak flows or flood elevations are shown, detention will be required on site to attenuate storm water runoff from post-development to pre-development rates. In the event that the City has developed a Comprehensive Plan for the area, the recommendations within the Comprehensive Plan will establish the requirements for detention. The City retains the right to require detention in areas of known flooding when detention will not exacerbate downstream flooding.

- (3) The release rate from any detention facility should approximate that of the site prior to the proposed development for the 2-year through 100-year storm events, with emergency overflow capable of handling at least the 100-year peak discharge except where waived or altered by the Planning Commission. Design of the detention pond shall be to insure that detention facilities will survive overtopping occurring for any reason, including clogging of controlled outlets for the 100 year storm event. Detention systems must be constructed during the first phase of major developments to eliminate damage to adjacent properties during construction. In this regard, the detention systems shall be designed to function as sediment traps and cleaned out to proper storage volumes before completion. If deposition of sediment has occurred, detention systems must be restored to their design dimensions after construction is complete and certified as part of the as-built submittal.
 - c. Detention facilities shall be provided with obvious and effective control structures. Plan view, sections and details of the structure shall be included in submittals. Sizing of the low flow pipe shall be by inlet control or hydraulic gradient requirements. Low flow pipe shall be not smaller than eight inches in diameter, except in parking lot and roof retention where the size shall be designed for the particular application as approved by the Commission.
 - d. The overflow opening or spillway shall be designed to accept the total peak runoff of the improved tributary area. Proper engineering judgment, with 25-year, 50-year or greater storm frequencies considered, shall be exercised in secondary routing of discharge greater than the basic design storm for the protection of downstream properties.
 - e. Aerators are required for all retention ponds. The Public Works Director shall approve the specifications for said aerator.
8. Post Development Water Quality Best Management Practices –
- a. Storm water quality BMPs for new development and significant redevelopment are required for projects that disturb three acres or more or subdivisions with four or more lots. (The effective acreage for a project is not limited to a fractional part of the total concept; even though developed in phases, it is the total area of the conceptual plans which governs). The BMPs must be designed to achieve the goal of removing at least 80% of the average

annual post-construction total suspended solids (TSS) load. The storm water quality BMPs will be considered in compliance with this requirement if;

- (1) BMPs are sized to capture and treat the water quality treatment volume, which is defined as the runoff volume resulting from the first 1.8 inches of rainfall from a site; and,
- (2) Appropriate structural storm water BMPs are selected, designed, constructed, and maintained.

Storm water quality BMPs may be required on smaller projects if it is determined in the Planning Commission’s discretion that the intensity of the development could cause off-site storm water impacts during or after development.

- b. The storm water quality treatment goal is designed to capture 85% of the annual storm water runoff. Storm water quality BMPs must be designed to treat the runoff from the first 1.8 inches of rainfall. Each site’s storm water quality treatment volume is also based on its percent impervious cover. The treatment standard is the same for all sites unless other secondary pollutant reduction goals are established by ADEM; for instance, through the establishment of Total Maximum Daily Loads (TMDLs). The storm water quality treatment methodology to determine treatment volume is as follows:

$$WQ_v = P \times R_v \times \frac{A}{12}$$

Where:

- WQ_v = water quality treatment volume, acre-feet
- P = rainfall for the 85% storm event (1.8 inches)
- R_v = runoff coefficient (see below)
- A = drainage area in acres

$$R_v = 0.015 + 0.0092I$$

I = drainage area impervious cover in percent (50% imperviousness would be 50)

- c. This storm water quality treatment goal is designed to give the developer flexibility in meeting the 80% TSS reduction goal on each site. BMPs may be selected to meet the storm water quality requirements in numerous ways through the application of low-impact site design and layout, non-structural BMPs, and structural BMPs.
- d. The City encourages use of low-impact site design practices that reduce the impact of development on storm water quality and quantity. Low-impact site design practices are meant to:
 - (1) Minimize the impervious cover on a site,
 - (2) Preserve the natural infiltration ability of the site,
 - (3) Route storm water to “micro controls,” such as rain barrels, rain gardens, etc. that treat small portions of site storm water from the site, and,

- (4) Minimize long-term BMP maintenance by preserving and using natural features of the site.
- e. A developer should consider low impact site design practices early in the design process in an effort to reduce the overall water quality treatment volume requirement. These practices tie directly into the storm water quality program, the WQv calculation, and/or the storm water treatment volume. These practices should only be implemented when not in conflict with other City regulations.
- f. Structural storm water controls, or Best Management Practices (BMPs), are engineered structures designed to treat storm water or mitigate the impact from storm water runoff. The following table presents a pre-approved listing of structural BMP practices. These BMPs have been assigned a TSS removal capability, based upon existing research, and can be used by developers to meet the pollutant reduction goal of 80% TSS removal. The structural BMPs have been divided into two categories:
 - (1) General application BMPs are assumed to achieve the 80% TSS reduction.
 - (2) Limited application BMPs which have to be used in combination with other BMPs to achieve the 80% reduction goal. These BMPs may not be applicable for certain sites and require frequent intensive maintenance to function properly.

Pre-Approved BMPs

BMP Removal Efficiency for Total Suspended Solids (TSS)	
Structural Control	TSS Removal (%)
General Application BMPs	
Wet Pond	80
Storm water Wetland	80
Bioretention Area	80
Sand Filter	80
Enhanced Swale	80
Limited Application BMPs	
Filter strip	50
Grass Channel	50
Organic Filter	80
Underground Sand Filter	80
Submerged Gravel Wetland	80
Infiltration Trench	80
Gravity (Oil/Grit Separator)	40
Proprietary Structural Control	Varies
Dry Detention Basin	60

- g. The increase in the frequency and duration of bankfull flow conditions in stream channels due to development is the primary cause of accelerated streambank erosion and widening and downcutting of stream channels. Therefore, streambank protection criterion applies to all development sites for which there is an increase in the natural flows to downstream feeder streams, channels, ditches, and small streams. On-site or downstream improvements may be required for streambank protection, easements or right-of-entry agreements also may need to be obtained.

- h. The developer should determine if existing downstream streambank cover is adequate to convey storm water velocities for post-development conditions. This can be accomplished by first obtaining post-developed velocities for the “Streambank Protection” 2-year storm event in the downstream conveyance system. These velocities are then compared to the allowable velocity of the downstream receiving system. If the downstream system is designed to handle the increase in velocity as a result of the proposed development, the developer should provide all supporting calculations and/or documentation to demonstrate that the downstream storm water conveyance system will not be compromised as a result of the development.
 - (1) If the increased velocities are higher than the allowable velocity of the downstream receiving system, then the developer may choose to reinforce/stabilize the downstream conveyance system. The proposed modifications must be designed so that the downstream post-development velocities for the 2-, 5-, 10-, and 25-year storm events are less than or equal to either the allowable velocity of the downstream receiving system or the pre-development velocities, whichever is higher. The developer must provide supporting calculations and/or documentation that downstream velocities do not exceed the allowable range once the downstream modifications are installed.
 - (2) The developer may use on-site controls to keep downstream post-development discharges at or below allowable velocity limits. The developer must provide supporting calculations and/or documentation that the on-site controls will be designed such that downstream velocities for the three (3) storm events are within an allowable range once the on-site controls are installed.
 - (3) Another approach to meet the stream bank protection requirement is to provide 24 hours of extended detention on-site, for post-developed storm water runoff generated by the 1-year, 24-hour rainfall event (4.5 inches) to protect downstream channels. The required volume for extended detention is referred to as the Streambank Protection Volume (SPV). The reduction in the frequency and duration of bankfull flows through the controlled release provided by extended detention of the SPV will reduce the bank scour rate and severity.
 - i. Stormwater BMPs with either a permanent pool of water or that will hold storm water for an extended period of time can potentially provide mosquito-breeding habitat. However, if structural BMPs are properly designed, installed, and maintained, mosquito problems can be minimized. BMPs with open water (such as storm water ponds) shall require aeration for mosquito control. The Public Works Director shall approve the specifications for the aerator.
9. Location and Easements -
- a. Drain-ways, whether conduit or open channel, shall be located within the right-of-way insofar as is practicable.
 - b. Where topography or other conditions render impracticable the inclusion of drainage within road rights-of-way, perpetual unobstructed easements not less than fifteen (15) feet in width shall be provided across the property with access to the road right-of-way. Such easements shall be clearly delineated on the plat as areas dedicated to public use as drainage easements, with provision for maintenance by the landowners. The City shall not maintain such easements.

- c. Off premises drainage easements and improvements lying outside the proposed subdivision may be required of the Owner to handle runoff into a natural drainage channel.
 - d. Where a subdivision or development is traversed by a watercourse, drainway, channel or stream, there shall be provided a storm-water easement conforming substantially to the lines of such water course and of such width and construction as is adequate for the intended purpose, including maintenance operations.
 - e. No storm water detention shall be located in public right-of-way for any private development.
10. Maintenance -
- a. Acceptance for maintenance by the public of lakes or ponds which constitute a part of storm water drainage control is generally prohibited by storm water provisions herein. Any decision to the contrary must originate with the City Council.
 - b. Maintenance outside the street right-of-way shall be the responsibility of the legal entity established by the developer for the continued maintenance of common areas. No formal acceptance of streets and utilities shall be made by the City Council and no building permits shall be issued until developer has made provisions for continued maintenance of such common areas, including off-street drainage and detention. As part of the final plat submittal, the owner/developer shall verify in writing that a legal entity shall be responsible for continual maintenance. In the extra-territorial jurisdiction where street acceptance is the County's responsibility, the County Engineer may decline to sign approval for recording of plat unless maintenance provisions meet his approval.
 - c. All erosion and sedimentation protection facilities shall be regularly maintained as required to insure that they function effectively.
 - d. Means for perpetual and periodic maintenance of the facilities shall be established by the owner of the development as a condition prerequisite to approval of the development by the Commission.

G. UPSIZING:

1. Purpose - These upsizing standards shall implement the Comprehensive Plan for the physical development of the City by setting the location, character and extent of adequate public utilities. This design and arrangement shall promote the wise and efficient expenditure of public funds and establish the extent to which water and sewer and other utility mains, piping or other facilities shall be installed as condition precedent to the approval of the plat.

These standards shall promote the following goals in the Comprehensive Plan: (a) define priority growth areas that will guide the future extension of public infrastructure; (b) prioritize projects that “pay their way” through covering the cost of necessary support services; (c) require that the location and alignment of infrastructure systems are efficient and cost-effective; and (d) provide for balance between maintenance and reconstruction of existing streets, services or facilities and expansion into new areas.

2. Applicability - Whenever any portion of the required improvements for the subdivision is part of planned future facilities for the City serving an area larger than the subdivision, the Planning Commission may require that the applicant

construct the improvements to the capacity of the City plans. The applicant will be responsible for that portion of the costs required to serve the proposed subdivision, and the City shall reimburse the developer for those incremental costs to expand the improvements to the planned capacity. The Planning Commission may condition the approval of the preliminary plat on an agreement between the City and the applicant as to the equitable apportionment of those costs. The City's participation shall be based on at least three contractor bids comparing the construction costs of the minimum required improvements and construction costs of the improvements as planned by the City. The agreement shall be subject to approval by the City Attorney.