Stormwater Outreach

NCTCOG Elected Officials Luncheon
August 31, 2016
Stephanie Griffin, P.E., CFM
Who does the public call? YOU
What does the public tell you?

- House/yard
- Street flooded
- Standing water (mosquitos)
- Creek issues
- Flood insurance increased
What questions does the public ask?

• Why did my house/yard flood?
• Why did the street flood?
• Why doesn’t the City keep the creek from flooding my property?
When does the public contact you?

• After storm events
• After neighbor starts/completes a project
• During the hottest, driest months of summer
Where is the flooding problem?

- Streets
- Storm drains
- Ditches
- Creeks
- Culverts
- Outfalls
- Neighbor’s property
Why does the public call you?

• Don’t know who else to call
• Plumber/irrigation specialist/other professional/neighbor told them it was the City’s responsibility to fix it
• Claims the City fixed the problem in the past
• False impression that the City is responsible for everything
• Don’t like the neighbor’s “improvement”
Favorite lines from the public

• “I’ve lived here ___ years, and this has never happened before.”
• “I don’t want to get my neighbor in trouble, but ____.”
• “Someone else’s water is flooding my property.” (neighbor, City, HOA, etc.)
• “All the City has to do is ___ to fix the problem.”
• “The City’s lot next door ____.” (not actually a City-owned lot)
Favorite lines from the public

• “So and so (or generic someone) at the City told me that this was really the City’s responsibility to fix.”
• “The City built me a ___ and needs to maintain or repair it.”
• “I know the Mayor personally and have his number on speed dial.”
Favorite lines from the public

• “We flooded last year, so we won’t flood for another 100 years. Right?”
• “I don’t need flood insurance because I don’t plan to live another 100 years.”
• “Why do I have to keep paying a stormwater fee during a drought?”
How does the public contact you?

- Phone call
- Email
- Website
- Mail
- Start with the Mayor, City Manager or City Council member
What do you do with the call?

• Get information about the problem from the caller
• Explain that you will be out to investigate the issue
• Schedule a site visit
• Prepare map of area and download relevant documents
• If the report is a flooded house, bring the FEMA Substantial Damage Estimator form to complete onsite
• Perform a site visit and document findings
What can you do?

Caller wants City to:

• **Fix it!**
• Suggest potential solutions
• Provide recommendations for professional services
• Serve as mediator between neighbors

City can:

• Work within legal limitations
• Suggest potential solutions
• Mention other potential permit requirements (USACE)
• Perform additional investigation if warranted
• Provide names of professional services providers
• Mediate and/or issue citations
• Provide flood insurance information
How do you deliver the results of the investigation?

- Be respectful
- Be compassionate
- Be encouraging
- Be truthful about the findings
- Do not blast them with information overload
Standard City responses

• This is a lot-to-lot drainage issue, which is a civil matter between you and your neighbor. The City does not get involved in civil matters. Here is a copy of the City Resolution 4812-2016.

• You own the area above and below your fence. You are welcome to trim that tree that overhangs the fence.

• The area behind your house is a no maintenance zone. The City does not mow or trim in that area.
Standard City responses

• It is illegal to use public equipment to perform work on private property for private property benefit.
• The City does not maintain private property, even if it is within an easement.
• The lot to which you are referring is not a City-owned lot. That property owner is responsible for maintaining said property.
Standard City responses

• More than 20% of the flood insurance claims are outside the 1% annual chance floodplain.
• Residents that live within a high risk flood area have a 25% chance of flooding in a 30-year mortgage.
• During the May 2015 flood events, most of the properties that flooded (in Grand Prairie) were NOT within the high risk floodplain.
Intentional public outreach regarding stormwater and flood risk

Property Protection
Act now to protect your property from flood damage. If the first floor level of your structure is lower than the Base Flood Elevation (BFE) and your property is located on a Special Flood Hazard Area (SFHA), then you are required to purchase flood insurance. For a list of insurance companies and to get help in the purchase of flood insurance, please contact your local insurance agent or insurance broker. For more information on how to purchase flood insurance, please contact the Federal Emergency Management Agency (FEMA) or your insurance agent.

Flood Hazard
The City of Grand Prairie has 12 major watersheds, each of which has areas that are subject to flooding from rising streams or local street and yard flooding. Most stream flooding areas have been mapped by the Federal Emergency Management Agency (FEMA); however, not all flood-prone areas, areas with poor drainage, or localized street flooding have been mapped. Your property may have never been flooded or may be shown on the FEMA maps to be outside the mapped limits of flooding. Most areas of the City have yet to see record 1% annual chance flood event. In other words, the property you are purchasing may have never flooded. Statistics show that the 1% annual chance flood event has approximately a 30% chance of occurring over a 30-year mortgage period. Flooded-prone areas and historical flooding information is available by visiting the City’s Stormwater Department.
Intentional public outreach regarding stormwater and flood risk

- Program for Public Information (PPI)
  - Continue current activities
  - Expand outreach efforts
    - Bilingual letters, brochures and mailings
    - Target audiences
    - Cover the six CRS topics in the City newsletter
    - Electronic message boards
    - Train bus drivers about TADD™
    - Host a booth at Flight of the Monarch Festival
Six topics for CRS credit

1. Know your flood risk
2. Insure your property for your flood hazard
3. Protect people from the flood hazard
4. Protect your property from the flood hazard
5. Build responsibly
6. Protect natural floodplain functions
Documenting public outreach

• Floodplain in relation to specific property
• Floodplain inquiries prior to purchasing property
• Information provided
  – Elevation certificate, if we have it
  – Floodplain map with FEMA FIRM, flood zone, BFE, depth of flooding, etc.
  – Link to www.floodsmart.gov to find local flood insurance agent
Public Outreach Wrap-Up

• Waiting on FEMA’s approval of PPI Plan
• Encouraging flood insurance – everyone can purchase this coverage!
Texas Floodplain Management Association (TFMA)

► About TFMA
  - Non-Profit Established in 1988 with over 2,200 Members
  - Premier professional organization leading floodplain management and flood risk reduction in Texas
  - State Chapter of the Association of State Floodplain Managers (ASFPM)

► Outreach
  - Committed to educating the general public on the dangers and risks of natural hazards that affect Texas, with special emphasis on flash flooding.
  - **Turn Around Don’t Drown (TADD)** was developed over 10 years ago with The National Weather Service and other local and state agencies to serve as the Primary Flood Safety Outreach Slogan.
  - TFMA presents and sponsors events targeted towards school children and parents in order to promote flood safety. Host an Annual TADD Calendar Contest with over 15,000 calendars distributed annually.

Like us on Facebook: TXFMA
Follow us on Twitter: @TexasCFM
Texas Floodplain Management Association (TFMA)

► CFM Program
  - TFMA pioneered the Professional Certification of Floodplain Managers, the **Certified Floodplain Manager (CFM)** program, with the goal to increase the educational and professional skills of the state’s floodplain management professionals.
  - Over 2,000 in Texas currently hold the CFM certification, demonstrating their knowledge of the National Flood Insurance Program and Floodplain Management Regulations.
  - TFMA offered the CFM exam 30 times in 2015, with 200+ new CFMs certified last year.

► Training
  - TFMA hosts a variety of floodplain management courses each year in coordination with the Federal Emergency Management Agency (FEMA) and the Texas Water Development Board (TWDB.)
  - In 2015, over 2,000 attendees participated in 50 training classes hosted throughout the state.
Partnerships

North Central Texas Council of Governments

FEMA

Texas Water Development Board
Texas FloodED

2016 Grassroots Education Effort to Introduce Floodplain Management to our Elected Officials

- Over 30 meetings held in past 3 months
- Gaining Support for increased state funding for floodplain management and planning programs in Texas
Governor’s Proclamation

Texas Flood Awareness Week

May 23 – 27, 2016
Dallas-Fort Worth Flood System & Remaining Vulnerabilities
Reservoir Development
Dallas and Waco Floods

1908 Carrollton, TX

19XX Waco, TX

1908 Carrollton, TX

1942 Dallas, TX
Reservoir Development
1949 Fort Worth Flood
Statewide Reservoir Development Background

- Planned/constructed dams 111/32
  - 1st - Marshall Ford Dam (Lake Travis) 1942
  - Last – Cooper (Jim Chapman Reservoir) 1991
- Multi-purpose
  - Flood control, water supply, hydropower, environmental, recreation, navigation
- Critical to the early development of Texas
- Significant federal economic contribution
- 8.8 M ac-ft conservation storage
  - 20% - 25% surface water supply
- 15.9 M ac-ft flood storage in 31 federal dams
- Costs (2013)
  - Construction - $8.2 billion
  - Benefits - $76 billion (flood only)
  - B/C ratio – 9.3
- Annual recreation visits – 22 M
TRINITY RIVER BASIN

- Significant floods
  - 1908, 1942, 1949
- Authorizing legislation
- Planned/constructed dams- 21/8
  - 1st - Grapevine 1952
  - Last - Ray Roberts 1987
- Conservation/flood storage- 2.2 M/1.5 M ac-ft
- Cost (2013)
  - Construction- $1.67 billion
  - Benefits- $72.3 billion
  - B/C ratio- 43.2
GOALS AND OBJECTIVES!

RESERVOIR ALLOCATIONS

Top of Inactive Pool

Sedimentation Pool

Streambed

Perched Reserve Power Pool (not in Trinity Projects)

SWF - 214 GWH/yr @ 5 locations

16 million ac-ft

Keep this pool empty!

Never use this pool!

Keep this pool full!

9 million ac-ft
6 million ac-ft water supply
20-25% surface water supply for Texas

Top of Flood Control

Maximum Design Surface

Freeboard

Surcharge

Top of Conservation

Spillway Crest

Low Flow

Spillway Crest

Top of Dam

BUILDING STRONG®
Normal Reservoir Conditions
Drought Reservoir Conditions
Canyon Dam Surcharge Operations

Proctor Lake

Lavon Lake
Dallas-Fort Worth - Flood Control and Water Supply System

- Flood Control System
  - Over $79 billion in damages prevented
  - $2-3 billion per year

- Water Supply System
  - 6.8 million served
  - Cost = $2.5 billion
# USACE Reservoir Effectiveness

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<tr>
<th></th>
<th>Conservation Storage AC-FT</th>
<th>Flood Storage AC-FT</th>
<th>Sq. Mi.</th>
<th>Inches</th>
<th>Surcharge</th>
<th>millions of $</th>
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<td>Benbrook</td>
<td>72,500</td>
<td>170,350</td>
<td>429</td>
<td>7.4</td>
<td>6.6</td>
<td>7,261</td>
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<td>Joe Pool</td>
<td>142,900</td>
<td>123,100</td>
<td>232</td>
<td>9.9</td>
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<td>749,200</td>
<td>260,800</td>
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<tr>
<td>Lewisville</td>
<td>640,986</td>
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<td>968</td>
<td>6.6</td>
<td>21.3</td>
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<tr>
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<td>244,400</td>
<td>695</td>
<td>6.6</td>
<td>9.8</td>
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<tr>
<td>Lavon</td>
<td>380,000</td>
<td>275,600</td>
<td>770</td>
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<td><strong>Totals</strong></td>
<td><strong>2,130,686</strong></td>
<td><strong>1,415,027</strong></td>
<td><strong>3,786</strong></td>
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<td><strong>79,658</strong></td>
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Total Trinity River Drainage Area: 8,147

Percent of Watershed Regulated by USACE: 46%

Inches of Runoff (flood pool): 7.0 = 9"-24" rainfall

Inches of Runoff (surcharge pool): 14.8 = 18"-36" rainfall
Real-Time Operations and FRM

- Local, state and federal partnership – Takes more than an army
  - Real-time operations
    - USGS, NWS-RFC
    - City of Dallas, TRWD
  - EM community – State and local
  - Dam safety community
  - FRM
    - NCTCOG, CDC Program, ISWM
    - Local, state
    - FEMA
    - TFMA
Remaining Vulnerabilities
May-June 2015 Flooding

2.3 Million (ac-ft) stored in the 6 projects

Joe Pool
I=3.03 in
C=23.11 in

Grapevine
I=6.46 in
C=25.76 in

Ray Roberts
I=4.78 in
C=29.45 in

Lewisville
I=4.70 in
C=24.86 in

Lavon
I=5.07 in
C=22.93 in

Benbrook
I=5.16 in
C=19.43 in

Joe Pool
I=3.03 in
C=23.11 in

RSR & LOL
70k-80k cfs
10yr – 20 yr event

*Pool percent taken on the last day
2015 Surcharge Operations

Denton Creek

Lavon

Lewisville
Top of Inactive Pool

Sedimentation Pool

Streambed

Perched Reserve Power Pool (not in Trinity Projects)
SWF - 214 GWH/yr @ 5 locations
2010 Tropical Storm Hermine Flood
Rush Creek, Arlington, TX

7-8” Rain over Rush Creek

11” Rain

- 11.00 - 11.00
- 9.00 - 10.00
- 8.00 - 9.00
- 7.00 - 8.00
- 6.00 - 7.00
- 5.00 - 6.00
- 4.00 - 5.00
- 3.00 - 4.00
July 2014 – Valley View – Elm Fork Flood

15" Rain in 12 hours

Lewisville Lake Elevation July 2014

Ray Roberts Lake Elevation July 2014
1950-2040 Growth Animation
Where is the 7th flood control reservoir?
Seventh Flood Control Reservoir
NCTCOG - CDC Regulatory Program

Full floodplain conveyance and storage
Mean Annual Precipitation for Texas
Fort Worth District Lakes
Higher Standards

- Existing National Standard (Is this Appropriate for Texas)
  - 1’ above the 1% exceedance or 100-year level

- Higher standards
  - 2’ above the 1% exceedance or 100-year level
  - At or above the .2% exceedance or 500-year level

- Executive Order 11988 amended by 13690
  - 2’ or 3’ above the 1% exceedance or 100-year level
  - At or above the .2% exceedance or 500-year level

- Why
  - Less risk
  - Decrease future losses and costs
  - Lower insurance premiums
Dam Safety Program In USACE

**Routine (Locally Managed)**
- Managed locally with national guidelines
- Inspections
  - Annual, periodic
  - Periodic assessments
- Emergency action plans
  - Table top exercises
- WM activities
  - Scalable real-time to 24/7/365
  - State of the art forecasting, inundation mapping (CWMS)
- Surveillance during floods
  - Scalable to 24/7

**Non-Routine (Nationally Managed)**
- National program (700 + dams)
- Risk based approach
  - Failure processes
  - Consequences
  - DFW – elevated consequences
- DSAC
- Processes
  - Portfolio risk assessments screening
  - IRRM
  - IES
  - DSMS
Questions?

Jerry L. Cotter, P.E.
Chief Water Resources

U.S. Army Corps of Engineers
Fort Worth District (SWF)
819 Taylor Street
Fort Worth, TX 76102

(817) 886-1549 TEL
(817) 454-1290 CEL
Jerry.L.Cotter@usace.army.mil
Upper Trinity River Flood System

- Flood control system
  - Over $79 billion in damages prevented (60 years)
  - $2-3 billion per year
- Water supply system
  - 6.8 million served
- Cost = $2.5 billion

Legend:
- Trinity Unregulated
- Trinity Regulated
A Very Quick Look at the 2015 Texas Quick Guide

CRS Users Group – Aug 31, 2016
North Texas Central Council of Government
Arlington, TX

T. Lynn Lovell, PE, CFM, D.WRE
Outline of Presentation

• What is the Texas Quick Guide
• How can it help Texas floodplain administrators?
• Example pages from 2015 Texas Quick Guide
• TFMA initiative for updates and additions to Texas Quick Guide
The 2015 Quick Guide is ninety one pages and covers seventy-five floodplain-related subjects.
Quick Guide Includes:

- Why Communities Regulate Floodplains
- Safe Uses of the Floodplain
- Significant coverage of the National Flood Insurance program
- Floodplain Ordinances and Permits
- Common Issues with Development in the Floodplain
- Much, much More...
A quote from the Guide provides an insight to its content:

“This Quick Guide will help you understand more about why and how communities in the State of Texas manage floodplains to protect people and property.”
Why is the Texas Quick Guide Important?

• Have you tried to explain a floodplain or the 44 CFR - Federal Floodplain Management Regulations to an elected official, developer or concerned citizen?

• Pictures are worth a 1,000 words!
Texas Quick Guide Example Slides

Texas Flood Zones and Flood Costs:
- Zone A: Medium to high or high risk of flooding and high potential for loss.
- Zone B: Medium to low risk of flooding and potential for loss.
- Zone C: Low risk of flooding and potential for loss.
- Zone D: Low to moderate risk of flooding and potential for loss.
- Zone E: Moderate risk of flooding and potential for loss.
- Zone F: Low to high risk of flooding and potential for loss.

When Disaster Strikes:
- Presidential Major Disaster Declaration

Texas Quick Guide Example Slides:

RISKS:
- Property damage
- Livelihood loss
- Health impacts

Mitigation:
- Building codes
- Elevation
- Land use planning

Texas Quick Guide Example Slides:

Texas Quick Guide Example Slides:

Texas Quick Guide Example Slides:

HALFF
Understanding the Riverine Floodplain

For floodplains with Base Flood Elevations, check the Flood Insurance Study to find the Flood Profile which shows water surface elevations for different frequency floods.

The Special Flood Hazard Area (SFHA) is that portion of the floodplain subject to inundation by the base flood and/or flood-related erosion hazards. SFHAs are shown on FHBMs or FIRMs as Zones A, AE, A1-A30, AH, AO, AR, V, VE, and V1-V30.

See pages 21 and 22 to learn about the floodway, the area of the floodplain where floodwaters usually flow faster and deeper.

The base flood means the flood having a 1% chance of being equaled or exceeded in any given year (also called “100-year floodplain”).
CAUTION: Nature doesn’t read the flood map. Major storms and flash floods can cause flooding that rises higher than the 1% annual chance floodplain (BFE). Consider safety - protect your home or business by building higher. See page 34 to see how this will save you money on insurance.
What is Floodplain Management?

- Floodplain management is the operation of a program of preventive and corrective measures for reducing flood damage. FEMA helps communities develop floodplain management regulations that comply with NFIP regulations. Communities may adopt more restrictive regulations. Community officials may have knowledge of local conditions that require higher standards than the NFIP regulations, particularly for human safety.

- Source: FEMA Fact Sheet - Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium

This is a new slide for updated TX Quick Guide
Texas Flood Events and Flood Facts

- Flood-prone areas have been identified in most counties, cities and towns in Texas.
- Millions of structures are located in mapped flood-prone areas.
- Since 1988, over 400 people have died in flood-related incidents and over $4 billion in damage has occurred.
- About 12% of the state’s land area is mapped floodplain. Many waterways have not been mapped.

To Be Updated Through 2016

Not all flood events are declared major disasters. Many floods are local, affecting only small areas or a few watersheds.
The NFIP’s Community Rating System (CRS)

The NFIP’s CRS gives “extra credit” to communities in the form of reduced flood insurance premiums. Communities must apply to the CRS and commit to implement and certify activities that contribute to reduced flood risk. Examples of actions your community can take to reduce the cost of your insurance premiums include:

- Preserve open space in the floodplain
- Enforce higher standards for safer development through zoning, stormwater, subdivision, and flood damage protection ordinances
- Develop hazard mitigation plans
- Undertake engineering studies and prepare flood maps
- Obtain grants to buy out or elevate houses or to floodproof businesses
- Maintain drainage systems
- Monitor flood conditions and issue warnings
- Inform people about flood hazards, flood insurance, and how to reduce flood damage

DID YOU KNOW? Community officials can request assistance from CRS specialists to help with the application process and prerequisites. Check the online CRS Resource Center (see page 76).

Did You Know? Property owners who live in communities that participate in the CRS program receive a discount on their flood insurance premium.

TEXAS QUICK GUIDE

This is only CRS slide in 2015 Texas Quick Guide
We hope to add several more!
CRS Freeboard Credit

• For CRS credit, freeboard must be applied not just to the elevation of the lowest floor or floodproofing level, but also to the level of protection provided to ALL COMPONENTS OF THE BUILDING.

• All building utilities, including ductwork, must be elevated or protected to the freeboard level and all portions of the building below the freeboard level must be constructed using materials resistant to flood damage.

• If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures.

This is a new slide for updated TX Quick Guide
Understanding the Floodway

For any proposed floodway development, before a local floodplain permit can be issued, the applicant must provide evidence that “no rise” will occur (see page 44). You will need a qualified registered engineer to make sure your proposed project won’t increase flooding on other properties.

**Terms and Definitions**

The Floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to pass the base flood discharge without increasing flood depths.

Computer models of the floodplain are used to simulate “encroachment” or fill in the flood fringe in order to predict where and how much the base flood elevation would increase if the floodplain is allowed to be filled.
New Flood Insurance Rate Map (Riverine)

1. **Zone A** (unnumbered) is flood hazard areas without BFEs.
2. **Cross Section** location (see page 14)
3. **Zone X** (unshaded) is all other areas considered low risk (formerly Zone C).
4. **Base Flood Elevation (BFE)** is the water surface elevation of the base flood at specific locations.
5. **Zone AE** is the 100-year (1% annual chance) floodplain (also called Zone A1-A30).
6. **The Floodway** is the “cross-hatched” area.
7. **Zone X** (shaded) shows low risk areas affected by the 500-year flood (0.2% annual chance) floodplain (also called Zone B).
Be Flood Safe — Don’t Drive Through Flooded Roads

- Never drive through flooded roads – they may be washed out.
- Passenger cars may float in only 18-24 inches of water.
- Floating cars easily get swept downstream, making rescues difficult and dangerous.
- Be especially cautious at night when it is harder to recognize dangers.
- Hundreds of people have died in floods in Texas – many were trapped in cars.
- It takes only six inches of fast moving water to sweep an adult off their feet.

Flash floods are dangerous. Do not try to walk or drive through fast-moving water.
Federal Emergency Management Agency (FEMA) & National Flood Insurance Program (NFIP)

- FEMA’s mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards.

FEMA/NFIP

FloodSmart.gov [https://www.floodsmart.gov](https://www.floodsmart.gov)


ABOUT THE NATIONAL FLOOD INSURANCE PROGRAM [https://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp](https://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp)

FLOOD MAP SERVICE CENTER [https://msc.fema.gov/portal](https://msc.fema.gov/portal)

PLAN, PREPARE & MITIGATE [https://www.fema.gov/plan-prepare-mitigate](https://www.fema.gov/plan-prepare-mitigate)

Lots of Resources, References, and Useful Links
Additional Guidance – FEMA Technical Bulletins & FEMA 480 Desk Reference Set

- Local floodplain managers often find FEMA Floodplain Mandatory Development Criteria as found in the Code of Federal Regulations, 44 CFR, Section 60.3 somewhat vague and more generic rather than defining and specific. To help locals better manage floodplain development, FEMA has published a series of Technical Bulletins to provide additional guidance, clarification and definition to a number of building/construction/development situations. The following Bulletins are available for review and download:
    https://www.fema.gov/media-library/assets/documents/1169?id=1484
    https://www.fema.gov/media-library/assets/documents/2644?id=1579
    https://www.fema.gov/media-library/assets/documents/2655?id=1580
    https://www.fema.gov/media-library/assets/documents/3473?id=1716
    https://www.fema.gov/media-library/assets/documents/3478?fromSearch=fromsearch&id=1717
The Texas Floodplain Management Association (TFMA) is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program (NFIP), flood preparedness, flood warning, flood safety and disaster recovery.

TFMA is the largest State Chapter of the Association of State Floodplain Managers (ASFPM) and is one of only five states authorized by ASFPM to administer a National Accredited Certified Floodplain Manager Program (CFM).

TFMA is actively involved in NFIP training through working partnerships and coordination with FEMA and Texas Water Development Board (TWDB).

TFMA/ASFPM CERTIFIED FLOODPLAIN MANAGER PROGRAM (CFM)
http://www.tfma.org/?page=Certification

TFMA MEMBERSHIP
http://www.tfma.org/?page=Membership

TFMA MENTOR PROGRAM
http://www.tfma.org/?page=Mentor

TFMA TRAINING CALENDAR
http://www.tfma.org/events/event_list.asp

TFMA OUTREACH & FLOOD SAFETY
http://www.tfma.org/?page=Outreach

TEXAS FLOODPLAIN MANAGEMENT ASSOCIATION
"Turn Around Don’t Drown” TADD
Flood Safety Education and Outreach Program
2017 TFMA Texas Quick Guide

• Major Concept: Establishing a Mechanism and Structure to Keep the QG Updated Regularly in the Future (Living Document)

• Needs Updates/Revisions/New Subjects

• TFMA Texas Quick Guide Task Force

• Volunteers to Make it Happen!
Quick Guide

Floodplain Management in Texas


QUESTIONS?
TFMA Higher Standards Guide

Elected Officials
and
NCTCOG CRS Users Group
Arlington, TX
August 31, 2016

T. Lynn Lovell, PE, CFM, D.WRE
John Ivey, PE, CFM
2016 – 13th Annual TFMA Higher Standards Survey

Special Acknowledgement
To
Charlie Hastings, PE, CFM, who initiated the First TFMA Survey in 2004
“Work in Progress”

- Roy Sedwick, CFM – TFMA/TCRFC
- Mike Segner, CFM – TWDB
- John Ivey, PE, CFM – TFMA Higher Standards/Mentor Committee
Senate Bill 936

- Amends the Texas Water Code
- Authorizes political subdivisions to adopt more comprehensive floodplain management rules
- Authorizes participate in floodplain management and mitigation initiatives such as FEMA’s Community Rating System (CRS) Program
- Allows collection of reasonable fees to cover the cost of administering a local floodplain management program
- Allows steps, using regional, watershed, and multi-objective approaches, to improve the long-range management and use of flood-prone areas

Passed - 77th Legislature 2001
TFMA’s Higher Standard Goals

- Reduce the risk of loss of life and property damage from floods
- Encourage wise floodplain development
- Reduce annual flood claims
- Reduce the number of Repetitive Loss and Severe Repetitive Loss properties
- Encourage higher floodplain standards
- Increase participation in CRS
NFIP Flood Claims

- 1978-2016
- $6.5 Billion (Texas)
- $53.1 Billion Nationally
- Texas represents 12.2%
- AL, FL, LA, MS, NJ, NY, PA and TX = 82.2% (WOW)

Source: www.fema.gov
2016 Questionnaire - Freeboard

- Zone AE/VE - New construction must be elevated 1’; 2’; 3’ feet above BFE as shown on FIRM (existing conditions).

- Zone AE/VE - New construction must be elevated 1’; 2’; 3’ feet above BFE determined by a study based on fully developed watershed (future conditions).
Zone A (no BFE)

Zone A (no BFE) - Developer must conduct a study to define the BFE.

Yes ____; No ____;

[Note: Study required to identify BFE if development exceeds 50 lots or 5 acres – 44CFR60.3(b)(3)]
Zone A (unnumbered)

- Developer must conduct a study to define the floodplain and floodway boundaries and BFE’s based on **existing** conditions.

Yes ____; No ____;
Zone A (unnumbered)

- Developer must conduct a study to define the floodplain and floodway boundaries and BFE’s based on fully developed watershed (future conditions)

Yes ____; No ____;
Floodway Requirements

- Floodway - no development is allowed within the floodway boundary.

Yes ____; No ____;

[Several communities prohibit all development in the floodway]
Floodway Requirements

➢ No fill is allowed in the floodway or floodplain without mitigation (No Adverse Impact = NAI).

Yes ____; No ____;

[Several communities prohibit floodway development even if there is no rise]
Detention Requirements

- Is Detention Required?
  Yes ____; No ____;

- Notes:
  1. Several communities require “No Adverse Impact” (NAI)
  2. Several communities require mitigation of all fill placed in floodplain and floodway
  3. Several communities require zero rise for all development within the SFHA
Requirements in Zones B, C & X  
Zone X (Shaded)

- Zone X (Shaded) - New construction must be elevated 1’; 2’; 3’ feet above natural grade or above the crown of the nearest street.

- [Friendswood and other communities require new construction to be elevated a minimum of +2’ in Zone X-shaded and Zone X-unshaded]
Requirements in Zones B, C & X

Zone X (Unshaded) - New construction must be elevated 1'; 2'; 3' feet above natural grade or the crown of the nearest street.

Note: FEMA’s definition of Zone X (shaded) is areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
Elevation Certificates

Elevation Certificate Requirements -

- (1) Submitted prior to forming/pouring lowest floor. Yes ____; No ____;
- (2) Submitted when structure is completed. Yes ____; No ____;
- (3) Required prior to issuing a CO. Yes ____; No ____;

Note: Several communities require multiple EC submittals.
CFM’s

- Is your community floodplain manager a CFM? Yes _____; No _____;
- How many CFM’s does your community have on staff? ____
2016 Higher Standards Survey

- Is your community interested in enrolling in CRS?
- What is the top floodplain management issue facing your community?
- What other floodplain management requirements has your community established?
CRS in Texas

- Only 63 (5%) Texas cities and counties have enrolled in FEMA’s Community Rating System.
- CRS is FEMA’s method to acknowledge community efforts to enforce higher floodplain management programs that mitigate flood risks.
- TFMA’s goal is to increase the number of CRS communities in Texas.
Bastrop County - TFMA’s 2015 Higher Standards Award

- (1) New development must be elevated a minimum of +2' above BFE based on both current and fully developed watershed conditions. (2) Developer must conduct a study, based on fully developed watershed conditions, and determine BFE in Zone A; (3) On-site compensatory storage required along with floodway setback and mitigation of downstream impacts. (4) County enforces "cumulative damage over the life of the structure" threshold for substantial damage. (5) Elevation Certificates are required prior to framing and when construction is completed. (6) One acre minimum lot size with buildable area outside SFHA. (7) Floodplain must be preserved as open space, drainage easement or other defined area that limits impact. (8) Drainage study required to define detention needed to prevent adverse impact and mitigate downstream impacts. (9) Bastrop County is CRS Class 8. (9) LFA is a CFM and County has 4 CFM's on staff.
Higher Standards

- Detention (on-site and/or regional)
- Setbacks from FP and/or FW boundaries
- CLOMR required before permit issued
- No development in floodway or “Zero Rise”
- No development in floodplain or “Zero Rise”
- No Adverse Impact (NAI)
- Additional Wetland/Wildlife requirements
- Floodplain area must be open space or in easement
- Critical Facilities must be elevated above 500-year
- No loss of “Valley Storage”
- Cumulative Substantial Improvement/Damage
- Water quality (protection) requirements
- iSWM and other higher standards ..........
2016 Survey Results

142, 44%

269, 84%

+1 or Higher Freeboard

+1 or Higher (Fully-Developed Conditions)
2016 TFMA Higher Standards Survey

- 321 communities responded (240 cities & 68 counties)
- 269 (84%) have adopted +1’ or more freeboard
- 142 (44%) require BFE’s using fully developed hydrology
- 115 (36%) require freeboard (1’ to 3’) in Zone X
- 258 (83%) require detention
- 239 (76%) have a CFM on staff
- HCFCD has 9 CFM’s on staff
- Austin has 30 CFM’s on staff
- Dallas has 22 CFM’s on staff
- Houston has 13 CFM’s on staff
- TxDOT has 31 CFM’s across the state
FEMA Recommends Freeboard

- 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, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed.

- Source: www.fema.gov
Federal Flood Risk Reduction = BFE +1’

- EO 13632 (2012) created the Federal Interagency Hurricane Sandy Rebuilding Task Force (Sandy Task Force)

- Sandy Task Force reevaluated the 1% chance (100-year) flood standard

- In April 2013, the Sandy Task Force announced a new Federal Flood Risk Reduction which required elevation or other flood-proofing to +1’ above the best available and most recent base flood elevation and applied that standard to all Federal disaster recovery investments in Sandy-affected communities.
CRS Freeboard Credit

- Mitigate flood risks, reduce risk of loss of life and property damage from flood……..

- And:
  - +1’ Freeboard = 100 CRS Credits
  - +2’ Freeboard = 200 CRS Credits
  - +3’ Freeboard = 300 CRS Credits

- So why stop at +1’
For CRS credit, freeboard must be applied not just to the elevation of the lowest floor or floodproofing level, but also to the level of protection provided to ALL COMPONENTS OF THE BUILDING.

All building utilities, including ductwork, must be elevated or protected to the freeboard level and all portions of the building below the freeboard level must be constructed using materials resistant to flood damage.

If the garage floor is below the freeboard level, the garage must meet the opening requirements for enclosures.
Benefits of Freeboard on Flood Insurance Premiums – Zones VE and AE

- Maximum coverage for a $250,000 residential building and $100,000 contents

<table>
<thead>
<tr>
<th>Freeboard</th>
<th>Zone VE</th>
<th>Zone AE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT BFE</td>
<td>$8500</td>
<td>$1700</td>
</tr>
<tr>
<td>+1’</td>
<td>$5800</td>
<td>$900</td>
</tr>
<tr>
<td>+2’</td>
<td>$4000</td>
<td>$800</td>
</tr>
<tr>
<td>+3’</td>
<td>$2800</td>
<td>$600</td>
</tr>
<tr>
<td>+4’</td>
<td>$2500</td>
<td>$500</td>
</tr>
</tbody>
</table>

- Source: FEMA Fact Sheet - Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium

- Savings over a 30 year mortgage varies from $15,000 to $51,000 for Zone AE and $75,000 to $255,000 for Zone VE
Reduced Flood Insurance Premiums in Zone VE

- **Current Rates**
  - At BFE=$8,500

- **At BFE+3’=$8,800**
  - **BFE+3’=$2,800**
Under the Flood Insurance Reform Act of 2012, you could save more than $90,000 over 10 Years if you build 3 Feet above BFE

- If you rebuild to pre-flood conditions, your flood insurance premium could increase dramatically in the future.

  - PREMIUM AT 4 FEET BELOW BASE FLOOD ELEVATION = $9,500/yr
  - $95,000/10 years
  - PREMIUM AT BASE FLOOD ELEVATION = $1,410/yr
  - $14,100/10 years
  - PREMIUM AT 3 FEET ABOVE BASE FLOOD ELEVATION = $427/yr
  - $4,270/10 years
FEMA Supports Freeboard

- FEMA’s Fact Sheet, *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*

- Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a 1-foot freeboard to account for the 1-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated. Freeboard results in significantly lower flood insurance rates due to lower flood risk.
Freeboard is included in the 2015 International Residential Code

Section R322.2.1 Elevation requirements.

- Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
EO 11988

Under Executive Order 11988, Floodplain Management, Federal agencies funding and/or permitting critical facilities are required to:

- avoid the 0.2% (500-year) floodplain, or
- protect the facilities to the 0.2% chance flood level.

Note: EO 11988 has been amended by EO 13650 and we are awaiting Federal agency implementation.
The new federal flood risk standard requires all future federal investments in and affecting floodplains to meet the level of resilience as established by the standard. For example, this applies where federal funds are used to build new structures and facilities or to rebuild those that have been damaged.
FEMA PROPOSED RULE 08/22/2016

- The 8/22/16 Federal Register
- Updates to Floodplain Management and Protection of Wetlands Regulations to implement EO 13690 and the FFRMS
- Comment period ends 10/21/16
- FEMA will adopt regulations to implement EO 13690
FFRMS 4 Options available to Federal Agencies

1) CISA – Climate Informed Science Approach

2) FVA – Freeboard Value Approach (FEMA Baseline Approach)

3) 0.2 FPA – 0.2% annual Chance Flood Approach

4) Elevation and Flood Hazard Area that result from using any other method identified in an update to FFRMS
Figure 1: Process to Establish the Appropriate Floodplain for the 8-Step Decision-Making Process
Higher Elevation = Wider Floodplain
NCTCOG Higher Standards

Higher Standard Ordinances (1980’s)

- Freeboard - +1’, +2’ or +3’
- BFE’s & Floodways - fully developed conditions

The John Promise Rule:

- Non participating communities should join the NFIP
- NFIP communities should adopt higher standards and join CRS
- CRS communities adopt higher standards and improve rating

Source: NCTCOG Regional Risk Assessment, 2003
North Texas CRS Communities

(21)

- Arlington – CRS 7
- Benbrook – CRS 6
- Burleson – CRS 7
- Carrollton – CRS 6
- Cleburne - CRS 8
- Coppell - CRS 7
- Dallas - CRS 5
- Denton - CRS 6
- Denton Co – CRS 10
- Duncanville - CRS 7
- Fort Worth – CRS 8
- Garland - CRS 7
- Grand Prairie - CRS 5
- Haltom City – CRS 7
- Hurst – CRS 7
- Lewisville – CRS 7
- North Richland Hills – CRS 6
- Plano – CRS 5
- Richardson – CRS 7
- Richland Hills – CRS 8
- Tarrant Co – pending
- Wichita Falls – CRS 8
Benefits of NCTCOG’s Higher Standards

- 2016 Population: 7,000,000 (est)
- 2000-2010 Growth: 1,230,673 (23%)
- NFIP Policies: 24,266
- NFIP paid Claims: 5,871 (1)
- Claims/10,000 pop: 8.38

(1) Total from 1978 to 2016
### Benefits of NCTCOG’s Higher Standards

- **RL Properties**: 538 (1)
- **RL Claims**: 1,546 (1)
- **SRL Properties**: 106 (1)
- **Planning Area**: 12,796 sq mi
- **Density**: 511 persons/sq mi
- **CRS Communities**: 20 (31%) (1)

(1) Total from 1978 to 2016

**Data sources:**
- NCTCOG
- FEMA.gov
NCTCOG

- NCTCOG is 4th largest metro area in US
- NCTCOG 2010 population = 6,539,950
- NFIP paid claims (1978 – 2016) = 5,871
- Claims/year (38 years) = 154.5
- Claims/100,000 population = 83.8
- Repetitive Loss/100,000 population = 8.2
- Severe Repetitive Loss/100,000 = 1.6
Texas Communities with Freeboard

- In the 8/22/16 Federal Register, FEMA points out that Higher Floodplain Management Standards have already been implemented throughout the US.

- Currently 22 states and 596 localities have adopted freeboard requirements ranging from 1 to 3 feet.

- The 2016 TFMA Higher Standards Survey shows that 269 Texas cities and counties have adopted freeboard ranging from +1’ to +4’.
Resources

**ASFPM Higher Standards Guide:**

**www.floods.org**  NAI Committee - *A Common Sense Strategy for Floodplain Management*

**2015 Texas Quick Guide** -

**FEMA’s Community Rating System (CRS)** -
Thanks to all communities that participated in the TFMA Higher Standards Survey!

Roy says “Higher Standards saves lives and reduce flood losses”

Survey summary posted on www.tfma.org
A Guide for Higher Standards in Floodplain Management
Pilot Project by:
TFMA Mentor/Higher Standards Committee
Updated from ASFPM’s 2013 HS Guide
TFMA Higher Standards Guide

- In 2016, TFMA’s Higher Standards Committee initiated a project to update the 2013 version of the ASFPM Regulations Committee’s *Higher Standards Guide*

- TFMA HS Guide documents higher standards implemented by Texas cities and counties and serves as a companion to the *Texas Quick Guide* published by TWDB in 2015
The TFMA HS guide is in MS Word format to assist communities as they develop flood damage prevention ordinances, floodplain regulations and court orders.

Many higher standards, such as “freeboard”, allow selection of +1’, +2’, +3’ above BFE or select fractional values should the community desire: 1.5’, 18 inches……
Guide for Higher Standards

- I. FREEBOARD
- II. ACCESS (INGRESS-EGRESS)
- III. COMPENSATORY STORAGE
- IV. CRITICAL DEVELOPMENT PROTECTION
- V. CUMULATIVE SUBSTANTIAL DAMAGE/IMPROVEMENT
- VI. REPETITIVE LOSS PROPERTIES
- VII. FLOODPLAIN FILL STANDARDS
- VIII. FLOODWAY RISE
- IX. FOUNDATION DESIGN
X. FULLY DEVELOPED WATERSHED HYROLOGIC MAPPING

XI. MATERIALS STORAGE

XII. SETBACKS

XIII. STORMWATER MANAGEMENT

XIV. STORMWATER DETENTION

XV. SUBDIVISION STANDARDS

XVI. FLOODPLAIN USE RESTRICTIONS

XVII. REGULATING AREAS NOT MAPPED ON FIRM

XVIII. HIGHER STANDARDS IN ZONE D

XIX. ELEVATION REQUIREMENTS FOR STRUCTURE ADDITIONS

XX. COASTAL SITING

XXI. DUNE PROTECTION
XXII. COASTAL CONSTRUCTION

XXIII. COASTAL A ZONE - LiMWA

XXIV. SINK HOLE STANDARDS

XXV. PLAYA LAKE STANDARDS

XXVI. ALLUVIAL FAN STANDARDS

XXVII. RIGHT OF ENTRY TO ENFORCE FLOODPLAIN ORDINANCE

XXVIII. ENFORCEMENT – FINES AND PENALTIES

XXIX. GAS and LIQUID STORAGE TANKS

XXX. GLOSSARY/REFERENCES
Examples from the TFMA Higher Standards Guide

- Coastal A Zone - LiMWA
- Zone A (no BFE)
- Zone X (Shaded and not Shaded)
- Zone D
- Gas and Liquid Storage Tanks
Freeboard Requirements in Coastal A Zones:

- Coastal V Zones (Zone VE) are areas where wave height exceeds 3’ and new construction must be elevated on piling or piers.

- Coastal A Zones are areas adjacent to Zone VE where wave height is less than 3’ and greater than 1.5’, also known as LiMWA – Limit of Moderate Wave Action.

- TFMA’s recommended “higher standard” is to require new construction in Coastal A Zones and LiMWA areas to meet VE Zone requirements (elevated on piers or piling).
Coastal Floodplain Zones

V Zone: Wave Height ≥ 3 ft
Coastal A Zone: Wave Height 3.0-1.5 ft
A Zone: Wave Height <1.5 ft
X Zone:

1% Annual Chance Stillwater Elevation

BFE (D+D/2)
Flood Level Including Wave Effects
Stillwater Depth Between 4 and 2 ft
Stillwater Depth < 2 ft

Sea Level
Shoreline
BFE -- Ground = 6 ft at This Location
BFE -- Ground = 3 ft at This Location
Limit of Flooding and Waves

V Zone: 1% Annual Chance Flooding Stillwater Depth = D

HALFF®
Zone A (no BFE)

- The base flood elevation is the level of the 1% chance flood.
- TFMA recommends- where base flood elevation data is not available, a floodplain study must be performed by a Professional Engineer (PE) establishing the base flood elevation (BFE) and the floodplain and floodway boundaries prior to issuing a development permit.
Zone A (no BFE) Ordinance Language

- Where base flood elevation data is not available, a floodplain study must be performed by a Professional Engineer (PE) establishing the base flood elevation (BFE) and the floodplain and floodway boundaries prior to issuing a development permit.
Freeboard in Zone X

Why do you need Freeboard in Zone X?

During Tropical Storm Allison (2001) heavy rainfall over a 5-day period in Harris County, Texas, resulted in over 73,000 residences being flooded with over 30,000 located outside the Special Flood Hazard Area (SFHA) in Zones B, C, X (shaded) and X (unshaded).
Freeboard in Zone X

- In areas mapped as Zone X (shaded) on the community Flood Insurance Rate Map (FIRM), defined as Areas of 0.2% annual chance flood; **areas of 1% annual chance flood with average depths of less than 1 foot** or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
Zone X (shaded)

- Based on the previous definition of Zone X (shaded) it is conceivable that a new “at grade” structure in Zone X (shaded) could be flooded with 12” or more of floodwater during the 1% annual chance (100-year) flood.

- A good reason for Freeboard in Zone X
In areas mapped as Zone X (shaded and unshaded) on the community Flood Insurance Rate Map (FIRM), new construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor, including basement, elevated at least two feet above the highest adjacent natural grade or above the crown of the nearest street, whichever is higher.
Freeboard Requirements in Zone D:

- Zone D: areas mapped as Zone D on the community Flood Insurance Rate Map (FIRM), are defined as areas in which flood hazards are undetermined, but possible.
Figure 4-4. Freeboard Deficient Cross Section View
Freeboard Requirements in Zone D:

- TFMA recommends that communities require new development in Zone D to meet the recommended freeboard requirements for new development in Zone X. By requiring new structures to be elevated +2’ above natural grade provides a level of protection and allows owners to benefit when Zone D areas are remapped and placed in a higher risk zone.
Gas and Liquid storage tanks located in the floodplain

- NFIP Regulations 44 CFR 59.1 defines a “structure” as:
  - **Structure** means, for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.

- **Surprise!** Gas and liquid storage tanks are structures!
Structures in the Floodplain

- 44 CFR 60.3.c
- Require that all new construction and substantial improvements of nonresidential structures within Zones A1–30, AE and AH zones on the community’s firm (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) 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;
Protecting Building Utilities From Flood Damage

- FEMA P-348, Edition 1 / November 1999
Protecting Building Utilities From Flood Damage
FEMA P-348, Edition 1 / November 1999

FEMA
Elevated Storage Tanks

- FEMA P-348 Section 3

- The most effective technique for providing flood protection for a fuel storage tank is **elevation of the tank on a platform** above the Design Flood or Base Flood Elevation.

- The following outlines some additional considerations when protecting tanks:
  - 1. The tank should be anchored to the platform with straps, which would constrain the tank in wind, earthquake, and other applicable forces.
  - 2. In coastal zones, the straps should be made of non-corrosive material to prevent rusting. Should be supported by posts or columns that are adequately designed for all loads including flood and wind loads.

Construction requirements:
- (1) The posts or columns should have deep concrete footings embedded below expected erosion and scour lines.
- 3. In velocity flow areas, the platform
  - (2) The piles, posts, or columns should be cross-braced to withstand the forces of velocity flow, wave action, wind, and earthquakes; cross-bracing should be parallel to the direction of flow to allow for free flow of debris.
A storage tank elevated above the DFE on a platform in a velocity flow area
In non-velocity flow floodplains, elevation can also be achieved by using compacted fill to raise the level of the ground above the DFE and by strapping the tank onto a concrete slab at the top of the raised ground.
Storage Tanks below Grade

- FEMA P-348 Section 3.2.3C
- If a tank must be located below the DFE in an SFHA, it must be protected against the forces of buoyancy, velocity flow, and debris impact. This can be achieved by the following methods:

Anchoring Tanks Below Ground
- A tank located below ground in a flood-prone area can be anchored to a counterweight in order to counteract the buoyancy force that is exerted by saturated soil during a flood.
- One effective method is to anchor the tank to a concrete slab with (non-corrosive) hold-down straps. The straps must also be engineered to bear the tensile stress applied by the buoyancy force. The maximum buoyancy force is equal to the weight of floodwaters which would be required to fill the tank minus the weight of the tank.
An underground fuel tank anchored to a concrete counterweight
Protecting Building Utilities From Flood Damage


FEMA P-348, Edition 1 / November 1999

FEMA
A Guide for Higher Standards in Floodplain Management
Soon to be posted on www.tfma.org
TFMA Higher Standards Guide

Elected Officials
and
NCTCOG CRS Users Group
Arlington, TX
August 31, 2016

T. Lynn Lovell, PE, CFM, D.WRE
John Ivey, PE, CFM
Freeboard is a term for an extra margin of protection. Ordinances or codes often include a freeboard requirement to add height above the base flood elevation to account for future flood fringe development, uncertainties inherent with the methods for calculating the expected flood, lack of data, waves or debris that accompany the base flood, and floods higher than the base flood.

In a community floodplain management ordinance, a freeboard requirement means that new buildings will be protected to a level higher than the NFIP’s base flood elevation.
Can a Texas County adopt higher Standards?

- Yes_; No___
Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated.

Freeboard results in significantly lower flood insurance rates due to lower flood risk.
EO 13690 Slides
Federal Flood Risk Management Standard (Options)

1. Elevating +2 feet above the 100-year, or 1% annual-chance flood elevation (+3’ for critical facilities)

2. Elevating to the 500-year, or 2% annual-chance flood elevation, or

3. Utilizing best-available, actionable data and methods that integrate current and future changes in flooding based on science. (Science based technology)
Freeboard is important to Floodplain Management

- Floodplain management is the operation of a program of preventive and corrective measures for reducing flood damage. FEMA helps communities develop floodplain management regulations that comply with NFIP regulations. Communities may adopt more restrictive regulations. Community officials may have knowledge of local conditions that require higher standards than the NFIP regulations, particularly for human safety.

Source: FEMA Fact Sheet - Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium
For some activities and facilities, even a slight chance of flooding is too great a threat. Typical critical facilities include hospitals, fire stations, police stations, storage of critical records, and similar facilities. These facilities should be given special consideration when formulating regulatory alternatives and floodplain management plans.

Source: www.fema.gov – Critical Facility - definition/description
Critical Facilities

- A critical facility should not be located in a floodplain if at all possible. If a critical facility must be located in a floodplain it should be provided a higher level of protection so that it can continue to function and provide services after the flood. Communities should develop emergency plans to continue to provide these services during the flood.

- Source: [www.fema.gov](http://www.fema.gov) – Critical Facility - definition/description
Higher Standards for Critical Facilities

- Both EO 11988 and EO 13690 apply to Federal agency funding and/or permitting critical facilities and does not pertain to NFIP communities.

- However, a community can adopt higher standards requiring new and substantially improved “critical facilities” to be elevate or protected to a higher level such as BFE +3’; above the 0.2% (500-year) level; or elevation determined by science based technology.

- Hint – Define “critical facility” in your ordinance
Levees

- Unaccredited Levees and Zone D
Figure 4-2. Sound Reach Cross Section View
Figure 4-4. Freeboard Deficient Cross Section View
Figure 4-6. Overtopping Cross Section View
Figure 4-8 Structural-Based Inundation Cross Section View

- 1-percent-annual-chance flood elevation
- Potential Breach
- Zone AE / VE
- Zone AE
- Zone D

CROSS SECTION VIEW
Figure 4-10. Natural Valley Cross Section View

1-percent-annual-chance flood elevation

Zone AE / VE

Zone AE

CROSS SECTION VIEW
Zone D Challenges

- Communities typically do not deal with Zone D
- Flood insurance is not required in Zone D however lenders may require anyway
- Zone D rates are higher than Zones B, C, X
Model Language

- Add the following sentence (bolded) to specific requirements for Residential Structures and Non-Residential structures:

- *In areas mapped as Zone D on the community Flood Insurance Rate Map (FIRM), the structure shall have the lowest floor, including basement, elevated at least two feet above the highest adjacent natural grade or above the crown of the nearest street, whichever is higher.*