# Repetitive Loss Area # 20

## Joe Creek

## E. 58th St. & S. Birmingham Ave. Area

August 17, 2017

Flanagan & Associates, LLC
Planning Consultants

SWIFT WATER RESOURCES ENGINEERING, LLC
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Bill Robison, P.E., CFM
Engineering Services

CITY OF Tulsa
A New Kind of Energy.

**ENGINEERING SERVICES**

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 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 a 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.

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

The City of Tulsa Repetitive Loss Area Analysis Plans were developed by Engineering Services with local funding from the City of Tulsa in compliance with the Federal Emergency Management Agency's Community Rating System's requirements. Numerous agencies, departments, organizations and individuals participated in these studies, including:

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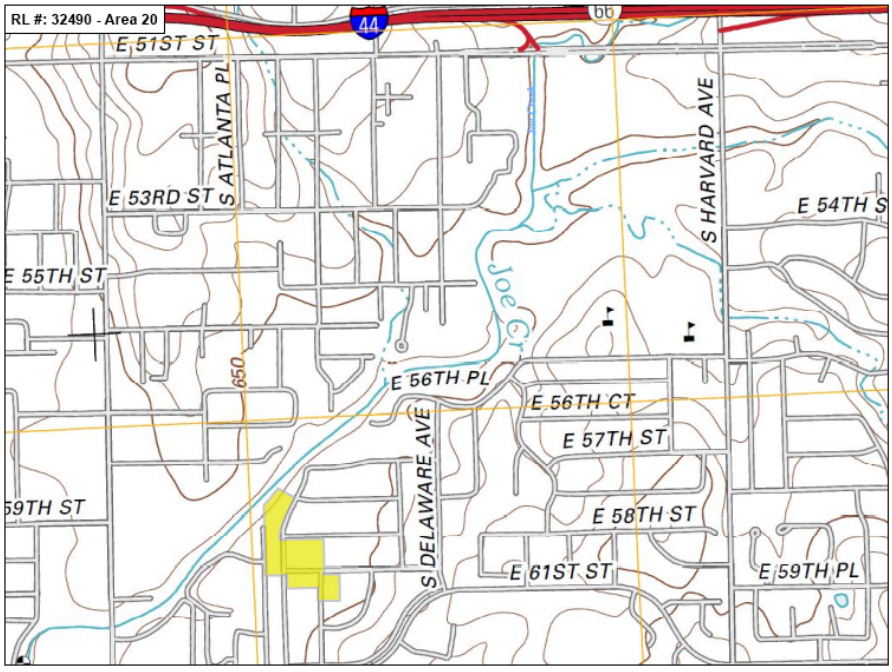
# Repetitive Loss Area # 20

## Joe Creek
## E. 58th St. & S. Columbia Ave. Area

**Overview**

Repetitive Loss Area (RLA) #20 is located on the southeast bank of Joe Creek, along S. Birmingham Ave. and S. Birmingham Pl., and from E. 57th Pl. south to just beyond E. 59th St., as shown in the map below. There are 15 single-family residences and one repetitive loss property in the RLA, all of them in the original Joe Creek floodplain. The homes were constructed from 1956 through 1959, with a more recent home built in 1973. All are upscale, ranch-style, masonry brick structures in very good condition. Between 1979 and 1993 storm sewer backup and overland flow in the neighborhood generated five claims totaling $20,800. The individual claims were for $5,055 (1979), $518 (1980), $6,567 (1984), $2,000 (1984) and 6,660 (1994). Four of the claims (those for 1979, 1980, 1984 and 1994) were for a single residence—the local repetitive loss property. This structure is slab-on-grade on relatively flat ground with essentially 0 inches of elevation and inadequate storm sewer capacity in the immediate area. The other property in RLA 20 with a flood claim is also slab-on-grade. Since channel modifications were completed by the US Army Corps of Engineers in the 1980s, the only recent reported overbank flooding along Joe Creek was in 1984. The channelization project removed this area from FEMA's Special Flood Hazard Area (SFHA) and the City of Tulsa's Regulatory Floodplain (TRFP). What flooding remains is due to sewer backup, inadequate drainage in the generally level terrain, and homeowner landscape modifications.




**RLA #20 is located on the southeast side of Joe Creek, along S. Birmingham Ave. and S. Birmingham Pl., from E. 57th Pl. south to just beyond E. 59th St.**

A more detailed aerial photo/topography map is presented on page 5. The detailed map identifies residential properties, County Assessor parcels, floodplains and the existing storm sewers and inlets 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 to reduce 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 in finding 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 the RLA, 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 has been 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 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.

The more detailed location of RLA #20 is shown on the aerial photo/topography map on the next page. The map identifies residential properties, County Assessor parcels, floodplains, the existing storm sewers and inlets systems.

## 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 (East and West 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 branches have been channelized through much of their lengths.

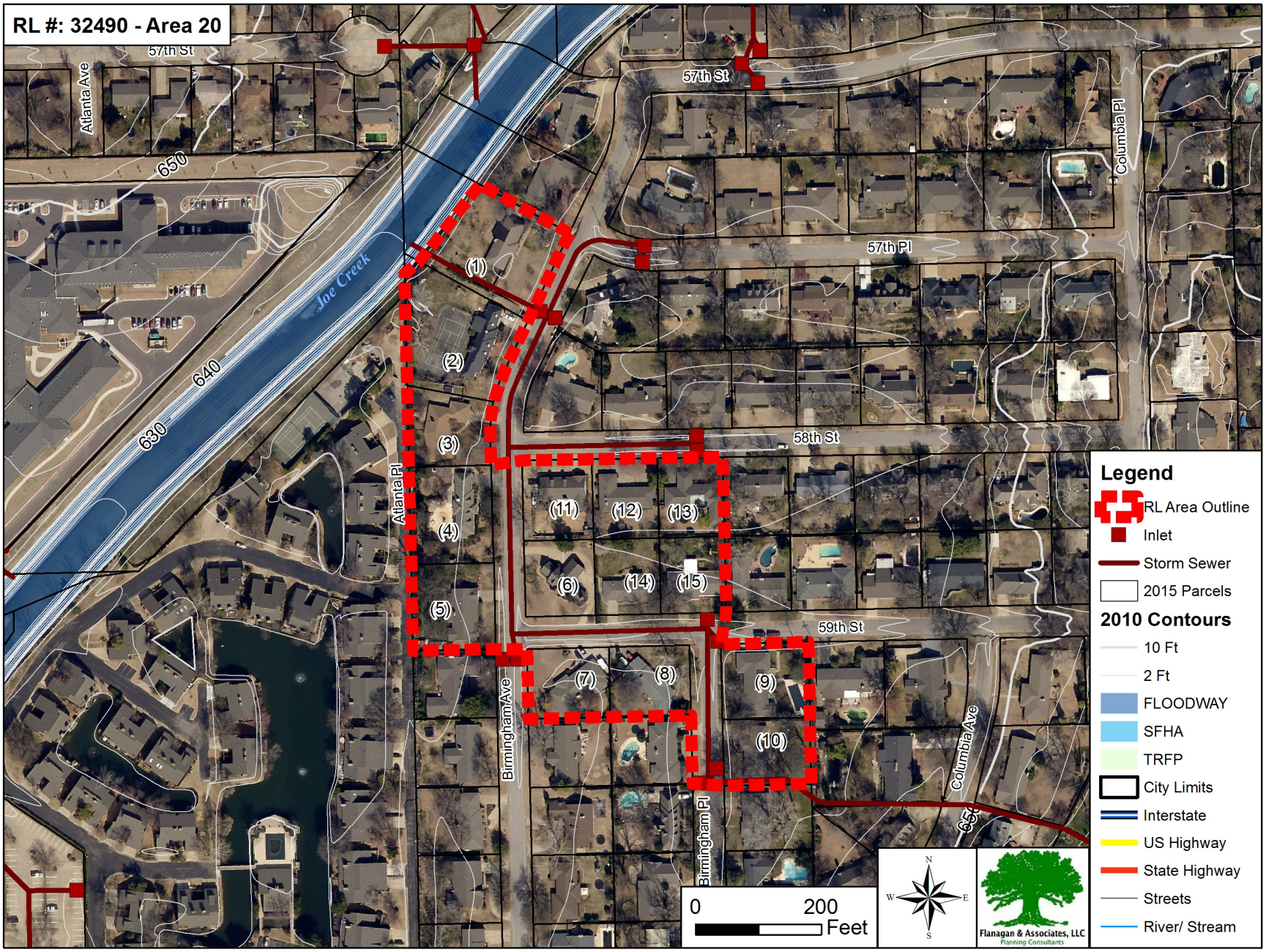
Located at about E. 58th St. and S. Birmingham Ave., RLA #20 is 2.7 miles above the creek's junction with the Arkansas River, and 2,000 ft. northeast of the Lewis Avenue Joe Creek bridge. The 15 residences that make up the RLA are all on the southeast side of the stream, along S. Birmingham Ave. and S. Birmingham Pl., from E. 57th Pl. south to E. 59th St. The residences are situated in the Joe Creek alluvial floodplain at between 646 and 650 ft. elevation. The terrain is generally flat and some of the properties have been subject to shallow street and overland drainage flooding during very heavy rains.

**Joe Creek channelization near E. 57th Pl. and Birmingham Ave.**

## III. History

### *Development*

The homes in RLA #20 were constructed between 1956 and 1959 (with a final home built in 1973), before any channelization improvements had been made along Joe Creek. In its lower reaches, the creek used to meander through soft, loamy soils and often shifted channels by as much as 1,000 feet, undermining trees, which would then topple into the creek and block flows during heavy downpours.


RL #: 32490 - Area 20
57th St
Atlanta Ave
650
640
630
Joe Creek
57th St
Columbia Pl
57th Pl
(1)
(2)
(3)
58th St
Atlanta Pl
(4)
(5)
(11)
(12)
(13)
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(10)
Birmingham Ave
Birmingham Pl
Columbia Ave
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
0
200
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### *Flooding*

There was 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) and May 7, 1993. According to newspaper reports, flooding was particularly bad on Joe Creek in 1974 and 1976, although not necessarily along this reach. The floods that resulted in the five damage claims in RLA #20 totaling $20,800 occurred in July 1979, May 1980, June 1980, May 1984, and July 1994.

### *Improvements*

Subsequent improvements to the Joe Creek channel by the City and the US Army Corps of Engineers between 1978 and 1981 largely solved the riverine flooding problems, and removed this stretch of Joe Creek from both FEMA's SFHA and the City's Regulatory Floodplain. The City also enlarged the storm sewer system within the basin, from 55$^{th}$ and Delaware to 38$^{th}$ and Sandusky, to solve chronic storm sewer backup problems at numerous locations during times of heavy rainfall. Nevertheless, there has been some continued localized flooding due to individual residential landscaping and drainage patterns in the generally level terrain.

## IV. Research and Analysis

The analysis of Repetitive Loss Area #20 was conducted by the Project Team through interviews with City officials, research into Engineering Services and Stormwater Drainage files, including the Joe Creek Master Drainage Plan, 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 the residences 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.

***Plans, Studies and Documents***

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

- FEMA Flood Map 40143C0358L
- *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
- *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 # 16. There are storm sewer improvement and regional detention facilities on the existing CIPs for Little Joe Creek along with Master Drainage Plan recommendations that are not yet on the CIPs. None are presently funded.

***Flood Insurance Data***

Five of the 15 properties in the RLA have carried flood insurance. One property has made four damage claims to the NFIP and another property has made one claim. 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.

***Claims Data.***

Two properties in RLA #20 have made five flood damage claims—in 1979, 1980, two in 1984, and 1993, and received total payments of $20,800. Four of the claims were for a single property (i.e., the Repetitive Loss Property).

***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 flooding 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 made a number of visits to RLA #20 to determine the situation and condition of the structures. Visual analysis was verified by queries of Tulsa County Assessor data.

### *Structure Type.*

The structures in RLA #20 are all single-family residences.

### *Foundation Type.*

The type of foundation was determined by field investigation and query of Tulsa County Assessor records. Of the 15 residences, 10 had crawl spaces and five were slab-on-grade.

### *Condition of Structures.*

The condition of the residences in the RLA was determined by field investigation and the County Assessor's records. The structures were all considered to be in Very Good or Good+ condition, with only one house receiving simply a Good rating. These findings are summarized in the following table.

**Since the completion of channel improvements along Joe Creek in the 1980's, the causes of flooding have been largely due to the level terrain, surface drainage issues, and slab-on-grade foundations.**

**Properties in the RLA**

| Address | Structure Type | Foundation Type | Year Built | Condition |
|---|---|---|---|---|
| Property 1 | Residential | Crawl Space | 1959 | Very Good |
| Property 2 | Residential | Crawl Space | 1959 | Good + |

| Address | Structure Type | Foundation Type | Year Built | Condition |
|---|---|---|---|---|
| Property 3 | Residential | Slab | 1958 | Very Good |
| Property 4 | Residential | Crawl Space | 1958 | Good + |
| Property 5 | Residential | Crawl Space | 1958 | Very Good |
| Property 6 | Residential | Crawl Space | 1957 | Very Good |
| Property 7 | Residential | Crawl Space | 1959 | Very Good |
| Property 8 | Residential | Slab | 1959 | Very Good |
| Property 9 | Residential | Crawl Space | 1959 | Very Good |
| Property 10 | Residential | Slab | 1959 | Very Good |
| Property 11 | Residential | Crawl Space | 1973 | Very Good |
| Property 12 | Residential | Crawl Space | 1957 | Very Good |
| Property 13 | Residential | Crawl Space | 1957 | Very Good |
| Property 14 | Residential | Slab | 1957 | Good |
| Property 15 | Residential | Slab | 1956 | Very Good |

### *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 and families, including the purchase of flood insurance.

**Annual Repetitive Loss Area Notification.** Residents in Repetitive Loss Area #20 are notified annually that their homes are located in a Repetitive Loss Area, and are potentially subject to flood damage from overland flow and storm sewer back-up.

**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.** The single repetitive loss property in RLA #20 is a slab-on-grade structure that received flood damage on four occasions from overland flow and storm sewer backup. A nearby neighbor has complained to the City on several occasions (1997, 1999 and 2003) of water being in the yard from street runoff and storm sewer backup. Several streets drain to the storm sewer inlet in front of the property, and the drain is not able to handle the runoff. There have been no reports concerning overbank flooding from Joe Creek itself.

### *Conclusions*

Since the construction of Joe Creek channel improvements in the 1980s, flooding is this area has largely been due to surface flow and local drainage issues. Based on flood data, site surveys and feedback from residents and homeowners, the causes of the drainage problems are the flat topography of the former floodplain area, the slab-on-grade

construction of some of the homes, local landscaping, and occasional storm sewer backup. The five NFIP claims that have been paid average about $4,000 each, with four of the claims coming from the one Repetitive Loss structure.

## V. Mitigation Measures

### *Overview*

The Master Drainage Plan for this reach of the 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. There are presently no funded Capital Improvement Projects for future flood control projects in this area. The *Joe Creek Master Drainage Plan* is in the process of being updated, and additional structural and non-structural solutions may be identified.

### *Individual Mitigation 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, sanitary sewer backup protection, and flood insurance.

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 properties using 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 will be required. Contact the Customer Care Center at (918) 596-2100.This may be the most feasible solution for areas with flooding due to overland flow in RLA #20.

**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 owners who are in this situation have a way out. 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 restored as open space to protect the natural and beneficial function of the floodplain. If you would like more information about this program contact the Customer Care Center at (918) 596-7777.

Acquisition is usually not feasible or cost effective for areas of shallow flooding, as in RLA #20. 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 homes in RLA #20 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 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.

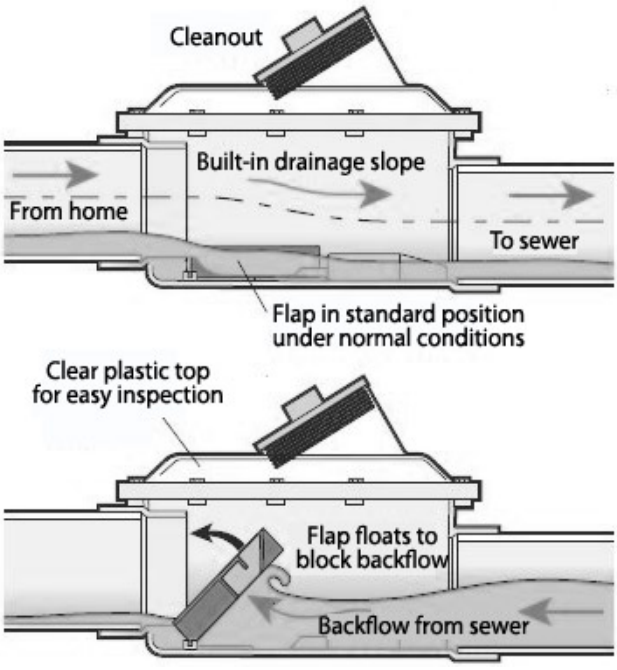
**Wet Floodproof Your Garage.** The garage, with its slab-on-grade construction, is one of the most vulnerable areas of your home to overland flow flooding. Remove, relocate, protect or elevate items that can be damaged from flooding.

**Elevate Damage-Prone Components.** Critical items such as furnace or air conditioning units, should be elevated to avoid flood damage. 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 a major problem for Joe Creek itself, debris can block bar ditches and storm sewer inlets and must be kept free of debris. Residents and property owners should do their part in keeping inlets and drainage ways clear of brush and debris. Do not 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 #20. The installation of backflow prevention valves on your sanitary sewer lines is highly 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 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 the 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 may be appropriate for RLA #20.

- 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.
- Create berms or swales to direct runoff away from residential properties.
- 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 #20, the funding of needed improvements will have to be borne by the individual 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 project in a Bond Issue, 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

Due to the improved channel of Lower Joe Creek from Harvard Ave. to the Arkansas River, overbank flooding is no longer a major problem along this reach of the stream. Nevertheless, low-lying areas along the channel are always subject to potential flooding from overland flow and occasional storm sewer backup.

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 professional advice.