Repetitive Loss Area # 12

Fred Creek
E. 72nd St. & S. Indianapolis 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 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.

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 # 12

Fred Creek
E. 72nd St. & S. Indianapolis Ave. Area

Overview

Repetitive Loss Area (RLA) #12 is comprised of 15 properties in the Sherrelwood South and Pebble Creek additions. The neighborhood is situated in the upper reach of Fred Creek, at the junction of the West Tributary with Fred Creek mainstem, about 1 mile above the Oral Roberts University campus and 2.75 miles above Fred Creek's junction with the Arkansas River. The RLA is located along S. Indianapolis and Jamestown Aves., between E. 71st Pl. and E. 73rd St., and contains four upscale single-family residential duplexes and eleven upscale multifamily units. The properties are one- and two-story, ranch-style, slab-on-grade structures built between 1973 and 1998, currently in Average to Good condition. The 100-year flood elevation at this location is between 684 and 688 feet, while the properties are at between the 684 and 690 elevation contours. The *Fred Creek Master Drainage Plan* determined that one structure in the RLA (not the Repetitive Loss Property) was below the 100-year flood level. One residence in the RLA (the Repetitive Loss structure) has made five paid flood damage claims—in 1979, 1980, 1982, 1984 and 1986—for a total of $11,493. The claims averaged about $2,300. According to the owner of the property, damage has been due to water from the Pebble Creek Addition draining to the west down the 72nd St. cul de sac and into the rear of the property, flooding the duplex. Three other properties in the RLA have made four additional claims in 1979, 1980, 1982 and 1994, none of which was approved. There have been no claims or reported flooding in this neighborhood since 1994.

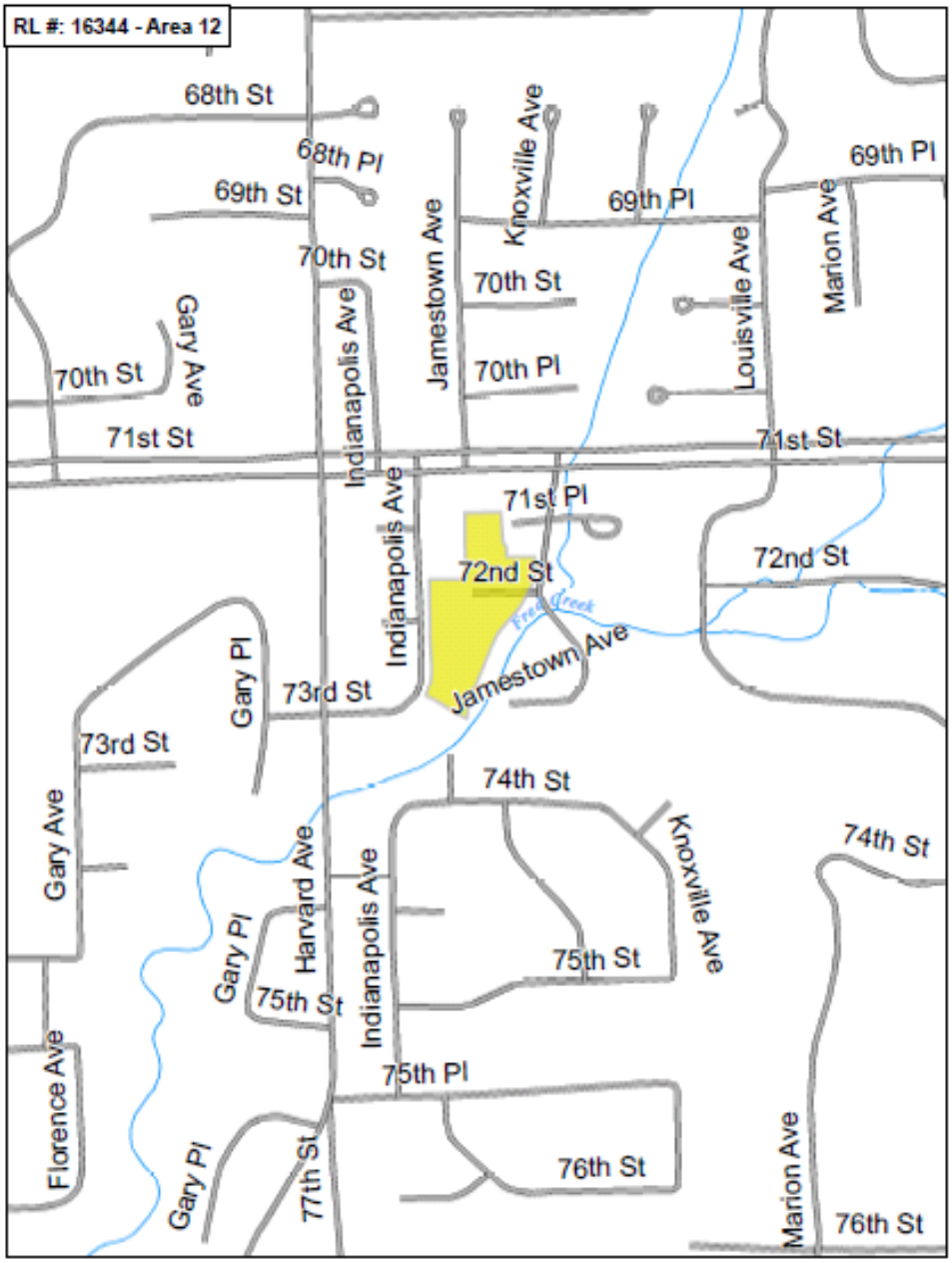
Fred Creek's West Tributary flows in an open channel from north to south beginning about E. 66th St. and S. Marion Ave. to join the Fred Creek mainstem at about E. 72nd and S. Jamestown Ave. The Fred Creek mainstem flows generally from east to west, beginning at the detention facility at E. 72nd St. and S. Urbana Ave., to join the West Branch at 72nd and Jamestown, before continuing southwest across the ORU campus to the Arkansas River.

The general location of RLA #12 is shown on the map on Page 2 and on the more detailed photo/topography map on Page 4. The detailed map identifies residential properties, County Assessor parcels, floodplains and the existing storm sewers 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, Joe and Fred 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.



RLA #12 is located at the junction of the West Tributary with Fred Creek mainstem at about E. 72nd St. and S. Jamestown Ave.

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.

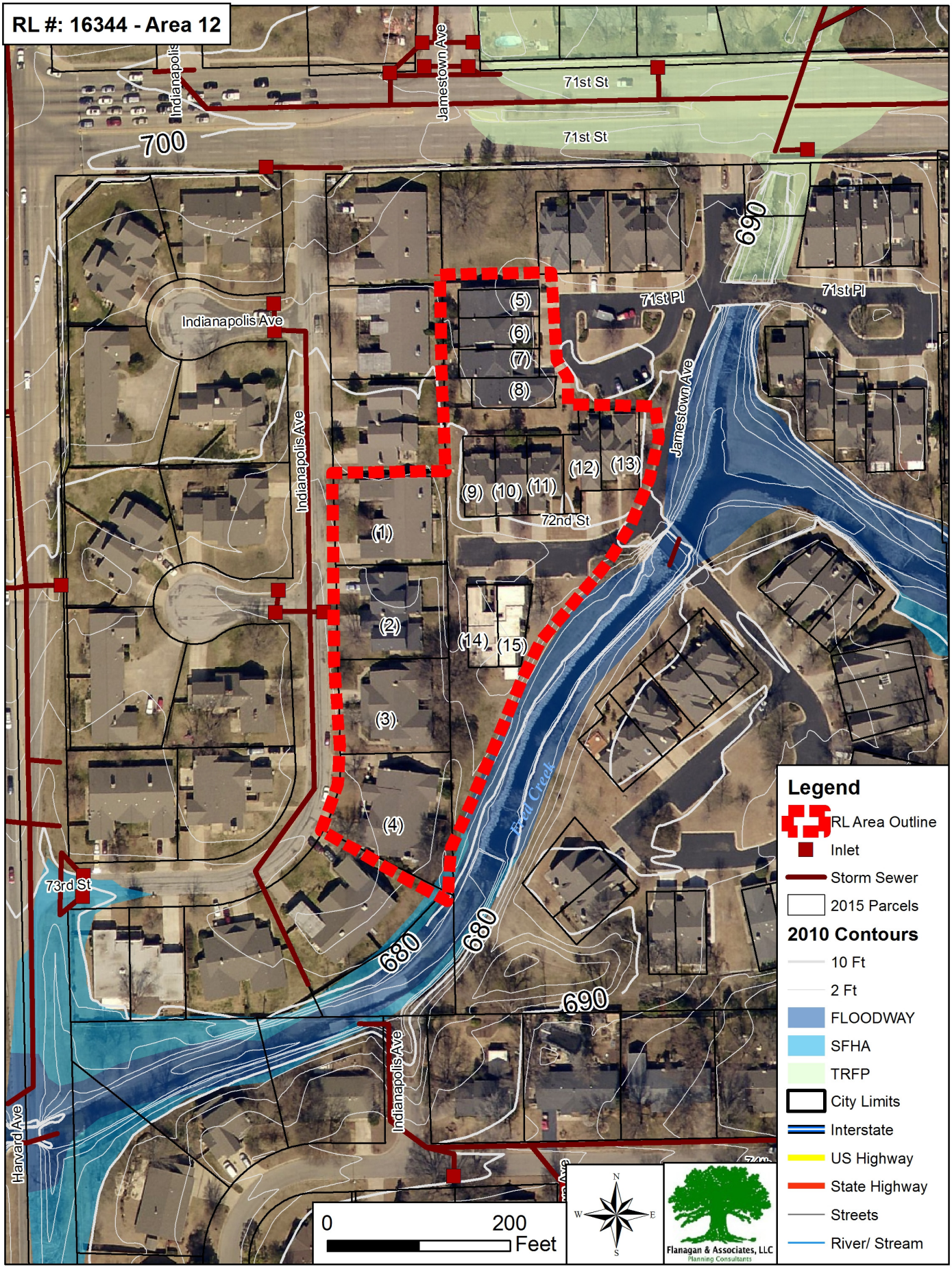
For its part, the NFIP is continually faced with the job of paying claims while trying to keep the price of flood insurance at an affordable level. Properties that flood repeatedly—known as "repetitive loss properties," have been a particular problem for the program: Although they make up only 1 percent of insured properties, they account for one-third of all claims payments (about $200 million per 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 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.

West Tributary looking south from 71st Pl. to 72nd St.
Fred Creek mainstem is in the distance, just before the 72nd St. bridge.

It is important to note that most of the homes in an RLA—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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Planning Consultants
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2010 Contours
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2 Ft
FLOODWAY
SFHA
TRFP
City Limits
Interstate
US Highway
State Highway
Streets
River/ Stream

neighbor's property into a low-lying, slab-on-grade home or garage. The location of RLA #12 is shown on the aerial photo/topography map on page 4, above. The map identifies residential properties, County Assessor parcels, floodplains and the existing storm drainage system.

II. Location

The Fred Creek is a 4.5-mile-long, left-bank tributary to the Arkansas River that drains 3.76-square-miles of southeast Tulsa. The creek rises in five principal branches at about the 750-ft. contour in the south Tulsa hills, near E. 69th St. and S. Columbia Ave., E. 67th and S. Florence Ave., E. 66th and S. Marion Ave., E. 68th and S. Yale Ave., and E. 73rd and Yale Ave. The stream flows generally to the south and west through fully developed neighborhoods and across the campus of Oral Roberts University, to join the Arkansas River at about E. 83rd and Riverside Dr. The creek has been channelized through much of its lower reaches. Four former tributaries of Joe Creek have been rerouted to join Fred Creek near E. 78th and S. Lewis Ave., and Fred Creek's mainstem itself has been re-channeled to meet the Arkansas River at E. 83rd St., rather than following its original course to join the river near E. 91st St. and Riverside Dr.

Repetitive Loss Area #12 is located on the west bank of Fred Creek's West Tributary, along S. Jamestown and Indianapolis Aves., between E. 71st Pl. and E. 73nd St. The RLA is at the junction of the West Tributary with the mainstem, about 2.75 miles above where the stream joins the Arkansas River. The 100-year flood elevations at this point are between 684 and 688 ft., with the properties of the RLA situated at between 684 and 690 ft. elevation, with all but one structure situated above the 100-year flood hazard area.

III. History

Development

The 15 properties in RLA #12 were developed between 1973 and 1998 as parts of the Pebble Creek and Sherrelwood South additions. The Pebble Creek structures are all upscale multifamily residences and the Sherrelwood South homes are upscale single-family duplexes. All structures are built on slab foundations and are in Average to Good condition. The West Tributary of Fred Creek emerges from beneath E. 71st St. and flows south through an open channel on the east side of Jamestown Ave., passing under bridges at E. 71st Pl. and E. 72nd St. The two streams have been attractively channelized through this neighborhood with grass-lined and carefully constructed riprap banks. Additional curbing, storm drains and piping were installed at the west end of 72nd St. to prevent flooding of the Repetitive Loss Property.

Looking north from E. 72nd St. Fred Creek mainstem (on the right) joins the West Branch just north of E. 72nd St. bridge.

Flooding

Flood damage in the RLA has primarily been the result of overland flow west along E. 72nd St. and into the backyards and duplexes in Sherrelwood South that face S. Indianapolis Ave. One property in the RLA (not the Repetitive Loss property) was determined to be about one foot below the level of the 100-year flood. The Repetitive Loss Property is in a shallow swale that at one time appears to have drained runoff from the north to the southwest to join Fred Creek at about where the Harvard Branch now merges into the stream. Flooding appears to have been caused by overland flow down the 72nd St. cul de sac into this low area. The flooding events that resulted in the five paid claims totaling $11,493 occurred on June 20, 1979, June 17, 1980, May 18, 1982, May 27, 1984 and September 29, 1986. Three other properties made four flood damage claims that were not approved for rainfall events in 1979, 1980, 1982 and 1994. When the multi-family units were constructed on the north side of E. 72nd Ave. in the late 1990s, additional curbing and storm sewer inlets were put in place at the end of the cul de sac.

Improvements

The first homes in the RLA were the duplexes in Sherrelwood South along the east side of Indianapolis Ave., all of which were constructed in 1973. The first homes in Pebble Creek were built at the west end of the 71st Pl. and 72nd St. cul de sacs in 1979 and 1980. Other homes followed in 1997 and 1998. The channel of Fred Creek and West Tributary were improved from a point approximately 500 ft. east of Harvard Ave. to the confluence with the West Tributary and north to 71st. St. to accommodate the construction of townhomes in the Pebble Creek development.

As stated above, all but one property in RLA #12 is situated above the 100-year floodplain. The exception is the southernmost duplex residence, which was determined to be 1.1 feet below the SFHA. The Fred Creek and West Tributary channels were improved with drop structures during the construction of the Pebble Creek Addition, and those banks subject to erosion fortified with carefully constructed riprap. The culvert beneath Harvard Ave. was enlarged with three 12-ft. by 10-ft. RCBs, and the City of Tulsa added a storm sewer inlet at the bottom of the 72nd St. cul de sac, behind the Repetitive Loss Property. These measures appear to have been effective in reducing, if not eliminating, flooding in the RLA.

The mainstem of Fred Creek flows through manicured grass-lined banks into the West Tributary between E. 71st Pl. and E. 72nd Ave.

IV. Research and Analysis

The analysis of Repetitive Loss Area #12 was conducted by the Project Team through interviews with City officials, research into Engineering Services and Stormwater Drainage files, including the Fred 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. The Repetitive Loss Property in RLA #12 is an upscale slab-on-grade duplex that was damaged on five occasions from overland flow from the Pebble Creek Addition and into the rear of the property, which fronts onto Indianapolis Ave. and backs onto the 72nd St. cul de sac.

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:

- *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
- *Fred Creek Master Drainage Plan, Interim Report*, September 1987
- *Fred Creek Master Drainage Study, Final Report*, August 1988
- *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 # 12. There are storm sewer improvement and regional detention facilities on the existing CIPs for Fred Creek along with Master Drainage Plan recommendations that are not yet on the CIPs. None are presently funded.

Flood Insurance Data

Three properties in the RLA currently carry flood insurance. 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-property claim data are detailed in this Plan.

Claims Data.

One residence in the RLA (the Repetitive Loss structure) has made five paid flood damage claims—in 1979, 1980, 1982, 1984 and 1986—for a total of $11,493. Three other properties in the RLA have made four additional claims in 1979, 1980, 1982 and 1994, none of which was paid. There have been no claims or reported flooding in this neighborhood since 1994.

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 several visits to RLA #12 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 #12 are all upscale, multi-family and single-family duplex residences.

Foundation Type.

The type of foundation was determined by field investigation and query of Tulsa County Assessor records. All residences in RLA #12 are built on slab-on-grade foundations.

Condition of Structures.

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

Properties in the RLA

Address	Structure Type	Foundation Type	Year Built	Condition
Property 1	Single Family Res. Duplex	Slab	1973	Good
Property 2	Single Family Res. Duplex	Slab	1973	Good
Property 3	Single Family Res. Duplex	Slab	1973	Average
Property 4	Single Family Res. Duplex	Slab	1973	Good
Property 5	Single Family Res. MD*	Slab	1979	Good
Property 6	Single Family Res. MD*	Slab	1979	Good
Property 7	Single Family Res. MD*	Slab	1979	Good
Property 8	Single Family Res. MD*	Slab	1979	Average
Property 9	Single Family Res. MD*	Slab	1997	Good
Property 10	Single Family Res. MD*	Slab	1997	Average
Property 11	Single Family Res. MD*	Slab	1997	Average
Property 12	Single Family Res. MD*	Slab	1998	Good
Property 13	Single Family Res. MD*	Slab	1998	Good
Property 14	Single Family Res. MD*	Slab	1980	Average
Property 15	Single Family Res. MD*	Slab	1980	Average

** Indicates Medium Density Single Family structure*

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 #12 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. There have been seven comments concerning flooding from property owners in response to notification. All seven state that

there has been no flooding since the purchase of their properties in 1998, 2000, 2003 and 2007. The owner of the Repetitive Loss Property (purchased in 2007) said there has been no flooding since purchase, and what flooding had previously occurred was due to runoff from Pebble Creek Addition. Another respondent stated that all properties in Pebble Creek should be removed from the RLA, as any remaining flooding problems are only in Sherrelwood South.

Conclusions

Repetitive Loss Area #12 is located along S. Indianapolis and Jamestown Aves., between E. 71st Pl. and E. 73rd St., and contains four upscale single-family residential duplexes in Sherrelwood South Addition and eleven upscale multifamily units in the Pebble Creek Addition. The properties are one- and two-story, ranch-style, slab-on-grade structures built between 1973 and 1998, currently in Average to Good condition. Only one property in the RLA (the southernmost duplex in Sherrelwood South) was determined to be below the level of the 100-year flood. One residence in the RLA (the Repetitive Loss structure) has made five paid flood damage claims—in 1979, 1980, 1982, 1984 and 1986. According to the owner of the Repetitive Loss Property, all flood damage has been due to overland flow, with water from the Pebble Creek Addition draining to the west down the cul de sac of E. 72nd St. into the rear of the property, flooding the duplex. Three other properties in the RLA have made four additional claims, none of which was approved or paid. Along with the construction of additional units in Pebble Creek in the late 1990s, curbing and a larger storm sewer inlet were installed at the base of the 72nd St. cul de sac. These measures appear to have significantly limited, if not eliminated, flooding in the RLA. There have been no claims or reported flooding in the neighborhood since 1994.

V. Mitigation Measures

Overview

The Master Drainage Plan for this reach of the West Tributary identifies the most cost-effective structural solutions, while the Non-Structural Plan identifies buildings where structural measures are not cost-effective, and acquisition is the recommended solution. As noted above, all flooding events have been the result of overland flow to the west from the Pebble Creek Addition following the 72nd St. cul de sac into a gentle swale of what was apparently a former drainage way. Only one property in the RLA is below the level of the 100-year flood. The addition of a storm sewer inlet at the base of E. 72nd St. has significantly reduced, if not eliminated, flooding of the Repetitive Loss Property. No additional changes were recommended for this reach in the *Fred Creek Master Drainage Plan*, as a number of improvements had already been put in place during the construction of the Pebble Creek Addition in the late 1990s.

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.

Make a Disaster Preparedness Plan. It is always a good idea for people living in flood hazard zones to have 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 residences 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 is the most feasible solution for areas with flooding due to overland flow, as in RLA #12.

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.

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

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 #12. 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 #12 is a candidate for elevation.

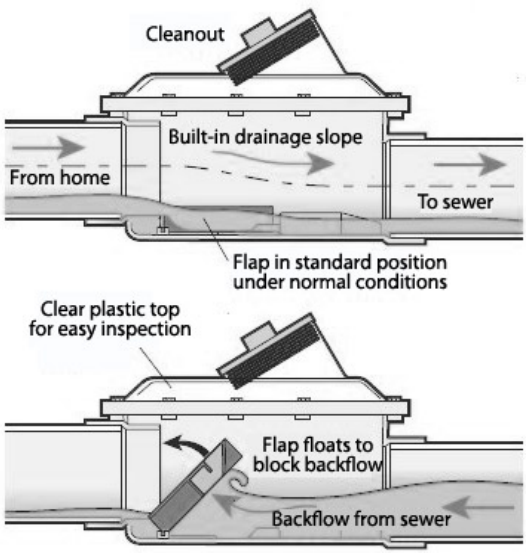
Dry Floodproof Your Structure. This can include actions that seal a structure and prevent floodwaters from entering. This method is best in areas where flood depths are no more than two or three feet. Buildings can be made watertight by sealing the walls with waterproof coatings, impermeable membranes, 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 sanitary sewer lines and drains. Dry floodproofing needs to be designed by an engineer to einsure 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, 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. Channel blocking by limbs, grass cuttings and other debris in the largely natural



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

course of the West Tributary through RLA #12 could contribute to future flooding. The channel must be regularly inspected and kept free of blockage. . 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. Sewer backup can be a problem in low-lying, flood-prone areas like RLA #12. The installation of backflow prevention valves in 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 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.

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 #12.

- 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.
- Create berms or swales to direct runoff away from residential properties.
- Improve conveyance of Creek to mitigate overbank flooding.

VI. Funding

Due to the nature of the flooding problems and the localized, minor damages involved in RLA #12, the funding of needed improvements will have to be borne by the individual homeowner.

VII. Conclusions and Recommendations

The channel of Fred Creek and West Tributary were improved from a point approximately 500 ft. east of Harvard Ave. to the confluence with the West Tributary and north to 71st. St. during the construction of townhomes in the Pebble Creek development. The channels of Fred Creek and West Tributary were improved with drop structures, and those banks subject to erosion were fortified with riprap. The culvert beneath Harvard Ave. was enlarged with three 12-ft. by 10-ft. RCBs. The City of Tulsa has added a storm sewer inlet at the bottom of the 72nd St. cul de sac, immediately behind the Repetitive Loss Property. These measures have largely eliminated flooding in RLA #12. Residents and homeowners stated, in response to inquires by the City, that their homes had not flooded since purchase, and that there has been no flooding in the Pebble Creek Addition in any case. (In actuality, there had been two claims from Pebble Creek, neigher of which was approved.) The flood damage to homes in Sherrelwood South appears to have been the result of runoff from Pebble Creek. The addition of an enlarged culvert, curbing and storm sewer at the base of E. 72nd St. may well have eliminated flooding in the Sherrelwood South section of the RLA. Nevertheless, the *Fred Creek Master Drainage Plan* cautions that some street and yard flooding could continue to occur during storms of a 100-year magnitude or greater—particularly in the low spot at the end of the 72nd St. cul de sac. Consequently, slab-on-grade structures will continue to be at some risk of flooding.

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.