CHAPTER 158: STORM WATER DRAINAGE POLICY

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158.01 DEFINITIONS.

This chapter represents the application of accepted principles of storm water drainage engineering and is a working supplement to basic information obtainable from standard drainage handbooks and other publications on drainage design. The policy statements of this section provide the underlying principles by which all drainage facilities shall be designed. The application of the policy is facilitated by the technical criteria contained in the remainder of the chapter. All terms and abbreviations used in §§ 158.01-158.12 are presented in Subchapters 2 through 8, Appendix A, Appendix B and the Glossary of the Drainage Criteria Manual, last revised September 25, 2007. This policy shall prevail.

(Ord. 2007-18, passed 6-26-07; Am. Ord. 2007-26, passed 9-25-07)

158.02 APPLICATION.

(A) The city's drainage policy shall govern the planning and design of drainage infrastructure within the corporate limits of the city and within all areas subject to its extra territorial jurisdiction, as required. Definitions, formulae, criteria, procedures and data in this manual have been developed to support this policy. If any condition requiring some additional measure of protection is identified during design or construction, the Engineer shall make provisions within the design.

(B) The Engineer for the applicant/developer may use definitions, formulae, criteria, procedures and data not contained in this chapter if they are applicable for use in this area and the civil engineering industry.

(Ord. 2007-18, passed 6-26-07)

158.03 GENERAL.

(A) Storm water runoff peak flow rates for the 10-year and 100-year frequency storms shall not cause increased adverse inundation of any building or roadway surface.

(B) Street curbs, gutters, inlets and storm sewers shall be designed to intercept, contain and transport all runoff from the 10-year frequency storm, without overtopping the curb.

(C) In addition to division (B) above, the public drainage system shall be designed to convey those flows from greater than the 10-year frequency storm up to and including the 100-year frequency storm within defined public rights-of-way or drainage easements.

(D) When storm water detention is provided, storm water runoff peak flow rates shall not be increased at any point of discharge for the 25-year storm. The 100-year storm event shall be passed from the detention facility through an emergency spillway such that the flow from that event shall not overtop the facility or cause damage to downstream facilities.

(Ord. 2007-18, passed 6-26-07)

158.04 DRAINAGE FLOW IN STREETS.

(A) No concentrated point discharges directly into streets will be allowed unless approved by the Director of Public Works or City Engineer.

(B) No lowering of the standard height of street crown shall be allowed for the purposes of obtaining additional hydraulic capacity.

(Ord. 2007-18, passed 6-26-07)

158.05 STREET CROSS FLOW.

(A) Whenever storm runoff, other than limited sheet flow, moves across a traffic lane, a serious and dangerous impediment to traffic flow occurs. Cross-flow is allowed only in case of super elevation of a curve or overflow from the higher gutter on a street with cross-flow. When runoff is allowed to cross from one curb line to the opposing curb line, the depth of flow shall not exceed six inches of depth at any point within the street. This policy prohibits the use of concrete valley gutters at points other than intersections. At points of concentration other than intersections, cross-flows shall be contained within underground storm conduit. The crown of the street shall not be removed to allow cross-flow.

(B) In the event that underground storm drainage is not practical, cross-flow shall be allowed. The crown shall be removed and a concrete valley shall be required to convey the runoff across the street. Cross- flow shall not exceed six inches of depth within the concrete valley.

(Ord. 2007-18, passed 6-26-07)

158.06 ALLOWABLE FLOW OF WATER THROUGH INTERSECTIONS.

As the storm water flow approaches a street intersection, inlets shall be required if the depth of flow exceeds six inches in any portion of the street intersection. Concrete valley gutters shall be used to convey storm water flow through intersections. In the case of T intersections designed as sump conditions, the Engineer shall demonstrate that the depth of storm water will not exceed six inches at any point within the intersection. Inlets in such cases shall not be installed within the curb radius of the intersection.

(Ord. 2007-18, passed 6-26-07)

158.07 DRAINAGE SYSTEM.

(A) Construction plans for proposed reinforced concrete box culverts, bridges and related structures may be adaptations of the current Texas Department of Transportation (TxDOT) Standards.

(B) For bridges and culverts in residential streets, runoff from the 100-year frequency flow shall not produce a headwater elevation at the roadway greater than either six inches above the roadway crown elevation or any top of upstream curb elevation, whichever is lower.

(C) For bridges and culverts in streets other than a residential street, runoff from the 100-year frequency storm shall not produce a headwater elevation at the roadway greater than three inches above the roadway crown elevation or three inches above any top of upstream curb elevation, whichever is lower.

(D) All drainage facilities (including but not limited to headwalls, open channels, storm sewers, area inlets, and detention, retention and water quality controls and their appurtenances) shall comply with the following requirements, unless otherwise noted in this section.

(1) Storm sewer inlets and gutter transitions shall be designed to avoid future driveways and to avoid conflicts with standard water and wastewater service locations. No utilities shall be allowed to cross under a storm sewer inlet unless approved by the City Director of Public Works or City Engineer.

(2) Drainage channels and detention ponds that are to be maintained by the public (city) shall be contained within drainage easements. Adequate room for access shall be provided for drainage channels and detention ponds. Ramps no steeper than five feet horizontal to one foot vertical shall be provided at appropriate locations to allow access to drainage channels and detention ponds. The minimum bottom width for any channel with vegetative side slopes shall be four feet.

(3) Detention ponds shall be designed with adequate area around the perimeter for access and maintenance. The said area shall be a minimum of seven feet wide for ponds with depths of five feet or less (back slopes included) and a minimum of 15 feet wide for ponds over five feet deep or with back slopes in excess of five feet high. The said area shall not slope more than 5%.

(4) Rip-rap for slope protection or velocity dissipation shall be formed by concrete dissipaters or designed rock rip-rap. Designed rock rip-rap shall include a D50 sizing and a gradation for the rock. Mortared rock or stone shall not be allowed.

(5) Storm drains between lots (crossing blocks) shall be avoided as much as possible. When unavoidable, such drains shall be underground storm drains, unless underground storm drainage is not practical. Flumes will be allowed only if approved for use by the City Engineer or Director of Public Works. In either case, the improvements shall be contained within the dedicated drainage easement. Storm drains along rear of residential lots (through back yards) shall be avoided. Easements shall be a minimum of 15 feet in width.

(6) All bends, wyes and pipe size changes in storm sewers shall be prefabricated or shall occur at manholes/junction boxes.

(7) Storm drains shall be reinforced concrete pipe (RCP), ASTM C76, minimum 18 inches diameter. The Engineer shall provide load analysis to the Planning and Development Department as appropriate to demonstrate that class of pipe used is sufficient for the loading conditions as set forth in TxDOT Item 464. Higher strength pipes shall be used where loadings warrant such. Storm drains shall have a minimum of two feet of cover in unpaved areas and a minimum of one and five-tenths feet of cover from sub-grade in paved areas. Embedment of RCP shall be to the spring line of the conduit.

(8) The use of High Density Polyethylene (HDPE) shall be allowed up to 36 inches in diameter. Pipe sizes larger than 36 inches in diameter may be used if approved by the City Engineer or Director of Pubic Works. The use of HDPE pipe shall be limited to unpaved areas outside of city streets. All cross street storm drainage conduit shall be reinforced concrete pipe (RCP). All outfall structures shall be constructed of reinforced concrete and the connection with the outfall structure shall be accomplished using RCP. A transition fitting from HDPE to RCP shall be made upstream of the outfall structure. Embedment of HDPE shall be to six inches above the top of the pipe.

(9) Junction boxes and manholes shall be reinforced concrete. Junction boxes in lieu of manholes shall be provided where any pipe opening exceeds 37 inches and where the distance from the outside surfaces of any two pipes entering a manhole is less than one foot, measured along the inside of the manhole.

(10) Prefabricated wyes, mitered angle fittings and pipe size reducers shall be allowed in lieu of junction boxes and manholes.

(11) Channels.

(a) *Concrete channels.* Concrete channels shall be of sufficient cross section and slope as to fully contain design flows and facilitate self- cleaning. Outfalls shall enter major collector drainage ways and major streams at grade or be designed and constructed with adequate concrete aprons, energy dissipaters or similar features to prevent erosion.

(b) *Vegetated channels*. Vegetated channels shall have sufficient grade but with velocities that will not be so great as to create erosion. Side slopes shall not be steeper than three feet horizontal to one foot vertical for channels four feet or less in depth and no steeper than four feet horizontal to one foot vertical in all other channels to allow for future growth and to promote slope stability. All slopes shall be hydro-mulched, sodded or seeded with approved grass, grass mixtures or ground cover as indicated in TxDOT Item 164 for use in the Waco District and season in which they are applied. All earthen channels must have vegetation established prior to acceptance by the City of Harker Heights. If vegetation has not been established at the time applicant/developer requests approval of the final plat, the channel side slopes and bottom shall be lined with erosion control matting prior to being seeded and approval of the final plat shall be conditional to the establishment of the vegetation.

(c) Major streams shall not be modified without consent of applicable state and federal agencies and authorization from the City Engineer or the Director of Public Works.

(12) Discharge from storm sewer outfalls shall not cause channel, bluff, or stream bank erosion. If the storm drain discharges to an open drainage facility (as determined by the city), the applicant must show acceptable non-erosive conveyance to that drainage facility, appropriate energy dissipation at the outfall and a stable headwall. No outfalls shall be allowed to discharge on the slope of the receiving channel without adequate erosion control measures.

(13) If the development is located such that there is considerable drainage from potentially developable upstream areas, the developer may request participation by the city for the cost of over- sizing of elements of the overall drainage system. The city shall consider these requests on a case-by-case basis.

(Ord. 2007-18, passed 6-26-07)

158.08 COMPUTATIONS.

(A) Computations to support all drainage designs shall be submitted to the appropriate city departments for review. The computations shall be in such form as to allow for timely and consistent review and also to be made a part of the permanent city record for future reference. Computations shall include the impact of the proposed development to the downstream properties and existing structures adjacent to the drainage resulting from the 100-year event. All computations submitted shall be certified by a Professional Engineer licensed in the State of Texas. The Engineer shall provide the report to the city in both hard copy and a scanned electronic .pdf file with the proper seal, signature and date.

(B) *Determination of runoff***.** Numerous methods of rainfall-runoff computation are available on which the design of storm drainage and flood control systems may be based. The Rational Method shall be an acceptable means of computing runoff for drainage areas of 200 acres or less when designing streets, storm drainage systems, channels and culverts. When the drainage area exceeds 200 acres in size, the National Resource Conservation Service (NRCS) (formerly the Soil Conservation Service) hydrologic methods (available in TR-20, TR-55 or HEC) should be used.

(C) *Detention pond storage determination***.** A flow-routing analysis using detailed hydrographs must be applied for all detention pond designs. The NRCS hydrologic methods (available in TR-20, TR-55, HEC-1, HEC RAS and the Hydrologic Engineering Center (HEC)) hydrologic methods may be used for areas of 200 acres or more. Use of the Modified Rational Method is limited to drainage areas less than 200 acres. If additional methods become available, they must be approved by the city prior to submittal of plats.

(Ord. 2007-18, passed 6-26-07)

158.09 STORM WATER DETENTION.

(A) Pre-developed peak flows generated from the 25-year frequency storm shall not be increased. The peak flows from the 25-year storm shall be detained in onsite stormwater detention basins with release rates equal to, or less than, the flows generated from the site for the 25-year storm event when the site was in its existing (natural) state. Detention ponds must also be designed such that the 100-year storm will not overtop the structure. The Engineer shall design an emergency spillway system that will safely discharge the 100-year storm without damage to the downstream property.

(B) The City Engineer or the Director of Public Works shall have the authority to waive the requirement for onsite detention, provided that at least one of the following conditions is met:

(1) The development is eligible to financially participate in an approved Regional Stormwater Management Program (Facility). Under this provision, the applicant shall demonstrate that the peak, post-developed runoff generated from the 100-year storm can be conveyed downstream to the Regional Facility and not impact adversely any downstream properties. An adverse impact shall be:

(a) Any impact which causes an inundation, or an increased inundation, of any building structure, roadway, or improvement.

(b) Downstream erosion and/or sedimentation, or an increase in erosion and/or sedimentation.

(2) The development is adjacent to a defined water course that has sufficient capacity to convey the site's post-developed peak discharge from the 100-year storm event without creating an adverse impact on any other properties. The discharge in the water course shall be determined by using the 100-year storm event with the post-developed site and the remainder of the watershed in an ultimate build-out state.

(3) The development is located within the watershed such that onsite detention may worsen downstream conditions of the watershed. In such cases, the developer's Engineer shall demonstrate that conveyance or a combination of detention and conveyance will provide a safer downstream condition.

(4) The applicant can demonstrate that there will be no increased adverse effect to downstream properties, or if changes made by the applicant to downstream properties can mitigate future increased adverse effects.

(Ord. 2007-18, passed 6-26-07)

158.10 FLOODPLAIN MANAGEMENT.

(A) *City of Harker Heights*.

(1) In all cases where floodplain delineation is required, its determination shall be based on the projected ultimate development of all properties contributing to the point of consideration. It is the responsibility of the developer's Engineer to determine that the ultimate developed drainage condition is based on the most accurate information available.

(2) For the purposes of this policy, any concentrated flow within a watershed that has a drainage area of 320 acres or greater, unless previously defined by FEMA, shall be delineated as a floodplain.

(3) All existing floodplains created by the base flood as computed with current, existing conditions, shall be deemed the Floodway (regulatory floodway) and shall be wholly contained within dedicated rights-of-way or easements. Encroachments are prohibited, including fill, new construction, substantial improvements and other development unless certification by a Professional Engineer is provided, demonstrating that encroachments shall not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

(4) All new construction and substantial improvements of buildings (structures) shall have the lowest floor (including basement) one foot above the base flood, based upon the projected, ultimate development of all properties (without storm water detention) contributing to the point of consideration.

(5) All floodplains shall be computed utilizing the computer software and methodologies outlined in the Drainage Criteria Manual and accepted by FEMA.

(6) If land development activities are proposed which will result in flood hazard boundary delineations different from those depicted on the current Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA), the applicant for a development permit shall obtain a Conditional/Letter of Map Revision (CLOMR/LOMR) from FEMA.

(7) All floodplain delineations for FIRM revisions shall be based upon cross-sections developed in accordance with the accepted FEMA guidelines.

(B) *Federal Emergency Management Agency*. FEMA guidelines shall be followed.

(C) *Coordination of City of Harker Heights and FEMA floodplain delineations*. For all subdivisions developed adjacent to or within non-detailed designated FEMA floodplains, the applicant/ developer shall be required to provide a detailed study to determine the Base Flood Elevations (BFEs) for all lots that are adjacent or within the non-detailed area. The BFEs must be developed using approved FEMA guidelines and methods. A copy is to be furnished to the city prior to final plat.

(Ord. 2007-18, passed 6-26-07)

158.11 LOT GRADING.

(A) All retail, commercial and industrial site developments must provide a site grading and drainage plan that includes drainage computations, detention of runoff (if required) and a detailed site grading plan that does not adversely affect adjacent lots, property or downstream property.

(B) A comprehensive grading scheme including all proposed lots shall be included with subdivision construction plans. The grading scheme will include arrows indicating the direction of flow of runoff for each lot. The finished floor slab elevation shall be a minimum of one foot above the average top of curb elevation fronting the lot. Where practical, all lots shall be graded from rear to front, at which point the drainage shall be intercepted by the street. If the minimum one-foot requirement can not be met due to land slope, topography or existing trees, alternate grading schemes may be utilized. In these instances it shall be demonstrated to the satisfaction of the City Engineer or Director of Public Works that grading from front to rear would be more reasonably adaptable to the existing topography. All lots that fall into this second category shall be identified on the final plat by a listing table.

(C) Finished floor elevations shall be shown for all lots adjacent to or encroaching upon the FEMA- designated 100-year floodplain. Finished floor elevations shall be a minimum of two feet above the ultimate base flood elevations.

(D) The applicant for a building permit for a residential lot that is included in the listing table described in division (B) above and is graded from front to rear shall prepare a detailed site-grading plan that includes elevations for all corners of the subject lot, the finished floor slab elevation, final contours, swales, and any modifications to side yard or rear yard fencing to facilitate removal of runoff from the subject lot.

(Ord. 2007-18, passed 6-26-07)

158.12 EROSION CONTROL.

Rock berms, silt fences, sedimentation basins, stabilized construction entrances/exits and similar recognized techniques shall be employed during and after construction to prevent point source sedimentation loading of downstream facilities. Such installations shall comply with current TCEQ requirements. Additional measures may be required during and after construction if during subsequent runoff events erosion or sediment damage is documented as a violation of TCEQ Regulations or city ordinance by city staff.

(Ord. 2007-18, passed 6-26-07)