Higher Standards (Best Practices) for Floodplain Management – DRAFT Document

Best Practices	NFIP Requirements	Justification	Examples (Summary)	Sample Codes/Ordinances
Adopt 1-3' freeboard requirements for residential and nonresidential structures (options): 1. In SFHA 2. In SFHA based on fully developed (if data is available) and changing watershed conditions 3. In all flood risk zones	Freeboard is not required	Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management Freeboard tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions (e.g., bridge openings, hydrological effect of urbanization of the watershed) Freeboard is the single most effective means for reducing flood risk to a structure in the floodplain Flooding occurs outside the SFHA, making the adoption of freeboard requirements in all flood risk zones important	Many communities in North Texas have adopted 1-3' freeboard in the SFHA, with several requiring freeboard be based on fully developed watershed conditions. Examples include: • Aurora (2' above BFE) • Mansfield (2-3' above BFE depending on if fully urbanized hydrology exists) • Johnson County (3' above BFE) • Denton (1.5-2.5' above 100-yr WSEL, depending if based on fully developed conditions, within floodway fringe and 200' of SFHA) • Fort Worth (new development constructed ≥2' regulatory 1% annual chance floodplain BFE or fully developed watershed WSEL, whichever is higher) Additional examples are posted to www.nctcog.org/tsi ("StoryMap")	TFMA Model Language for Freeboard in Zone A, A1-30, and AE (page 6-7)[1] TFMA Model Language for Freeboard in Zone X (pages 7-8)[1] TFMA Model Language for Freeboard in Zones AO and AH (pages 9-10)[1] City of Aurora Flood Damage Prevention Ordinance (§ 4.04.005 (b)(1)(2))[2] City of Mansfield Flood Damage Prevention Ordinance (§ 151.41 Specific Standards (B)(1)(2))[3] Johnson County Flood Damage Prevention Order (Article 5, Section B(1)(2))[4] City of Denton Land Development Code (Chapter 30, Article III, Section 30-53(a)(b), Section 30-4)[5] City of Fort Worth Buildings Code (Article VIII, § 7-303(g))
Ensure residential and nonresidential building sites, walkways, driveways, and roadways are located on land with a natural grade with elevation not less than the BFE and with evacuation routes	Ingress/egress is not specifically addressed	Even when buildings are elevated via freeboard, residual risk remains on the property Ensuring building sites are relatively accessible during floods decreases the likelihood of stranded residents, reduces the need for water rescues which places emergency personnel at risk, and increases public safely	Limited number of communities in North Texas require the building of roadways and other access routes be above the BFE. Examples include: • Benbrook (in SFHA, all streets, driveways, parking lots ≥2' BFE)	TFMA Model Language for Access (page 14)[1] City of Benbrook Buildings and Construction Codes (Chapter 15.40.400(J))[6]

Best Practices	NFIP Requirements	Justification	Examples (Summary)	Sample Codes/Ordinances
leading directly out of the floodplain area				
Preserve valley storage in the floodplain through compensatory volume requirements	Development is allowed within the Floodway Fringe	Valley storage is the volume of water in a river's floodplain during a flood Valley storage functions like a reservoir Valley storage is lost due to land alterations, such as through fill, development, stream channelization, etc. The impacts of valley storage loss, include: • Peak flow increases • Peak water surface elevation increases • Deeper and more frequent roadway overtopping • Shorter flood response times • Life safety threat	Only a few communities in North Texas have a no loss in valley storage policy. Examples include: • Benbrook (no loss of valley storage below the BFE in SFHA) • Denton (restricts valley storage loss to 0-15% reduction for streams, depending on drainage basin size) • Fort Worth (regulated citywide; maximum allowable valley storage decrease for 1% annual chance flood is 0.0% based on a comparison of pre-project and post-project conditions; includes both citywide watercourses and sump areas associated with the Trinity River levee system, with a few exceptions)	City of Benbrook Buildings and Construction Codes (Chapter 15.40.600(J))[6] City of Denton Development Standards (Subchapter 7.5.3(H)(3))[7] City of Fort Worth (updated Ordinance to be published in February 2026; Chapter 7, "Buildings," Article VIII "Floodplain Provisions")
Protect critical facilities and development by requiring them to be built outside the SFHA	Not required to be protected Under Executive Order 11988-Floodplain Management, federal agencies funding and/or permitting critical facilities are required to avoid the 0.2% floodplain or protect to the 0.2% chance flood level	Critical facilities, as defined by FEMA, are "facilities where even a slight chance of flooding is too great a threat", and may include: • Hospitals • Police/fire stations • Storage of critical records • Retirement centers • Water and wastewater treatment facilities • Power plants • Schools • Correctional facilities • Nursing homes • Fuel/hazardous storage facilities • Day care facilities • Retirement facilities	Many North Texas communities require critical facilities (hospitals, schools, fire stations, etc.) be built outside the SFHA. Examples include: • Benbrook (not allowed within the 500-yr floodplain) • Fort Worth (locate outside SFHA, 2' above FEMA 500-yr storm or city 100-yr storm occurring on fully-developed basin conditions) • Johnson County (locate outside 500-yr floodplain; if not feasible, ≥3' above BFE)	TFMA Model Language for Critical Development Protection (pages 17-18)[1] City of Benbrook Buildings and Construction Codes (Chapter 15.40.400(I))[6] City of Fort Worth Buildings Codes (Chapter 7, Article VIII, § 7-304, § 7-347(h))[8] Johnson County Flood Damage Prevention Order (Article 5, Section C(4)(r))[4]

Best Practices	NFIP Requirements	Justification	Examples (Summary)	Sample Codes/Ordinances
		Protecting critical facilities and development to an even higher standard than other development minimizes damage and the potential loss of life		
Require development be setback (50', 100', 200'…) from adjacent streams	No setback requirements	Setbacks establish minimum distances that structures must be positioned (or set back) from river channels Setbacks may be used to keep development out of harm's way Setbacks can help protect riparian corridors, which are important for flood control, water quality, erosion prevention, etc.	A few North Texas communities restrict the use or development of a set area along waterways. Examples include: • Benbrook (10' and 20' setback lines from upper banks) • Dallas (20' setback line from crest of natural channel bank) • Denton (25' from centerline of channel or from outer edge of surface water bodies)	TFMA Model Language for Setbacks (pages 35-36)[1] City of Benbrook Zoning Ordinance (Chapter 17.76.060)[9] City of Dallas Development Code (Article V, Section 51A-5.106)[10] City of Denton Development Standards (Subchapter 7.4.7)[7]
Match pre-developed site runoffs by requiring a downstream assessment and installing on-site stormwater management controls	Not required	Matching pre-development site runoff is rooted in flood mitigation and downstream protection principles, such as to: • Prevent Increased Flood Risk - Matching pre-development peak flows ensures that development does not increase downstream flooding during major storm events (1-, 25-, and 100-year storms) • Maintain Hydraulic Capacity - By controlling discharge rates, existing downstream infrastructure and channels can continue to function without being overloaded • Protect Stream Stability - Limiting velocities and peak flows helps prevent erosion and streambank degradation, which are common when post-development runoff exceeds natural conditions	Many communities in the region have fully or partially adopted match pre-developed site run-off through following iSWM Detention Structure Discharge and Flood Mitigation Criteria. Examples include: • Denton (maintain pre-development peak discharges with on-site controls) • Kennedale (conduct a downstream assessment; install stormwater management controls to ensure downstream post construction discharges are at or below pre-development discharges)	City of Denton Stormwater Design Criteria Manual (3.2.2.2, Option 3)[11] City of Kennedale Public Works Design Manual (Section 5(L)(M)(b))[12]
Prohibit rise in flood waters	Up to 1' rise in flood stage when designating the floodway is allowed	Implementing a no-rise/no-net rise or no adverse impact (NAI) policy for development anywhere in the watershed (including the floodway	Limited number of communities in North Texas implement a no-rise/no-net rise in flood waters policy for development. Examples include:	Town of Flower Mound Land Development Regulations (Chapter 90, Article VI, Division 6, Section 90-404)[13]

Best Practices	NFIP Requirements	Justification	Examples (Summary)	Sample Codes/Ordinances
		fringe and beyond) provides comprehensive protection through a myriad of benefits Prohibiting an increase in BFE maintains the natural functions of the floodplain and prevents worsening flood conditions as development continues, protecting existing structures and neighboring communities both upstream and downstream.	• Flower Mound (0 increase in WSEL and velocity) • Richardson (no rise in BFE) • Wise County (0.00 difference between existing and proposed conditions in BFE in SFHA) • Fort Worth (enforces strict 0.00' rise for habitable structures)	City of Richardson Floodplain Management Ordinance (Chapter 9, Article II, Section 9-42)[14] Wise County Flood Damage Prevention Ordinance (Article I, Section D(6))[15] City of Fort Worth Stormwater Criteria Manual (Section 2.3.4)

[1]Texas Floodplain Management Association. 2018. "A Guide for Higher Standards in Floodplain Management." https://cdn.ymaws.com/www.tfma.org/resource/resmgr/documents_smc/tfma_higher_standards_guide0.pdf.
[2]City of Aurora. 2009. "Flood Damage Prevention Ordinance." https://ecode360.com/45501579#45501579.
[3]City of Mansfield. 2013. "Flood Damage Prevention Ordinance." https://codelibrary.amlegal.com/codes/mansfieldtx/latest/mansfield_tx/0-0-0-46400.
[4]Johnson County. 2019. "Flood Damage Prevention Order." https://www.johnsoncountytx.org/home/showpublisheddocument/7483/636899050965830000.
[5]City of Denton. 2022. "Land Development Code." https://library.municode.com/tx/denton/codes/code_of_ordinances?nodeId=SPBLADECO_CH30FLPRPR_ARTIIISTFLHARE.
[6]City of Benbrook. 2025. "Buildings and Construction Codes." https://library.municode.com/tx/benbrook/codes/code_of_ordinances?nodeId=CD_ORD_TIT15BUCO_CH15.40FLHAPR_15.40.400PRFLHARE.
[7]City of Denton. 2022. "Development Standards." https://www.cityofkennedale.com/DocumentCenter/View/596/Public-Works-Design-Manual?bidId=.
[8]City of Fort Worth. 2022. "Buildings Codes." https://codelibrary.amlegal.com/codes/ftworth/latest/ftworth_tx/0-0-0-10704.
[9]City of Benbrook. 2012. "Zoning Ordinance." https://library.municode.com/tx/benbrook/codes/code_of_ordinances?nodeId=CD_ORD_TIT17ZO_CH17.76PDPLDEDI_17.76.060NAFERE.
[10]City of Dallas. 2025. "Development Code." https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-85307.
[11]City of Denton. 2022. "Stormwater Design Criteria Manual." https://www.cityofdenton.com/DocumentCenter/View/6232/Draft-Stormwater-Criteria-Manual_2022?bidId=.
[12]City of Kennedale. 2025. "Public Works Design Manual." https://www.cityofkennedale.com/DocumentCenter/View/596/Public-Works-Design-Manual?bidId=.
[13]Town of Flower Mound. 2014. "Land Development Regulations." https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPBLADERE_CH90SU_ARTVIST_DIV6DR_S90-403FUDEFEFL.
[14]City of Richardson. 2017. "Floodplain Management Ordinance." https://library.municode.com/tx/richardson/codes/code_of_ordinances?nodeId=PTIICOOR_CH9FLMA_ARTIIADEN_S9-42DUREEN.
[15]Wise County. 2019. "Flood Damage Prevention Ordinance." https://www.co.wise.tx.us/DocumentCenter/View/414/Flood-Damage-Prevention-Ordinance-PDF.

Acronyms

Base Flood Elevation (BFE)
Federal Emergency Management Association (FEMA)
integrated Stormwater Management (iSWM)
National Flood Insurance Program (NFIP)
Special Flood Hazard Area (SFHA)
Texas Floodplain Management Association (TFMA)
Water Surface Elevation (WSEL)

[2]**City of Aurora Flood Damage Prevention** (https://ecode360.com/45501579#45501579)

(b) Specific standards. In all areas of special flood hazards where base flood elevation data has been provided as set forth in section 4.04.003(b), section 4.04.004(b)(8), or subsection (c)(3) of this section, the following provisions are required:

(1) Residential construction. **New construction and substantial improvements of any residential structure shall have the lowest floor (including basement) elevated to <u>two feet (2') above</u> the base flood elevation.** A registered professional engineer, architect, or land surveyor shall submit a certification to the floodplain administrator that the standard of this subsection, as proposed in section 4.04.004(c)(1)(A), is satisfied.

(2) Nonresidential construction. **New construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to <u>two feet (2') above</u> the base flood level** or, together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the floodplain administrator.

[3]**City of Mansfield Flood Damage Prevention** (https://codelibrary.amlegal.com/codes/mansfieldtx/latest/mansfield_tx/0-0-0-46400)

(B) In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) § 151.08, (ii) § 151.26(H), or (iii) § 151.42(C), the following provisions are required:

(1) Residential construction. **New construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to <u>three feet above</u> the base flood elevation where FEMA Flood Insurance Study data exists or <u>two feet above</u> the base flood elevation as determined by a study using fully urbanized hydrology.** A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in § 151.27(A)(1), is satisfied.

(2) Nonresidential construction. **New construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to <u>three feet above</u> the base flood elevation where FEMA Flood Insurance Study data exists or <u>two feet above</u> the base flood elevation as determined by a study using fully urbanized hydrology** or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

[4]**Johnson County Flood Damage Prevention** (https://www.johnsoncountytx.org/home/showpublisheddocument/7483/636899050965830000)

Section B. Specific standards. In all areas of special flood hazards where base flood elevation data has been provided as set forth in these regulations the following provisions are required:

(1) Residential construction - **new construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to a minimum of <u>three (3) feet above</u> the base flood elevation.** A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of these regulations are satisfied.

(2) Nonresidential construction - **new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to a minimum of <u>three (3) feet above</u> the base flood level** or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural

components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

Section B. Specific standards.

r) **Construction of critical facilities shall be to the extent possible, located outside the limits of the 0.2% floodplain or 500-year floodplain** (Shaded Zone X) and any —"A" Zone. Construction of new critical facilities shall be permissible within the base floodplain if no feasible alternative site is available.

i. **Construction of critical facilities on land located below the base flood elevation in the 0.2% (500-year) floodplain or within the base floodplain shall have the lowest floor elevated to at least three (3) feet or more above the base flood elevation of the site.**

[5]City of Denton Land Development Code, Chapter 30 Flood Prevention and Protection, Article III Standards for Flood Hazard Reduction
(https://library.municode.com/tx/denton/codes/code_of_ordinances?nodeId=SPBLADECO_CH30FLPRPR_ARTIIISTFLHARE)

Sec. 30-4. Definitions.

Minimum building elevation means the elevation to which uses regulated by this chapter are required to be elevated or floodproofed. This elevation would be equal eighteen (18) inches above the one-hundred-year water surface elevation based on fully developed conditions or thirty (30) inches above the BFE as indicated in the flood insurance study or, if the BFE is unavailable, thirty (30) inches above the one-hundred-year flood elevation based on current development watershed conditions.

Sec. 30-53. Specific standards.

(a) Residential construction. **New construction or substantial improvement of any residential structure within the floodway fringe or within two hundred (200) feet of the floodplain or SFHA boundary shall have the lowest floor, including basement, elevated at or above the *minimum building elevation*.** A registered professional engineer, architect, or land surveyor shall submit a FEMA Elevation Certification to the city engineer, in accordance with section 30-34(a)(1), that the standard of this subsection is met.

(b) Nonresidential construction. **New construction or substantial improvement of a commercial, industrial, or other nonresidential structure within the floodway fringe or within two hundred (200) feet of the floodplain or SFHA boundary shall have the lowest floor, including any basement, elevated at or above the *minimum building elevation***, or this construction, together with attendant utility and sanitary facilities, shall be floodproofed so that the structure is watertight to an elevation at or above the minimum building elevation with walls substantially impermeable to the passage of water and structural components have the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. If the flood insurance study does not include the property, the required one-hundred-year water surface elevations shall be based on ultimate development watershed conditions. A registered professional engineer, architect, or land surveyor shall submit a certification to the city engineer, in accordance with section 30-34(a)(1), that the requirements of this subsection are met.

[6]City of Benbrook Buildings and Construction Codes
(https://library.municode.com/tx/Benbrook/codes/code_of_ordinances?nodeId=CD_ORD_TIT15BUCO_CH15.40FLHAPR)

15.40.400 - Provisions for flood hazard reduction.

In all areas of SFHAs the following provisions are required for all new construction and substantial improvements:

I. **No critical facilities, such as emergency centers, hospitals, fire stations, power stations, hazardous materials storage sites, or others shall be placed within the five-hundred-year floodplain;**

J. **All streets, driveways and parking lots shall be no less than two feet above the base flood elevation** unless otherwise approved;

15.40.600 - Standards for subdivisions, including manufactured home parks or subdivisions.

J. Floodplain Modifications: Any proposals for modifications of the special flood hazard area shall be accompanied by an application for a conditional letter of map revision (CLOMR), including fees, for submittal to FEMA for approval. The developer shall also be responsible for submitting an application for a letter of map revision (LOMR), including fees, upon approval of the CLOMR and completion of the proposed construction of the floodplain modifications. No construction on the subdivision infrastructure (including grading) shall be permitted until the CLOMR has been approved by FEMA and no structures (including buildings and residences) shall be approved for construction until the CLOMR has been approved by FEMA. Any proposal for floodplain modification shall comply with the following design criteria:

1. There shall be no increase (rise) in the floodway elevation over the effective FIS. No rise shall be defined as an increase of 0.01 of a foot or less.

2.**There shall be no loss of valley storage below the base flood elevation.** Any fill within the special flood hazard area shall be offset with compensatory storage within the effective hydrologic reach.

3.Channel velocities shall not be increased over existing conditions. No increase shall be designed as one percent or less.

[7]**City of Denton Development Standards, Chapter 7.4.7 Riparian Buffer and Water-Related Habitat ESAs** (https://library.municode.com/tx/denton/codes/development_code?nodeId=CITY_DENTONDECO_SUBCHAPTER_7DEST_7.4ENSEARES_7.4.7RIBUWALAHAES)

7.4.7. Riparian Buffer and Water-Related Habitat ESAs.

The following subsection defines permitted and prohibited uses and activities within riparian buffers and water-related habitats. In areas where multiple types of ESAs overlap, the standards, permissions, and prohibitions specified for those other types of ESAs, as outlined in this subsection, shall also apply.

A. Permitted Uses and Activities.

1. **Riparian buffers nested, partially or wholly, inside developed floodplains may be disturbed up to 10 percent of the riparian buffer area, but in no instance shall the protective buffer width be decreased below 25 feet, measured each direction from the centerline of the existing channel, or from the outer edge of surface water bodies.** No disturbance is permitted in delineated wetlands.

7.5.3. General Drainage Requirements.

H. Floodplain Reclamation-Engineering Criteria.

3. Valley Storage.

a. Encroachments and/or channelization is strongly discouraged along Pecan, Cooper, Hickory Creek, Milam, and Clear Creeks to prevent the reduction of storage capacity of streams and drainage ways and to prevent increasing discharges downstream.

b. **The city restricts the valley storage loss to zero percent reduction for all streams serving with a drainage basin of one square mile or greater in the city. For minor tributaries (drainage basins with less than one square mile), a 15 percent maximum reduction in valley storage shall be allowed.**

[8]**City of Fort Worth Buildings Codes, Article VIII Floodplain Provisions** (https://codelibrary.amlegal.com/codes/ftworth/latest/ftworth_tx/0-0-0-10704)

§ 7-304 Definitions.

Critical Facility. Those buildings and facilities that are essential for the delivery of vital services or protection of a community, especially during or after a disaster. When constructed, **these facilities must be protected from flooding to the higher of 2.0 feet above the FEMA 0.2% chance ("500-year") storm or the city 1% chance ("100-year") storm occurring on fully-developed basin conditions**.

§ 7-347 Specific Standards.

(h) Critical facilities. Construction of new critical facilities shall be, to the extent possible, located outside of the limits of the area of special flood hazard. Construction of new critical facilities shall be permissible within the area of special flood hazard area if no feasible alternative site is available. Access routes elevated to or above the base flood elevation shall be provided to all critical facilities to the maximum extent possible.

[9]City of Benbrook Zoning Ordinance, Chapter 17.76.060 Natural Feature Requirement
(https://library.municode.com/tx/benbrook/codes/code_of_ordinances?nodeId=CD_ORD_TIT17ZO_CH17.76PDPLDEDI_17.76.060NAFERE)

17.76.060 - Natural feature requirement.

In those areas that contain certain natural features causing an area to be unique and worthy of preservation and denoted as a natural feature area and so designated on the zoning map, a "PD"[planned development] development site plan is not required unless specifically requested by city council. However, the following features and requirements shall be met and shown on the building permit plot plan required:

A. **There shall be a building line or setback line for the construction of residences located no less than twenty feet from the upper bank of the Trinity River.** Outbuildings or accessory buildings may be erected and maintained between the twenty-foot setback line and the upper bank of the Trinity River in the same manner and under the same conditions as is permitted in the rear yards under the applicable land use zoning classification of the area. Except, however, vegetation must be preserved as set forth in the following paragraph.
B. **No trees or other natural vegetation having a trunk diameter of four inches dbh [diameter at breast height] or more may be cut or removed within ten feet of the top of the riverbank** (as determined by the city engineer) without zoning board of adjustment approval. Outbuildings or accessory buildings may be located between the aforementioned ten feet vegetation setback line and the upper bank of the Trinity River in the same manner and under the same conditions as permitted in the rear yards under the applicable land use zoning classification of the area provided that no trees or other natural vegetation having a truck diameter of four inches DBH or more need be cut or removed in order to erect and maintain any such outbuilding or accessory building or structure.
C. **Individual building permit plot plan conformance for each lot or tract involved shall be reviewed by the city building inspection department and in addition to the standard plot plan requirements shall show the top of the bank (as determined by the city engineer) of the Trinity River and the ten feet and twenty feet setback lines.**
D. The city council may by specific action require a natural feature site plan to be submitted.

[10]City of Dallas Development Code, Article V, Division 51A-5.100 Floodplain Regulations, Section 51A-5.106 Setback Requirement
(https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-85307 and https://files.amlegal.com/pdffiles/Dallas/32039.pdf)

Sec. 51A-5.106. Setback from Natural Channel Required.

(a) For purposes of this section:
  (1) NATURAL CHANNEL SETBACK LINE means that setback line described below located the farther beyond the crest:
    (A) That line formed by the intersection of the surface of the land and the vertical plane located a horizontal distance of 20 feet beyond the crest.
    (B) That line formed by the intersection of the surface of the land beyond the crest and a plane passing through the toe and extending upward and outward from the channel at the designated slope. For purposes of this paragraph, the designated slope is:
      (i) four to one if the channel contains clay or shale soil; and
      (ii) three to one in all other cases.
  (2) CREST means that line at the top of the bank where the slope becomes less than four to one.
  (3) TOE means that line at the bottom of the bank where the slope becomes less than four to one.

(b) **Except as otherwise provided in Subsection (c), all development must be located behind the natural channel setback line.**
(c) A structurally engineered retention system approved by the director may be substituted for the setback required in Subsection (b).

[11]City of Denton Stormwater Design Criteria Manual, Section 3.0 Design Criteria, 3.2.2.2 Flood Mitigation Design Options (https://www.cityofdenton.com/DocumentCenter/View/6232/Draft-Stormwater-Criteria-Manual_2022?bidId=)

Option 3: In lieu of a Downstream Assessment, Maintain Existing On-Site Runoff Conditions

Lastly with Option 3, **on-site controls shall be used to maintain the pre-development peak discharges from the site.** The developer must provide supporting calculations and/or documentation that the on-site controls will be designed and constructed to maintain on-site existing conditions.

It is important to note that Option 3 may not require a downstream assessment. It is a detention-based approach to addressing downstream flood mitigation after the application of the integrated site design practices. However, a downstream assessment may be required for sites adjacent to or near streams in which delayed release of flows from detention facilities could potentially increase the peak flow in the stream due to coincident peaks. This assessment of the impact of coincident peaks is required for all sites with a contributing drainage area greater than or equal to ten percent (10%) of the stream drainage area at the subject discharge point.

[12]City of Kennedale Public Works Design Manual, Section 5 Stormwater Design (https://www.cityofkennedale.com/DocumentCenter/View/596/Public-Works-Design-Manual?bidId=)

L. Stormwater Detention Basin Design

The basic concept underlying the use of stormwater detention basins involves providing temporary storage of stormwater runoff so that peak rates of runoff can be reduced. **Runoff is released from storage at a controlled rate which cannot exceed the capacities of the existing downstream drainage systems or the predevelopment peak runoff rate of the site, whichever is less.**

Stormwater detention basins may be of two (2) basic types: On-site and Regional. In general, on-site basins are those which are located off-channel and provide stormwater detention for a particular project or development. Regional basins are designed to provide stormwater detention in conjunction with other improvements on a watershed-wide basis. The performance and safety criteria in this section apply to all basins which provide management of peak rates of stormwater runoff, regardless of type.

M. Streambank Protection

1. The developer must meet at least one of the following conditions detailed in Section 2.1 of iSWM Hydrology Technical Manual:
   b. The developer must conduct a downstream assessment as described in Section E above. **On site stormwater management controls must be installed to ensure that downstream post development discharges are at or below their pre-development discharges.** Supporting documentation/calculations must be provided

[13]Town of Flower Mound Land Development Regulations, Chapter 90 Subdivisions, Article VI Standards, Division 6 Drainage (https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPBLADERE_CH90SU_ARTVIST_DIV6DR_S90-403FUDEFEFL).

Sec. 90-403. Fully developed FEMA floodplain.

(a)The fully developed FEMA floodplain shall mean the special flood hazard area (FEMA floodplain) that would be inundated by the one percent annual chance (100-year) flood based on future hydrology provided in the town-wide hydrologic study (i.e., fully developed flows).

(b)No construction or construction-related activities and no structures or uses are allowed in the fully developed FEMA floodplain.

(c)Exception: If such construction, construction-related activity, structure or use is allowed, **there shall be zero increase in the fully developed water surface elevation and zero increase in the water velocity on any property that is upstream, downstream, or on the opposite bank and/or lot (if under different ownership) from the proposed construction or construction-related activity.**

(d)A hydraulic study must be provided by a licensed professional engineer for review by the town to verify conformance with the above-identified exception(s).

(e)Any request for an exception must be presented to the town council for their review and approval.

[14]City of Richardson Floodplain Management Ordinance, Article II Administration and Enforcement, Sec. 9-42 Duties and Responsibilities of the City Engineer, Editor's Note
(https://library.municode.com/tx/richardson/codes/code_of_ordinances?nodeId=PTIICOOR_CH9FLMA_ARTIIADEN_S9-42DUREEN)

Section 1. That in order to protect the public health and safety for both present and future developments within the watershed, the following eight policies are hereby endorsed:

2. **Allow no rise in base flood elevation.** Reclamation of the floodplain should be permitted only if it can be demonstrated that there will be no rise in the base flood elevation.

[15]Wise County Flood Damage Prevention Ordinance, Article I Statutory Authorization, Finding of Fact, Purpose and Methods
(https://www.co.wise.tx.us/DocumentCenter/View/414/Flood-Damage-Prevention-Ordinance-PDF)

Section D. Methods of Reducing Flood Loss

In order to accomplish its purposes, this ordinance uses the following methods:

(6) In order to preserve the existing hydraulic conditions and Base Flood Elevation, any work to be performed in the Special Flood Hazard Areas ZONE A OR ZONE AE will be required to perform a Hydrologic and Hydraulic study to determine the existing Base Flood Elevation as well as a Hydrologic and Hydraulic study for the proposed conditions. **The Base Flood Elevation shall not have a difference between the existing and proposed conditions of more than 0.00 feet.**