Repetitive Loss Area # 45

West Branch of Joe Creek
E. 31st St. & S. Florence Ave. Area

August 17, 2017

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Planning Consultants

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Engineering Services

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August 17, 2017

Dear Resident/Property Owner:

Once considered the most flood-prone city in America, Tulsa has worked hard to reduce or eliminate flooding of its homes and neighborhoods. The City joined the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) in 1974 and through decades of effort is now recognized as a national leader in flood hazard mitigation. As a result, property owners in Tulsa receive as much as 40% discount on their flood insurance.

A key component of the NFIP has been its focus on Repetitive Loss Properties, which make up only 1 percent of insured properties, but account for over 30 percent of flood insurance claims payments. A Repetitive Loss Property is defined by FEMA as any property that has been paid two or more flood insurance claims of $1,000 or more in a 10-year time period.

The NFIP recently expanded its flood hazard mitigation program to include the identification of "Repetitive Loss Areas" (RLA)—those properties near an existing Repetitive Loss Property that may be subject to the same general flooding conditions. In most instances, 95% of the properties in an RLA will never have experienced flooding—especially if the cause of damage is shallow, overland flow due to local drainage conditions. Once the City has identified an RLA, we are required to contact the owners and residents of the area and, work together to develop a plan to reduce or eliminate flooding in the neighborhood.

Your property has been identified as being in an Repetitive Loss Area. We want to re-emphasize that this does not mean your property has flooded or is even likely to flood—only that it is in the same area, and in a similar geographical situation, as an existing Repetitive Loss Property.

You can protect your property from flooding. We would like to invite you to participate in our flood prevention and mitigation efforts for your neighborhood. We need your input. What can we do, working together, to eliminate potential flood losses in your area? We look forward to hearing from you.

To learn more about your risk of flooding visit www.floodsmart.gov or contact the City of Tulsa Customer Care Center at (918) 596-7777.

Sincerely,
CITY OF TULSA, ENGINEERING SERVICES

Bill Robison

Bill Robison, P.E., CFM
Senior Special Projects Engineer
Stormwater Project Coordination

Contents

Acknowledgements

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Repetitive Loss Area # 45

West Branch of Joe Creek
E. 31st St. & S. Florence Ave. Area

Overview

Repetitive Loss Area (RLA) #45 is located between S. Florence Ave. on the west and S. Gary Ave. on the east, and generally from about E. 29th St. on the north to E. 32nd St. in the south. The RLA is situated on the west and south sides of Lakewood Lake, and along what was once the West Branch of Upper Joe Creek, which is carried in storm sewers south of the lake and through most of its course. The RLA is about 6 miles above where the creek joins the Arkansas River. There are 13 developed properties and 15 addresses in the RLA, including one Repetitive Loss Property. The 13 structures include seven single-family dwellings and six multi-family residences (four multi-family duplexes, and two single-family duplex condominiums). Eleven of the properties are either in or touched by FEMA's SFHA or the City of Tulsa's Regulatory Floodplain. South of 31st St. the elevation of the 100-year flood is between 719.5 and 723.3 feet. There are five properties south of E. 31st St., all of them duplexes and duplex condominiums, that have their first finished floor elevations at between 0.37 to 0.80 feet below the level of the 100-year flood.

In 1994, 1999, 2000, 2002 and 2009 heavy rains resulted in five flood damage claims from four properties totaling $22,234. The claims averaged about $4,500 and ranged from a low of $2,068 to a high of $14,039. (One claim in 2002 was not paid.) The flooding was largely due to overland flow, and in one instance from backup flooding caused by an undersized culvert beneath Florence Ave. on the west side of Lakewood Lake. This culvert has since been enlarged, but overland flow continues to cause damage north of E. 31st St., and south of 31st along the gentle swale that follows the course of the former West Branch channel.

RLA #45 is located on Lakewood Lake and along the West Branch of Upper Joe Creek between S. Florence Ave. and S. Gary Ave., on the north and south sides of E. 31st St.

The location of RLA #45 is shown on the map above and on the more detailed photo/topography map on page 5. The detailed map identifies properties, County Assessor parcels and floodplains, as well as the existing storm sewer system.

I. Background

During the post-World War building boom of the 1950s and 1960s, Tulsa expanded rapidly east and south into the basins of Mingo and Joe creeks. Because of the city's climate and the broad floodplains along these creeks this growth brought with it an increased risk of flooding. And indeed, by the mid-1980s floods were occurring almost yearly and flooding had become Tulsa's most destructive natural hazard. One researcher at the time declared Tulsa "the most flood-prone community in the nation."

Tulsa was not unique in its rapid post-war development and attendant risks. Cities across America were experiencing similar problems as they spread out into prosperous subdivisions. In response, the U.S. Congress created the National Flood Insurance Program (NFIP) in 1968 to help property owners protect themselves from flood losses. The NFIP offered flood insurance to homeowners, renters, and business owners if their community participated in the NFIP and agreed to adopt and enforce ordinances that met or exceeded FEMA requirements for reducing the risk of flooding.

Tulsa joined the NFIP in 1974, and through great effort and considerable expense has significantly reduced its exposure to flooding. As a result, Tulsa has been awarded a Class II rating in the NFIP's Community Rating System (CRS), which grants its residents a 40 percent discount on the cost of flood insurance for structures in the Special Flood Hazard Area (SFHA), also known as the 1% or 100-year floodplain. Since the Biggert-Waters Flood Insurance Reform Act of 2012, many properties have seen a substantial increase in their premiums, making this discount even more important.

For its part, the NFIP is continually faced with the job of paying claims while trying to keep the price of flood insurance at an affordable level. Properties that flood repeatedly—known as "Repetitive Loss Properties," have been a particular problem for the program: Although they make up only 1 percent of insured properties, they account for one-third of all claims payments (about $200 million a year, or $4.5 billion to date). A Repetitive Loss Property is defined by FEMA as any property that has been paid two or more flood insurance claims of $1,000 or more in a 10-year time period.

Consequently, one of the requirements of the CRS is that communities identify all Repetitive Loss Properties in their jurisdiction and work with the owners to find ways to reduce or eliminate future flood damage. This initiative has been very successful in reducing flood losses and claims.

FEMA has recently extended its repetitive loss program to include "Repetitive Loss Areas" (RLA). To maintain a Class II rating in the CRS, Tulsa is now required to analyze the area surrounding each of its Repetitive Loss Properties and identify any neighboring properties (including uninsured ones) that may be subject to the same general flooding conditions. This group of nearby properties is then designated as an RLA. The City is required to contact the owners of the properties in all its RLAs, inform them that they are located in an area subject to flooding, and develop a plan for mitigating or eliminating flooding in the area, much as is being done for the individual Repetitive Loss Properties.

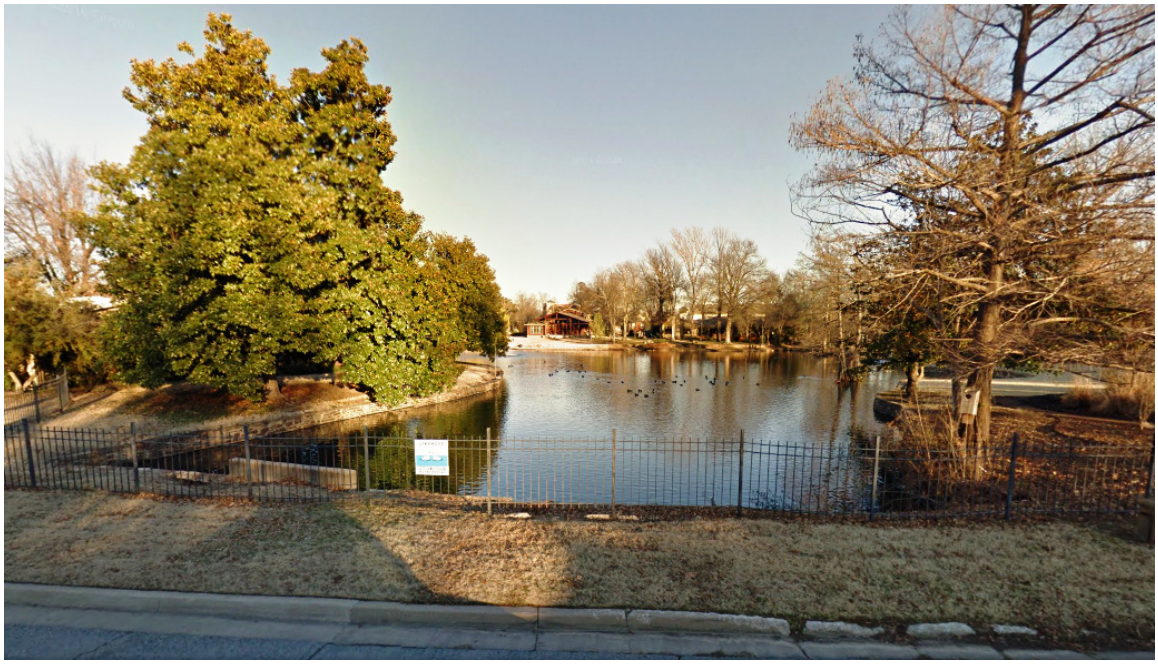
It is important to note that most of the homes in a Repetitive Loss Area—perhaps as many as 80% or 90%—may not have experienced flooding of any kind. What they have in common is being subject to the same general geographical and flood conditions as the nearby repetitive loss property. It should also be stressed that the flooding events in question may have had little or nothing to do with overflow from a creek, but perhaps may have been the result of storm sewer backup or overland flow from a neighbor's property into a low-lying, slab-on-grade home or garage.

II. Location

Joe Creek is about 6.5 miles in length and drains an area of 13.7 sq. miles in southeast Tulsa. The creek has several tributary branches (Upper Joe Creek, Little Joe and South Joe) that converge near E. 53rd and S. Evanston Ave., at Manion Park, just north of Eisenhower International School, to form lower Joe Creek mainstem. The mainstem and its tributaries have been channelized through much of their lengths.

Upper Joe Creek has two branches: West Branch and East Branch. The West Branch, in which RLA #45 is located, rises near E. 23rd St. and S. Oswego Ave. and flows south for about 3 miles to join the East Branch at Skelly Dr. and I-44, and then the mainstem at Manion Park. Almost all of the West Branch is carried in storm sewers. The creek emerges at E. 28th St. and S. Florence Ave. as the source of Lakewood Lake, and again briefly between E. 33rd and E. 36th St. before returning underground until it surfaces at E. 49th St. to merge with the East Branch under I-44, just west of Harvard Ave.

RLA #45 is situated between E. 29th St. on the north and E. 32nd St. on the south, and from S. Florence Ave. on the west to S. Gary Ave. on the east. Five single-family residences are along S. Florence Ave. on the north side of 31st St., and two single-family residences and all six multi-family structures are on the south side of E. 31st along S. Florence Ave., S. Florence Ct. and S. Gary Ave.



The West Branch of Joe Creek is impounded on the north side of E. 31st St. to form Lakewood Lake.

III. History

Development

The properties of RLA #45 were largely developed between 1951 and 1970, although one home was built in 1933 and another in 2010. Lakewood Lake was created in the late 1940s along the West Branch of Upper Joe Creek on the north side of E. 31st St. All but one of the upscale, ranch-style homes around the lake were built in the early 1950s, while the six multi-family structures in the Touche Villas addition on the south side of E. 31st St. on Florence Ct. and Gary Ave. were developed between 1967 and 1970. On the north side of 31st the creek was excavated and deepened to form the lake, and on the south side the land was filled and the creek routed through storm sewers.

Flooding

There was significant flooding on Joe Creek in October 1959, May 10-11, 1970 (Mothers Day flood), June 7-9, 1974, May 31, 1976 (Memorial Day flood), June 21, 1979, June 17, 1980, May 27, 1984 (another Memorial Day flood), August 11, 1992, May 7, 1993, July 1994, May 6, 2000, May 8, 2007, September 21, 2009 and May 20, 2010. According to newspaper reports, flooding was particularly bad on Joe Creek in 1974 and 1976, although not necessarily along this reach. The storms that resulted in the five damage claims in RLA #45 totaling $22,234 occurred in 1994, 1999, 2000, 2002 and 2009.

Flooding in RLA #45 has been largely due to overland flow that resulted from undersized storm sewers, which were only designed to carry 10- to 50-year rainfall events. When more severe storms occurred (as in the 300-year event of 1984), the storm sewers were overwhelmed, with the resulting overland flow generally following the course of the original creek bed. In the case of RLA #45, water spilling out of Lakewood Lake ran through the backyards of properties along Florence Ave. and Florence Ct., where it was often blocked by privacy fencing. Particularly vulnerable were the slab-on-grade multi-family units in the Touche Villas addition, all of which had first finished floor elevations below the level of the 100-year storm.

Improvements

Improvements to the Joe Creek channel by the City and the US Army Corps of Engineers in the 1970s and 1980s channelized a good deal of Joe Creek and its tributaries and installed parallel storm sewers along much of the East and West Branches. In the 1990s the City enlarged the storm sewer system in the lower Joe Creek drainage to solve chronic backup problems at numerous locations, including the installation of enlarged box culverts beneath the Skelly Bypass and I-44. These improvements have reduced flooding along Joe Creek and its tributaries, but not eliminated it.

The culvert beneath S. Florence Ave. on the west side of Lakewood Lake that backed up runoff in the storm of 1984 has been enlarged and is no longer a source of flood damage in RLA #45. Flooding continues to occur to homes north of 31st St., on the west side of Florence Ave., but it is not from the lake itself, or the culvert, but due to overland flow across the John Knox Church parking lot to the west of the properties. Low berms have been put in place to block this flow, but these have been only partially successful. The

Upper Joe Creek Master Drainage Plan recommended a combination of floodproofing and flood insurance as the most effective flood protection options for these homes.

The Interim Master Drainage Plan for the West Branch of Joe Creek recommended two detention sites, one of them in RLA #45 in the Touche Villas addition, along with a new parallel storm sewer. These improvements were rejected by local residents. Consequently, the Final Plan recommended acquisition, floodproofing and flood insurance as the primary option for reducing flooding south of 31st St., particularly for the duplexes and duplex condominiums in the Touche Villas addition.

IV. Research and Analysis

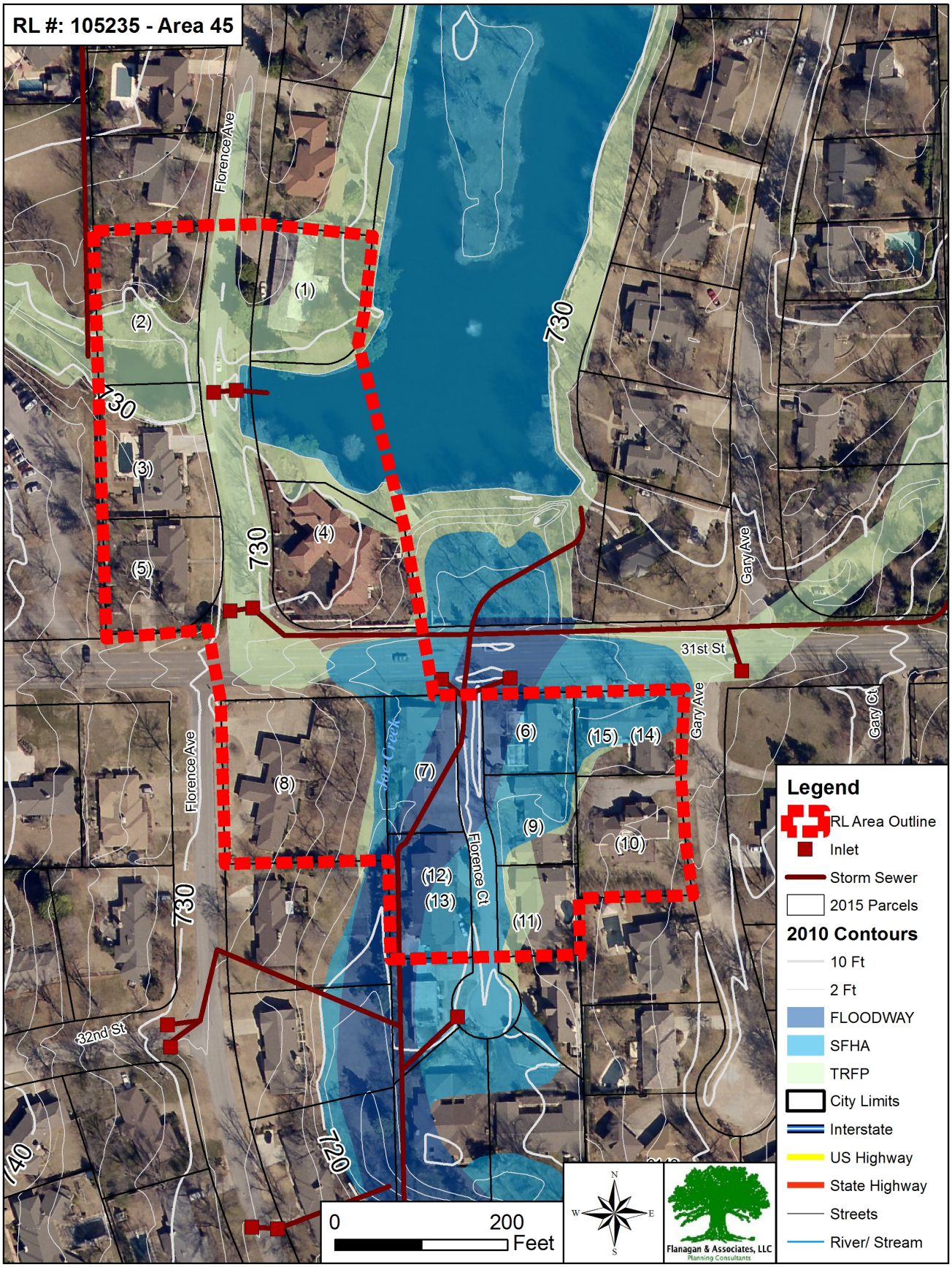
The analysis of Repetitive Loss Area #45 was conducted by the Project Team through interviews with City officials, research into Engineering Services and Stormwater Drainage files, including the *Little Joe Creek Master Drainage Plan* and the *Joe Creek East and West Branches Interim Report*, review of the City's extensive flood history documentation, assessment of insurance claims, field trips to the RLA, interviews with home owners and questionnaires mailed to owner and residents soliciting information about prior and existing flooding issues, if any.

Agencies and Organizations

The City of Tulsa's Storm Drainage & Hazard Mitigation Advisory Board (SDHMAB), which also serves as the City's Hazard Mitigation and CRS Committee, and the CRS Public Participation Involvement & Information Committee (PPI) met monthly during the two-year Repetitive Loss Area Planning process. Each committee was updated on the status of the planning process, discussed issues, and provided guidance. Research and analysis were done in accordance with guidelines from the Federal Emergency Management Agency (FEMA), the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).

Local, State & Federal Agencies and non-profit organizations are represented on the PPI Committee. The RLA plans were discussed at the PPI Committee meetings, and other agencies such as TAEMA were contacted by phone or email. The RLA plans were presented to City Council for adoption; the agenda was made public and furnished to the media. The council meeting is a public meeting and the local media was present at the meeting. In addition the council meetings are aired on our local government network TV channel TGOV.

Participating agencies and organizations involved were: City of Tulsa (CoT) Storm Drainage & Hazard Mitigation Advisory Board, CRS PPI Committee, CoT Communications Department, CoT Development Services, Working in Neighborhoods, CoT Engineering Services, CoT Finance Department, CoT Legal Department, CoT Streets & Stormwater, CoT Water & Sewer Department, Child Care Resource Center, Indian Nations Council of Governments, Tulsa Area Emergency Management Agency (TAEMA), Disaster Resilience Network, Metropolitan Environmental Trust, Oklahoma Insurance Department, Tulsa Association of Realtors, U.S. Army Corps of Engineers.


RL #: 105235 - Area 45
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Florence Ct
Gary Ave
Gary Ave
Gary Ct
31st St
32nd St
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Flanagan & Associates, LLC
Planning Consultants
Legend
RL Area Outline
Inlet
Storm Sewer
2015 Parcels
2010 Contours
10 Ft
2 Ft
FLOODWAY
SFHA
TRFP
City Limits
Interstate
US Highway
State Highway
Streets
River/ Stream

Plans, Studies and Documents

The following City of Tulsa and FEMA documents were used in the analysis:

- *Flood Insurance Rate Map*, City of Tulsa, October 16, 2012
- *Regulatory Floodplain Map Atlas*, Tulsa Engineering Services, October 2016
- *2014 City of Tulsa Hazard Mitigation Plan Update*, Flanagan & Assoc., 2014
- City of Tulsa *Stormwater Management Plan*
- Stormwater Design Criteria Manual: Critical Neighborhood Flood Control Projects
- Stormwater Capital Improvements List, City of Tulsa, Engineering Services
- *Joe Creek Flood Survey and Study*, Owen, Mansur & Steele, 1955
- *Joe Creek East and West Branches Master Drainage Plan, Interim Report*, W.R. Holway & Assoc., March 1988
- *Joe Creek East and West Branch Master Drainage Plan, Final Report*, W.R. Holway & Assoc., 1989.
- *Guidebook to Conducting Repetitive Loss Area Analyses*, UNO and FEMA

Capital Improvements Plans

No City of Tulsa Capital Improvements are currently planned that could have a positive impact on the flooding problems in Repetitive Loss Area # 45. There are storm sewer improvement and regional detention facilities on the existing CIPs for the West Branch of Joe Creek along with Master Drainage Plan recommendations, including floodproofing of units in Touche Villa, that are not yet on the CIPs. None are presently funded.

Flood Insurance Data

Four properties in the RLA currently carry flood insurance, including two single-family residences and two single-family duplex condominiums.

Claims Data.

Five flood claims have been made by four different properties in RLA #45 for a total of $22,234—an average of about $4,500 per claim. There was one claim for each year in 1994 ($3,448), 1999 ($2,679), 2000 ($2,068), 2002 ($0), and 2009 ($14,039). The Repetitive Loss Property's claims were in 1994 and 1999. As indicated, the 2002 claim was not paid. Because the Privacy Act of 1974 (5 USC 522a) restricts the release of flood insurance policy and claims data to the public, neither the Repetitive Loss Property nor specific claim data are detailed in this Plan.

Field Surveys and Site Visits

Site visits were conducted during the study, primarily to confirm foundation type and view local on-site overland flow drainage patterns.

Review Drainage Patterns.

The Project Team examined aerial topography maps, master drainage plans, storm sewer plans, City Customer Care Center complaints and comments, and conducted field checks to determine area drainage patterns and identify flood problem areas. The results of the

research and analysis are described in the following paragraphs and summarized in the table below.

Structures

The Project Team has made numerous visits to RLA #45 to determine the situation and condition of the structures. On-site, visual analysis was verified by queries of Tulsa County Assessor data.

Structure Type.

The structures in RLA #45 are seven single-family residences and six multi-family duplexes (comprising 15 addresses), four of which are condominiums.

Foundation Type.

The types of foundations were determined by field investigation and query of Tulsa County Assessor records. The foundations of all multi-family duplexes and condominiums are slab-on-grade, as are two of the single-family residences. Of the other five single-family properties, three have conventional foundations, and two are built on crawl spaces.

Condition of Structures.

The condition of the structures in the RLA was determined by field investigation and a search of the County Assessor's records. The structures are in Average to Very Good condition. These findings are summarized in the following table.

Properties in the RLA

Address	Year Built	Structure Type	Foundation Type	Condition
Property 1	1959	Single-Family	Slab-on-Grade	Average
Property 2	1952	Single-Family	Conventional	Good
Property 3	1951	Single-Family	Crawl Space	Average
Property 4	2010	Single-Family	Slab-on-Grade	Very Good
Property 5	1952	Single-Family	Crawl Space	Average
Property 6	1969	Multi-Family	Slab-on-Grade	Good
Property 7	1968	Multi-Family	Slab-on-Grade	Good +
Property 8	1951	Single-Family	Crawl Space	Good +
Property 9	1969	Multi-Family	Slab-on-Grade	Good
Property 10	1933	Single-Family	Conventional	Good +
Property 11	1968	Multi-Family	Slab-on-Grade	Good
Property 12	1970	Condo	Slab-on-Grade	Very Good
Property 13	1970	Condo	Slab-on-Grade	Very Good
Property 14	1967	Condo	Slab-on-Grade	Average
Property 15	1967	Condo	Slab-on-Grade	Average

Notification

Annual Floodplain Notification. Each year, in March, the City notifies all homeowners and residents living in a 100-year floodplain that their properties are subject to flooding and informs them of what steps they can take to protect their residences, businesses and families, including the purchase of flood insurance.

Annual Repetitive Loss Area Notification. Residents and property owners in Repetitive Loss Area #45 are notified annually that their properties are located in a Repetitive Loss Area, and are potentially subject to flood damage from overland flow and storm sewer backup flooding.

Property Owners/Residents Notification. Property owners and residents/occupants were advised of the Repetitive Loss Area study and analysis by letter, were sent a questionnaire soliciting information and input, and asked to contact the City for more information or a copy of the completed RLA Plan.

Public Participation and Involvement. City Staff/Consultants interviewed homeowners to brief them on the Repetitive Loss Area Analysis Study/Plan, receive their input, and discuss possible mitigation measures.

Property Owner Response to Notifications. There have been five responses from property owners in RLA #45 to the City in recent years concerning flooding: On the north side of E. 31st St., one homeowner stated that the property had flooded four times in the past, but not since the culvert was added beneath S. Florence Ave. On the south side of E. 31st St., two property owners reported that their homes had not flooded since purchase in 2009 and 2011, while two others said their properties had experienced flooding: One had had ¼-inch of water in the house in 2009, and the other had experienced two flood events, one in 1984 and another at a later date when water was only in the yard.

Conclusions

Flooding in RLA #45 has generally been caused by rainfall that exceeds the capacity of the existing storm sewer system, which is designed to carry lower frequency storms—generally less than the 50-year event. When larger storms occur, the sewers overflow and excess runoff finds its way overland, generally following the original creek bed and collecting in valleys and low spots. In places where the creek bed runs along back property lines, overland flow has often been hampered by privacy fences. South of 31st St. the elevation of the 100-year flood is between 719.5 and 723.3 feet. There are five properties in the RLA, all of them duplexes and duplex condominiums, that have their first-finished-floor elevations at between 0.37 to 0.80 feet below the level of the 100-year flood.

The Interim Master Drainage Plan initially recommended the construction of a detention facility in this reach of the West Branch, and new storm sewer parallel to the existing system. However, during public meetings about the Plan local residents and property owners voiced concerns about the impact the proposed facilities would have on the neighborhood's quality of life. Consequently, the Final Plan did not adopt the suggested improvements, other than adding a culvert under Florence Ave. and recommending floodproofing, acquisition, or flood insurance for flood-prone properties south of E. 31st St. It was well understood by property owners and residents that flooding from overland

flow would likely continue to occur whenever rainfall and runoff exceeded the capacity of the local storm sewers.

V. Mitigation Measures

Overview

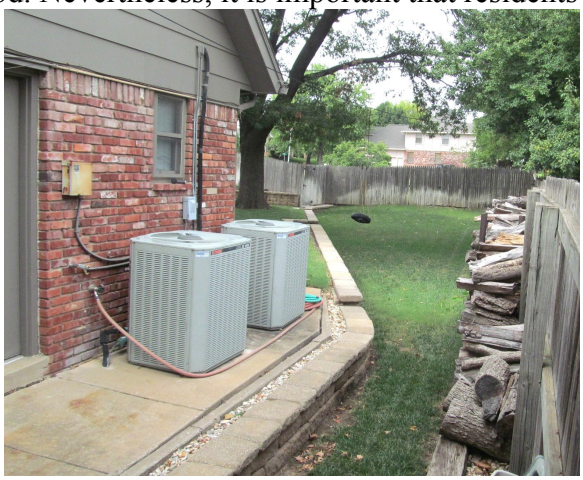
The Master Drainage Plan for Joe Creek identifies the most cost-effective structural solutions (channel improvements, enlarged inlets and storm sewers, stormwater detention ponds) for the area. The Non-Structural Plan identifies buildings where a structural solution is not cost-effective, and acquisition is the recommended solution.

Individual Flood Protection Measures. What You Can Do

Individual property protection actions are usually undertaken by property owners on a lot-by-lot, building-by-building basis, and include private floodproofing, moving mechanical equipment above flood levels, installing French drains and minor site grading to move local drainage to the street, sewer backup protection, and flood insurance. Dry floodproofing is sometimes recommended for commercial structures.

The City of Tulsa is willing to have a stormwater engineer do a site visit to assist you in analyzing your specific drainage problems and discuss potential solutions. Contact the Customer Care Center at (918) 596-7777, or go online to www.cityoftulsa.org/connect/contact-the-city.

Know and Understand Your Flood Risk. As stated above, being located in a Repetitive Loss Area does *not* mean a property will flood. Nevertheless, it is important that residents and property owners in flood hazard areas know and understand their flood risk and take what steps they can to protect their homes, families and possessions. City staff is available to explain the local flood risk, interpret floodplain maps, and determine if an area or property has drainage problems or a history of prior flooding. Staff can also discuss the ways a specific property can be protected from flooding. An Elevation Certificate can help define a property's flood risk under various rainfall scenarios (e.g., in a 10-year, 50-year, 100-year, or 300-year storm). You can receive a free flood zone determination by contacting the City with the correct legal description and street address, or the Tax Assessor/Parcel Number of the property.



This platform and wall protect the home and air conditioning equipment from shallow flooding.

Make a Disaster Preparedness Plan. It is always a good idea for residents and property owners in flood hazard zones to prepare a disaster preparedness and response plan that addresses all the steps and details that will demand attention once a flood watch or warning is issued. A Building Permit is required to install a safe room in a flood-prone area.

Create Berms, Swales or Redirected Drainage. Flood waters can be diverted away from structures using such things as berms, brick planter boxes and swales, but these may not be done in ways that cause damage to other properties. Owners and residents can request a meeting with a City Engineer to discuss the best ways to solve existing drainage problems, and whether a Building Permit would be required. Contact the Customer Care Center at (918) 596-2100. Berms or redirected drainage may be the most feasible solution for areas with flooding due to overland flow, such as RLA #45.

Install Local, Property-Specific Paving, Plantings and Catchment Basins. City Engineering staff can explain the natural functions of floodplains and how they act to slow and purify urban runoff and reduce flooding. Staff can also suggest low-impact development projects which imitate natural floodplain functions by slowing runoff and filtering out impurities. These include such things as rain gardens, catchment basins and pervious paving materials.

Acquisition. The City of Tulsa has a repetitive loss acquisition program to purchase repeatedly flooded properties. This voluntary program offers a way out for property owners who are in this situation. The City applies to FEMA for funds using the Hazard Mitigation Grant Program. Once the grant is awarded, the property is appraised as if it were not a flooded property and the offer for the property is based on this appraisal. In addition to getting the best possible price, the owner receives moving expenses, a $1,000 stipend for purchasing a home outside the floodplain, and a 30-day rent-free period after closing in which to move. All closing costs and other fees are paid by the City. Once the owner has moved out, the home is demolished and the land restored as open space to protect the natural and beneficial function of the floodplain. Property owners who would like more information about this program are encouraged to contact the City's Customer Care Center at (918) 596-7777.

Acquisition is usually not feasible or cost effective for areas of shallow flooding, as in RLA #45. If a property is located in a FEMA Floodway or Special Flood Hazard Area, demolition, acquisition and relocation may be feasible and cost-effective.

Elevate Your Structure. Elevating the structure is only suitable for areas of shallow flooding, and is usually not feasible or cost-effective for masonry homes built on concrete slabs. It can sometimes be cost-effective for wood frame buildings on crawlspaces. None of the structures in RLA #45 is a candidate for elevation.

Dry Floodproof Your Structure. This can include actions that seal a structure and prevent floodwaters from entering. This method is best applied in areas where flood depths are no more than two or three feet. Buildings can be made watertight by sealing the walls with waterproof coatings, impermeable membranes, or additional layers of masonry or concrete. Doors, windows, and other openings below the base flood elevation must also be equipped with permanent or removable shields, and backflow valves must be installed in sewer lines and drains. Dry floodproofing needs to be designed by an engineer to ensure the structure can resist the force of the water.

Wet Floodproof Your Building. Wet floodproofing allows water to enter a structure, while removing, protecting or elevating items that can be damaged, such as air conditioning equipment. This is often used on structures with crawl spaces and shallow

flood depths. The City does not allow basements in flood-prone areas, or the wet floodproofing of basements.

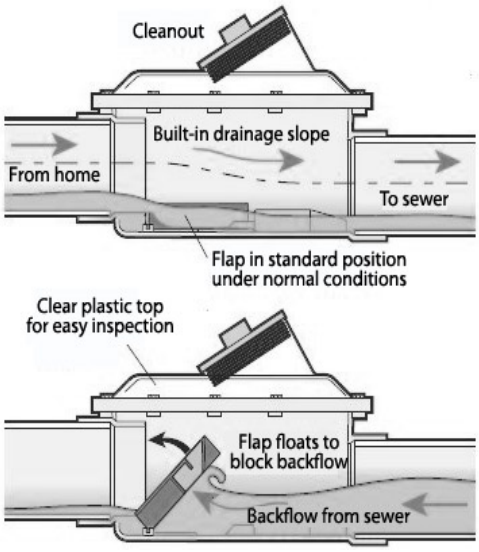
Wet Floodproof Your Garage. The garage, with its slab-on-grade construction, is one of the most vulnerable areas of your home to overland flow flooding. Remove, relocate, elevate, or otherwise protect items that can be damaged from flooding.

Elevate Damage-Prone Components. Critical items such as furnace or air conditioning units. This should be done for components that are in the wet-floodproofed area of the building as well as for units that are outside of the structure but subject to shallow flooding.

Maintain Nearby Streams, Ditches, and Storm Drains. Local flooding can often be caused by brush and other debris blocking drainage ways and culverts. Although this is not at present a major problem for the West Branch of Joe Creek in this reach, in the past debris has blocked bar ditches, storm sewer inlets and overland flow across properties in RLA #45. Residents and property owners should do their part in keeping inlets and drainage ways—including the swales of the old stream bed—clear of brush and debris Don't attempt to clear debris during a flood event.

Correct Sanitary Sewer Backup Problems. Sanitary sewer backup can be a problem in low-lying, flood-prone areas like RLA #45. The installation of backflow prevention valves on sanitary sewer lines is recommended.

Purchase and Maintain Flood Insurance. Flood Insurance is available and recommended for the structure and contents for all properties in Tulsa. A large percentage of all flood insurance claims are for properties that are outside the FEMA floodplain. Because of the City of Tulsa's sustained efforts to reduce flooding, you are entitled to a discount on your flood insurance. A property does not have to be in a floodplain to qualify for flood insurance.



Sewer backflow prevention valves are essential components for homes in low-lying, flood-prone areas.

Repetitive Loss Area Mitigation Measures: What the City Can Do

The City of Tulsa is actively committed to the following floodplain management activities:

- Preventative activities to keep flood problems from getting worse.
- Natural resource protection activities to preserve or restore natural areas or the natural functions of floodplain and watershed areas.
- Emergency services measures taken during an emergency to minimize its impact.
- Structural projects to keep flood waters away from properties.

- Public information activities to advise property owners, potential property owners, and visitors about flood hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains.

As funding becomes available for this Repetitive Loss Area, the City will undertake a more detailed Mini-Master Drainage Plan to identify alternative solutions to the flooding problems and recommend a public works project. The actual construction of any public works project may require the acquisition of properties and/or drainage easements. The City will continue to fulfill its maintenance responsibility for channels, drainageways, and storm sewer inlets and pipes. At this time, the City has identified the following actions which are appropriate for RLA #45.

- Extend and/or improve the storm sewer system to better collect storm water runoff.
- Create overland flow path to allow better drainage of ponded water to the Creek.
- Acquire flood prone properties on a voluntary basis.

VI. Funding

Due to the nature of the flooding problems and the localized, minor damages involved in RLA #45, the funding of needed individual improvements will have to be borne by the homeowner. The City will investigate the availability of funding for the public works actions listed above. Funding for ongoing City maintenance responsibilities is provided by the Stormwater Utility Fee. Funding for a public works project in this RLA is dependent of several factors, including the prioritized ranking of the project with other Capital Improvement projects, inclusion in future street maintenance projects, being part of a Bond Issue project, etc. The City will investigate the possibility of increasing the storm sewer capacity with any future street projects in the area. Another potential funding source is FEMA's Hazard Mitigation Grant Program (HMGP), which can be implemented after a Presidential Major Disaster Declaration in the State.

VII. Conclusions and Recommendations

RLA #45 is situated in the original floodplain of the West Branch of Upper Joe Creek, generally between S. Florence Ave. and S. Gary Ave., on the north and south sides of E. 31st St. On the north side of 31st St. the stream has been impounded to form Lakewood Lake, while to the south the land has been filled and the stream carried in storm sewers. Properties in the RLA have been flooded in 1976, 1984, 1994, 1999, 2000, 2002, 2007 and 2009. The causes of flooding have largely been due to under-sized storm sewers and overland flow along the gentle, shallow swales of the old stream bed. The sewers were designed to carry 50-year rainfall events and are incapable of handling storms like the 300-year flood of May 27, 1984, which resulted in overland flow along streets and across yards and parking lots. The subsequent enlargement of the culvert beneath Florence Ave. has solved backup flooding on the north side of E. 31st St., although overland flow from the west across the parking lot of John Knox Presbyterian Church continues to inundate the back yards of several properties along S. Florence Ave. On the south side of E. 31st St. the gentle swale of the old channel passes through the Touche Villas addition, where a number of slab-on-grade duplexes and duplex condominiums have their first-finished-floor elevations at between 0.37 and 0.80 feet below the level of the 100-year flood. Residents in the neighborhood rejected the recommendation of the Interim Master Drainage Plan for the West Branch that called for the acquisition and removal of a

number of these low-lying, slab-on-grade properties and the installation of a detention facility. Consequently, the only options for flood reduction in RLA #45 are acquisition, floodproofing, and flood insurance. Since the storm sewers in the area are only capable of handling a 50-year flood event, future flooding is certain.

Homeowners are encouraged to maintain flood insurance. The City of Tulsa is a Community Rating System (CRS) Class II Community, and all homeowners qualify for up to a 40% discount on their flood insurance premiums. Homeowners are also encouraged to undertake individual mitigation measures to reduce their risk of overland flooding. The City of Tulsa is ready to assist in this effort with advice.