



Drainage Criteria Manual



PREFACE

CITY OF ROLLINGWOOD REQUIREMENTS FOR DRAINAGE:

The intent of this manual is to implement design principles and practices that control runoff from all development, during and after construction, such that no development will result in additional adverse flooding impacts. Any development that causes an increase in stormwater runoff requires mitigation by providing drainage analysis and a drainage plan performed by a Professional Engineer licensed in the State of Texas. The City's drainage policy shall govern the planning and design of drainage facilities within the Corporate Limits of the City. Definitions, criteria, procedures and data in this manual have been developed to support this policy.

For developments requiring drainage facilities, construction plans and all associated documents shall be provided to the City and shall conform to the requirements described within the Drainage Ordinance and the City's Drainage Criteria Manual. Drainage facilities located on private property shall be maintained by the property owner. Developments that include drainage improvements require an Operations and Maintenance (O&M) plan and schedule for routine inspection and maintenance of the drainage facilities to ensure proper functionality. The owner is responsible for complying with the O&M requirements.

SEPARATION OF WATER QUALITY AND DRAINAGE FACILITIES:

The City's drainage requirements are separate from Texas Commission on Environmental Quality's regulations pertaining to water quality BMP's and required facilities. Facilities required by the city's drainage regulations are to be separated from drainage facilities provided for compliance with applicable water quality regulations unless approved by the City Engineer.



Definitions:

BMP means Best Management Practices and means a practice, or combination of practices, that is determined to be an effective and practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals and/or for controlling stormwater runoff to the required standard.

Construction activity means the disturbance of soils associated with clearing, grading, grubbing, demolition or excavating activities or other construction activities.

Conveyance refers to streams, channels, drainage ways, floodplains, storm drainage systems, watercourse, waterways and other means to convey runoff.

Discharge means any addition or introduction of stormwater, pollutants, sediment, or any other substance whatsoever into the municipal separate storm sewer system (MS4) or conveyances.

Design Engineer means the engineer responsible for performing engineering design for construction plans or engineering studies.

Detention Pond means a low lying area that is designed to temporarily hold a set amount of water while slowly releasing the water at a controlled rate.

Development Activity means the construction of any improvements; an alteration of topography; or, a disturbance of soils or surface features or obstruction that will cause a permitted drainage facility to fail to perform to the standard required affected permit.

Drainage Facility means any structure, installation, or activity, the purpose of which is to serve to convey or control storm water runoff.

EPA means the United States Environmental Protection Agency and any federal department, agency, regional office, or commission under the authority and authorized official of the EPA.

EAPP means Edwards Aquifer Protection Plan, regulated by the TCEQ, and is an outline of best management practices that will be implemented and maintained – both during and after construction activities – to prevent contaminants found in stormwater reaching the Edwards Aquifer. The EAPP may include: a water pollution abatement plan, organized sewage collection system plan, underground storage tank facility plan, aboveground storage tank facility plan, contributing zone plan, or a modification, exception, or extension request granted by the TCEQ executive director.



HEC-HMS means Hydrologic Engineering Centers Hydrologic Modeling System designed by the US Army Corps of Engineers to simulate the complete hydrologic processes of dendritic watershed systems.

HEC-RAS means Hydrologic Engineering Centers River Analysis System designed by the US Army Corps of Engineers to perform one-dimensional steady flow, unsteady flow, sediment transport/mobile bed computations, and water temperature modeling.

Impervious Cover (IC) means impermeable, constructed, or installed coverage of natural ground surfaces and includes only the footprint on a horizontal plane (vertical walls are not included).

Regulated Activity means (per TCEQ) any construction-related activity or post construction activity on the recharge zone of the Edwards Aquifer having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams. Activities include: construction of buildings, utility station, utility lines, roads, highways, or railroads; clearing, excavation, or other disturbances of topography, geologic, or existing recharge characteristic of a site; any installation of aboveground or underground storage tanks, or any other activity that may pose a potential for contaminating the Edwards Aquifer and hydrologically connected surface streams.

Release means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the MS4 or conveyances.

Site means the land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

Stormwater Runoff means precipitation from rain events that flows over land or impervious surfaces and does not percolate into the ground.

SWPPP means Storm Water Pollution Prevention Plan. It is a site-specific, written document that identifies potential sources of stormwater pollution at the construction site, describes practices to reduce pollutants in stormwater discharges from the construction site, and identifies procedures the operator will implement to comply with the terms and conditions of a construction general permit.

TCEQ means Texas Commission on Environmental Quality or any duly authorized official of said agency.

TPDES means Texas Pollutant Discharge Elimination System and is a program delegated to the State of Texas by EPA pursuant to 33 USC 1342(b).



Trash/Garbage/Debris means any solid waste consisting of combustible materials such as paper, rags, cartons, furniture, synthetic materials, yard clippings, twigs, or noncombustible materials such as sediment, dirt, rock, gravel, sand, glass, and any metal waste.

WPAP means Water Pollution Abatement Plan and is a plan that outlines the best management practices that will be implemented in order to protect water quality when a regulated activity is conducted in the Edwards Aquifer recharge zone.

Water Quality means a standard, as set by TCEQ 31 Tex. Admin. Code Ch. 307, created to maintain the quality of water in the state consistent with public health and enjoyment, propagation and protection of terrestrial and aquatic life. Water Quality is also regulated by Ch. 213 Edwards Aquifer, created to regulate activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams in order to protect existing and potential uses of groundwater and maintain Texas Surface Water Quality Standards.

Water Quality Facility means permanent BMP's that are designed for water quality control for total suspended solids (TSS) reduction. Typically BMP's include basins for capturing the first flush of stormwater runoff from upgradient drainage areas.



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1. GENERAL PLAN REQUIREMENTS

All development in the City shall be performed under a building permit obtained prior to any construction activity. Drainage and construction plans shall be submitted as part of the building permit approval process. The drainage plan shall include a vicinity map, construction notes, drainage area maps for pre and post-development conditions, grading and drainage plan, detention and water quality plan, sedimentation and erosion control plan, and construction details.

2. DRAINAGE EASEMENTS

- 2.1. All easements across private property shall contain the necessary language to permit the required unobstructed water flow, require maintenance of vegetation by the property owner(s), and permit the necessary access by city officials for inspection.
- 2.2. All easements, one-hundred year flood boundaries, and buffer zones shall be clearly shown on drainage and site plans.

3. STORMWATER DRAINAGE CHANNELS

- 3.1. Channels should be designed for the 25 year storm with provisions for the 100 year storm event to be contained within the property right-of-way.
- 3.2. New channels shall be designed with dense grasses or materials that would provide adequate soil erosion control based on quantity of flow and design velocities. Channels shall be designed, at a minimum, with the following criteria:
 - A. Side slopes of channels shall not exceed four (4) horizontal to one (1) vertical slopes unless slope stabilization for steeper areas are approved by the City Engineer.
 - B. For channels lined with grass or other materials, the maximum permissible velocity for the one hundred 100 year storm event is six (6) feet per second.
 - C. All constructed and altered drainage channels, sediment ponds, and detention ponds shall be stabilized with vegetation, and if necessary, synthetic erosion control matting, immediately after final grading.
- 3.3. Permanent erosion control measures shall be required for all proposed channels as needed to prevent loosening of earth and migration of soils from designated drainage channels. Methods to prevent soil erosion may include, maintained vegetation, mulch blankets, energy dissipaters (check dams, filter socks, etc.), geogrid or geotextile reinforcement (mats/blankets). Grass lined channels are preferred. If the project site conditions create difficulty for the design of grass lined swales, then swales with concrete, mortared rocks, rock rip-rap or other materials are acceptable upon the approval of the City Engineer.



3.4. Natural drainage channels shall be preserved whenever possible. Modification of an existing channel is only allowed if approved by the City Engineer. The design engineer should check the requirements of Section 404 of the Clean Water Act, and if required a permit should be obtained from the U.S. Army Corps of Engineers by the design engineer.

4. STORMWATER DETENTION

4.1. Permanent stormwater detention designed for post-construction, along with any other drainage facilities in combination, shall be designed such that post-development peak flows do not exceed pre-development peak flows along the perimeter of the subject property for 2, 10, 25, and 100 year storm events. Drainage calculation methods shall be based on the COA DCM (Supplement 9 – 2014) Sections 2-8. Stormwater detention facilities shall be designed and sealed by a Texas licensed professional engineer.

4.2. The permanent stormwater detention pond or an equivalent temporary detention pond, as approved by the City Engineer, shall be provided for the construction phase and rough cut prior to rough grading a site.

4.3. All computations for all drainage related design shall be submitted with the plans for review.

4.4. Side slopes of detention pond earth berms shall not be steeper than three (3) horizontal to one (1) vertical unless approved by the City Engineer.

4.5. Aesthetic enhancement is required for exposed concrete of drainage facilities that are visible from adjacent roadways and neighboring properties. All concrete shall be stained and/or stamped concrete or veneered with rock, brick, steel, tile or other material or method that is harmonious with the landscaping and design of improvements, as approved by the City Engineer. If indisputable evidence is provided that demonstrates that drainage facilities will not be visible from adjacent properties or roadways, due to significant differences in elevation, screening may not be required. If topography is claimed in lieu of screening, the developer shall provide a contour map to scale with sections at appropriate intervals that clearly illustrates the topographic differences.

4.6. Detention facilities shall be located within property lines. The requirement shall be measured from the edge of any portion of the facility such as top of embankment, end of concrete apron/rock rip rap or top of structural wall.



5. SEDIMENTATION & SOIL EROSION CONTROL

- 5.1.** No rough cutting or site clearing shall be permitted without an approved temporary and permanent sediment and soil erosion control plan (BMP's) as part of the building permit process. No permanent certificate of occupancy shall be issued before all approved BMP's have been installed and established as necessary to effectively control sediment and soil erosion.
- 5.2.** The developer shall provide a combination of measures, structural and non-structural, management and planning techniques to control erosion and sedimentation for the construction period and for post-development

6. SITE DISTURBANCE

- 6.1.** The following requirements are adopted by this ordinance regarding site disturbance. Disturbance is defined by the depth of cut and height of fill.
 - A.** No rough cutting or site clearing shall be permitted without first obtaining a building permit.
 - B.** No rough cutting or site clearing shall be permitted until the construction of temporary erosion and sedimentation controls and tree protection are in place.
 - C.** No grade changes are allowed at any point along the property line.
 - D.** Grading inside a 10 foot setback shall be a maximum of 4:1 (1 foot elevation per 4 feet of horizontal) slope unless it is impracticable or such limitation on slope would not improve drainage conditions, and a deviation is approved by City Engineer for construction of allowable drainage facility.
 - E.** Outside of the designated building envelope and outside of the 10 foot setback, the maximum allowable depth of cut is 8 feet.
 - F.** Outside of the designated building envelope and outside of the 10 foot setback, the maximum allowable height of fill is 8 feet.
 - G.** Outside of the 10 foot setback, vertical cut slopes should not be used unless the cut is in stable rock or adequately cemented soil.
 - H.** Outside of the 10 foot setback, maximum slopes for cut and fill shall be 2:1 slopes provided that adequate slope stabilization is provided as need to prevent movement of loose earth.
 - I.** Disturbance of earth in the 100-year floodplain is not allowed.
 - J.** Grade changes will not be approved that negatively impact adjacent property owners, or adjacent street flow.



Slope stability shall be required for areas of cut or fill with steep slopes as needed to resist and prevent movement of loose earth. The method of stabilization shall be chosen as appropriate to the local soil conditions, steepness of slope, ability of vegetation to properly grow, and any other variable that would affect the functionality of the chosen stabilization method. Allowable stabilization methods include, geogrid or geotextile reinforcement (mats/blankets), rock rip-rap, rock rip-rap encased in concrete, retaining walls, rock gabions, slope roughening, and terracing. Refer to Rollingwood Ordinance Sec. 107-32 Vision Clearance for more information on grading and retaining wall design requirements. All construction shall require contractor to take special care when grading in the vicinity of critical root zones, including root zones for off-site trees with root zones that overlap property boundaries. Any permitted construction requiring tree removal that will negatively alter drainage flows as determined by the City Engineer shall require approval by the City Engineer or specific mitigation for the area effected. Tree protection, removal, and mitigation shall be in compliance with the Rollingwood Tree Canopy Ordinance.

7. SITE IMPROVEMENT PLAN SUBMITTAL REQUIREMENTS

The drainage plan submittal shall include the drainage plan and additional information as described below:

7.1. SITE IMPROVEMENT PLAN FORM

A Site Improvement Plan form will be provided when a building permit is applied for. The form requires input on the following aspects:

- A. Existing site conditions
- B. Summary of proposed improvements
- C. Estimated construction time and completion date
- D. Description of pre and post-development drainage conditions
- E. Description of method for post-development control of runoff
- F. Results of drainage analysis
- G. Name of Professional Engineer assigned to drainage plan
- H. Discussion on how TCEQ Chapter 213 requirements are met.

7.2. SITE PLAN

The site plan shall include a drainage plan, sediment and soil erosion control plan, and a rain harvest system plan (if applicable).

7.2.1. DRAINAGE PLAN

Provide drainage area maps for pre-development and post-development conditions as two (2) individual maps. The pre-development drainage area map should demonstrate the on and off-site contributing watershed boundaries and all existing structures and hard surfaces that are to be demolished (if applicable). The post-



development map should demonstrate the on and off-site watershed boundaries and all proposed construction with impervious surfaces clearly identified. At a minimum the map should include the following:

- A. Legible drawing(s), at a minimum 11x17, drawn to scale.
- B. On and off-site watershed boundaries with enclosed polylines, surface flow arrows and labeled contours clearly shown.
- C. Time of concentration (Tc) lines demonstrating flow pattern transition points for sheet flow, shallow concentrated, and channel/ditch/pipe.
- D. Tc calculation tables demonstrating equations, variables, and values used for pre-development and post-development conditions.
- E. Discharge points identified for each watershed boundary.
- F. Table demonstrating peak flows for 2, 10, 25, and 100 year storm events for pre-development and post-development conditions. If hand calculations are used to determine peak flows, provide table with equations, variables, and values used. If hydrologic modeling is performed, use HEC-HMS software and provide software generated report showing tabulated peak flows for pre-development and post-development conditions for a 100 year storm event including peak elevation in a detention pond (if applicable). Submit a copy of final hydrologic file with submittal.
- G. Construction details and applicable cross-sections for swales, detention structures, etc. with peak flow elevations demonstrated for a 100 year storm. If swales are designed for the 25 year storm event, provide the 25 year peak flow elevation and demonstrate method to prevent the 100 year storm flows from inundating surrounding properties.
- H. Table of impervious cover with detailed categories for the impervious cover type, i.e. separate sidewalk, driveway, decks, patios, etc. Provide calculations demonstrating total pre and post-development impervious cover (in square feet), as a percent of the total area of the lot, and the net increase (in square footage) of impervious cover with post-development conditions. Note that traditional decks (boards spaced with gaps) are calculated with 50% impervious cover and water surface area of swimming pools are not considered impervious cover.

If development includes a net increase of impervious cover of less than 250 square feet, then items b-h are not required.

7.2.2. SEDIMENT AND SOIL EROSION CONTROL PLAN

The sedimentation and soil erosion control plan shall include the following:

- A. Provide a general/sequence of construction for the life of the project as well as



a sequence of construction specifically related to the time between when soil erosion control measures are in place, the roof and/or slab are completed and the permanent storm water controls are provided. The sequence must clearly identify the following:

1. Install all BMP controls such as silt fence, stabilized construction entrance, sediment ponds, and drainage channels prior to any other site disturbances.
 2. Sequencing for all construction activities that require soil erosion control such as site clearing, grubbing, topsoil stripping, stockpiling, soil stabilization, and vegetation.
 3. Sequencing of post construction final measures including:
 - a. Vegetation for any bare soil areas
 - b. Inspection of all drainage facilities and removal of sediment and debris
 - c. Removal of temporary soil erosion control measures
 - d. Monitoring of seeded areas to ensure proper vegetation is established
- B.** Clearly demonstrate the location of all erosion and sedimentation control plans including stabilized construction entrance, silt fence, triangular filter dikes, rock berms, check dams, etc.
- C.** If an existing paved driveway is to be used as the construction entrance, please indicate on plans that machinery and construction related traffic shall be limited to the driveway for R.O.W access.
- D.** Standard details for the silt fence, tree protection and a stabilized construction entrance, etc. City of Austin details are preferred. Tree protection, removal, and mitigation shall be in compliance with the Rollingwood Tree Canopy Ordinance.
- E.** The following notes shall be required on plans:
1. The contractor shall be responsible for maintaining and inspecting, on a regular basis, all erosion and sediment control best management practices including the silt fences, construction entrances, rock filter dams, etc. during construction/demolition and including the removal and proper disposal of any accumulated silt and debris.
 2. The contractor shall not begin any work until tree protection and the erosion and sediment control best management practices such as silt fence, construction entrances, rock filter dams, etc. have been installed.
 3. The contractor shall be responsible for keeping the streets free of mud, dirt, debris and material at all times and shall clean/sweep the streets on a



regular basis and at the direction of the City.

4. Increased stormwater peak flows during construction must be mitigated with temporary best management practices to prevent harm to neighboring properties.

7.2.3. WATER QUALITY & BMP PLAN

Indicate if a BMP is planned with the site improvements and provide a description of the method including the stormwater runoff capture area and BMP method including runoff storage detention time and release rate (if applicable). If a rainwater harvest (RWH) system is the BMP chosen for compliance with TCEQ Chapter 213 requirements, provide the following to the City Engineer:

- A. Indicate the amount of area to be captured by the rainwater harvesting system to decrease the effective IC, as required, to account for the net increase associated with the new construction.
- B. Indicate the size of the tank required, its location, and the size of the discharge area.
- C. Show the route and the discharge location for the overflow of the rainwater harvesting tanks. If the RWH overflow is to be directed to a detention facility, provide grading detail and any pipes, channels, etc. necessary to convey overflow.
- D. Provide a construction detail for the RWH system including the location, mounting and support of the tanks, overflow, pumps (if applicable), etc. with plan view and cross-section shown.



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