Flood Protection in Garland – Past, Present, and Future

Presented by:
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City of Garland, Texas
A few facts about Garland:

- Originally incorporated in 1891
- Population 226,876 (2010 census)
- 12th most populous city in Texas
- Over 200 Flood Insurance Policies currently in force
- 57 Repetitive Loss Properties citywide as of 2014
Brief History of Garland Flooding

Severe flooding has a long history in Garland:

- June 1949
- May 1957
- July 1962
- April 1966
- October 1981
- April 1990
- April 1991
- June 2000
- March 2006
- September 2007
- September 2010
- January 2012
Major Drainage Basins

Duck Creek Drainage Basin
- Development along creeks 1950s-1960s
- Majority of flooding issues are here
- Any redevelopment must conform to current stds.
- Majority of impact from 2014 FIRM revisions

Rowlett/Spring Creek Drainage Basins
- Development along creeks 1970s and later
- More stringent flood protection ordinances
- Fewer flooding problems
Historic FIRM

Initial FIRM effective date 4-16-1971

- Areas in Duck Creek drainage basin already developed
- Flood Zone delineation based on best available data at that time
- Some tributaries with small drainage basins never received large (50-year+ floods)
- No restudy or change to these areas was ever done
- Flood zones in area shown delineated 11-1-1979
Historic FIRM panels

FIRM Revision of February, 2003

- Revised 5 panels within Garland to account for Duck Creek Widening project
- Only studied Duck Creek proper, not upstream tributaries
- Flood zone delineations along tributaries more detailed but basically unchanged since 1979
- No major floods along tributaries, no Repetitive Loss properties
- Older established neighborhoods, many residents own homes outright
- Almost all pre-FIRM homes
- Investigation of possible projects to reduce floodplain areas but not feasible (economics, lack of available open space, etc.)
Detailed restudy of entire City

- Based on more detailed aerial topography
- BFEs unchanged
- Resulted in significant alterations to long-standing flood zone delineations
- Subsequent site surveys (so far) are confirming new flood zones
- Significant “spike” in Elevation Certificate and LOMA requests, almost all for pre-FIRM homes
- Still have not received large floods on most tributaries
Elevation Certificates in Garland

2000 – 23 Elevation Certificates
2001 – 21 Elevation Certificates
2002 – 46 Elevation Certificates
2003 - 52 Elevation Certificates
2004 - 28 Elevation Certificates
2005 – 8 Elevation Certificates
2006 – 12 Elevation Certificates
2007 – 6 Elevation Certificates
2008 – 9 Elevation Certificates
2009 – 5 Elevation Certificates
2010 – 11 Elevation Certificates
2011 - 5 Elevation Certificates
2012 – 12 Elevation Certificates
2013 - 11 Elevation Certificates
2014 - 45 Elevation Certificates
2015 - 4 Elevation Certificates (so far)

- 2002/03 “spike” due to FIRM revisions
- Significant 2014 “spike” due to new FIRM\s
- Almost all ECs were for pre-FIRM homes
- Approximately 75% led to LOMAs
- Many others led to reduced insurance premiums
- Most by City, a few by outside firms
Flooding/Erosion Reduction Projects
Duck Creek Channelization (1994-2001)

- Project length approx. 15,400 ft
- Done in cooperation with USACOE, including all required permits
- In response to multiple damaging floods in 1980s and 1990s, especially 1990-1991
- Project components finalized 1994, construction completed 2001
- Approximate project cost $4,000,000 (1997 dollars)
- Project maintained by Garland Street Department
- Annual inspections by City and Corps staff
Duck Creek Channelization (1994-2001)

Channel widening at multiple locations along project Length

(Pictured: Duck Creek at confluence with Keen Branch, looking upstream towards State Street)
Duck Creek Channelization (1994-2001)

Bridge/structural replacement/modifications (3 locations)

(Pictured: Duck Creek looking upstream towards Avenue “F”)
Duck Creek Channelization (1994-2001)

Project included 3 vegetation mitigation areas

(Pictured: Mitigation area along east bank of Duck Creek, just upstream of Centerville Road)
Duck Creek Channelization (1994-2001)

New infrastructure in the project limits must not increase flooding levels

(Pictured: Duck Creek looking south towards State St. and MKT RR bridge, new Dallas Area Rapid Transit bridge installed upstream of MKT bridge since 1994 report – also note creek widening to right/west)
Duck Creek Channelization (1994-2001)

Benefits of the project since completion:

- 5 FIRM panels in Garland revised by FEMA effective 2-5-2003 to reflect this project (later included in 7-7-2014 revision)

- 100-year flood levels reduced by 1 to 3 feet along Duck Creek

- Flood levels reduced for approx. 300 residences along Duck Creek

- Approx. 40 homes removed from SFHA altogether

- 51 Repetitive Loss properties along Duck Creek before construction
- All had flood insurance claims in 1990-91
- Only 8 RL properties have had any flood insurance claims since 2001

- Large storm events occurred in 2006, 2007, 2010, 2012 (2006 storm approached 100-year levels in lower reaches of Duck Creek)

- City working to remove properties from RL list

- Reductions in channel erosion and flood velocity
University Channel (2008-2010)
University Channel (2008-2010)

- Project length approx. 3,700 ft.
- 61 Residential properties along channel
- Most homes constructed in the 1960’s
- Significant channel erosion over the years
- Erosion damage to many properties
- Standing water problems
- General eyesore
- Near-vertical channel slopes in some areas
- Narrow channel, limited working room
- Some homes impacted by 100-year floodplain
University Channel (2008-2010)

• Permit obtained for self-mitigating project under USACOE Nationwide Permit 27

• Minimized intrusion on existing properties, and restored property back to owners

• Reduced 100-year floodplain levels

• Used native plantings whenever possible

• Avoided necessity of City buyouts

• Construction Cost $6.5 million
University Channel (2008-2010)

2011 Texas Council of Engineering Companies Engineering Excellence Gold Medal Award Winner (Water Resources)
Naaman Forest Boulevard CIP

- Road reconstruction to alleviate an area of frequent roadway flooding in addition to improving traffic flow in northern Garland

- Consideration given to SFHA mitigation for all CIP projects, where applicable
Naaman Forest Boulevard CIP

- Project designed to have no adverse impact (no rise) in 100-year flooding levels
- LOMR application completed and approved by FEMA
- Significant increase in safety for the public on major travel route in northern Garland
Other local flooding/erosion projects

Garland maintains database of current and historic local flooding/erosion issues and projects

- Database currently has almost 1500 entries from 1979 to present day, separated into 5 categories:
  - Code A: Flooding of building (non-floodplain)
  - Code B: Streambank erosion
  - Code C: Standing water/other minor flooding issues
  - Code D: Flooding of building (floodplain)
  - Code E: Groundwater
Code A

Flooding in a home or business from sources other than streams

• Blocked drainage channels
• Inadequate/undersized storm sewer
• Grading work on adjacent private property
• Soil settlement causing poorly drained areas
• Poorly maintained private drainage infrastructure
• Pavement settlement/failure in alleys causing storm runoff to flow into private driveways
• Soil settlement/vehicle traffic in older unpaved alleys can cause runoff to enter private property

When issues are related to City-maintained facilities, an appropriate repair is selected, designed, and constructed

• Street Department has a dedicated Stormwater crew tasked with maintaining storm sewer facilities, removing blockages, regrading unpaved alleys, etc.
• Localized channel improvements and new storm sewer installation designed and constructed as needed
• Paved alley reconstruction where necessary
• Dedicated Capital Improvement Projects where needed for larger problem areas
• Storm sewer upgrades designed and constructed in conjunction with new Capital Improvement Projects wherever possible, even if no complaints received
Streambank erosion causes damage to private property and can threaten structures.
City of Garland has term contract in place for erosion protection improvements on private property:
• City shares cost of design and construction (50% residential, 33% non-residential)
• Owner can finance out their portion of cost over 3-years if desired
• All walls 4 feet or more in height are designed by a PE and approved by City
• City takes on permanent maintenance responsibility after completion
Code C

- Minor standing water issues, usually in streets and alleys, no threat to private property
- Usually caused by pavement settlement due to soil consolidation
- Most of these issues can be easily corrected by “mud-jacking” or patching
- Some more severe locations may require sections of street or alley replacement
Code D

- Flooding along streams (including non-FEMA regulated streams with small drainage basins)
- Mostly along Duck Creek and tributaries
- Many Code D issues were resolved by Corps of Engineers project discussed previously
- Known locations of potential street floodplain monitored and closed where necessary during flood events
- Turn Around, Don’t Drown!
• Minor groundwater issues have occurred throughout the City over the years

• No significant amount of water standing in streets or alleys

• Private property issue

• Often can be resolved by private installation of a french drain or other similar method to collect groundwater and convey it to storm drain
Garland Systematic Storm Sewer Study

- City contracted with Freese & Nichols to analyze areas of old/inadequate storm sewer
- Initial study completed in 2001
- New areas added as needed
- Study looked at both pipes and drainage channels
- Full hydraulic analysis of each system in identified study areas
- Deficient areas identified and improvements recommended, including cost estimates
- Study was pro-active, not limited to locations where complaints have been received
- Improvements are being constructed on an ongoing basis, usually in conjunction with street repair or Capital Improvement Projects
- Some larger improvements are being constructed as separate CIP’s
Garland Flood Damage Prevention Ordinance/CRS Program

- Based on FEMA Model Ordinance for the requirements in 44 CFS 60.3 “c”
- Floodplain Development Permit required for all development within the SFHA
- 2-foot freeboard requirement for all new construction unless floodproofed
- No manufactured homes allowed in the SFHA
- Flood Study required for all development impacting 100-year floodplains, including non-SFHA areas
- LOMR/CLOMR/LOMR-F required for all new development in SFHA, depending on size of encroachment
- No rise allowed in 100-year floodplain as a result of development
- Fully-developed flows required to be used in the Rowlett and Spring Creek 100-year floodplains
- Additional requirements for Rowlett/Spring Creeks – no reduction in valley storage, restrictions on post-developed stream velocities (6 ft/sec max)
- Future increases to development standards (i.e., storm sewer design frequency)

- City is long-standing participant in CRS program
- Currently a Class 7 community
- Likely to go to Class 6 next reverification due to changes in CRS manual/additional credits for open space and other items
- Currently reviewing additional credit opportunities (i.e. Floodplain Information Committee per Activities 330/370)
Elevation Certificates

- City maintains database of Elevation Certificates back to the 1970’s in PDF format (also LOMCs).
- Database includes all ECs done by the City as well as private surveyors/engineers (if known).
- Existing ECs/LOMCs available to the public at no charge.
- Upon request, the City will do field work prior to a full EC to advise a property owner on probable results of an EC.
- After field work, EC can be completed for a charge of $325.
- ECs can generally be completed and returned to property owner in 2 weeks or less.
- City also provides assistance in completing MT-1 forms for LOMAs where applicable.
- City provides additional support if FEMA comments need to be addressed for LOMA applications.
- City will also review/comment on private ECs, when requested.
Letters of Map Amendment

- As mentioned previously, the City of Garland assists property owners in the preparation and submission of LOMA applications to FEMA for review
- Most of them and reviewed and approved with no additional data required
- Occasionally, additional data is needed

- Sometimes LAG appears to be below BFE
- Detailed inspection shows that BFE does not touch building
- Submission of detailed planimetric data to FEMA allows for LOMA to be issued
Unusual Cases

- Incorrect third-party map company reading of flood elevation (computer program)
- Aerial view of commercial building confuses reviewer
- Attached AC machinery a significant distance away from building

- Should a database of unusual situations/resolutions be established?
Thoughts?

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