DRAFT VERSION FOR PUBLIC COMMENT

2019

Multi-Jurisdiction Multi-Hazard Mitigation Plan

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Acronyms and Abbreviations

211	Phone number that directs a caller to health, human services and agency organizations
911	Emergency call and notification number
AWOS	Automatic Weather Observing System
BFE	Base flood elevation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CIP	Capital Improvement Plan
COOP	Continuity of Operations Plan
CRS	Community Rating System
EAP	Emergency Action Plan
EOC	Emergency Operation Center
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FLASH	Federal Alliance for Safe Homes
GIS	Geographic Information System
ham	Amateur radio operator
HMGP	Hazard Mitigation Grant Program
IBHS	Insurance Institute for Business & Home Safety
ICC	International Code Council
IFC	International Fire Code
INCOG	Indian Nations Council of Governments
ISO	Insurance Services Office
KBDI	Keetch-Byram Drought Index
LEPC	Local Emergency Planning Committee
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
ODEQ	Oklahoma Department of Environmental Quality
OEM	Oklahoma Emergency Management
OWRB	Oklahoma Water Resources Board
SAME	Specific Area Message Encoding
SPIA	Sperry-Piltz Ice Accumulation Index
SUV	Sport Utility Vehicle
TAEMA	Tulsa Area Emergency Management Agency
TCHMPC	Tulsa County Hazard Mitigation Planning Committee
TMAPC	Tulsa Metropolitan Area Planning Commission
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VHF	Very High Frequency

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Chapter 1: Introduction

1.1 About the Plan

This document is the first phase of a multi-hazard mitigation plan for Tulsa County and the jurisdictions participating in this plan. It is a strategic planning guide developed in fulfillment of the Hazard Mitigation Grant Program requirements of the Federal Emergency Management Agency (FEMA), according to the Stafford Disaster Relief and Emergency Assistance Act. This act provides federal assistance to state and local governments to alleviate suffering and damage from disasters. It broadens existing relief programs to encourage disaster preparedness plans and programs, coordination and responsiveness, insurance coverage, and hazard mitigation measures.

This plan fulfills requirements for the Hazard Mitigation Grant Program (HMGP). The plan addresses natural hazards and hazardous materials events.

1.1.1 Purpose

The purpose of this plan is to:

1. Provide an overview of Tulsa County, its regulations and its plans (Chapter 1)

2. Outline the Planning Process used in completing this Multi-Hazard Mitigation Plan (Chapter 2)

3. Identify and assess the hazards that may pose threats to citizens and property (Chapter 3)

4. Evaluate mitigation measures that should be undertaken to protect citizens and property (Chapter 4)

5. Outline a strategy for implementation of mitigation projects (Chapter 5)

6. Provide methodology for the plan's maintenance and adoption (Chapter 6)

The objective of this plan is to provide guidance for hazard mitigation activities for the next five years. It will ensure that Tulsa County and other participating jurisdictions, including school districts, implement activities that are most effective and appropriate for mitigating natural hazards and hazardous materials incidents.

1.1.2 Scope

The scope of the Tulsa County Multi-Hazard Mitigation Plan is county-wide. The plan addresses natural hazards as well as hazardous-materials events deemed to be a threat to Tulsa County and the participating communities and schools. Both short-term and long-term hazard mitigation opportunities are addressed beyond existing federal, state, and local funding programs.

The jurisdictions participating in this plan are Tulsa County, three communities, and six schools.
The communities are:

- City of Bixby
- City of Jenks
- Town of Sperry

The schools are:

- Berryhill Public Schools
- Bixby Public Schools
- Jenks Public Schools
- Liberty Public Schools
- Keystone Public Schools
- Sperry Public Schools

Berryhill Public Schools has five schools on one campus; Bixby Public Schools has nine schools on five campuses; Jenks Public Schools has 11 schools on 8 campuses; Keystone Public Schools has one school; Liberty Public Schools has three schools on one campus; and Sperry Public Schools has four schools on two campuses.

Tulsa County	600 Civic Center, EOC	Tulsa
City of Bixby	116 W Needles	Bixby
City of Jenks	211 N Elm St	Jenks
Town of Sperry	115 N Cincinnati Ave	Sperry
Berryhill High School	2901 S 65th W Ave	Tulsa
Berryhill Middle School	2900 S 65th W Ave	Tulsa
Berryhill North Elementary School	3128 S 63rd W Ave	Tulsa
Berryhill South Elementary School	3128 S 63rd W Ave	Tulsa
Berryhill Early Childhood Center	3128 S 63rd W Ave	Tulsa
Bixby High School	601 S Riverview Dr	Bixby
Bixby Alternative Education	601 S Riverview Dr	Bixby
Bixby 9th Grade Center	301 S Riverview Dr	Bixby
Bixby Central Intermediate	9401 E 161st St S	Bixby
Bixby Central Elementary	201 S Main St	Bixby
Bixby North Elementary	7101 E 121st St S	Bixby
Bixby North Intermediate	6941 S 121st St S	Bixby
Bixby Northeast Elementary & Intermediate	11901 E 131st St S	Broken Arrow
Jenks High School	205 E B St	Jenks
Jenks Alternative Center	205 E B St	Jenks
Jenks Freshman Academy	205 E B St	Jenks
Jenks Early Childhood Center	205 E B St	Jenks
Jenks Middle School	3019 E 101 St	Tulsa
Jenks East Intermediate School	3933 E 91 St	Tulsa
Jenks West Intermediate School	909 N Adams	Jenks
Jenks East Elementary	8925 S Harvard	Tulsa
Jenks Southeast Elementary	10222 S Yale	Tulsa
Jenks West Elementary	900 N Adams	Jenks
Jenks Northwest Elementary	7625 S Elwood	Tulsa
Liberty Public School PK – 3rd	2727 E 201st St S	Mounds
Liberty Public School 4th – 6th	2727 E 201st St S	Mounds
Liberty Public School 7th – 12th	2727 E 201st St S	Mounds
Keystone Public Schools	23810 W SH51	Sand Springs
Sperry Intermediate School	1380 W 103rd St N	Sperry
Sperry Elementary School	400 W Main St	Sperry
Sperry Middle School	400 W Main St	Sperry
Sperry High School	400 W Main St	Sperry

1.1.3 Authority

Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, (Public Law 93-288, as amended), Title 44 CFR, as amended by Section 102 of the Disaster Mitigation Act of 2000, provides the framework for state and local governments to evaluate and mitigate all hazards as a condition of receiving federal disaster assistance.

1.1.4 Funding

Funding for the Tulsa County Multi-Hazard Mitigation Plan was provided by a grant from FEMA and Oklahoma Emergency Management (OEM). This is a 75% FEMA grant through the OEM, with a 25% local share match requirement. The HMGP grant number is FEMA-4256-DR-OK-007.

1.1.5 Major Disaster Declarations

The previous Tulsa County Hazard Mitigation Plan was approved February 9, 2016. Since then, there has been zero federally declared disasters in Tulsa County.

1.1.6 Goals

The goals for the Tulsa County Multi-Hazard Mitigation Plan were developed by the Tulsa County Hazard Mitigation Planning Committee (TCHMPC), with input from adjacent jurisdictions, agencies, and interested citizens. The local goals were developed taking into account the hazard mitigation strategies and goals of the federal and state governments.

Element C3
The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards. 44 CFR §201.6(c)(3)(i)

National Mitigation Strategy and Goal

FEMA has developed ten fundamental principles for the nation's mitigation strategy:

1. Risk reduction measures ensure long-term economic success for the community as a whole, rather than short-term benefits for special interests.
2. Risk reduction measures for one natural hazard must be compatible with risk reduction measures for other natural hazards.
3. Risk reduction measures must be evaluated to achieve the best mix for a given location.
4. Risk reduction measures for natural hazards must be compatible with risk reduction measures for technological hazards, and vice versa.
5. All mitigation is local.
6. Emphasizing proactive mitigation before emergency response can reduce disaster costs and the impacts of natural hazards. Both pre-disaster (preventive) and post-disaster (corrective) mitigation is needed.
7. Hazard identification and risk assessment are the cornerstones of mitigation.
8. Building new federal-state-local partnerships and public-private partnerships is the most effective means of implementing measures to reduce the impacts of natural hazards.
9. Those who knowingly choose to assume greater risk must accept responsibility for that choice.
10. Risk reduction measures for natural hazards must be compatible with the protection of natural and cultural resources.

FEMA's goal is to:

1. Substantially increase public awareness of natural hazard risk so that the public insists on having safer communities in which to live and work
2. Significantly reduce the risk of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from natural hazards

State of Oklahoma Mitigation Strategy and Goals
The State of Oklahoma has developed a Standard Hazards Mitigation Plan to guide all levels of government, business, and the public to reduce or eliminate the effects of natural disasters. The goals of the plan are:

1. To protect life
2. To protect property
3. To protect the environment
4. To increase public preparedness for disasters

The Tulsa County and participating jurisdictions' Goal
To improve the safety and well-being of the citizens residing and working in Tulsa County, the City of Bixby, the City of Jenks, the Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools, by reducing the potential of death, injury, property damage, environmental and other losses from natural and technological hazards.

Goals for mitigation of each of the hazards are presented in Chapter 4.

1.1.7 Point of Contact

The primary point of contact for information regarding this plan is:

Joe Kralicek
Director
Tulsa Area Emergency Management Agency
600 Civic Center, E.O.C.
Tulsa, OK 74103
(918) 596-9891
jkralicek@tulsacounty.org

The secondary point of contact is:
Tony Roda
Deputy Director
Tulsa Area Emergency Management Agency
600 Civic Center, E.O.C.
Tulsa, OK 74103
(918) 596-9891
troda@tulsacounty.org

Plan Update Contractor was:
INCOG
2 W Second Street, #800
Tulsa, OK 74103
Justin Dowd
(918) 579-9440
jdowd@incog.org

1.2 COMMUNITY DESCRIPTION

Like most counties in the region, Tulsa County is faced with a variety of hazards, both natural and man-made. Any part of the county may be impacted by high winds, hail, extreme heat, severe winter storms, tornados, hazardous materials events, and other hazards. With some hazards such as flooding, dam break, wildfires and expansive soils, the areas most at risk have been mapped.

1.2.1 Geography

Tulsa County is located in northeast Oklahoma and intersected by the Arkansas River. Tulsa County encompasses 587 square miles and the terrain is generally flat to mildly sloping toward the river. Tulsa County is bordered by Washington County to the north, Rogers County to the northeast, Wagoner County to the southeast, Okmulgee County to the south, Creek County to the southwest, and Pawnee County and Osage County to the northwest.

1.2.2 Climate

The Tulsa County climate is essentially continental, characterized by rapid changes in temperature. The winter months are usually mild and the summer months are hot. Temperatures of 100 degrees or higher are often experienced from late July to early September. January's average low temperature is 26.6 degrees Fahrenheit and July's average high is 94.2 degrees Fahrenheit. Tulsa County will receive a wide variety of precipitation throughout any given year. The average annual rainfall is 40.3 inches.

1.2.3 History

Located on the banks of the Arkansas River on lands that were once part of the Creek and Cherokee nations, Tulsa County was created at statehood and took its name from the town of Tulsa in the Creek Nation, Indian Territory. The name, Tulsa, is derived from Tulsey Town, an old Creek settlement in Alabama.

1.2.4 Population and Demographics

According to the U.S. Census 2016 American Community Survey 1-year estimates, Tulsa County had a population of 642,940. The median age is 35.5 years. Twenty-four and half percent of the population is under 18 years and 13.5 percent is 65 years or older. Older populations are more vulnerable to certain hazards, such as extreme heat and cold. Map Number 2 in Appendix 1 shows the age 65 and older areas. The median household income in Tulsa County is $51,325. In the County, 12.7 percent of households had income below $15,000. Low-income populations are also more vulnerable to extreme temperatures since they may not have the means to protect themselves from extreme heat and cold. The low-moderate income populations are shown on Map Number 3 in Appendix 1. The racial makeup of the County was 69% White, 10% African American, 5% Native American, 3% Asian, less than 0.5% Pacific Islander, 4% of another race, and 8% from two or more races.

1.2.5 Local Utilities — Lifelines

Lifelines are defined as those infrastructure facilities that are essential to the function of the community and the well-being of its residents. They generally include transportation and utility systems. Transportation systems include interstates, US and state highways, and railroads. Utility systems include electric power, gas and liquid fuels, telecommunications, water, and wastewater. The following table shows utilities and the companies that service Tulsa County.

Table 1-3:
Utility Suppliers for Tulsa County

Utility	*Supplier*
Electric	AEP/PSO OG&E East Central Electric
Water	City of Broken Arrow City of Collinsville City of Jenks City of Sand Springs City of Skiatook City of Tulsa Creek County RWD #2 Tulsa County RWD #1 Tulsa County RWD #2 Tulsa County RWD #3 Tulsa County RWD #4 Washington County RWD #3
Sewage Treatment	City of Broken Arrow City of Bixby City of Collinsville City of Glenpool City of Jenks City of Owasso City of Sand Springs City of Skiatook City of Tulsa Town of Sperry
Natural Gas	Oklahoma Natural Gas Company
Telephone (including Cellular)	SBC Sprint Verizon AT&T US Cellular T-Mobile Cox Bixby Telephone
Railroad	BNSF Railroad Sand Springs Railroad Union Pacific Railroad South Kansas & Oklahoma Railroad

1.2.6 Economy

According to the U.S. Census 2016 American Community Survey 1-year estimates, in Tulsa County, 67% of the population 16 years and older were employed. Of the people employed, 76% were private wage and salary workers, 10% were federal, state, or local government workers, and 5% were self-employed in their own unincorporated business. The median household income in Tulsa County was $51,325.

1.2.7 Industry

The larger employers in unincorporated Tulsa County and the participating communities are:

American Airlines
EDS
Bama Industries
Holly Industries Oil Refinery
Macy's Fulfillment Center
Cherokee Industrial Park, including Whirlpool Corporation and NORDAM Group
AEP Power Plant
Kimberly Clark
Tulsa Winch

1.2.8 Future Development

Outside of the large communities in Tulsa County, growth continues at a moderate pace. Nine residential subdivisions were developed from 2010 through 2017 and four commercial developments have been developed or are in the process of being developed during this time period.

Growth Trends:

The Oklahoma Department of Commerce estimates that unincorporated Tulsa County will continue to grow at 0.84% per year over the next 65 years. Residential development activity will be concentrated in and around the larger communities of Tulsa and Broken Arrow, and commercial development activity is forecast to occur primarily along SH 75 north of the City of Tulsa.

1.3 REGULATORY FRAMEWORK

Tulsa County is bound by Title 19, Oklahoma Statutes (Counties). The City of Bixby, City of Jenks, and Town of Sperry are bound by Title 11, Oklahoma Statutes (Cities & Towns). The six Public Schools are bound by Oklahoma Statute Title 70 (Schools), as well as state and federal laws as they relate to public schools. The Tulsa County resolutions, City of Bixby ordinances, City of Jenks ordinances, and Town of Sperry ordinances, allow for and prescribe the methods for changing their existing codes, policies, and programs.

Element C1
The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.
44 CFR §201.6(c)(3)

This section contains a summary of the current ordinances for land use, zoning, subdivision, and floodplains in Tulsa County, City of Bixby, City of Jenks, and Town of Sperry. These were reviewed by the Tulsa County Hazard Mitigation Planning Committee. It also lists the current building codes and fire insurance rating.

1.3.1 Comprehensive Planning and Zoning

Tulsa County:

The unincorporated portion of Tulsa County has comprehensive plans for three areas: North County Comprehensive Plan; Tulsa County District 9 Plan (bounded by the Arkansas River on the north and east, by I-44 and Tulsa County line on the south, by 65th West Avenue on the west); and the Tulsa County District 24 Plan (bounded by 76th Street North on the north, the Cherokee Expressway on the east, by 56th Street North on the south, and by the Osage County line on the west).

The Tulsa County Zoning Code is adopted by the Board of County Commissioners. The Subdivision Regulations for the Tulsa Metropolitan Area are adopted by the Tulsa Metropolitan Area Planning Commission (TMAPC), the entity responsible to oversee planning and zoning in the County. The comprehensive plans, zoning code and subdivision regulations, with input from the Land Development Services division at INCOG, were utilized as a

reference in the development of this hazard mitigation plan.

Some unincorporated areas of Tulsa County are within the fence line of communities such as Tulsa, Broken Arrow, Sand Springs, Bixby, Glenpool, Jenks, Sapulpa and Owasso. Each of those cities has its own comprehensive plan that can influence land use decisions within its fence line, although these areas remain under the jurisdiction of TMAPC and the Tulsa County Board of County Commissioners. Zoning and land use decisions are often a collaborative effort with the cities and TMAPC.

INCOG staff provides professional planning services to the Tulsa County Board of County Commissioners, TMAPC and the Tulsa County Board of Adjustment.

The Tulsa County Zoning Code, last updated in 2008, is administered by Tulsa Metropolitan Area Planning Commission staff.

The Subdivision Regulations for the Tulsa Metropolitan Area, last updated in 2005, are administered by Tulsa Metropolitan Area Planning Commission staff in conjunction with the Tulsa County engineering staff for unincorporated parts of Tulsa County. There is currently an effort underway to rewrite the subdivision regulations – to be called the Subdivision and Development Regulations for the Tulsa Metropolitan Area. A final draft is expected to be presented to the Tulsa Metropolitan Area Planning Commission for consideration.

The City of Bixby:
The City of Bixby has a comprehensive plan, zoning code, and subdivision regulations. The City of Bixby Planning Committee oversees planning and zoning in the City. The Zoning Code and Subdivision Regulations and input by the City were utilized as a reference in the development of this Hazard Mitigation Plan.

The City of Bixby comprehensive plan was last updated in 2002 and is administered by City staff.

The City of Bixby Zoning Code, last updated in 2007, is administered by City staff.

The City of Bixby Subdivision Regulations, last updated in 1993, is administered by City staff.

The City of Jenks:
The City of Jenks has a comprehensive plan, zoning code, and subdivision regulations. The City of Jenks Planning Committee oversees planning and zoning in the City. The Zoning Code and Subdivision Regulations and input by the City were utilized as a reference in the development of this Hazard Mitigation Plan.

The City of Jenks comprehensive plan was last updated in 2014 and is administered by City staff.

The City of Jenks Zoning Code, last updated in 2012, is administered by City staff.

The City of Jenks Subdivision Regulations, last updated in 1982, is administered by City staff.

The Town of Sperry:
The Town of Sperry has a comprehensive plan, zoning code, and subdivision regulations. The Town of Sperry Planning Committee oversees planning and zoning in the Town. The Zoning Code and Subdivision Regulations and input by the Town were utilized as a reference in the development of this Hazard Mitigation Plan.

The Town of Sperry comprehensive plan was last updated in 2013 and is administered by Town staff.

The Town of Sperry Zoning Code, last updated in 2012, is administered by Town staff.

The Town of Sperry Subdivision Regulations, last updated in 2012, is administered by Town staff.

1.3.2 Floodplain Management

Element C1
The hazard mitigation strategy shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate.
44 CFR §201.6(c)(3)(ii)

Tulsa County, City of Bixby, City of Jenks, and Town of Sperry participate in the National Flood Insurance Program (NFIP). Each administers its flood damage prevention ordinance. Each will remain compliant by continuing to enforce its ordinances, and they will continue to seek out opportunities to enhance their programs. Enhancements to their programs will improve their Community Rating System (CRS) ratings. The CRS is a voluntary incentive program through the NFIP that encourages communities to exceed the minimum NFIP requirements. A property owners discount on flood insurance premiums is based on their rate class. Rate classes range from 1 to 10, 1 being the best and 10 the worst. Lower rate class numbers receive higher discounts on flood insurance.

1.3.3 Building Codes

Tulsa County, City of Bixby, and Town of Sperry use the 2015 International Building Code developed by the International Code Council (ICC), as well as supplemental ordinances which cover areas where the International Codes are inadequate. The City of Jenks uses the 2015 International Fire Code (IFC). This information was used as a reference in updating the hazard mitigation plan.

1.3.4 Fire Protection and Insurance

Tulsa County does not operate a fire department. Fire protection coverage is provided by community fire departments in Tulsa County and by volunteer fire departments in the County. These include the City of Bixby Fire Department, City of Broken Arrow Fire Department, City of Collinsville Fire Department, City of Glenpool Fire Department, City of Jenks Fire Department, City of Owasso Fire Department, City of Sand Springs Fire Department, City of Sapulpa Fire Department, City of Skiatook Fire Department, City of Tulsa Fire Department, Town of Sperry Fire Department, Berryhill Fire Department, Collinsville Rural Fire Department, Keystone Volunteer Fire Department, Liberty Volunteer Fire Department, and the Turley Volunteer Fire Department.

The Insurance Services Office (ISO) collects information on fire department fire protection efforts. ISO assigns a rating from 1 to 10. Class 1 represents superior property fire protection, and Class 10 indicates that the area's protection doesn't meet ISO's minimum criteria. Primary factors related to the ISO rating involve how the department responds to alarms and notifies its personnel; the supply and distribution of water in the area; staffing; training and equipment.

As of October 2017, the ISO ratings within jurisdictional boundaries for the fire departments are as follows:

Fire Department	ISO Rating
City of Bixby	3
City of Broken Arrow	2
City of Collinsville	5
City of Glenpool	3
City of Jenks	4
City of Owasso	3
City of Sand Springs	2
City of Sapulpa	3

Fire Department	ISO Rating
City of Skiatook	6
Town of Sperry	6
City of Tulsa	2
Berryhill	2
Collinsville Rural	6
Keystone Volunteer	5
Liberty Volunteer	9
Turley Volunteer	6

Fire Department statistics and information were used as a reference in the assessment of the wildfire hazard discussed in Chapter 3.

1.4 EXISTING PLANS INCORPORATING HAZARD MITIGATION

All the participants in this mitigation plan update have existing plans that incorporate the goals, objectives and actions of hazard mitigation. The review of existing plans is important in the preparation of this hazard mitigation plan. These plans are improved annually by modifying them with input from the community partners to meet current needs. The TCHMPC reviewed the existing plans to include information from these plans into the mitigation plan.

1.4.1 Emergency Operations Plans

Tulsa County adopted an Emergency Operations Plan in 2017.
This City of Bixby adopted an Emergency Operations Plan in 2018.
The City of Jenks adopted an Emergency Operations Plan in 2017.
The Town of Sperry adopted an Emergency Operations Plan in 2012.
Berryhill Public Schools has an Emergency Operations Plan, adopted in 2017.
Bixby Public Schools has an Emergency Operations Plan, adopted in 2017.
Jenks Public Schools has an Emergency Operations Plan, adopted in 2017.
Keystone Public Schools has an Emergency Operations Plan, adopted in 2014.
Liberty Public Schools has an Emergency Operations Plan, adopted in 2014.
Sperry Public Schools has an Emergency Operations Plan, adopted in 2017.

Their EOPs were used as reference in preparing this hazard mitigation plan update. As part of the municipalities' EOPs, critical facilities were identified. These facilities include shelters, police and fire stations, schools, childcare centers, senior citizen centers, hospitals, disability centers, vehicle and equipment storage facilities, and emergency operations centers. The critical facilities in Tulsa County and the municipalities and school districts located in the County are listed in Section 3.3. The vulnerability of critical facilities to various hazards is addressed in this study.

1.4.2 Capital Improvement Plans

The capital improvement plan (CIP) is the principle method of scheduling and financing future capital needs, and some of those needs could address hazard mitigation actions. Major updates to capital improvement plans occur as events warrant, and plans receive a minor review during the annual budgeting process. Projects on a capital improvement plan could have a positive impact upon the community's ability to mitigate and respond to hazard events.

Tulsa County has a CIP. Its CIP was last updated in 2017. Projects on its plan include:

- Media Safe for Administrative Services
- Courthouse Asbestos Abatement
- Asphalt LaFortune Walking Trail
- Irrigation Supply Wells at South Lakes
- Splash Pads – O'Brien
- Splash Pads – LaFortune
- Splash Pads – Chandler Park
- South Lakes Tie Walls
- South Lakes Pond Liners
- Playground shade structures at County playgrounds

The City of Bixby has a CIP. Its CIP was last updated in 2017. Projects on its plan include:

- Wastewater Treatment Plant
- 151st and Harvard intersection widening and traffic light
- 121st and Mingo intersection widening
- 131st and Mingo intersection widening
- Remodel dispatch to include an EOC
- Additional outdoor warning sirens

- Additional police cars
- Equipment for emergency management
- Upgrade camera system – highway and infrastructure

The City of Jenks has not adopted a formal CIP; however, various projects are being planned. Projects being planned include:

- Wastewater treatment plant expansion
- Wastewater collection system improvements
- Main Street widening (Elm to US75)
- Main Street (Date east to TSU Railroad)
- 111th Street improvements (Elwood to US75)
- Elwood improvements (Main to 111th Street)
- 7th Street improvements (Main to Aquarium Drive)
- 1st Street improvements ("B" Street to Aquarium Drive)

The Town of Sperry has a CIP. The CIP was last updated in 2008. Projects on its plan include:

- Update storm sirens
- 10 kW Genset, trailer mounted
- One light and 4 duplex outlets in each area, EOC, FD, and PD
- Motorola APX 7000 hand held radios
- Motorola APX 8000 hand held radios
- Motorola APX 8500 mobile radio
- Motorola APX 7500 mobile radios
- Dodge Ram 2500, Cummins, 4x4
- PC stations for OEM/EOC
- Swift Water Rescue/Dive Team training, gear, and boat
- Resurfacing all streets west of Cincinnati both north and south of Main
- Curb and gutter on Main west of Cincinnati
- Clean out existing drainage ditches Town wide
- Replace old flooring in Town Hall with tile or laminate flooring

Berryhill Public Schools has a CIP. Its CIP was last updated in 2007. Projects on its plan include:

- Expand/add to security cameras
- Add security lighting in parking areas
- Add safe-rooms to existing buildings
- Find funding for a full-time campus police officer
- Repair or replace roofs in South Elementary, Middle School, and Administration Building
- Replace gravel parking lot at South Elementary with asphalt
- Construct new multi-purpose building in old maintenance building

Bixby Public Schools has a CIP. Its CIP was last updated in 2016. Projects on its plan include:

- Band Building
- Northeast Intermediate Addition
- 9th Grade Addition
- Baseball/Softball Turf
- Football Turf
- HVAC system at North Elementary

Jenks Public Schools has a CIP. Its CIP was last updated in 2017. Projects on their plan include:

- Technology Equipment/Improvements
- Maintenance Improvements
- District-wide Equipment
- District-wide Safety Improvements
- Textbooks/Media Equipment
- Middle School Athletic Fields
- Secondary Classroom Space

Keystone Public Schools has a CIP. Its CIP was last updated in 2017. Projects on its plan include:

- Repair roof on Old Gym
- New windows for Old Gym
- Resurface existing parking lot

Liberty Public Schools has a CIP. Its CIP was last updated in 2009. Projects on its plan include:

- Replace old gym floor
- New windows at the elementary school
- Address traffic flow for student drop-off and pick-up
- New fencing at school entrance
- New paving at school entrance

Sperry Public Schools does not have a CIP.

Chapter 2: Planning Process

2.1Documentation of the Planning Process

The Tulsa County Multi-Hazard Mitigation Plan is a county-wide effort to coordinate the Tulsa County multi-hazard planning, development, and mitigation activities. The Indian Nations Council of Governments (INCOG) was responsible for coordination and preparation of the plan. INCOG was aided by the Tulsa Area Emergency Management Agency (TAEMA) and the Tulsa County Hazard Mitigation Planning Committee (TCHMPC).

A mitigation plan is the product of a rational thought process that reviews the hazards, quantifies their impacts on the county, identifies alternative mitigation activities, and selects those activities that will work best for the jurisdiction.

This plan addresses the following hazards:

1. Floods
2. Tornados
3. High Winds
4. Lightning
5. Hailstorms
6. Winter Storms
7. Extreme Heat
8. Drought
9. Expansive Soils
10. Wildfires
11. Earthquakes
12. Hazardous Material Events
13. Dam Breaks/Levee Failures

Element A1
The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.
44 CFR §201.6(c)(1)

Element A2
The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.
44 CFR §201.6(b)(2)

The approach for the update to the Tulsa County Multi-Jurisdiction Multi-Hazard Mitigation Plan followed a ten-step process based on guidance and requirements from FEMA. The ten steps are described below.

2.1.1 Step One: Organize to Prepare the Plan

An open public process was established to give all Tulsa County residents and agencies an opportunity to be involved in the planning process and make their views known. Individuals and community leaders from Tulsa County, municipalities, participating school districts, and various state and federal agencies worked together in the hazard mitigation planning process.

The planning process was conducted by the Tulsa County Hazard Mitigation Planning Committee (TCHMPC). This committee is made up of qualified and knowledgeable people representing the best interests of the membership.

INCOG staff worked with TCHMPC on this hazard mitigation plan update. INCOG staff met several times during the planning process with TCHMPC members and attended the meetings of the TCHMPC. All of the TCHMPC meeting notices were posted at the Tulsa County Courthouse and were open to the public.

The TCHMPC met at Jenks Public Schools, Berryhill Public Schools, and Bixby City Hall during the planning process to review progress, identify issues, receive task assignments, and advise the INCOG staff. Local research and input was provided by committee members. INCOG staff provided a regional hazard mitigation perspective and direct access to state and federal hazard information resources and led the preparation of draft planning documents. INCOG staff outlined the plan and prepared a draft. Committee members reviewed the hazards, provided detailed information, conducted the public hazard awareness survey, evaluated mitigation activities, and selected the action plan activities. INCOG then prepared the final plan for review. A list of TCHMPC members is shown in Table 2-1 and meetings are shown in Table 2-2. The agendas, minutes, and sign-in sheets for these meetings are included in Appendix 2.

Roger Jolliff	Tulsa Area Emergency Management Agency	Director Committee Chair (9/6/17 - 12/7/17)	➢ Chaired planning meetings ➢ Contributed data on past hazards ➢ Coordinated survey within community
Joe Kralicek	Tulsa Area Emergency Management Agency	Deputy Director Committee Co-chair (9/6/17 - 12/7/17) Director Committee Chair (12/7/17 - Present)	➢ Chaired planning meetings ➢ Coordinated survey within community ➢ Contributed data on past hazards ➢ Provided information on County plans ➢ Contributed data concerning past mitigation efforts ➢ Reviewed draft plan
Allison Whitsitt	Tulsa Area Emergency Management Agency	Finance & Grants Coordinator	➢ Provided information on the County ➢ Contributed data concerning past hazards ➢ Contributed information on past mitigation efforts ➢ Reviewed draft plan ➢ Coordinated mitigation activities
Ike Shirley	City of Bixby Police Department	Chief	➢ Provided information on the City ➢ Contributed data concerning past hazards ➢ Coordinated survey within the community ➢ Provided information on City plans ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Laura Konshak	City of Bixby	Bixby Citizen	➢ Reviewed draft plan
Mellanee Roberts	City of Jenks Fire Department	Executive Assistant	➢ Provided information on the City ➢ Coordinated survey within the community ➢ Provided information on City plans ➢ Contributed data concerning past hazards ➢ Reviewed draft plan
Jason Jackson	City of Jenks Police Department	Support Division Commander	➢ Provided information on the City ➢ Contributed data concerning past hazards ➢ Coordinated mitigation activities ➢ Reviewed draft plan
John Carr	Town of Sperry Emergency Management	Deputy Director	➢ Provided information on the Town ➢ Coordinated survey within the community ➢ Contributed data concerning past hazards ➢ Contributed data concerning past mitigation efforts ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Mike Campbell	Berryhill Schools	Superintendent	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Contributed data concerning past mitigation efforts ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Dawn Nipps	Bixby Schools	Executive Director of Student Services	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Lydia Wilson	Bixby Schools	Assistant Superintendent	➢ Coordinated mitigation activities ➢ Reviewed draft plan

Roger Wright	Jenks Schools	Executive Administrator for School Operations	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Jeremy Hairrell	Jenks Schools	Director of Transportation	➢ Reviewed draft plan
Rhett Bynum	Keystone Schools	Superintendent	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Contributed data concerning past mitigation efforts ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Matthew Sweet	Liberty Schools	Junior High/High School Principal	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Contributed data concerning past mitigation efforts ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Mike Juby	Sperry Schools	School Safety Officer	➢ Provided information on the School ➢ Coordinated survey within the community ➢ Provided information concerning School plans ➢ Contributed data concerning past mitigation efforts ➢ Coordinated mitigation activities ➢ Reviewed draft plan
Justin Dowd	INCOG	Engineer/Project Manager	➢ Lead Contractor ➢ Prepared plan drafts ➢ Contributed data on past hazards ➢ Reduced and processed data ➢ Coordinated planning meetings ➢ Presented at planning meetings ➢ Reviewed draft plan ➢ Coordinated grant requirements
Ann Domin	INCOG	Deputy Director	➢ Reviewed draft plan ➢ Presented at planning meetings
Vernon Seaman	INCOG	Environmental & Energy Planning Manager	➢ Reviewed draft plan ➢ Presented at planning meetings

Table 2–2:
Committee Meetings and Activities

Date	*Activity*
Meeting #1 09/06/2017	The TCHMPC met at Jenks Public Schools' Sharp Center to discuss the overall need for a plan, jurisdictions to be included in the update, the planning process and plan outline, hazard identification and assessment, developed a hazard awareness survey, and determined the methods of disseminating and collecting survey data.
Meeting #2 10/12/2017	The TCHMPC met at the City of Bixby City Hall to review preliminary results of the hazard awareness survey and review the risk and vulnerability analysis of hazards affecting the participating jurisdictions.
Meeting #3 12/07/2017	The TCHMPC met at Berryhill Public Schools' Administration Office to review final results of the hazard awareness survey and review additional risk and vulnerability analysis of hazards affecting the participating jurisdictions.
Meeting #4 02/27/2018	The TCHMPC met at the City of Bixby City Hall to discuss the goals and objectives of hazard mitigation, review hazard mitigation action items, and write the action plan.
Meeting #5 05/03/2018	The TCHMPC met at the City of Bixby City Hall to discuss progress on the action plan and plan maintenance.
Meeting #6 10/11/2018	The TCHMPC met at the City of Bixby City Hall to discuss committee comments on the draft plan, the list of communities and agencies to contact for comment, and when to schedule the public hearing and final meeting to address community and agency comments.
Public Hearing 06/08/2015	A public hearing was held at the Tulsa County Board of County Commissioners meeting held on __/__/____ to gather public input on the update to the multi-jurisdictional multi-hazard mitigation plan.
Meeting #_ __/__/____	The TCHMPC met at the _____ to receive comments from other communities and agencies, and for a committee recommendation to approve the plan.

2.1.2 Step Two: Involve the Public

The TCHMPC conducted several activities to encourage public involvement in the planning process. All planning committee meetings were open to the public. A hazard awareness survey was developed and circulated by TCHMPC members to solicit community input on hazard awareness and assessment of their level of concern. Feedback from these surveys was important in the development of the plan because it indicated the level of concern the public has regarding these hazards. The surveys were completed during an approximately 6 week period stretching from September 11 to October 23, 2017. Four hundred sixty-five (465) responses were received. A copy of the survey and summary of the responses are included in Appendix 4. Public comments were also received during a public hearing. A public hearing was held on ___date___ to solicit public comments on the draft plan. A copy of the notice advertising the public hearing and minutes of the hearing are included in Appendix 2.

Element A3
The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.
44 CFR §201.6(b)(1)

2.1.3 Step Three: Coordinate with Other Agencies and Organizations

As part of the plan update process and to collect data on the hazards that impact Tulsa County, the TCHMPC reviewed information sources from public agencies, private organizations, and businesses that contend with natural hazards. These sources included printed documents, internet web sites and conversations. The agencies and organizations included FEMA, the Corps of Engineers, the US Geological Survey, INCOG, the Oklahoma State Department of Environmental Quality, the National Climatic Data Center, the National Oceanic and Atmospheric Administration (NOAA), and the Natural Resource Conservation Service. The following is a list of agencies invited to participate in the planning process and comment on a draft of the updated plan prior to approval. Sample letters are included in Appendix 3.

Federal
US Army Corps of Engineers
Joe Remondini
Floodplain Coordinator

Natural Resources Conservation Service
Tulsa County Conservation District
Gary Bishop
District Conservationist

State
Oklahoma Emergency Management
Matthew Rollins
State Hazard Mitigation Officer

Oklahoma Water Resources Board
Gavin Brady
State NFIP Coordinator

Oklahoma Conservation Commission
Dan Sebert
District Operations Director

Oklahoma Department of Wildlife Conservation
Richard Hatcher
Director

Oklahoma Department of Environmental Quality
Scott Thompson
Executive Director

Regional
Indian Nations Council of Governments (INCOG)
Rich Brierre
Executive Director

City
City of Bixby
Ike Shirley
Police Chief

City of Broken Arrow
Jamie Ott
Emergency Management Director

City of Collinsville
Harold Call
Fire Chief

City of Glenpool
Paul Newton
Fire Chief

City of Jenks
Chris Shrout
City Manager

City of Owasso
Dan Miller
Emergency Management Coordinator

City of Sand Springs
Greg Fisher
Director, Emergency Management

City of Skiatook
Dan Yancey
City Manager

Town of Sperry
Justin Burch
Police Chief

City of Tulsa/Tulsa Area Emergency Management Agency
Joe Kralicek
Director

Business
Oklahoma Property Investors
Kelly Baker
Property Manager

Academia
Berryhill Schools
Mike Campbell
Superintendent

Bixby Schools
Rob Miller
Superintendent

Jenks Schools
Stacey Butterfield
Superintendent

Keystone Schools
Rhett Bynum
Superintendent

Liberty Schools
Jim Gilmartin
Superintendent

Sperry Schools
Brian Beagles
Superintendent

Non-Profit
American Red Cross, Tulsa Chapter
Regina Moon
Executive Director

Coordination with other county planning efforts is critical to the success of the hazard mitigation plan update. The TCHMPC used information included in the current version of the County's Comprehensive Plan, Emergency Operations Plan, FIRM Maps, Building Codes and County Ordinances as part of the update process. The TCHMPC provided information in regard to the utilization of the initial Multi-Hazard Mitigation Plan as a resource for integrating action plan activities. Through participation in the TCHMPC, the City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools provided information during the planning update process.

2.1.4 Step Four: Assess the Hazard

The TCHMPC collected data on the hazards from available sources. Hazard assessment is included in Chapter 3, with the discussion of each hazard.

Table 2-3 lists various hazards that affect Tulsa County and how and why they were identified. The location of each hazard with respect to Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools will be addressed in the Risk Assessment chapter of the plan.

Table 2–3:
How and Why Hazards Were Identified

Hazard	How Identified	Why Identified
Floods	Review of Federal Emergency Management Agency (FEMA) and County floodplain maps Buildings in the floodplains Historical floods and damages	Improved and unimproved property parcels in Tulsa County are located in the regulatory floodplain
Tornados	Review of recent disaster declarations Input from Emergency Manager Review of data from the National Climatic Data Center (NCDC)	Tulsa County is located in "Tornado Alley", a region prone to tornadic activity
High Winds	NCDC information and statistics	High wind-related events regularly occur in Tulsa County
Lightning	NCDC information and statistics	Lightning occurs regularly throughout the County
Hailstorms	NCDC information and statistics	Anecdotal evidence suggests hail damage accounts for the highest number of residential insurance claims Hail can occur anywhere in the County
Winter Storms	Review of past Disaster Declarations Input from County Emergency Management	Severe snow and ice events occur almost annually The impact is felt regionally
Extreme Heat	Review of data from NCDC Recent summers have recorded above average temperatures	Anecdotal evidence from committee Extreme heat is especially dangerous to the elderly and infirm
Drought	Historical vulnerability to drought, the "Dust Bowl" era Water shortages in adjacent communities in recent years	Need to ensure adequate long-term water resources for the County Economically, drought is one of Oklahoma's costliest hazards
Expansive Soils	Input from INCOG Review of NRCS data	Damage to buildings from expansive soils is difficult to determine Can be mitigated with building code provisions
Earthquakes	Historic records of earthquakes in Oklahoma Input from Oklahoma Geological Survey	Two major earthquakes within 80 miles of Tulsa County in 2011 Oklahoma Geological Survey records suggest small events occur but go unfelt
Wildfires	Input from TAEMA	Continuing loss of life and property due to fires Other hazards (winds, heat, drought) compound this hazard
Dam Breaks/Levee Failures	Information from OWRB and Tulsa County	There are six high hazard dams in Tulsa County Tulsa County levee districts span over 26 miles and protect more than 6,500 acres
Hazardous Material Events	Input from ODEQ Input from the TAEMA	Hazard material storage sites are in Tulsa County Major traffic routes expose the County to potential transport related hazardous materials incidents

2.1.5 Step Five: Assess the Problem

Hazard data were analyzed in light of what each hazard means to public safety, health, buildings, transportation, infrastructure, critical facilities, and the economy. INCOG staff prepared several analyses using INCOG's geographic information system. Problem assessment is addressed for each hazard in Chapter 3.

DAMAGE ESTIMATION METHODOLOGY

Values and methods used to determine financial loss to structures and contents from flooding, tornados and high winds were obtained from the sources below.

Structure Value: The values of buildings within Tulsa County were obtained from the Tulsa County Assessor's office.

Contents Value: Value of contents for all buildings was estimated using FEMA 386-2 Understanding Your Risks. Table, page 3-11, "Contents Value as Percentage of Building Replacement Value".

2.1.6 Step Six: Set Goals

Hazard mitigation goals and objectives for Tulsa County were developed by the TCHMPC to guide the development of the plan. The hazard mitigation goals and objectives for the County and participating jurisdictions are listed in Chapter 4.

2.1.7 Step Seven: Review Possible Activities

A variety of measures that can affect hazards or the damage from hazards were examined. The mitigation activities were organized under the following five categories. A more detailed description of each category is located in "Chapter 4: Mitigation Strategies."

1. Preventive activities—Zoning, building codes, city ordinances, county resolutions
2. Structural Projects—Dams, levees, reservoirs, channel improvements
3. Property protection—Acquisition, retrofitting, insurance
4. Emergency service—Warning, sandbagging, evacuation
5. Public information and education—Outreach projects, technical assistance

2.1.8 Step Eight: Draft an Action Plan

The TCHMPC reviewed the list of recommended actions in the current Tulsa County Multi-Jurisdiction Multi-Hazard Mitigation Plan. Tulsa County, Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools reported the projects that were completed. Potential future hazard mitigation activities were reviewed and discussed by the committee. The County then selected mitigation projects and activities to include in this update. For each project or activity identified for this update, the County identified the party responsible for implementing the task, estimated the cost of the project, identified potential funding sources, and determined the target completion date for each activity. Each participating jurisdiction did the same for their own jurisdiction. Once all the jurisdictions action plans were drafted, they were inserted into the final draft of the Tulsa County Multi-Jurisdiction Multi-Hazard Mitigation Plan.

2.1.9 Step Nine: Adopt the Plan

The TCHMPC reviewed the final draft, approved the final plan, and submitted it for adoption to the Tulsa County Board of County Commissioners, City of Bixby City Council, City of Jenks City Council, Town of Sperry Town Board, Berryhill Public School's Board of Education, Bixby Public School's Board of Education, Jenks Public School's Board of Education, Keystone Public School's Board of Education, Liberty Public School's Board of Education, and Sperry Public School's Board of Education.

2.1.10 Step Ten: Implement, Evaluate, and Revise

Adoption of the Multi-Hazard Mitigation Plan is only the beginning of this effort. Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools will proceed with implementation. The TCHMPC will monitor progress, evaluate the activities, and annually recommend revisions to the action items when necessary. This process will involve quarterly meetings in which the TCHMPC will monitor progress on the Action Plan and review other mitigation actions for inclusion in the Action Plan for Years 2 through 5. This monitoring and review process will be coordinated so as to provide input into other appropriate Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools' planning efforts, specifically updates to capital improvement plans and annual budgets.

Chapter 3:Risk Assessment and Vulnerability Analysis

3.1 Identifying Hazards

There were 13 hazards investigated by the TCHMPC. The hazards are listed in Table: 2.2. Hazard information was obtained from the TAEMA, TCHMPC members, county records, the regional planning agency (INCOG), flood insurance rate maps, NOAA, and public input. All of these hazards were considered to be relevant to Tulsa County. Hazard identification was discussed at the second hazard mitigation planning meeting, held on October 12, 2017.

The location of each hazard will be profiled in Section 3.2. Of the 13 hazards, four hazards vary in magnitude by location. These four hazards are the flood hazard, dam break/levee failure hazard, wildfire hazard and the expansive soils hazard. Their locations will be discussed in each hazard's location sub-section in Section 3.2. The locations of these four hazards, with respect to the City of Bixby, City of Jenks, Town of Sperry and the six participating Schools, will also be discussed in Section 3.2. The other nine hazards do not vary in magnitude by location so they can occur at any magnitude anywhere in the County.

Element B1
For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.
44 CFR §201.6(c)(2)(iii)

Element B2
The risk assessment shall include information on previous occurrences of hazard events and on the probability of future hazard events.
44 CFR §201.6(c)(2)(i)

Element B3
The risk assessment shall include an overall summary of each hazard and its impact on the community.
44 CFR §201.6(c)(2)(ii)

The City of Bixby, City of Jenks, Town of Sperry, and the participating schools' buildings are all in Tulsa County. Each school building is located at the address shown in Section 1.1.1.2. Map Number 1A in Appendix 1 shows the location of the school buildings.

3.2 Profiling Hazards

This section provides a profile of each hazard. In this section, the letter "X", when included in a subsection identification label, refers to a specific hazard's subsection, as follows:

X=1 Flood Hazard
X=2 Tornado Hazard
X=3 High Winds Hazard
X=4 Lightning Hazard
X=5 Hail Storm Hazard
X=6 Winter Storm Hazard
X=7 Heat Hazard
X=8 Drought Hazard
X=9 Expansive Soils Hazard
X=10 Wildfire Hazard
X=11 Earthquake Hazard
X=12 Hazardous Material Hazard
X=13 Dam Break/Levee Failure

Subsection 3.2.X.1 describes each hazard, subsection 3.2.X.2 identifies the location of the hazard, subsection 3.2.X.3 identifies the extent (such as severity or magnitude) of the hazard, subsection 3.2.X.4 provides information on previous occurrences, subsection 3.2.X.5 discusses the probability of future occurrences, and subsection 3.2.X.6 discusses vulnerability and impact. Each hazard affects the County as a whole, except floods, wildfires, expansive soil and dam breaks/levee failures, which are location specific.

3.2.1 Flood Hazard

3.2.1.1 Flooding is defined as the accumulation of water within a water body and the overflow of the excess water onto adjacent lands. The floodplains are the lands adjoining the channel of a river, stream, creek, lake, or other watercourse or water body that is susceptible to flooding.

Flooding is usually the result of excess precipitation or insufficient capacity within a receiving body such as a river or lake. Floods can occur with little or no warning and can reach peak flow within a few minutes. Flood water moves with great force and velocity and can roll boulders, tear out trees, destroy buildings and roads, and sweep away bridges. This swirling and fast moving water generally carries a large amount of sediment and debris.

3.2.1.2 Flooding in Tulsa County generally occurs within the regulatory floodplain, as shown on the Flood Insurance Rate Maps (FIRMs). The flood hazard is shown on Map Number 5 in Appendix 1. The County has historically seen flooding at the following locations:

- At 56th St. N. and Yale Avenue (Bird Creek)
- At 105th St. N. and Peoria Avenue (Bird Creek)
- At 101st St. S. and Garnett Road (Haikey Creek)
- At 101st St. S. and 33rd W. Avenue (Polecat Creek)

Flooding in the City of Bixby generally occurs within the regulatory floodplain, as shown on the Flood Insurance Rate Maps (FIRMs). The flood hazard is shown on Map Number 5A in Appendix 1. The County has historically seen flooding at the following locations:

- At E 164th St. S. and S. Memorial Dr. (Unknown Tributary to Arkansas River Tributary in Bixby)
- At Pecan Park (Unknown Tributary to Arkansas River Tributary in Bixby)
- At Southtown (Snake Creek)
- At John's Park (Snake Creek Tributary)
- At E. 131st St. S. and S. Mingo Rd. (Fly Ditch Creek)

The regulatory flood extends into the City of Jenks as shown on the street level Map Number 5B. The City has specific flooding hazard at the following locations:

- Green Valley Estates Trailer Park at 101st and Elm (Polecat Creek)

The regulatory flood plain extends into the Town of Sperry as shown on the street level map, Map Number 5C. The Town has historically seen flooding at the following locations:

- At 96th St. N. between Peoria and Yale Avenues (Bird Creek)
- At 98th St. N. and Peoria (Hominy Creek)
- At 86th St. N. and Cincinnati Avenue (Delaware Creek)

Berryhill Public Schools has five schools and four of the schools own property within a floodplain. However, their buildings are not physically located in the floodplain. These schools are the High School, Middle School, and the North and South Elementary Schools.

Bixby Public Schools has nine schools and four of the schools own property within a floodplain. However, their buildings are not physically located in the floodplain. These schools are the High School, Alternative Education, Middle School, and Central Intermediate.

Jenks Public Schools has eleven schools and four of the schools own property within a floodplain. However, their buildings are not within the floodplain. The schools with property within the floodplain are the Jenks East Elementary, Jenks East Intermediate, Jenks West Elementary, and Jenks West Intermediate.

Keystone Public School, Liberty Public Schools, and Sperry Public Schools do not own property within a regulatory floodplain.

Street level maps showing each school campus in relation to the regulatory floodplain is shown on maps in Appendix 1, as follows:

- Berryhill Public Schools - Map Number 5D
- Bixby Public Schools - Map Number 5E
- Jenks Public Schools - Map Number 5F
- Keystone Public School - Map Number 5G
- Liberty Public Schools- Map Number 5H
- Sperry Public Schools - Map Number 5J

3.2.1.3 The severity of a flood is determined by several factors including, rainfall intensity, duration, location, ground cover, imperviousness, slope and degree of saturation. The magnitude of the flood hazard is the regulatory floodplain. Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six School systems use the regulatory floodplain to measure the extent of the flood hazard.

The regulatory floodplain is defined as the area inundated by the runoff from rainfall having a one-percent chance of occurring in any given year. This is referred to as a 100 year event. The regulatory floodplain is identified in the County's Flood Insurance Rate Maps (FIRMs) as Zone A and Zone AE. This is also true for the City of Bixby, City of Jenks, and the Town of Sperry. The following chart describes the FIRM's flood zones.

Table: 3-1
FLOOD ZONES

Zone A	The 100-year or Base Floodplain. There are seven types of A zones:	
	A	The base floodplains mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFE's are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection
Zone V and VE	**V**	The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B zones are also used to designate base floodplains or lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.	
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six School systems consider runoff that stays within the watercourse banks, does not rise above the street curbs, and causes no damage to be of minor severity. Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools consider runoff that fills the floodplain, blocks streets, overtops street curbs, enters residences and businesses and/or threatens human safety to be of major severity.

Element B4
All plans must address NFIP insured structures that have been repetitively damaged by floods.
44 CFR §201.6(c)(2)(ii)

3.2.1.4 Historically, Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six School systems have recognized flooding as a hazard. The County joined the National Flood Insurance Program (NFIP) in 1981, adopting a Flood Damage Prevention Resolution, and requiring that all future development be built one foot above the 100-year base flood elevation. The City of Bixby, City of Jenks, and the Town of Sperry also joined the National Flood Insurance Program (NFIP) in 1981, adopting a Flood Damage Prevention Resolution, and requiring that all future development be built one foot above the 100-year base flood elevation. According to the National Climatic Data Center, from 2007 through 2016, Tulsa County had 28 flood events. The Cities of Bixby and Jenks had zero flood events from 2007 through 2016, and the Town of Sperry had three flood events from 2007 through 2016.

The Tulsa County floodplain administrator reports there are 16 repetitive loss structures in the county that are insured through the National Flood Insurance Program (NFIP). All repetitive loss structures in unincorporated Tulsa County are single family residential structures. The City of Bixby floodplain administrator reports there are 11 repetitive loss structures in the city that are insured through the NFIP. Seven of these structures are single family residential structures and four are commercial. The City of Jenks floodplain administrator reports there are no repetitive loss structures in the city that are insured through the NFIP. The Town of Sperry floodplain administrator reports there are no repetitive loss structures in the Town that are insured through the NFIP.

Berryhill Public Schools, Bixby Public Schools, and Keystone Public Schools, did not have a flood occurrence during the 2007 through 2016 time frame. Jenks Public Schools experienced 12 flood occurrences during the 2007 through 2016 time frame and Liberty Public Schools had one flood event from 2007 through 2016. This localized flood event was the result of poor drainage and Liberty Public Schools has addressed the drainage issues. Sperry Public Schools experienced one localized flood event in the same 2007 through 2016 time frame as a result of poor drainage between two buildings.

Appendix 6 summarizes previous occurrences of this hazard for Tulsa County, the City of Bixby, City of Jenks, and the Town of Sperry.

3.2.1.5 The probability of future flooding within the regulatory floodplain, in any given year, is statistically one-percent and referred to as a 100-year floodplain. Tulsa County, the City of Bixby, City of Jenks, and the Town of Sperry require all new development to comply with their flood damage prevention ordinances. Therefore, new development will not increase the flood hazard to adjacent property and structures will be built above the regulatory flood elevation; both provisions of the ordinance. The probability of future flood damage should not increase with future development. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a flood event is shown in Table: 3-2.

Table: 3-2 Likelihood Of A Flood Event

Jurisdiction	Likelihood of Flooding
Tulsa County	Highly Likely
Jenks Public Schools	Highly Likely
Town of Sperry	Likely
City of Bixby	Unlikely
City of Jenks	Unlikely
Berry Hills Public Schools	Unlikely
Bixby Public Schools	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.1.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage floods may cause to the structures and buildings is discussed in sections 3.3, and 3.4. The impact of the hazard in terms of capabilities or activities to Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools are discussed as follows.

Roadways in floodplains that have not been elevated are susceptible to inundation and closings. Flooded roadways can interrupt transportation and can isolate portions of a community for a period of time. High or prolonged flows can wash out bridges, roadways and infrastructure resulting in long term interruptions. Loss of access can result in longer emergency response times and the delay in emergency response times for fire, police or emergency personnel can jeopardize the well-being of affected residents.

Table: 3-3
CONTRIBUTING FACTORS TO THE FLOOD HAZARD

Factor	Effect
Precipitation Rate	As the rate of precipitation increases, the ground's infiltration rate may be exceeded. This is the dominant factor in flash flooding events, and can overwhelm any or all of the following factors.
Training Echoes	Storm cells that follow each other (much like box cars on a train) can repeatedly deposit large amounts of water on the same watershed, overwhelming its ability to handle runoff.
Slope of Watershed	Steeper topography (hills, canyons, etc.) will move runoff into waterways more quickly, resulting in a quicker, flashier response to precipitation.
Shape of Watershed	Longer, narrower watersheds will tend to "meter out" runoff so that water arrives from down shed (nearer to the mouth of the stream) areas faster than from up shed areas. In watersheds that are more square or circular than elongated, runoff tends to arrive in the main stem at the same time, intensifying the response. This factor becomes more significant with larger watersheds.
Saturation of Soils	Saturated or near-saturated soils can greatly reduce the rate at which water can soak into the ground. This can increase runoff dramatically.
Hardened Soils	Extremely dry soils can develop a pavement or "crust" that can be resistant to infiltration. This is especially true in areas of recent wildfire, where plant oils or resins may cause the soil to be even more water-resistant.
Urbanization	The urban environment usually intensifies the response to heavy precipitation. The two dominant urban factors are: 1) increased pavement coverage, which prevents infiltration and dramatically increases runoff; and 2) Urban systems are designed to remove water from streets and byways as quickly as possible. This accelerates the natural response to precipitation by placing runoff in waterways much more quickly.
Low-water crossings	The vast majority of flash flood related deaths occur in vehicles. Many of these deaths occur at low-water crossings where the driver is unaware of the depth of the water or the consequences of driving into it.

The number of parcels of property with structures within the 100 year floodplain and the value of these structures is shown in Table: 3-4. How many people are residing in these structures is unknown.

Table: 3-4 Number And Value Of Structures Within The Floodplain

Jurisdiction	Number of Parcels of Property with Structures	Value of Structures (In Million Dollars)
Tulsa County (Unincorporated)	2,050	348
City of Bixby	800	211
City of Jenks	236	52
Town of Sperry	22	1.3

The Berryhill Public Schools (High School, Middle School, and North and South Elementary Schools), Bixby Public Schools (High School, Alternative Education, Middle School, and Central Intermediate), and Jenks Public Schools (East Elementary, East Intermediate, West Elementary and West Intermediate) own property within the regulatory floodplain. However, their structures are built outside of the floodplain.

The Keystone Public School, Liberty Public Schools, and the Sperry Public Schools do not own property within the regulatory floodplain.

A typical flood hazard would be an event where precipitation results in runoff which exceeds the drainage channel's capacity. This excess water collects in and flows through the regulatory floodplain. This area of inundation

is regulated by Tulsa County's Flood Damage Prevention Ordinance in the unincorporated areas of Tulsa County. Municipal areas are regulated by the City of Bixby's Flood Damage Prevention Ordinance, the City of Jenks' Flood Damage Prevention Ordinance, and the Town of Sperry's Flood Damage Prevention Ordinance. With all ordinances, new buildings are protected under the ordinance requirements and older structures are addressed above in section 3.2.1.4. The worst case flood event would be where runoff exceeds the capacity of the 100 year regulatory floodplain, thereby inundating areas and possibly structures outside the areas regulated by the Flood Damage Prevention Ordinances. Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools consider the regulatory floodplain the extent of the flood hazard.

3.2.2 Tornado Hazard

3.2.2.1 A tornado is a rapidly rotating vortex or funnel of air extending to the ground from a cumulonimbus cloud. The path width of a tornado is generally less than a half-mile, but the path length can vary from a few hundred yards to dozens of miles. A tornado moves at speeds from 30 to 125 mph, but can generate winds exceeding 300 mph.

3.2.2.2 Tulsa County is located in the northeast part of Oklahoma. The following figure obtained from the FEMA web site shows tornadic activity per 1,000 m^2. Central Oklahoma, along with the area around Fort Worth Texas has the highest concentration of recorded tornados in the country.

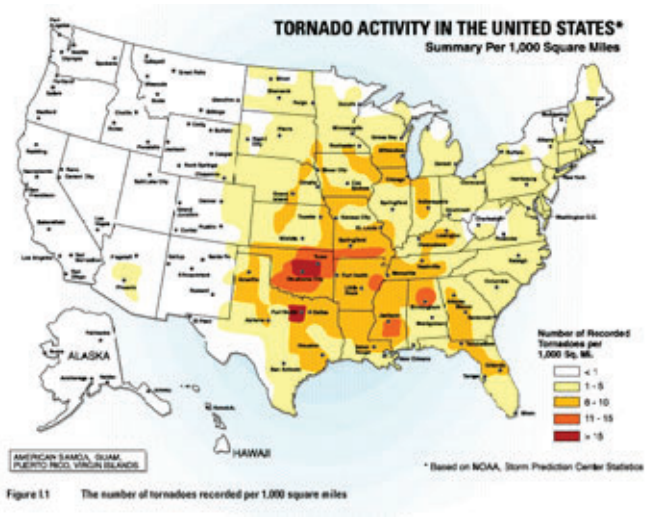


Figure I.1 The number of tornadoes recorded per 1,000 square miles

All portions of Tulsa County have the same tornado risk. This is true for the City of Bixby, City of Jenks, Town of Sperry, and the six Schools participating in the plan.

3.2.2.3 The severity of tornados is measured on the Fujita tornado scale and Enhanced Fujita tornado scale. On February 1, 2007, the Fujita tornado scale was decommissioned in favor of the more accurate Enhanced Fujita tornado scale. None of the tornados recorded on or before January 31, 2007 will be re-categorized. The Fujita tornado scale should be used when referring to tornadic activity prior to 02/01/07.
Tulsa County, the Cities, the Town, and the six participating Schools use these scales to measure the extent of this hazard.

Table: 3-5
FUJITA TORNADO SCALE

Category	Wind Speed (mph)	Damage
F0	Gale tornado (40-72)	**Light:** Damage to chimneys, tree branches, shallow-root trees, sign boards
F1	Moderate tornado (73-112)	**Moderate:** Lower limit is beginning of hurricane wind speed—surfaces peeled off roofs, mobile homes pushed off foundations or overturned, cars pushed off roads
F2	Significant tornado (113-157)	**Considerable:** Roofs torn off frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light-object missiles generated
F3	Severe tornado (158-206)	**Severe:** Roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, cars lifted off the ground and thrown
F4	Devastating tornado (207-260)	**Devastating:** Well-constructed houses leveled, structures with weak foundations blown off some distance, cars thrown and large missiles generated
F5	Incredible tornado (261-318)	**Incredible:** Strong frame houses lifted off foundations and carried considerable distance to disintegrate, automobile-sized missiles fly through the air in excess of 100 yards, trees debarked

Table: 3-6
ENHANCED FUJITA TORNADO SCALE

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
EF0	65-85	**Light damage:** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	**Moderate damage:** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**Considerable damage:** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	**Severe damage:** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	**Devastating damage:** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	**Incredible damage:** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yd.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

source: http://en.wikipedia.org/wiki/Enhanced_Fujita_Scale

According to the National Climatic Data Center, since 2007 when the Enhanced Fujita Tornado Scale was instituted, 84% of all tornadoes in Oklahoma have either been EF0 or EF1 while less than 2% have been EF4 or EF5. However, two-thirds of the EF4 and EF5 tornadoes were fatal.

Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools consider a tornado measuring EF0 and EF1to be of minor severity. Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools consider tornados measuring EF2 through EF5 to be of major severity.

3.2.2.4 From 2007 through 2016, there were 13 tornadoes in Tulsa County. The City of Bixby had three tornadoes from 2007 through 2016. The City of Jenks and the Town of Sperry did not have a tornado event in their corporate limits in this same 2007 through 2016 time frame. None of the six Schools had a tornado on their properties during this 2007 through 2016 time frame. Map Number 6 in Appendix 1 shows previous tornado events around the Tulsa County area.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.2.5 Meteorological conditions change slowly, so future tornado events should occur with the same probability as previous events. No area of the County is any more or less at risk from tornadic activity. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a tornado event is shown in Table: 3-7.

Table: 3-7 Likelihood Of A Tornado Event	
Jurisdiction	Likelihood of a Tornado
Tulsa County	Highly Likely
City of Bixby	Likely
Town of Jenks	Unlikely
Town of Sperry	Unlikely
Berryhill Public Schools	Unlikely
Bixby Public Schools	Unlikely
Jenks Public Schools	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.2.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage tornados may cause to the structures and buildings is discussed in sections 3.3 and 3.4. The impact of the hazard in terms of capabilities or activities on Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools is discussed as follows.

Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six School systems are located in what is considered an active part of tornado alley. Every structure in the County is vulnerable to tornados. Structures, automobiles, persons, agriculture, and utilities can sustain damage from tornados. Utility service outages can affect large segments of the population for long periods of time and threaten the well-being of citizens.

On the lower end, damage from an EF0 tornado with winds from 65-85 mph can result in the destruction of road signs, tall structures, trees, and possibly shingled roofs. Mid –range EF2 to EF4 tornados with winds from 86-200 mph will result in considerable damage. Roofs can be torn off structures, mobile homes completely demolished, most trees and plant life destroyed, objects as big as cars can be thrown short distances (other objects can become missiles too), and trains can be blown over. The worst case is the EF5 tornado with winds greater than 200 mph. Total destruction will occur in the path of these tornados, which have been up to ½ mile wide in the past. Homes, automobiles, appliances, outbuildings, and anything outdoors can be picked up and thrown long distances as large missiles.

Utility infrastructure, such as power lines, substations, water towers, and water wells, are vulnerable and can be severely damaged or destroyed by a tornado. Emergency vehicles responding to the devastated areas can have trouble responding due to down power lines and debris in roadways. Livestock is vulnerable during tornado events and are often killed since there is little protection for the animals on open range. People caught in the path of a tornado that don't take shelter, or have access to shelter, have the potential of being injured or killed. Residents most vulnerable to tornados are those living in mobile homes.

Historically, tornados move in a southwest to northeast direction, but can move in any direction. Consequently, vulnerability of humans and property is difficult to predict since tornados vary in strength, occur randomly, and the path of destruction varies in width. From a safety perspective a tornado may tear up an uninhabited rural area or pass through the middle of a densely developed urban area. Injuries and fatalities depend upon the magnitude and location of a tornado.

Advances in meteorology and the use of Doppler radar allow a more accurate prediction of tornado formation. A network of storm watchers attempt to identify funnel clouds and report to various networks which then alert the population. Tornado sirens, electronic media, TV and radio can all be used to accomplish this. Even though these advances have significantly improved response times, tornados can still occur unexpectedly and without adequate warning.

Utilizing warning systems, county residents can take appropriate precautions prior to and during these events. As a result, casualty rates are low. The popularity of mobile/manufactured housing has increased the risk to these

structures. The use of better building techniques, tie-down systems and the availability of storm shelters all help mitigate losses. As funding has become available, Tulsa County has installed emergency warning sirens to rural areas Tulsa County and will continue to add new sirens as funding becomes available. Specifically, Tulsa County plans to add new sirens to the West Tulsa area. The City of Bixby, City of Jenks, and the Town of Sperry also use emergency warning sirens to warn its citizens. The six Schools use their public address systems to warn everyone in their buildings and on their grounds.

A weak tornado would be an EF0 and a worst case tornado would be an EF5, as defined in Table: 3-5 and Table: 3-6

3.2.3 High Wind Hazard

3.2.3.1 Wind is defined as the motion of air relative to the earth's surface. Extreme windstorm events are associated with cyclones, severe thunderstorms, and accompanying phenomena such as tornados and downbursts. Winds vary from zero at ground level to 200 mph in the upper atmospheric jet stream 6 to 8 miles above the earth's surface. The mean annual wind speed in the mainland United States is reported by FEMA to be 8 to 12 mph, with frequent speeds of 50 mph and occasional wind speeds of greater than 70 mph. Oklahoma wind speeds average 10 miles per hour, but vary widely throughout the state.

3.2.3.2 The risk level is the same over the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry or the six participating Schools, are any more or less at risk from a high wind event.

3.2.3.3 The magnitude of a high wind event is categorized on various wind scales, such as the Saffir-Simpson and Beaufort Scales. Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools, use these scales to measure the magnitude of a wind event. The tables below containing the Saffir-Simpson (Table: 3-8) and Beaufort (Table: 3-9) scales show the discrepancy between the two scales. The National Weather Service (NWS) issues Severe Thunderstorm Warnings whenever a thunderstorm is forecast to produce wind gusts to 58 miles per hour (50 knots) or greater and/or hail one inch in diameter or larger. Hail size increased from ¾ inch to one inch on January 5, 2010, for warning purposes. The hail hazard will be addressed in Section 3.2.5.

Table: 3-8: Saffir-Simpson Scale

Category	Wind Speed (mph)	Storm Surge (feet)	Damages
1	74-95	4- 5	**Minimal:** Trees, shrubbery, unanchored mobile homes, and some signs damaged, no real damage to structures
2	96-110	6-8	**Moderate:** Some trees toppled, some roof coverings damaged, major damage to mobile homes
3	111-130	9-12	**Extensive:** Large trees are toppled, some structural damage to roofs, mobile homes destroyed, structural damage to small homes and utility buildings
4	131-155	13-18	**Extreme:** Extensive damage to roofs, windows, and doors, roof systems on small buildings completely fail, some curtain walls fall
5	155+	18+	**Catastrophic:** Roof damage is considerable and widespread, window and door damage is severe, extensive glass failure, entire buildings could fall

Table: 3-9: Beaufort Scale

Force	Wind Speed (knots)	Description	Damages
0	Less than 1	Calm	Smoke rises vertically.
1	1-3	Light air	Smoke drift indicates wind direction. Leaves and wind vanes are stationary.
2	4-6	Light breeze	Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.
3	7-10	Gentle breeze	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate breeze	Dust and loose paper are blown about. Small branches begin to move
5	17-21	Fresh breeze	Branches of a moderate size move. Small trees in leaf begin to sway.
6	22-27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.
7	28-33	High wind, near gale	Whole trees in motion. Effort needed to walk against the wind.
8	34-40	Gale	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	41-47	Strong gale	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.
10	48-55	Whole gale, storm	Trees are broken off or uprooted, structural damage likely.
11	56-63	Violent storm	Widespread vegetation and structural damage likely.
12	64+	Hurricane	Severe widespread damage to vegetation and structures. Debris and unsecured objects are hurled about

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools, consider a Saffir-Simpson Scale category 1 high wind event to be of minor severity. Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider Saffir-Simpson Scale categories 2 through 5 high wind events to be of major severity.

3.2.3.4 According to the National Climatic Data Center (NCDC), Tulsa County had five recorded high wind events during the period of 2007 through 2016. The NCDC did not report any high wind events in the City of Jenks, or the Town of Sperry during this time period; however the City of Bixby Emergency Management reported eight high wind events. Berryhill Public Schools experienced two high wind events from 2007 through 2016. Bixby Public Schools experienced two high wind events from 2007 through 2016. Jenks Public Schools experienced seven high wind events from 2007 through 2016. Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools each experienced one high wind event from 2007 through 2016.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.3.5 Meteorological conditions change slowly, so future high wind events should occur with the same probability as previous events. The risk level is the same for the entire county. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a high wind event is shown in Table: 3-10.

Table: 3-10 Likelihood Of A High Wind Event

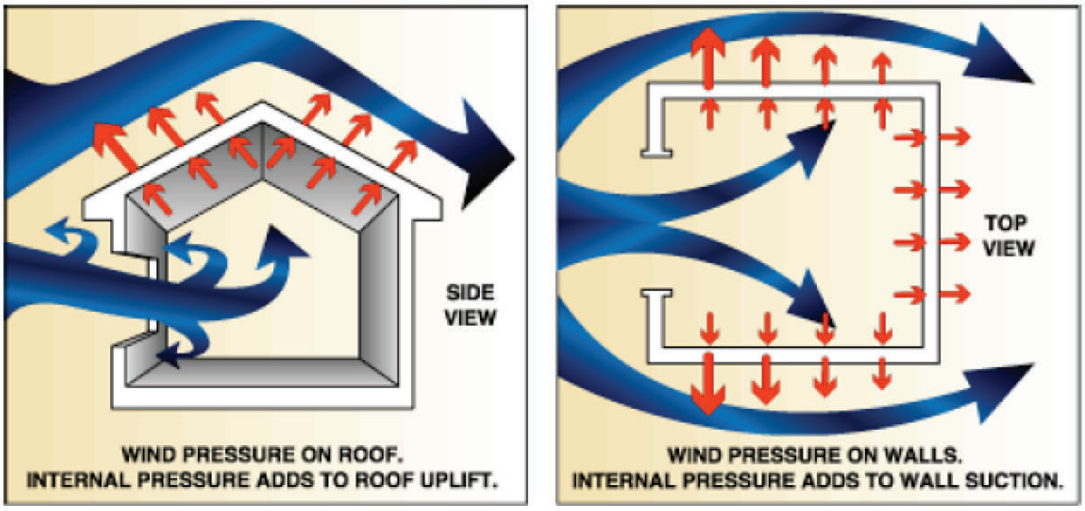
Jurisdiction	Likelihood of High Wind
Tulsa County	Highly Likely
City of Bixby	Highly Likely
Jenks Public Schools	Highly Likely
Berryhill Public Schools	Occasional
Bixby Public Schools	Occasional
Town of Sperry	Unlikely
City of Jenks	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.3.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage winds may cause to the structures and buildings is discussed in sections 3.3 and 3.4. The impact of the hazard in terms of the capabilities or activities on Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools is discussed as follows.

Winds are usually part of severe storms such as tornados and thunderstorms, but do not have to accompany a storm to be dangerous. Straight-line winds and microbursts can cause injury and damage. Very little available data exists concerning straight-line winds separate from thunderstorms or tornados. Mitigation efforts for tornados and thunderstorms should also address the hazard posed by high winds.

High winds can damage buildings in several ways. The diagram below shows how extreme winds affect a building and helps explain why these winds cause buildings to fail. Wind speeds can rapidly increase and decrease. An obstruction, such as a house, in the path of the wind causes the wind to change direction. This change in wind direction increases pressure on parts of the house. The combination of increased pressure and fluctuating wind speeds creates stress on the house that frequently causes connections between building components to fail. For example, the roof or siding can be pulled off or the windows can be pushed in.

Diagram of Windstorm Effects



Buildings that fail due to the effects of high winds often appear to have exploded, giving rise to the misconception that the damage is caused by unequal wind pressures inside and outside the building. This misconception has led to the myth that during a high wind event, the windows and doors in a building should be opened to equalize the pressure. In fact, opening a window or door allows wind to enter a building and increases the risk of building failure.

Damage can also be caused by flying debris. If wind speeds are high enough, debris can be thrown at a building with enough force to penetrate windows, walls, or the roof. Even a reinforced masonry wall can be penetrated unless it has been designed and constructed to resist debris impact during high winds. Because debris can severely damage, and even penetrate walls and roofs, airborne debris threatens not only buildings but the occupants as well.

In addition to structural issues, high winds can affect electrical and other utilities resulting in service outages. Power lines can be grounded out or knocked down causing loss of electrical service. There could also be loss of water, sewer, and communications.

A typical high wind event would be a Saffir-Simpson Scale category 1 as defined in Table: 3-8. The worst case high wind event would be a Saffir-Simpson Scale category 5.

3.2.4 Lightning Hazard

3.2.4.1 Lightning is a discharge of atmospheric electricity (accompanied by a vivid flash of light), frequently from one cloud to another or from a cloud to the earth. The accompanying sound (thunder) is produced by the rapid heating and cooling of the air as the electricity passes through the atmosphere.

Within the thunderstorm clouds, rising and falling air causes turbulence which results in the buildup of a static charge. The negative charges concentrate in the base of the cloud and positive charges concentrate in the top of the cloud. Since like charges repel, some of the negative charges on the ground are pushed down and away from the surface, leaving a net positive charge on the surface. Opposite charges attract, so the positive (ground) and negative (cloud) charges are pulled toward each other. This first, invisible, stroke is called a stepped leader. As soon as the negative and positive parts of the stepped leader connect there is a conductive path from the cloud to the ground and the negative charges rush down it causing the visible strike.

Thunder is caused by the rapid heating and cooling of the air associated with the lightning flash. In less than a second, the air can be heated 15,000 to 60,000 degrees Fahrenheit. When the air is heated to this temperature, it rapidly expands and then quickly contracts. When lightning strikes close by, the sound will be a loud bang, crack or snap. Thunder can typically be heard up to 10 miles away. During heavy rain and wind this distance will be less, but on quiet nights, when the storm is many miles away, thunder can be heard at longer distances.

3.2.4.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools, are any more or less at risk from a lightning strike.

3.2.4.3 The severity of a lightning strike depends upon where the electrical discharge occurs. Cloud-to-ground is the more severe type in terms of potential damage. The tables below from the National Climatic Data Center show the types (Table: 3-11) and frequency (Table: 3-12) of lightning. The more severe type of lightning; coupled with an increased frequency, poses a greater lightning risk.

Table: 3-11
TYPE OF LIGHTNING

Type	Contraction	Definition
Cloud to Ground	CG	Lightning occurring between cloud and ground.
In Cloud	IC	Lightning occurring within the cloud.
Cloud to Cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud to Air	CA	Streaks of lightning which pass from a cloud to the air, but do not strike the ground.

Table: 3-12
FREQUENCY OF LIGHTNING

Frequency	Contraction	Definition
Occasional	OCNL	Less than 1 flash per minute.
Frequent	FRQ	About 1 to 6 flashes per minute
Continuous	CONS	More than 6 flashes per minute.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider any lightning event of less than one flash per minute as minor in severity, and any event greater than one flash per minute as a major severity event.

3.2.4.4 For Tulsa County, NCDC reports eight lightning events during the ten year period from 2007 through 2016. The NCDC did not report any lightning events in the City of Bixby during this time period. For the City of Jenks, NCDC reports two lightening events from 2007 through 2016. The NCDC did not report any lightning events in the Town of Sperry during this time period. The Jenks Public Schools experienced eight lightning events during the 2007 through 2016 time frame. The Berryhill Public Schools, Bixby Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools did not experience a lightning event during this time frame.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.4.5 Meteorological conditions change slowly, so future lightning events are expected to occur with the same probability as previous events. The risk level is the same for the entire county. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a high wind event is shown in Table: 3-13.

Table: 3-13 Likelihood Of A Lightning Event	
Jurisdiction	Likelihood of Lightning
Tulsa County	Highly Likely
Jenks Public Schools	Highly Likely
City of Jenks	Occasional
City of Bixby	Unlikely
Town of Sperry	Unlikely
Berryhill Public Schools	Unlikely
Bixby Public Schools	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.4.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage lightening may cause to the structures and buildings is discussed in sections 3.3 and 3.4. The impact of the hazard in terms of the capabilities or activities on Tulsa County, the City of Bixby, the City of Jenks, the Town of Sperry, and the six Schools is discussed as follows.

Lightning strikes can cause high-voltage power surges through transmission lines and have the ability to seriously damage equipment. Property damage from power surges and resulting fires can destroy not only the electronics in a building, but the structure itself.

The greatest threat posed by lightning is the potential loss of human life. Property damage can also occur to structures and electrical equipment. Anyone outdoors during a thunderstorm is exposed and at risk of injury from lightning.

A minor lightning event would be cloud to cloud lightning that stays in the air and does not contact the ground or another structure. The worst case lightning event would be cloud to ground lightning where the lightning strikes a large public gathering resulting in multiple injuries and/or causalities.

3.2.5 Hail Storm Hazard

3.2.5.1 Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed by strong updrafts of warm air and downdrafts of cold air. As water droplets are carried high into a cloud they freeze and form small hailstones. These small hailstones can grow as additional water droplets freeze to them until they become too heavy to be supported by the updrafts. At this point they fall to earth as hail. Hail can be round, oval or irregularly shaped.

3.2.5.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools, are any more or less at risk from a hail storm.

3.2.5.3 The severity of damage caused by hail storms depends on the hailstone size (average and maximum), number of hailstones per unit area, and associated winds. Hailstone sizes are described in Table: 3-14.

Table: 3-14
HAILSTONE SIZES

Diameter	Example
1/4 inch	Pea
1/2 inch	Marble
3/4 inch	Penny
7/8 inch	Nickel
1 inch	Quarter
1 ½ inches	Ping Pong Ball
1 ¾ inches	Golf Ball
2 ½ inches	Tennis Ball
2 ¾ inches	Baseball
3 inches	Tea Cup
4 inches	Grapefruit
4 ½ inches	Softball

The National Weather Service (NWS) issues Severe Thunderstorm Warnings whenever a thunderstorm is forecast to produce wind gusts of 58 miles per hour (50 knots) or greater and/or hail one inch in diameter or larger is expected. Prior to January 5, 2010 the criteria for hail was ¾ inch or larger.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use hailstone size as a measure of potential damage.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider any hail event that causes major property damage or death to be a major event. Generally this means hailstone diameters one-inch or greater. Minor hail events are ones that cause little property damage and no injuries. This generally involves hailstones of less than one half inch in diameter.

3.2.5.4 According to the NCDC, Tulsa County had 100 hail events with hail diameters one inch and greater during the period from 2007 through 2016. The NCDC reports eight hail hazard events in the City of Bixby, three hail events in the City of Jenks and one hail event in the Town of Sperry. Jenks Public Schools experienced three hail events and Keystone Public Schools and Liberty Public Schools each experienced one hail event during the period from 2007 through 2016. Berryhill Public Schools, Bixby Public Schools, Keystone Public Schools, and Sperry Public Schools did not experience a hail event during this same time period.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.5.5 Meteorological conditions change slowly so future hail events are expected to occur with the same probability as previous events. The risk level is the same for the entire county. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a hail event is shown in Table: 3-15.

Table: 3-15 Likelihood Of A Hail Event

Jurisdiction	Likelihood of High Wind
Tulsa County	Highly Likely
City of Bixby	Highly Likely
City of Jenks	Likely
Jenks Public Schools	Occasional
Berryhill Public Schools	Unlikely
Bixby Public Schools	Unlikely
Town of Sperry	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.5.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage hail may cause to the structures and buildings are discussed in sections 3.3 and 3.4. The impact of the hazard in terms of the capabilities or activities on Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools is discussed as follows.

The impacts of hail range from damage through destruction of structures and personal property to bodily injury, depending on the diameter of the hail, the amount of hail and accompanying winds.. The National Climatic Data Center has reported hail in Tulsa County up to 4 ¼ inches in diameter.

A minor hail storm would be one with hailstones that are noticeable but cause no damage. A worst case hail storm would be when the hailstones are large enough to cause wide spread structural damage and occur over a large public outdoor gathering causing injuries to persons not under safe cover.

3.2.6 Winter Storm Hazard

3.2.6.1 All winter storms are accompanied by cold temperatures and blowing snow, which can reduce visibility. A severe winter storm is one that drops 4 or more inches of snow during a twelve hour period, or 6 or more inches during a 24- hour span. An ice storm occurs when freezing rain falls or falling rain freezes immediately upon contact. All winter storms make driving and walking extremely hazardous. The aftermath of a winter storm can impact a community or region for days, weeks, and even months. Winter storms are considered deceptive killers as they indirectly cause transportation accidents, injury and death from exhaustion/overexertion, hypothermia, and frostbite from wind chill. Asphyxiation and house fires occur more frequently in the winter due to the lack of proper safety precautions while using home heating equipment.

3.2.6.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry or the six participating Schools, are any more or less at risk from a winter storm.

3.2.6.3 A winter storm can range from moderate snow (2 to 4 inches over 12 to 24 hours) to blizzard conditions (4 to 6 inches over 12 to 24 hours). A combination of high winds, freezing rain, sleet, blowing and drifting snow when accompanied by extremely cold temperatures can increase the severity of a winter storm. Some winter storms may be large enough to affect several states while others may affect only a single community.

The Sperry Piltz Ice Accumulation Index attempts to quantify the severity of a winter storm. The scale is shown in Table: 3-16.

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	< 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use this index to measure the extent of the hazard.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider an SPIA index of 0 and 1 to be of minor severity and 2 to 5 to be of major severity.

3.2.6.4 For Tulsa County, the NCDC reports 14 winter storm events during the ten year period from 2007 through 2016. Winter storms are generally wide spread events so the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools also experienced these 14 winter storms from 2007 through 2016.

Appendix 6 summarizes previous occurrences of this hazard.

In the past ten years, from 2007 through 2016, Tulsa County has been included in five federally declared disasters, four of which, were for severe winter storms; DR-1678, DR-1735, DR-1876, and DR-1985.

3.2.6.5 Meteorological conditions change slowly so future events are expected to occur with the same probability as the previous events. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a winter storm in Tulsa County is "highly likely" and the TCHMPC determined that is an appropriate probability for the City of Bixby, City of Jenks, Town of Sperry and the six participating Schools.

3.2.6.6 The impact of this hazard in terms of the number of structures and buildings damaged and the potential damage winter storms may cause to structures and buildings is discussed in sections 3.3 and 3.4. The impact of the hazard in terms of the capabilities or activities in Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six Schools is discussed as follows.

A typical winter storm would have an ice damage index of 0, as defined by the Sperry Piltz Ice Accumulation Index, and the worst case winter storm hazard would have an ice damage index of 5.

Tulsa County is affected periodically by heavy snow and ice that can cause damage. Trees and power lines fall due to the weight of ice and snow causing power outages. Icy roads cause accident rates to increase and impair the ability of emergency vehicles to respond which can result in more severe injuries and a higher loss of life. Slips and falls are also more likely to result in injury and over exertion from snow removal activities can result in additional medical problems.

A major winter storm can be very dangerous. Preparing for cold weather conditions and responding to them effectively can reduce the dangers caused by winter storms.

3.2.7 Heat Hazard

3.2.7.1 A heat hazard occurs when the ambient temperature and conditions exceeds the body's ability to cool itself. Humid conditions can worsen the hazard by limiting the body's ability to cool itself through sweating (evaporative cooling). The National Weather Service issues an excessive heat warning when the heat index (a measure of the temperature combined with the relative humidity) is at least 105°F for more than 3 hours per day for 2 consecutive days, or if the heat index is greater than 115°F for any period of time.

3.2.7.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools, are any more or less at risk from a heat hazard.

3.2.7.3 High temperatures, when combined with high humidity, can put an area in the "Extreme Danger" category on the National Weather Service Heat Index scale (Table: 3-17). When extreme heat is combined with drought, excessively dry, hot, conditions can result in a higher risk of life-threatening heat-related illness. The heat index is a measure of the severity of a heat hazard and can be related to a range of specific heat disorders. Tulsa County can experience a heat index reading into the heat stroke range.

Table: 3-17
HEAT INDEX

Temperature (F) versus Relative Humidity (%)						
°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

Heat Index	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F - 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	**Heat stroke highly likely with continued exposure.**

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use this scale to measure the extent of this hazard.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider a heat index between 95° and 105° F to be of minor severity and a heat index above 105° F to be of major severity.

3.2.7.4 According to the National Climatic Data Center, three extreme heat events were reported in Tulsa County from 2007 through 2016. Extreme heat events are generally wide spread events so the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools also experienced these three extreme heat events from 2007 through 2016. No structural damage was recorded for the heat hazard.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.7.5 Meteorological conditions change slowly so future events should occur with the same probability as the previous events. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a hazardous heat event in Tulsa County is "Likely. The City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools are also likely to have hazardous heat events.

3.2.7.6 A typical high heat event would be one in which people experience heat indices between 90° and 105° F, as shown in Table: 3-17. The elderly population, individuals with respiratory issues and individuals that must spend time outdoors are most at risk from this heat hazard. A worst case high heat event would be to persons exposed to heat indices exceeding 130° F where heat stroke is more likely.

In Oklahoma, the National Weather Service reports July as generally the hottest month of the year, followed by August.

Heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

Most heat disorders occur because the victim has been overexposed to heat or has over exerted for his or her age and physical condition. Other conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality.

Extreme heat can have a serious economic impact on a community. Increased demand for water and electricity may result in resource shortages. Moreover, damage to food supplies may occur if extreme heat damages agricultural crops and livestock.

Young children, elderly people, those with respiratory issues and overweight individuals are more likely to become victims of extreme heat. Other conditions that can limit the ability to regulate temperature include fever, dehydration, heart disease, mental illness, poor circulation, sunburn, prescription drug use, and alcohol use. Another segment of the at risk population is those whose jobs require strenuous outside activity. When temperatures reach 90° F and above, people and animals are more likely to suffer sunstroke, heat cramps, and heat exhaustion.

Another extreme heat hazard is air pollution. During summer months, consistent high temperatures and stagnant airflow patterns can cause a build-up of hydrocarbons to form a dome-like ceiling over large cities. The abundance of factories, automobiles, lawn equipment, and other internal combustion machines emit particulate matter that builds and worsens with the increase in temperature. The resulting stagnant air does not move away until a weather front arrives to disperse it. When the particulate matter reaches a pre-determined level, an ozone alert is issued for the Tulsa area and implementation measures are undertaken to reduce the use of cars and the output of the offending chemicals. Ozone alerts usually include advisories for the elderly and those with breathing difficulties and recommendations to stay indoors in air-conditioned environments when possible.

Extreme heat can also have a structural impact. Roads can buckle during times of extreme heat. Extreme heat leads to rapid evaporation of ponds and lakes, depleting water sources used by both farmers and the community. Often times, residents use additional water during extreme heat to counter the drying of soils and prevent vegetation from dying. This additional strain on water systems can lead to low water pressure, and can cause water shortages when firefighters are trying to save property and vegetation dried out by the extreme heat.

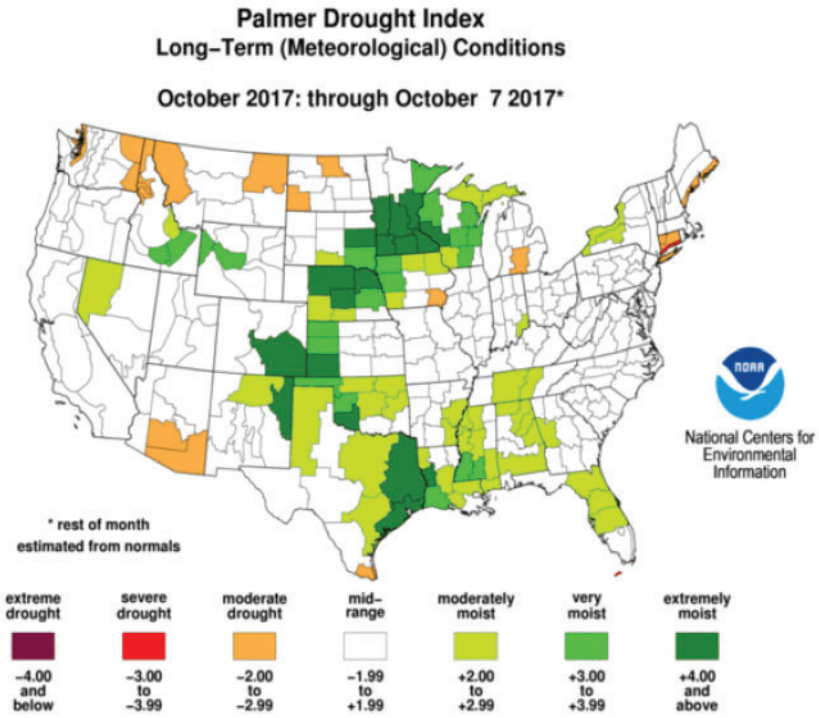
3.2.8 Drought Hazard

3.2.8.1 A drought is a period of drier-than-normal conditions resulting in water-related problems. Precipitation (rain or snow) falls in uneven patterns across the country. When no rain or only a small amount of rain falls, soils can dry out and plants can die. When rainfall is less than normal for an extended period of time, the flow in streams and rivers decline, the water level in lakes and reservoirs fall, and the depth to water in wells increases. If dry weather persists and water supply problems develop, the dry period is considered a drought.

Decreasing rainfall records are usually the first indication of an approaching drought. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more. A period of below-normal rainfall does not necessarily result in drought conditions. Some areas of the United States are more likely to have droughts than other areas. In humid or wet regions, a drought of a few weeks is quickly reflected in a decrease in soil moisture and in declining stream flow. In arid or dry regions (portions of Oklahoma), people rely on groundwater and water in reservoirs to supply their needs. They are protected from short-term droughts, but may have severe problems during long dry periods because they may have no other water source if wells or reservoirs go dry.

3.2.8.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools, are any more or less at risk from a drought hazard.

3.2.8.3 The Palmer Drought Index was developed in the 1960's and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought severity index. The Palmer Index is most effective in determining long term drought; a matter of several months. It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. NOAA has used this index to classify the drought hazard throughout the continental United States. As of October 2017, Tulsa County was in the moderately moist severity range of the Palmer Drought Index. The national map showing the October 2017 Palmer Drought Index is shown below.



Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use this scale to measure the extent of the hazard.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider a mid-range Palmer Drought Index to be of minor severity and a severe drought index to be of major severity.

3.2.8.4 One of the greatest natural disasters in U.S. history and the most severe and devastating in Oklahoma was the decade-long drought in the 1930's that has become known as the Dust Bowl. Reaching its peak from 1935 through 1938, high temperatures and low rainfall combined to destroy crops and livestock. High winds literally blew the soil and vegetation away resulting in massive soil erosion. Hundreds of small rural communities were ruined and about 800,000 people were displaced. The total expenditure by the American Red Cross for drought relief in Oklahoma in 1930-1931 was the third largest ever in the nation.

According to the National Climatic Data Center, four drought events were reported in Tulsa County from 2007 through 2016. Drought events are generally wide spread events so the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools also experienced these four drought events from 2007 through 2016. No structural damage was recorded for this hazard.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.8.5 Meteorological conditions change slowly so future events are expected to occur with the same probability as the previous events. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a drought event in Tulsa County is "highly likely". The City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools are also highly likely to have drought events.

3.2.8.6 A typical drought condition would be a mid-range to moderate Palmer Drought Index, where some form of voluntary water rationing would be encouraged but not required and the only damage would be to under watered lawns. The worst case drought condition would be a Palmer Drought index of negative 4.00 and below, an extreme drought that lasts for months to years.

Water shortages can also affect firefighting capabilities in both urban and rural settings through reduced water flows and pressures. Most droughts dramatically increase the danger of wildfires. Although droughts are most associated with summer and high temperatures, droughts can impact the county during winter months.

3.2.9 Expansive Soils Hazard

3.2.9.1 A drought is a period of drier-than-normal conditions resulting in water-related problems. Precipitation (rain or snow) falls in uneven patterns across the country. When no rain or only a small amount of rain falls, soils can dry out and plants can die. When rainfall is less than normal for an extended period of time, the flow in streams and rivers decline, the water level in lakes and reservoirs fall, and the depth to water in wells increases. If dry weather persists and water supply problems develop, the dry period is considered a drought.

Decreasing rainfall records are usually the first indication of an approaching drought. Within a short period of time, the amount of moisture in soils can begin to decrease. The effects of a drought on flow in streams and rivers or on water levels in lakes and reservoirs may not be noticed for several weeks or months. Water levels in wells may not reflect a shortage of rainfall for a year or more. A period of below-normal rainfall does not necessarily result in drought conditions. Some areas of the United States are more likely to have droughts than other areas. In humid or wet regions, a drought of a few weeks is quickly reflected in a decrease in soil moisture and in declining stream flow. In arid or dry regions (portions of Oklahoma), people rely on groundwater and water in reservoirs to supply their needs. They are protected from short-term droughts, but may have severe problems during long dry periods because they may have no other water source if wells or reservoirs go dry.

3.2.9.2 The risk level is the same for the entire County. No area of the County, including the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools, are any more or less at risk from a drought hazard.

3.2.9.3 The Palmer Drought Index was developed in the 1960's and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought severity index. The Palmer Index is most effective in determining long term drought; a matter of several months. It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. NOAA has used this index to classify the drought hazard throughout the continental United States. As of October 2017, Tulsa County was in the moderately moist severity range of the Palmer Drought Index. The national map showing the October 2017 Palmer Drought Index is shown below.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use this scale to measure the extent of the hazard.

Table: 3-18 Soil Types In Tulsa County		
Jurisdiction	Shrink-Swell Potential of Majority of Soils	Map Number in Appendix 1
Town of Sperry	High to Very High	7C
Sperry Public Schools	High	7J
Keystone Public Schools	High	7G
Tulsa County	Moderate to High	7
Berryhill Public Schools	Moderate to High	7D
Liberty Public Schools	Moderate to High	7H
City of Bixby	Low to Moderate	7A
City of Jenks	Low to Moderate	7B
Jenks Public Schools	Low to Moderate	7F
Bixby Public Schools	Low	7E

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider a very low to moderate expansive soil shrink-swell potential to be of minor severity and a high and very high expansive soil shrink-swell potential to be of major severity

3.2.9.4 No information is available for Tulsa County on how expansive soils have damaged structures. This hazard develops gradually and thus is not usually reported, largely because a catastrophic expansive soils event has not occurred. This is also the case for the City of Bixby, City of Jenks, Town of Sperry, and five of the participating Schools. Jenks Public Schools reported four expansive soil events from 2007 through 2016.

3.2.9.5 Soil properties have not changed significantly, so future occurrences of soils expansion and contraction should continue. An estimate of future occurrences is rated as "unlikely" for Tulsa County, as shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6 (an explanation of the likelihood scale is shown in Appendix 6). Because no data is reported for this hazard, the TCHMPC determined that this "unlikely" rating is appropriate for the City of Bixby, City of Jenks, Town of Sperry, and five of the participating Schools. The likelihood of an expansive soils event for the Jenks Public Schools is "highly likely".

3.2.9.6 The negative impact of expansive soils on foundations of structures occurs slowly over time. Structural foundations, such as in homes, commercial buildings, and concrete slabs in driveways, sidewalks and parking lots are at risk when built over expansive soils. Asphalt surfaces such as highways and runways can also be affected. Expansive soils can cause uneven settlement of the soil under a structure's foundation resulting in foundation cracks and damage to the structure above the foundation.

Structures built in areas of high shrink-swell potential that are not built with any foundation displacement protection, such as post-tension reinforcing, can be at risk. These conditions become worse during extreme and extended drought conditions when the soils dry out and voids occur. The voids increase the likelihood foundations will deflect resulting in structure damage.

Due to the generalized nature of the available soils information, specific site analyses would be necessary to determine if Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the school properties have been impacted by expansive soils. Therefore, mitigation actions will be recommended to better quantify this hazard for each site.

3.2.10 Wildfire Hazard

3.2.10.1 Wildfires are defined as the uncontrolled burning of highly vegetated areas. They are difficult to extinguish and usually occur in wooded, prairie or rural areas.

Wildfires are often referred to as grass fires in Tulsa County. The amount of control the fire department has over the burning vegetated area is a factor in defining a fire as a wildfire. Also, the size of the burning area is a factor. A small area of burning vegetation is often referred to as a grass fire while a large area of burning vegetation is called a wildfire. Both size and control are factors in how this hazard is named.

3.2.10.2 According to TAEMA, these fires occur more frequent around the boundaries of communities. This area is referred to as the wildland-urban interface. Wildfire risk varies by location. This interface is defined as the area ½ mile either side of a community's corporate limits. Locations in the community, inside their ½ mile wildland-urban interface, are at less risk due to the reduction in vegetated area because of the community's homes, structures, landscaping and infrastructure. Areas outside the wildland-urban interface have a lower risk because they are less populated. The wildland-urban interface around Tulsa County communities is shown on Map Number 8 in Appendix 1.

The City of Bixby's wildland-urban interface is shown on Map Number 8A in Appendix 1. The interior of the City of Bixby is inside the City's wildland-urban interface. Eight of the nine Bixby Public Schools are in the City of Bixby wildland-urban interface, also shown on Map Number 8A in Appendix 1. The eight Bixby Public Schools located within the City of Bixby's wildland-urban interface are the High School, the 9th Grade Center, the Middle School, the Alternative School, the Central Intermediate, the North Elementary, the North Intermediate, and the Northeast Elementary and Intermediate schools.

The Liberty Public Schools is located in the Bixby wildland-urban interface, also shown on Map Number 8A in Appendix 6.

The City of Jenks' wildland-urban interface is shown on Map Number 8B in Appendix 1. The interior of the City of Jenks is inside the city's wildland-urban interface. Five of the eleven Jenks Public Schools are in the City of Jenks' wildland-urban interface, and one of the eleven Jenks Public Schools is located inside the City of Tulsa's wildland-urban interface, also shown on Map Number 8B in Appendix 1. The five Jenks Public Schools located within the City of Jenks' wildland-urban interface are the High School, Freshman Academy, West Intermediate, West Elementary, and the Early Childhood Center. The school located within the City of Tulsa's wildland-urban interface is the Middle School.

The Town of Sperry's wildland-urban interface is shown on Map Number 8C in Appendix 1. All properties in the Town of Sperry are in Sperry's wildland-urban interface. The Sperry Public Schools is in the Town of Sperry's wildland-urban interface, also shown on Map Number 8C in Appendix 1.

The Berryhill Public Schools is in the City of Sand Springs' wildland-urban interface, as shown on Map Number 8D in Appendix 1.

The Keystone Public Schools is outside of the City of Sand Springs' wildland-urban interface, also shown on Map Number 8D in Appendix 1.

3.2.10.3 The Keetch-Byram Drought Index (KBDI) was created by John Keetch and George Byram in 1968 for the United States Department of Agriculture's Forest Service. It quantifies the probability of a wildfire based on soil moisture and other conditions related to drought. The index is designed as an assessment for fire potential. It is a continuous index, relating to the flammability of organic material in the ground. The KBDI attempts to measure the amount of precipitation necessary to return the soil to full field capacity. It is a closed system ranging from 0 to 800 units. Zero is the point of no moisture deficiency (or saturation) and 800 is the maximum drought that is possible where the soil is absolutely dry. The index number indicates the amount of rainfall (in hundredths of an inch) that is required to reduce the index to zero, or saturation. With this scale soil is assumed to have a maximum storage capacity of 8 inches.

KBDI levels and its relationship to expected fire potential are reflected as follows:

- KBDI = 0 – 200: Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. This is typical of spring dormant season following winter precipitation.
- KBDI = 200 – 400: Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity
- KBDI = 400 – 600: Typical of late summer, early fall. Lower litter and duff layers contribute to fire intensity and will burn actively.
- KBDI = 600 – 800: Often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider the wildfire hazard with a KBDI level of 0-400 to be of minor severity. Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider the wildfire hazard with a KBDI level of 400-800 to be of major severity.

3.2.10.4 The Bixby Fire Department, Jenks Fire Department, and Sperry Fire Department were sampled as representative of hazardous material events in Tulsa County. The Bixby Fire Department responded to 368 grass fires from 2007 through 2016. The Jenks Fire Department responded to 149 grass fires from 2009 through 2016. The Sperry Fire Department responded to 165 grass fires from 2010 through 2014. Wildfires did not occur at the Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public School, Liberty Public Schools, or the Sperry Public Schools in this 2007 through 2016 time frame.

Appendix 6 summarizes previous occurrences of this hazard.

3.2.10.5 The fire departments in Tulsa County have continuing campaigns to educate the public on fire prevention. However, all fires cannot be prevented so this hazard will continue. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a wildfire event is shown in Table: 3-19.

Table: 3-19 Likelihood Of A Wildfire Event

Jurisdiction	Likelihood of a Wildfire
Tulsa County	Highly Likely
City of Bixby	Highly Likely
City of Jenks	Highly Likely
Town of Sperry	Highly Likely
Berryhill Public Schools	Unlikely
Bixby Public Schools	Unlikely
Jenks Public Schools	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.10.6 The impact of this hazard, in terms of the number of structures and buildings and the potential damage a wildfire may cause to the structures and buildings is discussed in sections 3.3 and 3.4. The impact of this hazard in terms of the capabilities or activities on Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools is discussed as follows.

A typical wildfire would be a grass fire in which the fire department is dispatched and puts out the fire before it causes significant damage to crops, structures, or causes personal injury. A worst case wildfire scenario would be an event that could not be controlled before it overwhelms the fire department's capabilities, causing damage to facilities, structures, and/or persons.

The number of structures in the Tulsa County communities' wildland-urban interface (the area more vulnerable to a wildfire than the interior of the community), is shown in section 3.3.10 and the damage estimate for those structures is shown in section 3.4.5.

When wild lands are destroyed by fire, the resulting erosion can cause heavy silting of streams, rivers, and reservoirs resulting in serious damage to aquatic life, irrigation systems and power production.

3.2.11 Earthquake Hazard

3.2.11.1 An earthquake is a sudden, rapid, shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped our planet as the huge plates that form the earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together and unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet but some earthquakes occur in the middle of plates. Earthquakes strike suddenly, often without warning and can occur at any time of the year and any time of the day or night.

On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. Estimates of losses from future earthquakes in the United States approach $200 billion. There are 45 states and territories in the United States at moderate to very high risk from earthquakes and they are located in every region of the country. California experiences the most frequent damaging earthquakes. Alaska experiences the greatest number of large earthquakes but most are located in uninhabited areas. The largest earthquakes felt in the United States were along the New Madrid Fault in Missouri. At this time a three-month long series of quakes (1811 to 1812) included three quakes larger than a magnitude of 8 on the Richter scale. These earthquakes were felt over the entire Eastern United States, with Missouri, Tennessee, Kentucky, Indiana, Illinois, Ohio, Alabama, Arkansas, and Mississippi experiencing the strongest ground shaking.

3.2.11.2 The faults most likely to affect Oklahoma are the New Madrid Fault, centered in the Missouri Bootheel region, the Meers Fault, located in southwestern Oklahoma near Lawton, and the Wilzetta Fault in central Oklahoma. The distance from the Missouri Bootheel region to Tulsa County is approximately 350 miles and the distance from the Meers fault region to Tulsa County is approximately 180 miles. The risk level is the same for the entire county. No area of the county, including the Town of Sperry and the four participating schools, are at more or less risk from an earthquake.

3.2.11.3 The severity of an earthquake is expressed by the Richter scale. The Richter scale is a logarithmic measure of the amplitude of the seismic waves. This scale, named after Dr. Charles F. Richter of the California Institute of Technology, is the best known scale for measuring the magnitude of earthquakes. An earthquake of magnitude 2 is the smallest earthquake normally felt by people. Earthquakes with a Richter value of 6 or more are commonly considered major. Great earthquakes have a magnitude of 8 or more on the Richter scale.

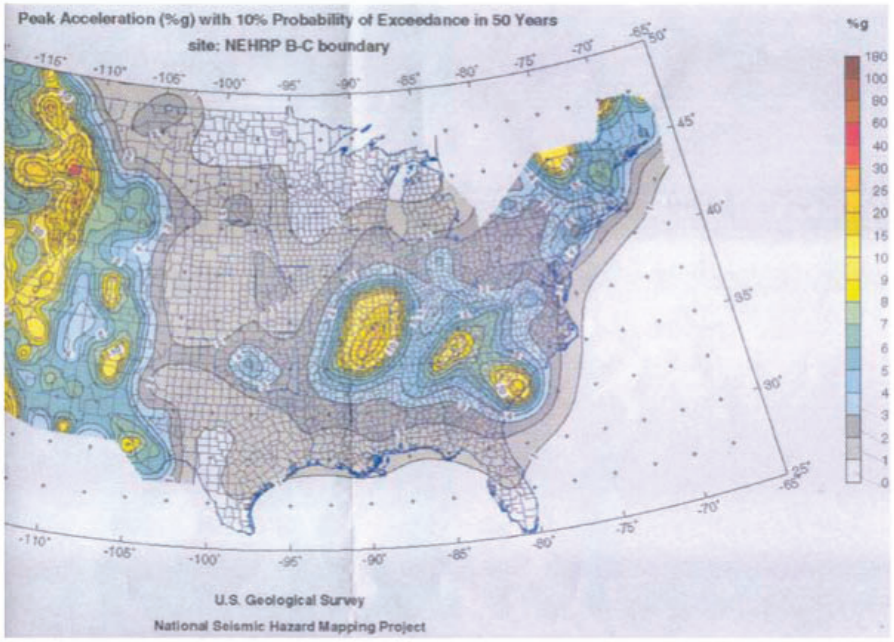
Table: 3-20
THE RICHTER SCALE

Magnitude	Description
1 to 3	Recorded on local seismographs, but generally not felt.
3 to 4	Often felt, with little to no damage reported.
5	Felt widely, slight damage near epicenter.
6	Damage to poorly constructed buildings and other structures within 10 km.
7	"Major" earthquake. Causes serious damage up to 100 km (recent Taiwan, Turkey, Kobe, Japan, Iran and California earthquakes).
8	"Great" earthquake, great destruction, loss of life over several 100 km (1906 San Francisco, 1949 Queen Charlotte Islands).
9	Rare great earthquake, major damage over a large region over 1000 km (Chile 1960, Alaska 1964, and west coast of British Columbia, Washington, Oregon, 1700)

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools use this scale to measure the magnitude of an earthquake.

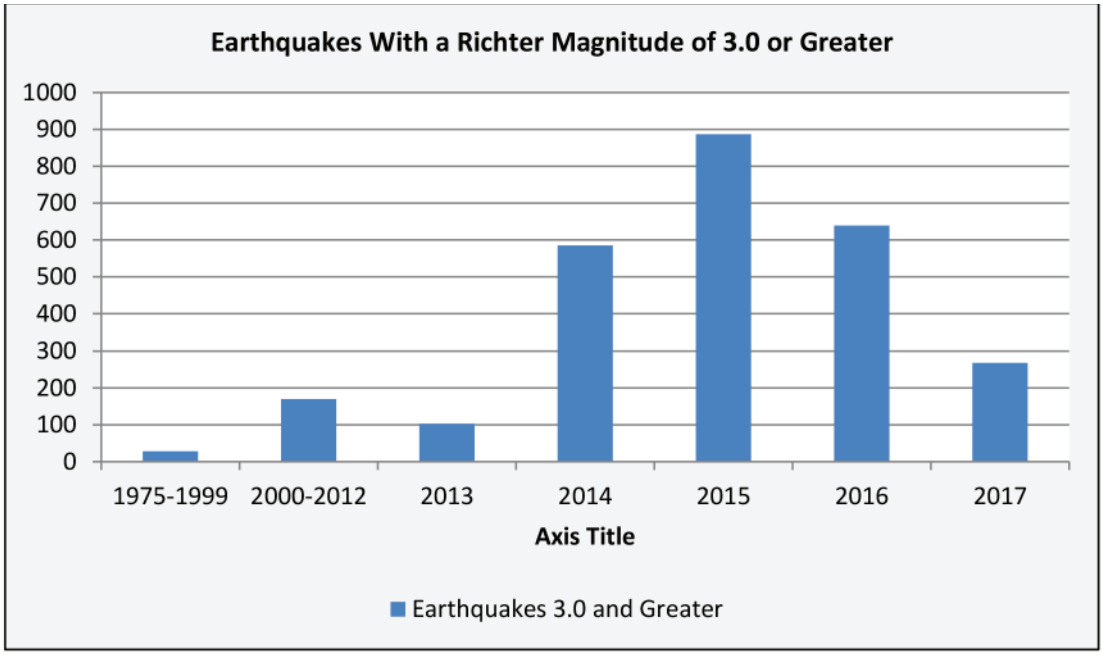
Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools consider an earthquake of magnitude 4 and below on the Richter scale to be a minor earthquake and an earthquake greater than magnitude 4 on the Richter scale to be a major earthquake.

The USGS National Seismic Hazard Mapping, shown below, shows Tulsa County in the 2%g (peak acceleration) range and with a 10% probability of exceedance in 50 years. According to FEMA document number 386-2, "Understanding Your Risks", Step 1; areas with 2%g peak acceleration or less have a relatively low seismic risk, and an earthquake risk assessment is not warranted.



3.2.11.4 According to the U.S. Geological Survey, there were no earthquake events centered in Tulsa County from 2007 through 2016, and none in the City of Bixby, City of Jenks, Town of Sperry, or the six participating Schools. On November 5, 2011, the state experienced its largest and third largest earthquakes in state history. A 4.8 magnitude earthquake occurred near Prague and then a 5.6 magnitude earthquake occurred near Sparks. Both earthquakes were centered in Lincoln County, a county southwest of Tulsa County, in central Oklahoma. The later earthquake surpassed the previous largest earthquake in state history, a 5.5 magnitude earthquake near El Reno on April 9, 1952.

In the past few years, Oklahoma has seen a noticeable increase in the number of earthquakes according to U.S. Geological Survey records. From 1975 to 2000, Oklahoma experienced 28 earthquakes with a magnitude of 3.0 or greater. From 2000 through 2012 there were 170 earthquakes. In 2013 alone, Oklahoma had 103 earthquakes of magnitude 3.0 or greater and in 2014, there was an exponential increase to 585 earthquakes. In 2015, Oklahoma experienced 887 earthquakes of magnitude 3.0 or greater, prompting the state to issue new rules governing wastewater injection wells. Oil field wastewater injection activity is considered, by some scientists, to be responsible for the increased seismic activity. While it is still to be determined whether or not the injection wells are causing Oklahoma's increase in earthquakes, 2016 saw a reduction in earthquakes of magnitude 3.0 or greater, with 639 earthquakes recorded. The following year (2017) saw an even more significant decline, with only 268 earthquakes of magnitude 3.0 or greater.



3.2.11.5 The U.S. Geological Survey shows there were no earthquake events centered in Tulsa County from 2007 through 2016, resulting in a likelihood rating of "unlikely". This probability is appropriate for the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools. The estimate of future occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6 (the definition of the likelihood scale is shown in Appendix 6).

3.2.11.6 The impact of this hazard in terms of the number of structures and buildings and the potential damage the hazard may cause to the structures and buildings is discussed in sections 3.3 and 3.4. The impact of this hazard in terms of the capabilities or activities on Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating Schools is discussed as follows.

A typical earthquake event would be a magnitude 1 to 3 on the Richter scale, which would be largely unfelt and would not cause noticeable damage. The worst case earthquake event would be a magnitude 9 on the Richter scale, resulting in a large amount of structure damage and personal injury.

All structures, homes, businesses, utilities and transportation infrastructure are vulnerable to an earthquake. Earthquakes occurring near Tulsa County can still impact the County. In addition, Keystone Dam sits on the west edge of Tulsa County and poses a significant hazard to the county's residents in the event of a dam failure. While an analysis of the dam's structural stability in the event of a large earthquake near or centered at the dam is beyond the scope of this plan, it is noted that earthquakes pose a potential threat to the structure. The timely notification of earthquake events can allow residents to take some precautions and remind individuals of the possibility of aftershocks. This is recommended as a mitigation activity to help minimize damage and injuries from earthquakes.

3.2.12 Hazardous Material Hazard

3.2.12.1 Hazardous materials are chemical substances that, if released or misused, can pose a threat to the environment or human health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials are divided into nine classes. They are: (1) explosives, (2) gases, (3&4) flammable and combustible materials, (5) oxidizers and organic peroxide, (6) poisons, (7) radioactive, (8) corrosive and (9) miscellaneous. These substances are most often released in large quantities as a result of transportation accidents or chemical accidents at plant sites. In Oklahoma, an owner or operator of a facility with on-site storage of hazardous substances is required to submit an inventory of those substances to the Oklahoma Department of Environmental Quality (ODEQ) and the local fire department. These facilities are referred to as Tier II facilities.

3.2.12.2 The Tier II facilities within unincorporated Tulsa County and in the City of Bixby, City of Jenks, and the Town of Sperry are listed in Table: 3-21: Tier 2 Sites In Unincorporated Tulsa County, City Of Bixby, City Of Jenks, and Town Of Sperry. Their general location is shown on Map Number 9 in Appendix 1. There are no Tier II sites at the six participating Schools' locations.

Table: 3-21
TIER 2 SITES IN UNINCORPORATED TULSA COUNTY, CITY OF BIXBY, CITY OF JENKS, AND TOWN OF SPERRY

Facility Name	Location	City
AAON, Inc.	2425 S Yukon	Tulsa
Acme Brick Co. – Tulsa Plant	4103 Dawson Rd	Tulsa
Adjuvants Unlimited, LLC	3620 W 5th St	Tulsa
Airgas USA, LLC – Mid South	9741 E 56th St N	Tulsa
Allan Edwards	2505 S 33rd W Ave	Tulsa
American Alloy Steel	6350 N Erie Ave	Tulsa
Baker Hughes Upstream Chemical	1818 W 21st St	Tulsa
Bama Foods, Limited Partnership	5377 E 66th St N	Tulsa
Bluelinx – Tulsa Distribution Center	5717 N Mingo Rd	Tulsa
BSO, Inc. – Round Mountain	W 55th St S & S 265th W Ave (¼ mile S)	Cleveland
Cartledge Oil – North Glen Sand	W 111th St S & S Olmsted St	Jenks
Cartledge Oil – Perryman	W 117th St S & S Vine St	Jenks
Cartledge Oil – Rosa Chisholm	E 106th St N & N Cincinnati Ave (SE Corner)	Tulsa County
Central Tube and Bar	6433 North Erie St	Tulsa
Chemtrade Refinery Services	5201 W 21st St	Tulsa
Citation Oil and Gas – Luvena	HWY 51 & S Campbell Creek Rd (1 mile SW)	Tulsa
City of Tulsa – Northside WWTP	5628 N 105th E Ave	Tulsa
Cornelius Energy Partners – Lact Sta.	3411 W 21st St S	Tulsa
Corrpro Companies – Sand Springs	11616 W 59th St	Sand Springs
Corrpro Companies – Tulsa	5750 S 116th W Ave	Sand Springs
Cox Communications – Owasso	10036 N 145th E Pl	Owasso
Cox Communications – Yale Hub	1530 N Yale Ave	Tulsa
Creek County RWD #2	2425 W 121st S	Jenks
D & L Oil Tools	1915 S 49th W Ave	Tulsa
DaPro Rubber Inc. – Owasso Plant	6712 N Canton Ave	Tulsa
Enable OK Intrastate Transmission, LLC – Riverside Power Station	113th St & S 5th Pl (¼ mile E)	Tulsa County
Enable OK Intrastate Transmission, LLC – Riverside Tie Station	W 106th St S & S Elm St	Jenks
Enable OK Intrastate Transmission, LLC – Tulsa Power Sta. – (High Pressure Yard)	W 36th St & S Elwood Ave	Tulsa
Enable OK Intrastate Transmission, LLC Tulsa Power Sta. – (Low Pressure Yard)	W 36th St & S Elwood Ave	Tulsa County

EQ of Tulsa	2700 S 25th W Ave	Tulsa
FedEx Freight Inc. – Tulsa	6882 W 76th St	Tulsa
Fiber Glass Systems	25 S Main St	Sand Springs
Fuel Marketing Corporation Terminal	3202 W 21st St	Tulsa
Gateway Resources USA – Freeman	E 136th St N & N 71st E Ave (NW Corner)	Tulsa
Gateway Resources USA – Minnix	E 136th St N & N 92nd E Ave	Cobb Ranch
Gateway Resources USA Sand Springs	Shell Creek Rd & Madison Rd (½ mile S)	Sand Springs
Grand Resources – Bird Creek	E 96th St N & N 26th E Ave (¼ mile N)	Tulsa County
Grand Resources – Charley Battery	E 106th St N & N Delaware Ave (¼ mile S)	Tulsa County
Grand Resources – Eagan	N Harvard Ave & E 106th St N (¼ mile SE)	Tulsa County
Green Country Energy, LLC	12307 S Florence Ave	Jenks
Greg Sparks – Mayberry	Shell Creek Rd & Rou Sims Rd (1¾ mile SSW)	Cleveland
H&L Tooth Company	10055 E 56th St	Tulsa
Hewlett Packard – MGG03	4000 Mingo Rd	Tulsa
Hewlett Packard – TUB01	7400 N Lakewood Ave	Tulsa
Holly Energy Partners – Tulsa E Terminal	1307 W 35th St	Tulsa
HollyFrontier Tulsa Refining LLC, (East)	902 W 25th St	Tulsa
HollyFrontier Tulsa Refining, LLC (West)	1700 S Union	Tulsa
Honeywell Aerospace – Tulsa Facility	6930 N Lakewood Ave	Tulsa
Hydrotex – Tulsa Manufacturing	4912 S 48th W Ave	Tulsa
Industrial Welding & Tool Supply	8595 W 81st S	Tulsa
KLO – Bruner Vern Unit	S 57th W Ave & W 1st St S	Sand Springs
KRMG	5801 S 256th W Ave	Sand Springs
Lowe's of Bixby, OK (#1532)	11114 S Memorial Dr	Bixby
Macy's Logistics and Operations – Tulsa	7120 E 76th St N	Owasso
Magellan Pipeline Co. – Tulsa Terminal	2120 S 33rd W Ave	Tulsa
MCI –TUCBOK (VZB-OKTUCBOK)	6929 N Lakewood Ave	Tulsa
Metals USA/Port City Metal Services	3101 Charles Page Blvd	Tulsa
Michael Allen – Thomas	Martin Luther King Jr Blvd & W 46th St N (½ mile SW)	Tulsa
Mid-Continent Energy – MTR #1	N Yale Ave & E 126th St N (½ mile E)	Collinsville
Mid-Continent Energy – MTR #4	HWY 75 & E 126th St N (SW Corner)	Collinsville
Midwestern Manufacturing Company	2119 S Union Ave	Tulsa
Mike Worstell – Chisholm	N Cincinnati Ave & E 106th St N (¼ mile S)	Sperry
Mike Worstell – May	N Peoria Ave & E 96th St N (¼ mile E)	Sperry
NBI Services – Wacoho Glenn Sand U	N Peoria Ave & E 96th St N (¼ mile E)	Tulsa County
Nexeo Solutions, LLC – Tulsa	3535 W 21st St	Tulsa
Nordam – Manufacturing	6910 N Whirlpool Dr	Tulsa
Nordam – Nacelle Thrust Reversers	6911 N Whirlpool Dr	Tulsa
Nordam – Transparency	7018 N Lakewood	Tulsa
Norris Sucker Rods	4801 W 49th St	Tulsa
North American Galvanizing Co. – Tulsa	1800 W 21st St	Tulsa
NOV Ameron West Tulsa Facility	2333 S Yukon	Tulsa
OK Tank Trucks Storage Facility	N Cincinnati Ave & E 136th St N (NW Corner)	Skiatook
Oklahoma Forge	5259 S 49th W Ave	Tulsa
Penske Truck Leasing Co., LP	11330 E Pine St	Tulsa
Phillips 66 – Glenpool Product Terminal	10600 S Elwood	Jenks
Pinnacle – Emery	N Lewis Ave & E 116th St N (¼ mile S)	Skiatook

Pinnacle – Sheehand	Martin Luther King Jr Blvd & E 56th St N (¼ mile SW)	Tulsa
PRL Manufacturing, Inc.	4946 E 66th St N	Tulsa
PSO – Riverside 138kV Substation	745 E 116th St	Jenks
PSO – Riverside 345kV Substation	745 E 116th St	Tulsa
PSO – Riverside Power Station	116 St S and Arkansas River	Jenks
PSO – Sapulpa Road Substation	1800 S Cherokee	Sapulpa
PSO – Tulsa North 138kV Substation	727 E 86th St N	Sperry
PSO – Tulsa Power Station	3600 S Elwood	Tulsa
PSO – Tulsa Power Station Substation	325 W 36th	Tulsa
PSO – Wekiwa Substation	251 S 209th W Ave	Sand Springs
Pump it Up – Amos Thompson/Anna Koch	N Lewis Ave & E 86th St N (NW Corner)	Sperry
Pump it Up – Fields	N Harvard Ave & E 100th St N	Sperry
Pump it Up – Spencer	N Harvard Ave & E 86th St N (½ mile N)	Sperry
Pump it Up – Van Hoose/Hummingbird	N Birmingham Ave & E 96th St N (¼ mile S)	Sperry
Ralston Farmers Fuel & Oil	Highway 75 and 131st St N	Skiatook
Ranger Systems – Hennage	N Lewis Ave & E 126th St N (¼ mile S)	Tulsa
Reliable Oil Industries, Inc. – Cora McKee	12595 W 56th St	Sand Springs
Rock Oil Company – Barnett	N Harvard Ave & E 116th St N (¼ mile N)	Sperry
Rock Oil Company – Jenny Murray	N Harvard Ave & E 116th St N (¼ mile N)	Sperry
Rock Oil Company – Osborn	N Harvard Ave & E 116th St N (½ mile N)	Skiatook
Rock Oil Company - Perkins	HWY 75 & E 126th St N (SE Corner)	Sperry
Ryerson – Tulsa	6434 North Erie St	Tulsa
Scott Underwood – Ellis	N Lewis Ave & E 106th St N (NW Corner)	Skiatook
SH Production – Fugate	N Florence Ave & E 76th St N	Tulsa County
SH Production – Gate Emery	N Victor Ave & E 69th St N	Tulsa County
SH Production – Hinshaw	N Lewis Ave & E 66th St N (½ mile N)	Tulsa County
SH Production – JO and William Burgess	N Lewis Ave & E 66th St N	Tulsa County
SH Production – Lantz	N Lewis Ave & E 66th St N (½ mile E)	Tulsa County
SH Production – Linehan	N Lewis Ave & E 66th St N (¾ mile E)	Tulsa County
SH Production – Offenbacher	N Lewis Ave & E 66th St N (¼ mile N)	Tulsa County
SH Production – Sisler A	N Lewis Ave & E 66th St N	Tulsa County
SH Production – Sisler A1, B	N Lewis Ave & E 66th St N (¼ mile N)	Tulsa County
SH Production – Story and Guest	N Lewis Ave & E 66th St N (¼ mile N)	Tulsa County
Sherwin-Williams #4332	3699 S 73rd E Ave	Tulsa
Spess – Roady	36.0837, -96.2709	Tulsa County
Spirit AeroSystems	3330 N Mingo Rd	Tulsa
Sprint – OK, Tulsa POP	6802 S 65th W Ave	Tulsa
SW Bell – Sperry Co	120 1/2 W Main	Sperry
T.D. Williamson Tulsa Mfg. Plant	6801 S 65th W Ave	Tulsa
Taylor Forge Engineered Systems Inc.	6333 N Erie Ave	Tulsa
Triumph Aerostructures – Tulsa, LLC	3330 N Mingo Rd – Bldg B004	Tulsa
Truckers Disposal Facility	N Cincinnati Ave & E 126th St N	Skiatook
Tulsa Winch, Inc.	11135 S James Ave	Jenks
US Cellular – 101st and Memorial	E 101st St and S Memorial Dr	Tulsa
Wagner Plate Works, LLC	4142 W 49th St	Tulsa
Webco Industries, Inc. – Star Center Tube	13701 W Highway 51	Sand Springs
Whirlpool Corporation, Tulsa Division	7301 Whirlpool Dr	Tulsa

William Park – Bird Creek	N Lewis Ave & E 86th St N (½ mile SE)	Hominy
William Park – Thelma	N Lewis Ave & E 86th St N (½ mile SE)	Hominy
William Park – Wagner	N Lewis Ave & E 86th St N (¾ mile SE)	Hominy
Xanadu Exploration Co. – McKee #1	S 193rd W Ave & HWY 51 (1 mile S)	Tulsa County
Xanadu Exploration Co. – Campbell Ranch	S 193rd W Ave & HWY 51 (½ mile S)	Tulsa County
Xanadu Exploration Co. – McKee #1-H	S 193rd W Ave & HWY 51 (1¼ mile S)	Tulsa County

3.2.12.3 Tier II sites represent stationary hazardous material locations. These sites include buildings or property where Tier II materials are manufactured or stored and are regulated nationally under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) by the U.S. Environmental Protection Agency (EPA), and in Oklahoma by the Department of Environmental Quality.

The hazardous material and location, as well as weather, population, topography, toxicity, flammability, vegetation, and number of people likely to be in close proximity all could be factors in the severity of a hazardous material release. A gallon of gasoline spilled on a flat, impervious surface on a calm, dry, day in an unpopulated area would constitute an event of minor severity. A tanker truck at a Tier II facility, carrying a Tier II hazardous substance and responsible for a large accidental release near a waterway, on a hill, in a populated area would constitute an event of major severity.

3.2.12.4 For the evaluation of previous occurrences of hazardous material events, traffic accidents with gasoline spills and response calls to Tier II facilities were reviewed. Fire departments are the first responders to hazardous material events in Tulsa County. The Bixby Fire Department, Jenks Fire Department, and Sperry Fire Department were sampled as representative of hazardous material events in Tulsa County. The Bixby Fire Department responded to 51 hazardous material spills during the 2007 through 2016 time frame. The Jenks Fire Department responded to 151 hazardous material spills during the 2009 through 2016 time frame. The Sperry Fire Department responded to 165 hazardous material spills during the 2010 through 2014 time frame. Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and the Sperry Public Schools are not Tier II storage facilities and did not have a hazardous material event on their property in the 2007 through 2016 time frame. Appendix 6 summarizes previous occurrences of this hazard.

3.2.12.5 Chemicals and hazardous materials are used in beneficial ways throughout our society and will continue to be used in the future. As such, Tulsa County will continue to be exposed to this hazard. According to the likelihood rating from Appendix 6 (the definition of the likelihood scale is shown in Appendix 6), the likelihood of a hazardous material event is shown in Table: 3-22.

Table: 3-22 Likelihood Of A Hazardous Material Event

Jurisdiction	Likelihood of a Hazardous Material Event
Tulsa County	Highly Likely
City of Bixby	Highly Likely
City of Jenks	Highly Likely
Town of Sperry	Highly Likely
Berryhill Public Schools	Unlikely
Bixby Public Schools	Unlikely
Jenks Public Schools	Unlikely
Keystone Public Schools	Unlikely
Liberty Public Schools	Unlikely
Sperry Public Schools	Unlikely

3.2.12.6 Many areas of Tulsa County are susceptible to hazardous materials events due to the high number of highly traveled roads, highways and railroads. Potential impacts include disruptions in transportation and commerce if roads are closed. Local businesses and residences can also be affected. Soils and waterways could become contaminated by spills and require remediation. Water supplies can be disrupted and citizen's health can be impacted. The county will follow its emergency operations plan in the event of any hazardous material event.

A typical hazardous material hazard scenario would be an automobile accident where gasoline (which is not Tier II) is spilled and the local fire department responds without further incident. A worst case scenario would be responding to a facility that contains a hazardous material that has not been properly documented so the responders may not be properly prepared for the hazardous material they would be encountering. The quantity of a hazardous substance is not the sole factor in the severity of a hazardous material event. Location, weather, population, topography, vegetation, toxicity and flammability all could be factors in the event's severity.

3.2.13 Dam Break/Levee Failure Hazard

3.2.13.1 A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings.

A dam break is the collapse, breach, or other failure resulting in the unintentional release of water and downstream flooding. Dam breaks are primarily caused by hydrologic or structural deficiencies. An example of a hydrologic deficiency could be inadequate spillway capacity. Structural deficiencies include seepage, erosion, cracking, sliding and overturning, mainly caused by the age of a dam and lack of maintenance.

A levee is an engineered embankment, usually constructed of compacted soil, designed to reduce the risk of flooding. Levees prevent flooding by providing a barrier between floodwater and low lying lands that would otherwise be inundated.

A levee failure is a breach or overtopping of the levee, which results in water flooding property otherwise protected by the levee. Levees can fail in a number of ways: overtopping, erosion, structural failures, and levee saturation. Typically, levees are breached when a section of the levee breaks away, leaving a gaping hole for water to inundate and flood property once protected by the levee. A levee can also fail through overtopping, when floodwaters rise above the top of the levee and allow floodwaters to flood property behind the levee.

3.2.13.2 The Oklahoma Water Resources Board (OWRB) coordinates the Oklahoma Dam Safety Program. OWRB categorizes dams into three categories; low hazard, significant hazard, and high hazard. There are two dams of major concern to Tulsa County and the participating jurisdictions: Keystone Lake Dam and Heyburn Lake Dam. These two dams are listed in Table: 3-23.

Table: 3-23
HIGH HAZARD DAMS

NAME	CREEK/RIVER	HAZARD CATEGORY
Heyburn Lake Dam	Polecat Creek	H
Keystone Lake Dam	Arkansas River	H

An emergency action plan (EAP) is required by the OWRB for all high hazard category dams. An element of the EAP is an inundation map showing the area inundated in the event of a dam break. The general location of the Keystone Lake Dam dam break inundation area is the floodplain along the Arkansas River through Tulsa County, the City of Bixby, and the City of Jenks. The general location of the Heyburn Lake Dam dam break inundation area is the floodplain along Polecat Creek through Tulsa County and the City of Jenks. The United States Army Corps of Engineers' Tulsa District (USACE) manages Keystone Lake and Heyburn Lake. They oversee maintenance and safety issues concerning these dams.

Tulsa County has two levee districts: Tulsa County Drainage District 12 and Jenks Levee. The Tulsa County Drainage District 12 provides operation and maintenance for the Tulsa-West Tulsa Levee System. The system, constructed in 1945, is approximately 20 miles all together along both the left and right banks of the Arkansas River. The left bank consists of a total of 11.8 miles and the right bank consists of 7.9 miles. The left bank contains Levees "A" and "B" with Levee "C" along the right bank. Jenks Levee construction was completed in 1949 after Congress approved the construction in 1944 and was completed under the direction of USACE. The levee protects the City of Jenks from flooding which occurs on the Arkansas River, Polecat Creek, and Hager Creek. The levee is 7.8 miles long and is composed of two sections: Section "A" (3.82 miles) and Section "B" (3.98 miles). Section "A" is located along the right bank of the Arkansas River and joins Section "B" at the confluence of the river with Polecat Creek, approximately 3.82 miles downstream. Section "B" continues along the left bank of Polecat Creek until the confluence of Hager Creek and Polecat Creek, where it continues along the left bank of Hager Creek, approximately two miles. This triangular shaped levee system contains approximately 1,540 acres.

3.2.13.3 Low hazard dams are those where a break would result in no probable loss of human life and low economic losses. Significant hazard dams are those dams where a break would result in no probable loss of human life but can cause economic or disruption of lifeline facilities. High hazard dams are those dams where a break will probably cause loss of human life.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating schools consider a partial collapse of a dam, with water releases contained within the creek banks to be of minor severity if water does not flood streets or cause damage. Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry and the six participating schools consider a partial to total collapse of a dam, where released water fills the inundation area, blocks streets, gets into residences and businesses or results in loss of life to be of major severity.

Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating schools consider a partial levee failure when water releases do not inundate roads and structures to be of minor severity. Tulsa County, including the City of Bixby, City of Jenks, Town of Sperry, and the six participating schools consider a partial or total failure of a levee, where released water inundates streets, residences and businesses, or results in the loss of life to be of major severity.

3.2.13.4 According to the Tulsa Area Emergency Management Agency (TAEMA) and the National Climatic Data Center (NCDC), there were no dam break or levee failure events in Tulsa County from 2007 through 2016.

3.2.13.5 The likelihood of future dam break or levee failure occurrences is shown in the Likelihood Rating field in the Hazard Summary Table in Appendix 6 (the definition of the likelihood scale is shown in Appendix 6). As shown in the table, the likelihood rating for a dam break or levee failure in Tulsa County, City of Bixby, Bixby Public Schools, City of Jenks, Jenks Public Schools, Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools is "unlikely.

3.2.13.6 A typical dam break or levee failure hazard scenario would be minor seepage through the dam or levee, which was identified during the dam or levee inspection and remedied. The worst case scenario of a dam break or levee failure hazard would be an unexpected break of the dam or levee in which emergency personnel could not effectively notify people downstream of the breach.

The depth of water following a dam break could be measured with dam break inundation maps. However, Keystone Lake Dam and Heyburn Lake Dam are federally regulated dams which fall under the jurisdiction of the USACE. The emergency action plans for these dams were prepared by USACE. These maps are classified as "for official use only" and are not distributed to the general public. The addresses of the structures in the inundation area are on file with TAEMA.

Therefore, in order to illustrate the impact of a Keystone Dam or Heyburn Dam failure, water depths from the 100-year floodplain of the Arkansas River downstream of the Keystone dam and the 100-year floodplain of Polecat Creek downstream of Heyburn Lake Dam were used to estimate the impact of the dam break hazard on Tulsa County, the City of Bixby, City of Jenks, Bixby Public Schools, and the Jenks Public Schools. The Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools are not located downstream of these dams so are not impacted by this hazard.

For the Keystone Dam, water depths in the Arkansas River during a 100-year flood stay below the SH97 Bridge over the Arkansas River. However, the 100-year flood depth in the Meadow Valley subdivision in Sand Springs at 26th and Bermuda is approximately 3.5 ft.

There are zero critical facilities in the 100-year floodplain downstream of this high hazard dam.

For the Heyburn Dam, there are 13 critical facilities in the 100-year floodplain downstream of this high hazard dam.

The impact of a levee failure in terms of the number of structures and buildings damaged is discussed in sections 3.3 and 3.4. The impact of the hazard in terms of capabilities or activities to Tulsa County, the City of Bixby, City of Jenks, Town of Sperry, and the six schools are discussed as follows.

Levees can produce a false sense of security since people tend to believe a levee will protect them and their property against flooding. While levees typically do protect people and their property, floodwaters breaching a levee are usually contained within the historic floodplain and create a hazard for structures built below the base flood elevation (BFE). In addition, floodwaters breaching a levee are forced through the narrow breach in the levee, which amplifies the velocity increasing the potential to cause even greater damage than floodwaters in the main channel. FEMA now requires certification of levees in order for properties protected by levees to be eligible for flood insurance rates at the flood-level protection. If a levee is not certified, the properties are only eligible for flood insurance at the actual rates for the structures elevation as compared to the BFE.

Roadways in levee protected areas that have not been elevated above the BFE are susceptible to inundation and closings. Flooded roadways can interrupt transportation and can isolate portions of a community for a period of time. High or prolonged flows can wash out bridges, roadways and infrastructure resulting in long term interruptions. Loss of access can result in longer emergency response times and a delay in emergency response times for fire, police or emergency personnel can jeopardize the well-being of affected residents.

Flooded streets are dangerous and can cause motorists to lose control of their vehicles. According to FEMA flood facts, six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling. A foot of water will float many vehicles. Two feet of rushing water can carry away most vehicles including sport utility vehicles (SUV's) and pick-ups.

There are 45 critical facilities in levee protected areas. Three are located in Tulsa County and the other 42 are located behind the Jenks Levee.

The hazard classifications are based upon current conditions, including population and land-use patterns below the dams. Such conditions can change over time, so a structure that is not currently considered high-hazard may receive this designation in the future, if enough dwellings are built within the floodplain below the dam. Other high-hazard dams may have a hazard designation lowered if land-use patterns change, reducing the threat of loss to life or property. Mitigation aspects, such as the relocation of vulnerable properties, can reduce the number of high-hazard dams or losses due to dam failures. To protect vulnerable populations in the State of Oklahoma and Tulsa County, the following law is in place:

State Law 785:25-7. Warning and evacuation plans.

- Owners of existing or proposed dams classified as high hazard, regardless of the size of such dams, and any other dam as determined by the Board, shall provide an adequate warning system and written evacuation plan to protect downstream lives and property, with a written description of said system and written evacuation plan to be approved by and filed with the local Civil Defense authorities.
- Additionally, the written description of the warning system and approved evacuation plan shall be filed with the Board.

3.3 Assessing Vulnerability: Identifying Assets

This section describes vulnerability in terms of the type and number of existing buildings and critical facilities in the hazard location. This section describes vulnerability in terms of the number of existing school buildings in the hazard location.

Element D1
A local jurisdiction must review and revise its plan to reflect changes in development.
44 CFR §201.6(d)(3)

The vulnerability analysis utilized FEMA document 386-2, "Understanding Your Risks," Step 3, in order to determine the building value and contents value to determine a total value per building at risk from the hazard.

For Tulsa County and the Town of Sperry, the Tulsa County Assessor classifies properties into three (3) types; residential, commercial, and agricultural. A value for each property with a structure was determined by the assessor. The contents value was determined as a percentage of the building value, based on the Contents Value table in FEMA 386-2, Step 3.

For the schools, the school buildings are inventoried below. The building value was estimated by the school. The contents value was determined as a percentage of the building value, based on the Contents Value table in FEMA 386-2, Step 3.

The following tables show this information for all buildings in unincorporated Tulsa County. This table will be referred to for all hazards that do not vary by location throughout the county.

Table 3-24
TOTAL BUILDINGS IN UNINCORPORATED TULSA COUNTY

Category	Number of Structures	Structure Value ($$)
Residential	7,817	764,263,882
Commercial	519	645,845,361
Agricultural	5,252	685,093,708
Total	13,588	2,095,202,951

The following table shows this information for all buildings in the City of Bixby. This table will be referred to for all hazards that do not vary by location throughout the City.

Table 3-25
TOTAL BUILDINGS IN THE CITY OF BIXBY

Category	Number of Structures	Structure Value ($$)
Residential	8,024	1,579,210,049
Commercial	442	215,928,863
Agricultural	211	123,521,336
Total	8,677	1,918,660,248

The following table shows this information for all buildings in the City of Jenks. This table will be referred to for all hazards that do not vary by location throughout the City.

Table 3-26
TOTAL BUILDINGS IN THE CITY OF JENKS

Category	Number of Structures	Structure Value ($$)
Residential	6,322	1,158,268,340
Commercial	336	167,297,388
Agricultural	1,270	358,545,815
Total	7,928	1,684,111,543

The following table shows this information for all buildings in the Town of Sperry. This table will be referred to for all hazards that do not vary by location throughout the Town.

Table 3-27
TOTAL BUILDINGS IN THE TOWN OF SPERRY

Category	Number of Structures	Structure Value ($$)
Residential	366	20,931,923
Commercial	32	2,062,837
Agricultural	72	6,502,164
Total	470	29,496,924

The following table shows this information for all the buildings for the Berryhill Public Schools. This table will be referred to for all hazards that do not vary by location.

Table 3-28
TOTAL BUILDINGS AT BERRYHILL PUBLIC SCHOOLS

Category	Number of Structures	Structure Value ($$)
Berryhill High School	22	7,711,638
Berryhill Middle School	1	957,545
Berryhill North Elementary School	4	4,112,600
Berryhill South Elementary School	2	4,138,968
Berryhill Early Childhood Center	3	741,829
Administration	1	325,000
Activity Center	1	1,949,000
Transportation (9 buses, 2 pickup trucks, 1 box van, 1 flatbed trailer, 3 suburbans)	16	502,273
Total	50	20,438,853

The following table shows this information for all the buildings for the Bixby Public Schools. This table will be referred to for all hazards that do not vary by location.

Table 3-29
TOTAL BUILDINGS AT BIXBY PUBLIC SCHOOLS

Category	Number of Structures	Structure Value ($$)
Bixby High School	19	54,720,839
Bixby Middle School	2	17,334,643
Bixby 9th Grade Center	2	5,054,116
Bixby Alternative Education	2	5,079,512
Bixby Central Intermediate	1	13,716,397
Bixby Central Elementary	3	14,579,789
Bixby North Elementary	3	12,460,364
Bixby North Intermediate	2	10,199,716
Bixby Northeast Elementary	2	14,457,208
Bixby Northeast Intermediate	1	Under Construction
Bixby Administrative Office	1	2,606,059
Bixby Transportation Center	1	1,688,860
Bixby Technology Building	1	751,932
Bixby Facilities/CN Building	2	597,336
Total	42	153,246,771

The following table shows this information for all the buildings for the Jenks Public Schools. This table will be referred to for all hazards that do not vary by location.

Table 3-30
TOTAL BUILDINGS AT JENKS PUBLIC SCHOOLS

Category	Number of Structures	Structure Value ($$)
Jenks High School	27	$147,052,035
Jenks Alternative Center	1	$3,757,500
Jenks Freshman Academy	1	$6,830,000
Jenks Early Childhood Center	1	$3,400,000
Jenks Middle School	1	$26,531,869
Jenks East Intermediate School	5	$11,532,895
Jenks West Intermediate School	5	$24,751,738
Jenks East Elementary	8	$22,569,250
Jenks Southeast Elementary	3	$14,425,000
Jenks West Elementary	7	$38,004,507
Jenks Northwest Elementary	1	$20,236,667
Jenks North Facilities	8	$8,329,500
Jenks Education Service Center	1	$2,000,000
Jenks Old Gym	1	$468,000
Total	70	$329,888,961

The following table shows this information for all the buildings for the Keystone Public Schools. This table will be referred to for all hazards that do not vary by location.

Table 3-31
TOTAL BUILDINGS AT KEYSTONE PUBLIC SCHOOLS

Category	Number of Buildings	Structure Value ($$)
Keystone Public School	7	7,903,324

The following table shows this information for all the buildings for the Liberty Public Schools. This table will be referred to for all hazards that do not vary by location. Structures include the school buildings, garage and storage buildings and support structures.

Table 3-32
TOTAL BUILDINGS AT LIBERTY PUBLIC SCHOOLS

Category	Number of Structures	Structure Value ($$)
Liberty Public School PK – 3rd, 4th- 6th, and 7th – 12th	42	13,253,187
Transportation (11 buses, 1 pickup truck, 2 cars, 2 trailers, 2 suburbans)	18	550,650
Total	60	13,803,837

The following table shows this information for all the buildings for the Sperry Public Schools. This table will be referred to for all hazards that do not vary by location.

Table 3-33
TOTAL BUILDINGS AT SPERRY PUBLIC SCHOOLS

Category	Number of Structures	Structure Value ($$)
Sperry Public School	52	32,567,940

Flood hazards, dam break/levee failure hazards, wildfire hazards, and hazards from expansive soils are the four hazards that vary in magnitude by location. A hypothetical tornado was analyzed in the tornado hazard section. For these hazards, GIS models were used to determine the buildings in a hazard location when the hazard's location data is available as discussed in the hazard's vulnerability assessment section to follow.

For each hazard, the buildings at risk from that hazard are tabularized in each hazard's section, or refer to the above tables. The total number of buildings at risk, the building type, the building value, its contents' value, and the total value is shown. These tables follow the format in FEMA 386-2, worksheets 3a "Inventory Assets".

This assessment also analyses the critical facilities at risk from each hazard. Where a hazard varies by location, these facilities' locations are shown in relation to the hazard. Information on mobile homes is not tracked by the Assessor; therefore, it is not included in the vulnerability assessment.

Facilities that are classified to be critical by the TCHMPC are listed in the following table, and shown on Map Number 4 in Appendix 1. These facilities are critical to the county. They provide public safety and emergency response services to the public in the event of a hazard occurrence or they are necessary to preserve the welfare and quality of life to the community or maybe they primarily house persons who will need emergency personnel to evacuate in the event of a hazard.

Table 3-34
CRITICAL FACILITIES

TYPE	NAME	ADDRESS	CITY
Childcare	Crossroads Church	2525 W Main St	Jenks
Childcare	Crossroads Daycare	2525 W Main St	Jenks
Childcare	Lords & Ladies Child Development	900 W Main St	Jenks
Childcare	Jenks Preschool Before/After Care	205 E B St	Jenks
Childcare	First Baptist Church	11701 S Elm St	Jenks
Childcare	Jenks Preschool Early Childhood Center	823 N 5th St	Jenks
Childcare	Early Childhood Center Park	825 N 5th St	Jenks
Childcare	Grace Living Preschool	711 N 5th St	Jenks
Childcare	New Spring Assembly of God Day Care	1233 W 96th St	Jenks
Fire	Berryhill Fire Department	2700 S 65th W Ave	Tulsa
Fire	Bixby Fire Department	116 W Needles	Bixby
Fire	Bixby Fire Department	8300 E 121st St S	Bixby
Fire	Collinsville Rural Fire Station	1018 S 12th St	Collinsville
Fire	Jenks Fire Department	205 N Elm	Jenks
Fire	Jenks Fire Department	1115 W 121 St	Jenks
Fire	Keystone Fire Department	25505 W 41st St	Sand Springs
Fire	Turley Fire and Rescue	6404 N Peoria	Tulsa
Fire	Sperry Fire Department	115 N Cincinnati	Sperry
Government	OK Dept of Transportation	4002 N Mingo Expressway	Tulsa
Government	TAEMA EOC	600 Civic Center	Tulsa
Government	Tulsa County Fairgrounds	4802 E 15th St	Tulsa
Government	Tulsa County Offices	500 S Denver	Tulsa
Government	Tulsa County Offices	300 S Houston	Tulsa
Government	Tulsa County District 1 Hwy Maintenance	3801 N Harvard	Tulsa
Government	Tulsa County District 2 Hwy Maintenance	3500 W 31st St S	Tulsa
Government	Tulsa County District 3 Hwy Maintenance	5625 S Garnett	Tulsa
Government	Chandler Park	6500 W 21st St	Tulsa
Government	O'Brien Park	6149 N. Lewis Ave	Tulsa
Government	LaFortune Park	5801 S Yale Ave	Tulsa
Government	TAEMA Staging Facility	6092 E 66th St N	Tulsa
Government	Bixby City Hall	116 W Needles	Bixby
Government	Bixby Radio Tower	18101 S 161st E Ave	Bixby
Government	Bixby Communications Building	18101 S 161st E Ave	Bixby

Government	Jenks City Hall	211 N Elm St	Jenks
Government	City County Library	523 W B St	Jenks
Government	US Postal Service	303 E A St	Jenks
Government	Tulsa County/Jenks Levee	511 S 1st St	Jenks
Government	AEP-PSO Power Plant	900 E 116th St	Jenks
Government	Green Country Energy Power Plant	12307 S Florence Ave	Jenks
Government	Oklahoma Aquarium	300 Aquarium Dr	Jenks
Government	Public Works Maintenance Facility	1701 N Birch St	Jenks
Government	Public Works Satellite Maintenance Facility	950 W 101st St	Jenks
Government	Wastewater Treatment Plan	12301 S Florence Ave	Jenks
Government	Wastewater Lift Station 1/1A	101 E Comanche St	Jenks
Government	Wastewater Lift Station Central	500 W B St / 208 N Elm	Jenks
Government	Wastewater Lift Station	300 E F St	Jenks
Government	Wastewater Lift Station	615 N 5th St	Jenks
Government	Wastewater Lift Station Melody Lane	807 N Fir St	Jenks
Government	Wastewater Lift Station Oakwood	11601 S 1st St	Jenks
Government	Wastewater Lift Station Country Meadows	2600 E 141st St	Bixby
Government	Wastewater Lift Station West Main	2200 W Main St	Jenks
Government	Wastewater Lift Station Green Valley	711 S Elm St	Jenks
Government	Wastewater Lift Station 106th/Elm	10597 S Elm St	Jenks
Government	Wastewater Lift Station Victoria Pond	10900 S Primrose Ct	Jenks
Government	Wastewater Lift Station Kimberly Clark	13252 S Yale Ave	Jenks
Government	Wastewater Lift Station	825 E B St	Jenks
Government	Wastewater Lift Station Shell Station	9592 S Elwood Ave	Jenks
Government	Wastewater Lift Station Sunrise Ridge	12801 ½ S 14th Circle	Jenks
Government	Wastewater Lift Station	302 ½ E 113th St	Jenks
Government	Wastewater Lift Station Commerce Park	10601 S Union Ave	Jenks
Government	Wastewater Lift Station Tulsa Tech	1616 N Elm St	Jenks
Government	Wastewater Lift Station OK Aquarium	192 S Aquarium Dr	Jenks
Government	Wastewater Lift Station Riverwalk	323 Riverwalk Terrace	Jenks
Government	Wastewater Lift Station Dutchers Crossing	14099 S New Haven Ave	Tulsa
Government	Wastewater Lift Station Southern Reserve I	10422 S Quincy St	Jenks
Government	Wastewater Lift Station Brookwood	10707 S Redbud Pl	Jenks
Government	Wastewater Lift Station Southern Reserve III	10411 S Nathan St	Jenks
Government	Wastewater Lift Station Providence Hills	131st & Harvard	Jenks

Government	Wastewater Lift Station Yorktown II	12911 S Elm St	Jenks
Government	Wastewater Lift Station Yorktown IV	431 E 131st St S	Jenks
Government	Booster Station Oak Hill	12602 ½ S 12th St	Jenks
Government	Booster Station Aberdeen Lake	1300 E 121st St S	Jenks
Government	Sperry Town Hall	115 N Cincinnati	Sperry
Government	Sperry wastewater facility	1700 E 106th St N	Skiatook
Government	Sperry AT&T Substation	100 W Main	Sperry
Government	Tulsa Levee District 12 Offices	1202 E Pecan	Sand Springs
Government	Levee A Pump station 1	Levee A	Tulsa County
Government	Levee A Pump station 2	Levee A	Tulsa County
Government	Levee A Pump station 3	Levee A	Tulsa County
Government	Levee B Pump station 4	Levee B	Tulsa County
Government	Levee B Pump station 6	Levee B	Tulsa County
Government	Levee C Pump station 6	Levee C	Tulsa County
Government	Levee C Pump station 7	Levee C	Tulsa County
Hazmat	Sooner Emergency Services	2131 S 49th W Ave	Tulsa
Medical	Tulsa City County Health Department	5051 S 129th E Ave	Tulsa
Medical	Tulsa City County Health Department	315 S Utica	Tulsa
Medical	Tulsa City County Health Department	5635 N M.L.K. Jr Blvd	Tulsa
Medical	Warren Clinic Physicians	2605 W Main St	Jenks
Medical	Anderson Clinic	715 W Main St	Jenks
Medical	Jenks Health Team	715 W Main St	Jenks
Medical	Springer Clinic	324 W Main St	Jenks
Medical	Infusion Specialist	205 E Main St	Jenks
Medical	Jenks Family Physicians	615 E Main St	Jenks
Medical	Utica Park Clinic	701 E Main St	Jenks
Medical	Core Hospital	3029 W Main St	Jenks
Medical	St. John Clinic	220 S Elm St	Jenks
Police	Bixby Police Department	116 W Needles	Bixby
Police	Jenks Police Department	211 N Elm St	Jenks
Police	Sperry Police Department	115 N Cincinnati	Sperry
School	Berryhill Early Childhood Center	3128 S 63rd W Ave	Tulsa
School	Berryhill High School	2901 S 65th W Ave	Tulsa
School	Berryhill Middle School	2900 S 65th W Ave	Tulsa
School	Berryhill North Elementary School	3128 S 63rd W Ave	Tulsa

School	Berryhill South Elementary School	3128 S 63rd W Ave	Tulsa
School	Berryhill Activity Center	2901 S 65th W Ave	Tulsa
School	Berryhill Administration Building	2900 1/2 S 65th W Ave	Tulsa
School	Berryhill Maintenance Building	2900 S 65th W Ave	Tulsa
School	Bixby High School	601 S Riverview Dr	Bixby
School	Bixby Alternative Education	601 S Riverview Dr	Bixby
School	Bixby Brassfield Learning Center	501 S Riverview Dr	Bixby
School	Bixby 9th Grade Center	301 S Riverview Dr	Bixby
School	Bixby Middle School	15400 S Mingo Rd	Bixby
School	Bixby Central Intermediate	9401 E 161st St S	Bixby
School	Bixby Central Elementary	201 S Main St	Bixby
School	Bixby North Elementary	7101 E 121st St S	Bixby
School	Bixby North Intermediate	6941 S 121st St S	Bixby
School	Bixby Northeast Elementary & Intermediate	11901 E 131st St S	Broken Arrow
School	Jenks High School	205 E B St	Jenks
School	Jenks Alternative Center	205 E B St	Jenks
School	Jenks Freshman Academy	205 E B St	Jenks
School	Performing Arts Center	205 E B St	Jenks
School	Betsy Mayo Building	205 E B St	Jenks
School	Jenks Early Childhood Center	322 E C St	Jenks
School	Jenks Middle School	3019 E 101st St	Tulsa
School	Jenks East Intermediate School	3933 E 91st St	Tulsa
School	Jenks West Intermediate School	909 N Adams	Jenks
School	Jenks East Elementary	8925 S Harvard	Tulsa
School	Jenks Southeast Elementary	10222 S Yale	Tulsa
School	Jenks West Elementary	900 N Adams	Jenks
School	Jenks Northwest Elementary	7625 S Elwood	Tulsa
School	Jenks Public School Education Center	951 W Main St	Jenks
School	Jenks Education Service Center	211 E A St	Jenks
School	Jenks Facilities Management	1602 N Birch St	Jenks
School	Jenks Print Shop/Warehouse Services	2065 N Elm St	Jenks
School	Jenks Transportation Department	2075 N Elm St	Jenks
School	Keystone Public School	23810 W Hwy 51	Sand Springs
School	Liberty Daycare	2727 E 201st St S	Mounds
School	Liberty Elementary School	2727 E 201st St S	Mounds

School	Liberty High School	2727 E 201st St S	Mounds
School	Liberty Middle School	2727 E 201st St S	Mounds
School	Sperry Elementary School	400 W Main	Sperry
School	Sperry High School	400 W Main	Sperry
School	Sperry Intermediate School	1380 W 103rd St N	Sperry
School	Sperry Middle School	400 W Main	Sperry
Senior Care	Grace Living Center	711 N 5th St	Jenks
Sheriff	Tulsa County Corrections Facility	300 S Denver	Tulsa
Sheriff	Tulsa County Juvenile Detention Center	315 S Gilcrease Museum Rd	Tulsa
Sheriff	Tulsa County Sheriff	500 S Denver	Tulsa
Sheriff	Tulsa County Sheriff	303 W 1st St	Tulsa
Sheriff	Tulsa County Training Center	6601 N Lakewood Ave	Tulsa

Note: some facilities are private and are included for reference.

3.3.1 Flood Hazard

Tulsa County

Tulsa County had 28 flood events from 2007 through 2016. The county floodplain administrator reports 16 repetitive loss structures in unincorporated Tulsa County that are insured through the National Flood Insurance Program. All insured structures are single family residences. Damaged structures are rebuilt in conformance with the county's flood damage prevention ordinance. As grant funds become available, the regulatory jurisdiction will work with the property owner to remove the structure from the floodplain. For all structures at risk from a flood event, those buildings on property intersecting the regulatory floodplain are summarized below.

Table 3-35
UNINCORPORATED TULSA COUNTY: TOTAL BUILDINGS IN FLOODPLAIN

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	269	27,497,184	13,748,592	41,245,776
Commercial	25	24,236,231	24,236,231	48,472,462
Agricultural	605	62,413,584	62,413,584	124,827,168
TOTAL	899	114,146,999	100,398,407	214,545,406

There is one critical facility located in the regulatory floodplain.

Any future construction in a flood hazard area will be built in conformance with the County Flood Damage Prevention Ordinance as part of the county's membership in the NFIP; therefore, future buildings will not be considered by FEMA as at risk.

City of Bixby

The City of Bixby had zero flood events from 2007 through 2016. The city floodplain administrator reports eleven repetitive loss structures in the City of Bixby that are insured through the National Flood Insurance Program. Seven of the insured structures are single family residences and four are commercial. Damaged structures are rebuilt in conformance with the city's flood damage prevention ordinance. As grant funds become available, the regulatory jurisdiction will work with the property owner to remove the structure from the floodplain. For all structures at risk from a flood event, those buildings on property intersecting the regulatory floodplain are summarized below.

Table 3-36
CITY OF BIXBY: TOTAL BUILDINGS IN FLOODPLAIN

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	392	39,561,368	19,780,684	59,342,052
Commercial	57	17,657,106	17,657,106	35,314,212
Agricultural	41	8,514,739	8,514,739	17,029,478
TOTAL	490	65,733,213	45,952,529	111,685,742

There is one critical facility in the regulatory floodplain.

Any future building in a flood hazard area will be built in conformance with the City Flood Damage Prevention Ordinance as part of the City's membership in the NFIP; therefore, future buildings will not be considered by FEMA as at risk.

City of Jenks

The City of Jenks had zero flood events from 2007 through 2016. The city floodplain administrator reports no repetitive loss structures in the City of Jenks that are insured through the National Flood Insurance Program. Damaged structures are rebuilt in conformance with the city's flood damage prevention ordinance. As grant funds become available, the regulatory jurisdiction will work with the property owner to remove the structure from the floodplain. For all structures at risk from a flood event, those buildings on property intersecting the regulatory floodplain are summarized below.

Table 3-37
CITY OF JENKS: TOTAL BUILDINGS IN FLOODPLAIN

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	173	17,535,292	8,767,646	26,302,938
Commercial	38	31,238,585	31,238,585	62,477,170
Agricultural	25	2,834,643	2,834,643	5,669,286
TOTAL	236	51,608,520	42,840,874	94,449,394

There are eleven critical facilities in the regulatory floodplain.

Any future building in a flood hazard area will be built in conformance with the Town Flood Damage Prevention Ordinance as part of the Town's membership in the NFIP; therefore, future buildings will not be considered by FEMA as at risk.

Town of Sperry

The Town of Sperry had three flood events from 2007 through 2016. The town floodplain administrator reports no repetitive loss structures in the Town of Sperry that are insured through the National Flood Insurance Program. Damaged structures are rebuilt in conformance with the town's flood damage prevention ordinance. As grant funds become available, the regulatory jurisdiction will work with the property owner to remove the structure from the floodplain. For all structures at risk from a flood event, those buildings on property intersecting the regulatory floodplain are summarized below.

Table 3-38
TOWN OF SPERRY: TOTAL BUILDINGS IN FLOODPLAIN

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	3	247,800	123,900	371,700
Commercial	1	18,268	18,268	36,536
Agricultural	7	449,440	449,440	898,880
TOTAL	11	715,508	591,608	1,307,116

There are zero critical facilities in the regulatory floodplain.

Any future building in a flood hazard area will be built in conformance with the Town Flood Damage Prevention Ordinance as part of the town's membership in the NFIP; therefore, future buildings will not be considered by FEMA as at risk.

Berryhill Public Schools

Four of the five Berryhill Public Schools are on properties that extend into the Berryhill Creek floodplain. However, the buildings have not been flooded during the time frame from 2007 through 2016. The value of these buildings is shown in the following table.

Table 3-39
BERRYHILL PUBLIC SCHOOLS: TOTAL BUILDINGS ON PROPERTY WITH THE FLOODPLAIN HAZARD

Name	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Berryhill High School	22	7,711,638	7,711,638	15,423,276
Berryhill Middle School	1	957,545	957,545	1,915,090
Berryhill North Elementary School	4	4,112,600	4,112,600	8,225,200
Berryhill South Elementary School	2	4,138,968	4,138,968	8,277,936
Berryhill Early Childhood Center	3	741,829	741,829	1,483,658
Administration	1	325,000	325,000	650,000
Activity Center	1	1,949,000	1,949,000	3,898,000
Transportation (9 buses, 2 pickup trucks, 1 box van, 1 flatbed trailer, 3 suburbans)	16	502,273	0	502,273
Total		20,438,853	19,936,580	40,375,433

Jenks Public Schools
Four of the eleven Jenks Public Schools are on property that extends into the floodplain; however, the buildings are not located in the floodplain. The value of these buildings is shown in the table below. From 2007 through 2016, Jenks Public Schools experienced twelve localized flood events due to poor drainage.

Table 3-41
JENKS PUBLIC SCHOOLS: TOTAL BUILDINGS ON PROPERTY WITH THE FLOODPLAIN HAZARD

Name	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Jenks East Elementary School	8	$22,569,250	$9,100,000	$31,669,250
Jenks East Intermediate School	5	$24,751,738	$7,550,000	$32,301,738
Jenks West Elementary School	7	$30,004,507	$7,400,000	$37,404,507
Jenks West Intermediate School	5	$24,751,738	$24,751,738	$49,503,476
TOTAL	25	$102,077,233	$48,801,738	$150,878,971

Keystone Public Schools
The Keystone Public Schools are not located in the regulatory floodplain so are not at risk from this flood hazard.

Liberty Public Schools
The Liberty Public Schools are not located in the regulatory floodplain so are not at risk from this flood hazard.

Sperry Public Schools
The Sperry Public Schools are not located in the regulatory floodplain so are not at risk from this flood hazard.

3.3.2 Tornado Hazard

To illustrate the damage a tornado could cause, a hypothetical tornado path was projected in the unincorporated area of northern Tulsa County through a residential area. This hypothetical tornado is one-mile long with a damage width of 600 feet. This hypothetical tornado is shown on Map Number 13 in Appendix 1. The total number of buildings within this example tornado's path is shown in the following table.

Table 3-42
BUILDINGS IN TORNADO SCENARIO

Type	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	54	4,866,442	2,433,221	7,299,663
Commercial	0	0	0	0
Agricultural	0	0	0	0
Total	54	4,866,442	4,866,442	7,299,663

There are no critical facilities, including schools, within this tornado path.

The City of Bixby, the City of Jenks, and the Town of Sperry are not located in the hypothetical tornado path.

None of the six participating schools are located in this hypothetical tornado path.

3.3.3 High Wind Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating Schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.4 Lightning Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.5 Hail Storm Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.6 Winter Storm Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.7 Heat Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.8 Drought Hazard

All areas, and all buildings, in the county, including the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools, are at equal risk from this hazard. The total number of buildings and their value, in Tulsa County, the City of Bixby, the City of Jenks, the Town for Sperry, and the six participating schools are shown in the tables at the beginning of this section 3.3.

3.3.9 Expansive Soils Hazard

The structures at risk from this hazard are properties located on high and very high shrink-swell potential soil types. The locations of expansive soils are shown on Map Number 7 in Appendix 1. The contents of the buildings are not at risk from this hazard. The number of buildings in unincorporated Tulsa County on each category of shrink-swell potential soils is shown below.

Structures with foundations such as homes and businesses, concrete slabs in driveways and sidewalks, and parking lots are vulnerable to this hazard because expansive soils cause the ground under the foundations to settle unevenly. Asphalt surfaces such as highways and runways could be affected. This settlement causes cracking and damage to the foundation and structure above the foundation, such as buildings wall and a road's pavement.

Table 3-43
UNINCORPORATED TULSA COUNTY BUILDINGS' EXPANSIVE SOILS BREAKDOWN

Shrink-Swell Potential of Soils	# of Structures	Structure Value ($)
Very Low	0	0
Low	3,176	385,309,298
Moderate	6,260	812,649,625
High	3,873	870,080,916
Very High	279	27,163,112

The number of buildings in the City of Bixby on each category of shrink-swell potential soils is shown below.

Table 3-44
CITY OF BIXBY BUILDINGS' EXPANSIVE SOILS BREAKDOWN

Shrink-Swell Potential of Soils	# of Structures	Structure Value ($)
Very Low	0	0
Low	6,120	1,394,347,382
Moderate	1,548	296,421,380
High	255	121,258,263
Very High	484	106,633,223

The number of buildings in the City of Jenks on each category of shrink-swell potential soils is shown below.

Table 3-45
CITY OF JENKS BUILDINGS' EXPANSIVE SOILS BREAKDOWN

Shrink-Swell Potential of Soils	# of Structures	Structure Value ($)
Very Low	0	0
Low	1,922	429,014,314
Moderate	5,136	1,094,688,478
High	741	133,423,956
Very High	129	26,984,795

The number of buildings in the Town of Sperry on each category of shrink-swell potential soils is shown below.

Table 3-46
TOWN OF SPERRY BUILDINGS' EXPANSIVE SOILS BREAKDOWN

Shrink-Swell Potential of Soils	# of Structures	Structure Value ($)
Very Low	0	0
Low	0	0
Moderate	8	695,268
High	406	25,913,307
Very High	56	2,888,349

The Berryhill Public Schools' buildings are located on moderate and high shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

The Bixby Public Schools' buildings are located on low, moderate, and very high shrink-swell potential soils;

however, the properties are primarily characterized by low shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

The Jenks Public Schools' buildings are located on low and moderate shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

The Keystone Public Schools' buildings are located on high shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

The Liberty Public Schools' buildings are located on moderate and high shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

The Sperry Public Schools' buildings are located on high shrink-swell potential soils. The number of buildings and their value is shown in the beginning of this section 3.3.

3.3.10 Wildfire Hazard

The areas in unincorporated Tulsa County within the communities' wildland-urban interface are at higher risk from a wildfire so are more vulnerable. The areas outside of the communities' wildland-urban interface are at less risk, so less vulnerable to a wildfire.

Table 3-47 shows the numbers of structures in unincorporated Tulsa County within the communities' wildland-urban interface.

Table 3-47
UNINCORPORATED TULSA COUNTY STRUCTURES IN THE CITIES' WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)
Residential	5,965	639,879,418
Commercial	361	463,324,667
Agricultural	3,440	473,725,429
TOTAL	9,766	1,576,929,514

Table 3-48 shows the numbers of structures in the City of Bixby within the communities' wildland-urban interface.

Table 3-48
BIXBY STRUCTURES IN THE CITIES' WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)
Residential	5,444	1,218,745,386
Commercial	176	131,963,007
Agricultural	151	113,568,129
TOTAL	5,771	1,464,276,522

Table 3-49 shows the numbers of structures in the City of Jenks within the communities' wildland-urban interface.

Table 3-49
JENKS STRUCTURES IN THE CITIES' WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)
Residential	4,047	662,697,618
Commercial	142	94,094,936
Agricultural	1,039	301,520,494
TOTAL	5,228	1,058,313,048

All of the Town of Sperry is in the town's wildland-urban interface. The total number of buildings, and value, in the town is shown in the table at the beginning of section 3.3.

The Berryhill Public School buildings are located in the City of Sand Springs' wildland-urban interface. The total number of school buildings, and their value, is shown in the table at the beginning of section 3.3.

Eight of the nine Bixby Public Schools are in the City of Bixby's wildland-urban interface, as shown on Map Number 8B in Appendix 1. Table 3-50 shows the value of the Bixby Public Schools located within the wild-land-urban interface.

Table 3-50
BIXBY PUBLIC SCHOOLS STRUCTURES IN THE WILDLAND-URBAN INTERFACE

Name	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Bixby High School	19	54,720,839	54,720,839	109,441,678
Bixby 9th Grade Center	2	5,054,116	5,054,116	10,108,232
Bixby Middle School	2	17,334,643	17,334,643	34,669,286
Bixby Alternative Education	2	5,079,512	5,079,512	10,159,024
Bixby Central Intermediate	1	13,716,397	13,716,397	27,432,794
Bixby North Elementary	3	12,460,364	12,460,364	24,920,728
Bixby North Intermediate	2	10,199,716	10,199,716	20,399,432
Bixby Northeast Elementary and Intermediate	3	14,457,208	14,457,208	28,914,416
TOTAL	34	133,022,795	133,022,795	266,045,590

Five of the eleven Jenks Public Schools are in the City of Jenks' wildland-urban interface, and one of the eleven Jenks Public Schools is located inside the City of Tulsa's wildland-urban interface. The Jenks Public Schools, in relation to the wildland urban interface are shown on Map Number 8C in Appendix 1. Table 3-51 shows the value of the Jenks Public Schools located within the wildland-urban interface.

Table 3-51
JENKS PUBLIC SCHOOLS STRUCTURES IN THE WILDLAND-URBAN INTERFACE

Name	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Jenks High School	27	$147,052,035	$35,960,000	$183,012,035
Jenks Freshman Academy	1	$6,830,000	$2,750,000	$9,580,000
Jenks Middle School	1	$26,531,869	$8,250,000	$34,781,869
Jenks West Intermediate	5	$24,751,738	$24,751,738	$49,503,476
Jenks West Elementary	7	$30,004,507	$7,400,000	$37,404,507
Jenks Early Childhood Center	1	$3,400,000	$450,000	$3,850,000
TOTAL	42	$238,570,149	$79,561,738	$318,131,887

The Keystone Public School buildings are located outside any wildland-urban interface. The total number of school buildings, and their value, is shown in the table at the beginning of section 3.3.

The Liberty Public School buildings are located in the City of Glenpool's wildland-urban interface. The total number of school buildings, and their value, is shown in the table at the beginning of section 3.3.

The Sperry Public School buildings are located in the Town of Sperry's wildland-urban interface. The total number of school buildings, and their value, is shown in the table at the beginning of section 3.3.

Fires can also destroy non-structural assets such as agriculture, vegetation, and vehicles. Vulnerability of these non-structural assets, both in identifying these assets and estimating their damage potential was not quantified.

3.3.11 Earthquake Hazard

All areas and all buildings in the county, including the Town of Sperry and the four participating schools, are at equal risk from this hazard. The total number of buildings, and value, in the county are shown in the table at the beginning of this section. The total number of buildings, and value, in the Town of Sperry and at the four participating schools are also shown in the tables at the beginning of section 3.3.

3.3.12 Hazardous Material Hazard

Materials in transit pose the greatest risk to the public. The county has defined the state and US highways along with railroads as the major transportation routes through the county. These are shown on Map Number 15 in Appendix 1.

3.3.13 Dam Break/Levee Failure Hazard

High hazard dams in Tulsa County pose the greatest hazard and have an emergency action plan (EAP) which identifies the structures and infrastructure in each dam's dam break inundation area. There are two high hazard dams of concern in unincorporated Tulsa County and the participating jurisdictions in this plan: Keystone Lake dam and Heyburn Lake dam. Both the Keystone Lake dam and the Heyburn Lake dam fall under the United States Army Corps of Engineers' (USACE) jurisdiction. The USACE manages the EAP for each of these dams and some of this information is confidential. Therefore, the number of structures is not included in this plan and a damage estimate was not completed.

The Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools are not located downstream of a high hazard dam and are not vulnerable to the dam break hazard.

Tulsa County

Structures at risk from a levee failure are structures located in the floodplain behind the levees in Tulsa County. Buildings on property located in the floodplain, behind the levees and at risk from a levee failure are shown below.

Table 3-52
UNINCORPORATED TULSA COUNTY: TOTAL BUILDINGS ON PROPERTY WITH THE LEVEE FAILURE HAZARD

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	385	21,418,147	10,709,074	32,127,221
Commercial	101	66,086,426	66,086,426	132,172,852
Agricultural	0	0	0	0
TOTAL	486	87,504,573	76,795,500	164,300,073

City of Bixby
The City of Bixby is not located behind a levee and is not at risk from this levee failure hazard.

City of Jenks
Structures at risk from a levee failure are structures located in the floodplain behind the levees in the City of Jenks. For all structures at risk from a levee failure, those buildings on property located in the floodplain behind the levees are shown below.

Table 3-53
CITY OF JENKS: TOTAL BUILDINGS ON PROPERTY WITH THE LEVEE FAILURE HAZARD

	Number of Buildings	Building Value ($$)	Contents Value ($$)	Total Value ($$)
Residential	1311	193,434,254	96,717,127	290,151,381
Commercial	235	101,090,790	101,090,790	202,181,580
Agricultural	16	14,771,945	14,771,945	29,543,890
TOTAL	1562	309,296,989	212,579,862	521,876,851

Town of Sperry
The Town of Sperry is not located behind a levee and is not at risk from this levee failure hazard.

Berryhill Public Schools
Berryhill Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Bixby Public Schools
Bixby Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Jenks Public Schools
Three of the eleven Jenks Public Schools are on properties that are located in the floodplain behind the Jenks Levee. The value of these buildings is shown in the following table.

3.4 Assessing Vulnerability: Estimating Potential Losses

For each hazard, an analysis was performed to determine the potential monetary losse to vulnerable buildings identified in Section 3.3. The analysis followed the methodology discussed in FEMA document number 386-2, "Understanding your Risks", step 4, and the format of FEMA 386-2 worksheet #4 "Estimate Losses" where applicable.

The flood hazard and the hypothetical tornado analyses identified structures with varying amounts of damage. The wildfire hazard section totaled structures and damages in unincorporated Tulsa County within the communities' wildland-urban interface.

3.4.1 Flood Hazard

For the flood hazard and this planning exercise, all structures on property intersecting the regulatory floodplain are evaluated at one foot below the base flood elevation. (Actual first floor elevations were not surveyed and the best available topography has 10 foot contour intervals) Using FEMA 386-2, step 4, building damage with one foot of flood depth is estimated to be 14 percent of the building value, and content damage is estimated to be 21 percent of the building value.

The flood hazard damage estimate for unincorporated Tulsa County is shown below.

Table 3-55
UNINCORPORATED TULSA COUNTY FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	269	27,497,184	1,924,803	2,887,204	4,812,007
Commercial	25	24,236,231	3,393,072	5,089,609	8,482,681
Agricultural	605	62,413,584	8,737,902	13,106,853	21,844,754
TOTAL	899	114,146,999	14,055,777	21,083,665	35,139,442

The flood hazard damage estimate for the City of Bixby is shown below.

Table 3-56
CITY OF BIXBY FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	392	39,561,368	2,769,296	4,153,944	6,923,239
Commercial	57	17,657,106	2,471,995	3,707,992	6,179,987
Agricultural	41	8,514,739	1,192,063	1,788,095	2,980,159
TOTAL	490	65,733,213	6,433,354	9,650,031	16,083,385

The flood hazard damage estimate for the City of Jenks is shown below.

Table 3-57
CITY OF JENKS FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Residential	173	17,535,292	1,227,470	1,841,206	3,068,676
Commercial	38	31,238,585	4,373,402	6,560,103	10,933,505
Agricultural	25	2,834,643	396,850	595,275	992,125
TOTAL	236	51,608,520	5,997,722	8,996,584	14,994,306

The flood hazard damage estimate for the Town of Sperry is shown below.

Table 3-58
TOWN OF SPERRY FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Agricultural	3	247,800	17,346	26,019	43,365
Commercial	1	18,268	2,558	3,836	6,394
Residential	7	449,440	62,922	94,382	157,304
TOTAL	11	715,508	82,825	124,238	207,063

The flood hazard damage estimate for Berryhill Public Schools is shown below.

Table 3-59
BERRYHILL PUBLIC SCHOOLS FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Berryhill High School	22	7,711,638	1,079,629	1,619,444	2,699,073
Berryhill Middle School	1	957,545	134,056	201,084	335,140
Berryhill North Elementary School	4	4,112,600	575,764	863,646	1,439,410
Berryhill South Elementary School	2	4,138,968	579,456	869,183	1,448,639
Berryhill Early Childhood Center	3	741,829	103,856	155,784	259,640
Administration	1	325,000	45,500	68,250	113,750
Activity Center	1	1,949,000	272,860	409,290	682,150
Transportation (9 buses, 2 pickup trucks, 1 box van, 1 flatbed trailor, 3 suburbans)	16	502,273	502,273	0	502,273
Total	50	20,438,853	3,293,394	$4,186,681	$7,480,075

The flood hazard damage estimate for Bixby Public Schools is shown below.

Table 3-60
BIXBY PUBLIC SCHOOLS FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Bixby High School	19	54,720,839	7,660,917	11,491,376	19,152,293
Bixby Alternative Education	2	5,079,512	711,132	1,066,698	1,777,830
Bixby Middle School	2	17,334,643	2,426,850	3,640,275	6,067,125
Bixby Central Intermediate	1	13,716,397	1,920,296	2,880,443	4,800,739
TOTAL	24	90,851,391	12,719,195	19,078,792	31,797,987

The flood hazard damage estimate for Jenks Public Schools is shown below.

Table 3-61
JENKS PUBLIC SCHOOLS FLOOD HAZARD DAMAGE ESTIMATE WITH ONE-FOOT FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Jenks East Elementary School	8	$22,569,250	$3,159,695	$1,911,000	$5,070,695
Jenks East Intermediate School	5	$24,751,738	$3,465,243	$1,585,500	$5,050,743
Jenks West Elementary School	7	$30,004,507	$4,200,631	$1,554,000	$5,754,631
Jenks West Intermediate School	5	$24,751,738	$3,465,243	$5,197,865	$8,663,108
TOTAL	25	$102,077,233	$14,290,813	$10,248,365	$24,539,178

Keystone Public Schools buildings are not in the floodplain so are not vulnerable to this hazard.

Liberty Public Schools buildings are not in the floodplain so are not vulnerable to this hazard.

Sperry Public Schools buildings are not in the floodplain so are not vulnerable to this hazard.

3.4.2 Tornado Hazard

For the tornado hazard, a hypothetical tornado path was located across a portion of northern Tulsa County, through an unincorporated residential area. This hypothetical tornado path was one-mile long with a damage width of 600 feet. The FEMA document number 386-2 states there are no standard loss estimation models and tables for tornados. For damage estimation purposes, those structures within 100 feet of the tornado path were considered to be completely damaged, those structures between 100 to 200 feet from the tornado path were considered to be 50 percent damaged, and those structures between 200 and the outside edge of the damage buffer were considered to be 25 percent damaged.

Table 3-62
TOTAL BUILDINGS IN TORNADO SCENARIO

Bldgs within 100 ft of Tornado Path (100% Damaged)					
Type	Number	Bldg Value	Contents Value	Total Value	100% Damaged $$
All	32	2,689,451	1,344,726	4,034,177	4,034,177
Res	32	2,689,451	1,344,726	4,034,177	4,034,177
Ag	0	-	-	-	-
Comm	0	-	-	-	-
Bldgs between 100 and 200 ft of Tornado Path (50% Damaged)					
Type	Number	Bldg Value	Contents Value	Total Value	50% Damaged $$
All	11	1,078,891	539,446	1,618,337	809,168
Res	11	1,078,891	539,446	1,618,337	809,168
Ag	-	-	-	-	-
Comm	-	-	-	-	-
Bldgs between 200 and 300 ft of Tornado Path (25% Damaged)					
Type	Number	Bldg Value	Contents Value	Total Value	25% Damaged $$
All	11	1,098,100	549,050	1,647,150	411,788
Res	11	1,098,100	549,050	1,647,150	411,788
Ag	-	-	-	-	-
Comm	-	-	-	-	-
Total Damage within 300 ft Buffer					
Type	Number	Bldg Value	Contents Value	Total Value	TOTAL DAMAGE
All	54	4,866,442	2,433,221	7,299,663	5,255,132
Res	54	4,866,442	2,433,221	7,299,663	5,255,132
Ag	0	-	-	-	-
Comm	0	-	-	-	-

3.4.3 Expansive Soils

The potential damage to structures and infrastructure located on high and very high shrink-swell potential soils is dependent on the design of its foundation and quality of the construction of the foundation. Both factors were beyond the scope of this multi-hazard mitigation plan. Pre-defined damage estimates based on a percentage of the structure value are not available because of the wide variation of the factors involved in a foundation's stability. Structures with foundations such as homes and businesses, concrete slabs in driveways and sidewalks, and parking lots, are vulnerable to this hazard because expansive soils cause the ground under foundations to settle unevenly. Asphalt surfaces such as highways and runways could be affected. This causes cracking and damage to the foundation and structure above the foundation, such as building walls and road pavement.

3.4.4 Wildfires

For this vulnerability analysis of wildfires, the structures in unincorporated Tulsa County within the communities' wildland-urban interface were inventoried and values were estimated from the County Assessor database. The contents of the structure were estimated based on the structure value and total value is the sum of the structure's value and its contents value. For this planning process, the structure is considered a total loss if burned by the wildfire and the estimated value of the loss due to the wildfire is the total value, and also shown below.

Table 3-63
UNINCORPORATED TULSA COUNTY STRUCTURES IN THE CITIES' WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)	Contents Value ($)	Total Value ($)
Residential	5,965	639,879,418	319,939,709	956,819,127
Commercial	361	463,324,667	463,324,667	926,649,334
Agricultural	3,440	473,725,429	473,725,429	947,450,858
TOTAL	9,766	1,576,929,514	1,256,989,805	2,833,919,319

Table 3-64 shows the vulnerability analysis for all the buildings in the City of Bixby and within the Bixby wild-land-urban interface.

Table: 3-64
CITY OF BIXBY STRUCTURES IN THE BIXBY WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)	Contents Value ($)	Total Value ($)
Residential	5,444	1,218,745,386	609,372,693	1,828,118,079
Commercial	176	131,963,007	131,963,007	263,926,014
Agricultural	151	113,568,129	113,568,129	227,136,258
TOTAL	5,771	1,464,276,522	854,903,829	2,319,180,351

Table 3-65 shows the vulnerability analysis for all the buildings in the City of Jenks and within the Jenks wild-land-urban interface.

Table: 3-65
CITY OF JENKS STRUCTURES IN THE JENKS WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)	Contents Value ($)	Total Value ($)
Residential	4,047	662,697,618	331,348,809	994,046,427
Commercial	142	94,094,936	94,094,936	188,189,872
Agricultural	1,039	301,520,494	301,520,494	603,040,988
TOTAL	5,228	1,058,313,048	726,964,239	1,785,277,287

All of the buildings in the Town of Sperry are in the Sperry wildland-urban interface. The same vulnerability analysis as shown above for Tulsa County is shown below for the Town of Sperry.

Table: 3-66
TOWN OF SPERRY STRUCTURES IN THE SPERRY WILDLAND-URBAN INTERFACE

Type	# of Structures	Structure Value ($)	Contents Value ($)	Total Value ($)
Residential	366	20,931,923	10,465,962	31,397,885
Commercial	32	2,062,837	2,062,837	4,125,674
Agricultural	72	6,502,164	6,502,164	13,004,328
TOTAL	470	29,496,924	19,030,963	48,527,887

For the Berryhill Public Schools, all their buildings are in the City of Sand Springs' wildland-urban interface. The same vulnerability analysis as shown for Tulsa County is shown below for the Berryhill Public Schools.

Table: 3-67
BERRYHILL PUBLIC SCHOOLS IN THE SAND SPRINGS WILDLAND-URBAN INTERFACE

School	Number of Buildings and Structures	Building and Structure Value ($)	Contents Value ($$)	Total Value ($$)
Berryhill Public School	50	20,438,853	19,936,580	40,375,433

For the Bixby Public Schools, eight of the nine campuses are in the City of Bixby's wildland-urban interface. The same vulnerability analysis as shown for Tulsa County is shown below for the Bixby Public Schools.

Table: 3-68
BIXBY PUBLIC SCHOOLS IN THE BIXBY WILDLAND-URBAN INTERFACE

School	Number of Buildings and Structures	Building and Structure Value ($)	Contents Value ($$)	Total Value ($$)
Bixby High School	19	54,720,839	54,720,839	109,441,678
Bixby 9th Grade Center	2	5,054,116	5,054,116	10,108,232
Bixby Middle School	2	17,334,643	17,334,643	34,669,286
Bixby Alternative Education	2	5,079,512	5,079,512	10,159,024
Bixby Central Intermediate	1	13,716,397	13,716,397	27,432,794
Bixby North Elementary	3	12,460,364	12,460,364	24,920,728
Bixby North Intermediate	2	10,199,716	10,199,716	20,399,432
Bixby Northeast Elementary and Intermediate	3	14,457,208	14,457,208	28,914,416
TOTAL	34	133,022,795	133,022,795	266,045,590

For the Jenks Public Schools, five of eleven schools are in the City of Jenks's wildland-urban interface and one of the eleven schools is in the City of Tulsa's wildland-urban interface. The same vulnerability analysis as shown for Tulsa County is shown below for the Jenks Public Schools.

Table: 3-69
JENKS PUBLIC SCHOOLS IN THE JENKS WILDLAND-URBAN INTERFACE

School	Number of Buildings and Structures	Building and Structure Value ($)	Contents Value ($$)	Total Value ($$)
Jenks High School	27	$147,052,035	$35,960,000	$183,012,035
Jenks Freshman Academy	1	$6,830,000	$2,750,000	$9,580,000
Jenks Middle School	1	$26,531,869	$8,250,000	$34,781,869
Jenks West Intermediate	5	$24,751,738	$24,751,738	$49,503,476
Jenks West Elementary	7	$30,004,507	$7,400,000	$37,404,507
Jenks Early Childhood Center	1	$3,400,000	$450,000	$3,850,000
TOTAL	42	$238,570,149	$79,561,738	$318,131,887

For the Keystone Public Schools, all their buildings are outside the communities' wildland-urban interface in unincorporated Tulsa County. The total building and content value for all structures at Keystone Public Schools is shown in Table: 3-31 at the beginning of Section 3.3.

For the Liberty Public Schools, all their buildings are in the City of Glenpool's wildland-urban interface. The same vulnerability analysis as shown for Tulsa County is shown below for the Liberty Public Schools.

Table: 3-70
LIBERTY PUBLIC SCHOOLS IN THE GLENPOOL WILDLAND-URBAN INTERFACE

School	Number of Buildings and Structures	Building and Structure Value ($)	Contents Value ($$)	Total Value ($$)
Liberty Public Schools	60	13,803,837	3,106,483	16,910,320

For the Sperry Public Schools, all their buildings are in the Town of Sperry's wildland-urban interface. The same vulnerability analysis as shown for Tulsa County is shown below for the Sperry Public Schools.

Table: 3-71
SPERRY PUBLIC SCHOOLS IN THE SPERRY WILDLAND-URBAN INTERFACE

School	Number of Buildings and Structures	Building and Structure Value ($)	Contents Value ($$)	Total Value ($$)
Sperry Public Schools	52	32,567,940	30,923,207	63,491,147

3.4.5 Hazardous Material Hazard

The locations of the major transportation routes within Tulsa County and the participating jurisdictions are shown on Map Number 16 in Appendix 1. The City of Bixby is intersected by SH 67 and US 64. The City of Jenks is intersected by US 75 and the Creek Turnpike as well as US 75 and SH 117. The Town of Sperry is intersected by SH 11. The locations of the six participating schools in relation to the major transportation routes are also shown on Map Number 16 in Appendix 1.

3.4.6 Dam Break/Levee Failure Hazard

High hazard dams in Tulsa County pose the greatest hazard and have an emergency action plan (EAP) which identifies the structures and infrastructure in each dam's dam break inundation area. There are two high hazard dams of concern in unincorporated Tulsa County and the participating jurisdictions in this plan: Keystone Lake dam and Heyburn Lake dam. Both the Keystone Lake dam and the Heyburn Lake dam fall under the United States Army Corps of Engineers' (USACE) jurisdiction. The USACE manages the EAP for each of these dams and some of the information is confidential. Therefore, the number of structures is not included in this plan and a damage estimate was not completed.

The Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools are not located downstream of a high hazard dam and are not vulnerable to the dam break hazard.

For the levee failure hazard and this planning exercise, all structures on property located within the regulatory floodplain behind the levee are estimated to be six feet below the base flood elevation. (Actual first floor elevations were not surveyed and the best available topography has 10 foot contour intervals.) Using FEMA 386-2, step 4, building damage with six feet of flood depth is estimated to be 40 percent of the building value, and content damage is estimated to be 60 percent of the contents value.

The levee failure hazard damage estimate is shown below.

Tulsa County

Structures at risk from a levee failure are structures located in the floodplain behind the levees in Tulsa County. For all structures at risk from a levee failure, those buildings on property located in the floodplain behind the levees are shown below.

Table 3-72
UNINCORPORATED TULSA COUNTY: LEVEE FAILURE HAZARD DAMAGE ESTIMATE WITH SIX-FEET FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Agricultural	385	21,418,147	8,567,259	6,425,444	14,992,703
Commercial	101	66,086,426	26,434,570	39,651,856	66,086,426
Residential	0	0	0	0	0
TOTAL	486	87,504,573	35,001,829	46,077,300	81,079,129

City of Bixby

The City of Bixby is not located behind a levee and is not at risk from this levee failure hazard.

City of Jenks
Structures at risk from a levee failure are structures located in the floodplain behind the levees in the City of Jenks. For all structures at risk from a levee failure, those buildings on property located in the floodplain behind the levees are shown below.

Table 3-73
CITY OF JENKS: LEVEE FAILURE HAZARD DAMAGE ESTIMATE WITH SIX-FEET FLOOD DEPTH

Type	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Agricultural	1311	193,434,254	77,373,702	58,030,276	135,403,978
Commercial	235	101,090,790	40,436,316	60,654,474	101,090,790
Residential	16	14,771,945	5,908,778	8,863,167	14,771,945
TOTAL	1562	309,296,989	123,718,796	127,547,917	251,266,713

Town of Sperry
The Town of Sperry is not located behind a levee and is not at risk from this levee failure hazard.

Berryhill Public Schools
Berryhill Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Bixby Public Schools
Bixby Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Jenks Public Schools
Three of the eleven Jenks Public Schools are on properties that are located in the floodplain behind the Jenks Levee. The value of these buildings is shown in the following table.

Table 3-74
JENKS PUBLIC SCHOOLS: LEVEE FAILURE HAZARD DAMAGE ESTIMATE WITH SIX-FEET FLOOD DEPTH

	Number of Buildings	Building Value ($$)	Building Damage Value ($$)	Contents Damage Value ($$)	Total Damage Value ($$)
Jenks High School	27	$147,052,035	$58,820,814	$21,576,000	$80,396,814
Jenks Freshman Academy	1	$6,830,000	$2,732,000	$1,650,000	$4,382,000
Jenks Alternative Center	1	$3,757,500	$1,503,000	$1,200,000	$2,703,000
TOTAL		$157,639,535	$63,055,814	$24,426,000	$87,481,814

Keystone Public Schools
Keystone Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Liberty Public Schools
Liberty Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

Sperry Public Schools
Sperry Public Schools is not located behind a levee and is not at risk from this levee failure hazard.

3.4.7 All Other Hazards

The magnitude of the damage to structures from all the other hazards does not vary by location. The total building and content value for all structures in unincorporated Tulsa County, the City of Bixby, the City of Jenks, the Town of Sperry, and the six participating schools is totaled and shown in their respective table in the beginning of Section 3.3.

3.5 Assessing Vulnerability: Analyzing Development Trends

This section discusses the county's land use and development trends so that mitigation options can be considered in future land use decisions. Three areas were analyzed. These are the types of existing land uses and the method for change; development in the hazard areas; and anticipated changes in land use and growth areas.

For tax purposes the Tulsa County Assessor assigns one of three land use categories. These are residential, commercial and agricultural. Land use changes can occur, and are initiated by the property owner, usually to accommodate a new development. Tulsa County has a Board of Adjustment which reviews use change requests and takes into account hazards and hazard prone areas in ruling on any land use change request. They also set conditions of approval to help ameliorate any perceived impacts. The county also has a Planning Commission which is a recommending body to the Board of County Commissioners. The Planning Commission also reviews requests for a change in zoning and makes recommendations to the Board of County Commissioners.

There are 10,949 undeveloped parcels of property in unincorporated Tulsa County, the City of Bixby, the City of Jenks, and the Town of Sperry. Of these 10,949 undeveloped parcels, 1,695 parcels are in the regulatory floodplain; 408 residential, 116 commercial, and 1171 agricultural. Map Number 17 in Appendix 1 shows this information. It must be noted that new building development in the flood hazard area will conform to the County's Flood Damage Prevention Ordinance, which the county will continue to vigorously enforce. It will be recommended that builders of new construction investigate the shrink-swell potential of soils and design and construct the foundation with the soils' properties in mind. In addition, be aware of the wildland urban interface fire hazard.

Changes in land use can occur throughout the county. However, residential growth is primarily anticipated to occur adjacent to the cities of Tulsa and Broken Arrow, and commercial growth is primarily anticipated along the SH 75 corridor.

Recent commercial development in unincorporated Tulsa County includes:

- OneStop
- SKW Tulsa Yard
- Tulsa County Sheriff's Office Training Center

Recent residential development in unincorporated Tulsa County includes:

- Vintage Oaks

Recent commercial development in the City of Bixby includes:

- Extreme Electric
- The Galley
- Heritage Point of Tulsa
- Jiffy Lube
- Kum & Go #835
- Self-Storage in Bixby
- Taco Bell

Recent residential development in the City of Bixby includes:

- Pine Valley Addition Blocks 10-11
- Trails at White Hawk II

Recent commercial development in the City of Jenks includes:

- Casey's General Store
- First Baptist Church of Jenks
- Flying Tee Golf Facility
- Gateway Mortgage Group
- The Hearing Doctor
- Neighborhood Walmart
- Sonic Drive-in
- Riverside Eye Clinic

Recent residential development in the City of Jenks includes:

- Meadow Creek
- Providence Hills IV
- Southern Reserve VI
- Yorktown Blocks 39-44

Since the last Tulsa County Hazard Mitigation Plan update was approved in 2016, the Town of Sperry has not had any commercial development or new subdivisions; however, three residential homes were constructed in existing neighborhoods during this time.

Berryhill Public Schools has not added buildings on their campuses since the last plan update was approved in 2016, and does not have any building plans for the next five years.

Bixby Public Schools currently has two buildings under construction. These buildings are the Bixby 9th Grade Center and the Bixby Northeast Intermediate. Bixby Public Schools has plans to construct a Band Building.

Jenks Public Schools completed 11 construction projects since 2012. These projects include:

- Jenks West Elementary Building F
- AgEd/FFA Greenhouse
- Education Service Center
- High School Music Building
- Early Childhood Center
- Frank Herald Field House
- Jenks Middle School Cafeteria Expansion
- Agriculture Research Facility
- Jenks Central Campus Dining Hall
- Jenks West Intermediate Expansion
- Jenks Northwest Elementary

Jenks Public Schools plan to complete four classroom expansions in the next five years. These projects include:

- Jenks Middle School Classroom Expansion
- Jenks High school Classroom Expansion
- Jenks Freshman Academy Classroom Expansion
- Southeast Elementary Classroom Expansion

Keystone Public Schools has not added buildings on their campuses since the last plan update was approved in 2016, and does not have any building plans for the next five years.

Liberty Public Schools constructed an agricultural-vocational building since the last plan update was approved in 2016. They do not have any building plans for the next five years.

Sperry Public Schools has not added buildings on their campuses since the last plan update was approved in 2016 and does not have any building plans for the next five years.

Chapter 4: Mitigation Strategies

This chapter identifies the hazard mitigation goals set by the TCHMPC, and discusses the mitigation projects or measures to be taken to achieve those goals.

4.1 Hazard Mitigation Goals

4.1.1 Mission Statement

To create a disaster-resistant community and improve the safety and well-being of the citizens of Tulsa County by reducing deaths, injuries, property damage, environmental losses, and other losses from natural and technological hazards in a manner that advances community goals, quality of life, and results in a more livable, viable, and sustainable community.

The mission statement and goals were determined by the committee at their initial meetings. Specific objectives were developed during the risk assessment phase and evaluated again as potential action steps were considered.

4.1.2 Specific Goals and Objectives

Goal 1 Flood Hazard: To reduce the risk of flood hazard in the county
Objectives:

1. Identify buildings at risk from the 100-year regulatory flood.
2. Ensure that development does not increase flooding downstream or have off-site adverse impacts.
3. Identify and maximize the natural and beneficial uses of the floodplain.
4. Implement the best flood control measures to reduce vulnerability of flood-prone properties.

Goal 2 Tornado Hazard: To reduce the risk from tornados in the county.
Objectives:

1. Encourage building of individual safe rooms and storm shelters.

Goal 3 High Winds Hazard: To reduce the risk from high winds in the county
Objectives:

1. Educate and encourage the building trades industry about construction standards that are capable of withstanding frequent high winds.

Goal 4 Lightning Hazard: To reduce the risk from lightning in the county.
Objectives:

1. Reduce loss of life, property, and injury due to lightning through increased public awareness of measures to prevent and reduce damage, including warnings.

Goal 5 Hailstorm Hazard: To reduce the risk from hailstorms in the county.
Objectives:

1. Promote construction of hail resistant roofs.

Goal 6 Winter Storm Hazard: To reduce the hazards from winter storms in the county.
Objectives:

1. Reduce property loss and community disruption due to severe winter cold and ice storms.

Goal 7 Extreme Heat: To reduce the risk from extreme heat in the county.
Objectives:

1. Lessen injury and potential loss of life to citizens during periods of extreme heat through education.

Goal 8 Drought Hazard: Reduce the economic impact of drought hazards in the county.
Objectives:

1. Reduce damage to property and building foundations due to drought by improving building codes.

Goal 9 Expansive Soil Hazard: Reduce structure's susceptibility to soil movement.
Objectives:

1. Reduce damage to property and building foundations due to expansive soils by improving building codes.

Goal 10 Wildfire Hazard: To reduce the threat of wildfire hazards and their financial impact within the county
Objectives:

1. Develop a county-wide fire response and support group to facilitate the provisioning of water to fires during large fires.

Goal 11 Earthquake Hazard: To reduce the risk from earthquakes in the county.
Objectives:

1. Educate and encourage the building trades industry about earthquake resistant construction.

Goal 12 Hazardous Materials Hazard: To reduce the risk from hazardous material storage facilities around the county.
Objectives:

1. Protect the public from exposure to hazardous materials events from sites within the community.

Goal 13 Dam Break Hazard: To reduce the risk of a dam break hazard in the county.
Objectives:

1. Identify dams that could impact the county.
2. Identify areas at risk.

Goal 14 General: To protect vulnerable populations and critical facilities from hazards.
Objectives:

1. Minimize the loss of life and damage to property and infrastructure from natural and man-made disasters.
2. Increase public awareness of risks from hazards and implement measures that can be taken to protect families and property from disasters.
3. Reduce the risk and effects of hazards and minimize disruption in the county.
4. Identify and protect vulnerable populations from natural and man-made hazards.
5. Identify and protect critical county and community facilities from hazards so that they can continue their missions in the event of a disaster.

4.2 Mitigation Categories

There are several types of measures communities and individuals can use to protect themselves from, or mitigate the impacts of, natural and man-made hazards. For purposes of this study, mitigation measures fall into the following categories:

1. Preventive Measures
2. Structural Projects
3. Property Protection
4. Emergency Services
5. Public Information and Education

4.2.1 Preventive Measures

Preventive measures are designed to keep certain conditions from occurring or getting worse. The objective is to ensure new development does not increase damage and new construction is protected from those hazards. Preventive measures are usually administered by building, zoning, planning, and code enforcement offices. They typically include planning, zoning, building codes, and floodplain development regulations and stormwater management.

Planning and zoning work to keep development out of hazardous or sensitive areas. Zoning Ordinances regulate development by dividing the county into zones or districts and setting development criteria for each zone or district. A zoning ordinance is considered the primary tool to implement the comprehensive plan's guidelines for how land is developed.

Tulsa County, the City of Bixby, the City of Jenks, and the Town of Sperry participate in the National Flood Insurance Program (NFIP). The NFIP sets minimum requirements for subdivision regulations and building codes. Stormwater management regulations require developers to mitigate any increase in runoff due to their development. Building codes require standards for new building construction.

4.2.1.1 Example Preventive Measures Activities

1. Planning and zoning help Tulsa County develop proactively so that the resulting infrastructure is laid out in a coherent and safe manner.
2. Building codes for foundations, sprinkler systems, masonry, and structural elements such as roofs and the exterior building envelope are prime mitigation measures for occurrences of floods, tornados, high winds, extreme heat and cold, and earthquakes.
3. Participation in the NFIP and using floodplain ordinances and subdivision regulations to regulate floodplain development is beneficial for Tulsa County.
4. Tree trimming adjacent to overhead power lines and placing new lines underground help prevent power outages during winter ice storms, tornadic events and high winds. This can also help reduce power outages from vehicle/utility pole accidents and reduce vehicle accident injuries.
5. Better information regarding hazardous materials stored in the County, as well as those materials transported through the County, helps provide safety and contingency planning.

4.2.2 Structural Projects

Structural projects are usually designed by engineers or architects and constructed by both the public and private sector. Structural projects traditionally include stormwater detention reservoirs, levees and floodwalls, channel modifications, and drainage and storm sewer improvements.

4.2.2.1 Example Structural Project Activities

- Crossing and roadway drainage improvements must take into account additional detention or run-off reduction.
- Drainage channels and storm sewers carry runoff from smaller, more frequent storms.
- Drainage system maintenance is an ongoing project and includes removal of debris that decreases the effectiveness of detention ponds, channels, ditches, and culverts.

4.2.3 Property Protection Measures

Property protection measures are used to modify existing buildings or property subject to damage from various hazardous events. Property protection measures are normally implemented by the property owner. In some cases, technical and financial assistance can be provided by a governmental agency. Property protection measures for flooding typically include acquisition and relocation, flood-proofing, building elevation, and barriers. Property protection measures for other natural hazards include retrofitting, reinforced foundations, enhanced building codes with emphasis on the exterior building envelope, anchoring of roof and foundation, installation of safe rooms, hail resistant roofing, and insurance.

4.2.3.1 Example Property Protection Measure Activities

Floods

- Dry flood proofing (making walls watertight so floodwaters cannot get inside)
- Wet flood proofing (letting the water in and removing everything that could be damaged by a flood)
- Installing drain plugs, standpipes or backflow valves to stop sewer backup

Tornado

- Constructing an underground shelter or in-building "safe room"
- Securing roofs, walls and foundations with adequate fasteners or tie downs
- Strengthening garage doors and other large openings

High Winds

- Installing storm shutters and storm windows
- Burying utility lines
- Installing/incorporating backup power supplies

Hailstorms

- Installing hail resistant roofing materials

Lightning

- Installing lightning rods and lightning surge interrupters
- Burying utility lines
- Installing/incorporating backup power supplies

Winter Storms

- Adding insulation
- Relocating water lines from outside walls to interior spaces
- Sealing windows
- Burying utility lines
- Installing/incorporating backup power supplies

Extreme Heat and Drought

- Adding insulation
- Installing water saver appliances, such as shower heads and toilets

Wild Fires

- Replacing wood shingles with fire resistant roofing
- Adding spark arrestors on chimneys
- Landscaping to keep bushes and trees away from structures
- Installing sprinkler systems
- Installing smoke alarms

General Measures

From the above lists, it is obvious that certain approaches can help protect from more than one hazard. These include:

- Strengthening roofs and walls to protect against wind and earthquake forces
- Bolting or tying walls to the foundation protect against wind and earthquake forces and the effects of buoyancy during a flood
- Adding insulation to protect against extreme heat and cold
- Anchoring water heaters and tanks to protect against ground shaking and flotation
- Burying utility lines to protect against wind, ice and snow
- Installing backup power systems for power losses during storms
- Installing hail resistant and fireproof roofing

Insurance is recommended because as long as the policy is in force, the property is protected and no human intervention is needed for the measure to work. Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the National Flood Insurance Program (NFIP).

4.2.4 Emergency Service Measures

Emergency service measures protect people during and after a hazard event. Locally, these measures are coordinated by the emergency management agencies of the individual communities. Measures include preparedness, threat recognition, warning, response, critical facilities protection, and post-disaster recovery and mitigation.

Threat recognition is the key. The first step in responding to a flood, tornado, storm or other natural hazard is knowing that one is coming. Without a proper and timely threat recognition system, adequate warnings cannot be disseminated.

After the threat recognition system tells the police department and/or County Emergency Management that a hazard is coming, the next step is to notify, or warn, the public and staff of other agencies and critical facilities. The following are common methods of alerting the public:

- Outdoor warning sirens
- Sirens on public safety vehicles
- NOAA Weather Radio
- Commercial or public radio or TV stations
- Cable TV emergency news inserts
- Door-to-door contact
- Mobile public address systems
- Automated telephone calling
- E-mail alerts, texts and other forms of social media

Telling people what to do is just as important as issuing a warning. A warning program should have a public information aspect. People need to know the difference between a tornado warning (when they should seek shelter in a basement) and a flood warning (when they should stay out of basements).

4.2.4.1 Example Emergency Service Measure Activities

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

Response Activities

- Activating the emergency operations room (Emergency Management)
- Closing streets or bridges (Sheriff/County/Bixby/Jenks/Sperry/Police)
- Shutting off power to threatened areas (OG&E/AEP/Rural Co-ops)
- Holding children at school/releasing children from school (School District)
- Passing out sand and sandbags (County/Bixby/Jenks/Sperry)
- Ordering an evacuation (Commission Chairman or Mayor)
- Opening evacuation shelters (Red Cross)
- Monitoring water levels (County)
- Security and other protection measures (Sheriff or Police)

After a disaster, communities should undertake activities to protect public health and safety, facilitate recovery, and prepare people and property for the next disaster. This is commonly referred to as Post-Disaster Recovery and Mitigation.

Recovery Activities

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus
- Clearing streets
- Cleaning up debris and garbage
- Regulating reconstruction to ensure it meets all code requirements, including the NFIP's substantial damage regulations

Mitigation Activities

- Conducting a public information effort to advise residents about mitigation measures they can incorporate into their reconstruction work
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Acquiring substantially or repeatedly damaged properties from willing sellers
- Planning for long term mitigation activities
- Applying for post-disaster mitigation funds

Overall Emergency Service Activities

- Using solid, dependable threat recognition systems is first and foremost in emergency services
- Following a threat recognition, multiple or redundant warning systems and instructions for action are most effective in protecting citizens
- Good emergency response plans that are updated yearly ensure that well-trained and experienced people can quickly take the appropriate measures to protect citizens and property
- To ensure effective emergency response, critical facilities protection must be part of the plan
- Post-disaster recovery activities include providing neighborhood security, safe drinking water, appropriate vaccinations, and cleanup and regulated reconstruction

4.2.5 Public Information and Education Measures

Successful public information and education measures involve both public and private sectors. Public information and education activities advise and educate citizens, property owners, renters, businesses, and local officials about hazards and ways to protect people and property from the hazards. Public information activities are among the least expensive mitigation measures, and at the same time are often the most effective thing a community can do to save lives and property. All mitigation activities begin with public information and education.

Many benefits stem from providing map information to inquirers. Residents and businesses that are aware of potential hazards can take steps to avoid problems and reduce their exposure to flooding, dam break or releases, hazardous materials events, and other hazards that have a geographical distribution. These mapped hazards are included in this Hazard Mitigation study, and are discussed below. Flood Insurance Rate Maps (FIRMS) and Flood Hazard Boundary maps are available to show the flood zones for each property. Flood insurance is always recommended for those properties subject to flooding, especially for those in Flood Zone A.

Hazardous materials sites, listed in the Oklahoma Department of Environmental Quality's Tier II list, are listed in Section 3.2.12.1. Transportation routes frequently used in the transport of hazardous materials include I-44 and US75. The railroad that runs through the County may also carry hazardous materials. High-pressure pipeline locations have been suppressed by the Federal government since 9/11.

4.2.5.1 Example Public Information and Education Measure Activities

- There are many ways public information programs can be used so people and businesses will be more aware of the hazards they face and how they can protect themselves.
- Most public information activities can be used to advise people about all hazards, not just floods or tornados.
- Some public information activities require coordination with other organizations, such as schools and real estate agents.
- There are several area organizations that can provide support for public information and educational programs.

4.3 Research, Review, and Prioritization

Element C5
The hazard mitigation strategy shall include an action plan, describing how the actions identified will be prioritized, implemented, and administered by each local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
44 CFR §201.6(c)(3)(iii)

Literature searches and numerous resources were used to identify mitigation measures for each hazard. Measures were identified to ascertain those that were most appropriate for Tulsa County. The public involvement process included a citizen hazard awareness survey. Four hundred thirty-seven (437) responses were received. The survey and summary of the responses are included in Appendix 4. The public involvement process also included open meetings for all committee meetings and a public hearing on _____. The results of the public participation and a list of potential mitigation measures were presented to the committee to stimulate debate and discussion.

The committee reviewed the mitigation activities and incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities. While not referred to by name at the time of the mitigation activity review, the intent of the method was used. An explanation of each STAPLE+E criteria item is as follows:

S: Social	Mitigations actions are acceptable to the county, city, town or school if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with their social and cultural values.
T: Technical	Mitigation actions are most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
A: Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P: Political	Mitigation actions can be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L: Legal	The jurisdiction or implementing agency should have the legal authority to implement and enforce a mitigation action.
E: Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to determine whether an action is cost-effective before an action is implemented.
E: Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with environmental regulations, and are consistent with the county's environmental goals are strongly encouraged.

Economic impact on the county is considered for each activity. A cost-benefit analysis was not performed for each activity under consideration. However, the committee decided to have a formal cost-benefit evaluation performed for any activity that follows the requirements of the funding source when funds are being sought and the TCHMPC will look for actions with a benefit greater than its cost.

While the committee did not select projects for Tulsa County, the City of Bixby, the City of Jenks, the Town of Sperry, or the six participating schools, it did offer recommendations. Tulsa County, the City of Bixby, the City of Jenks, the Town of Sperry, the Berryhill Public Schools, the Bixby Public Schools, the Jenks Public Schools, the Keystone Public Schools, the Liberty Public Schools, and the Sperry Public Schools selected their own mitigation actions, with the criteria as outlined in this section.

The potential social impact, implementation capabilities (county work force), and potential funding available for each activity, along with other STAPLE+E criteria principles were considered in prioritizing the activities. The county's action plan, the cities' action plans, the town's action plan, and the schools' action plans will take into account the above factors and include at least two projects for each hazard.

Chapter 5: Action Plan

Element D2
A local jurisdiction must review and revise its plan to reflect progress in local mitigation efforts.
44 CFR §201.6(d)(3)

Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools have reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their respective jurisdictions. Tulsa County, Town of Sperry, Berryhill Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools also reviewed the list of recommended actions or projects included in the previous Tulsa County plan to identify actions that have been started and/or completed, and what other actions should be continued, deferred, or cancelled. The results of this review are shown in Table 5-1, 5-2, 5-3, 5-4, 5-5 and 5-6 with non-substantive edits.

Table 5-1
STATUS OF TULSA COUNTY MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	Repair and Enhance levee A, B, and C to comply with current FEMA standards	Not started	Continue in updated plan, item 1
2	Develop Tulsa County regional interactive Emergency Operations Center to provide all-hazards countywide (Oklahoma Homeland Security Region 7) warning, preparedness, response, recovery, and mitigation activities throughout Tulsa County	Not started	Continue in updated plan, item 2
3	Move County Social Services out of the 100 year regulatory floodplain	Not started	Continue in updated plan, item 3
4	Move Juvenile Bureau out of the 100 year regulatory floodplain	Not started	Continue in updated plan, item 4
5	Move county parks administration out of the 100 year regulatory floodplain	Not started	Continue in updated plan, item 5
6	Install additional outdoor warning sirens to expand coverage area to include all the unincorporated area of Tulsa County	Not started	Continue in updated plan, item 6
7	Promote county employee awareness of the risk of nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event	Not started	Continue in updated plan, item 7
8	Provide equipment to county facilities to strap nonstructural elements to walls	Not started	Continue in updated plan, item 8

9	Develop a Continuity of Operations plan for each department within county government. Encourage each municipality within Tulsa County to develop COOP plans for each department.	Not started	Continue in updated plan, item 9
10	Develop exercise program to test and update COOP plans for all county departments and municipal departments within the county	Not started	Continue in updated plan, item 10
11	Provide employee shelters/safe rooms at critical facilities, such as 911 Center, fire stations and sheriff's stations to protect first responders	Not started	Continue in updated plan, item 11
12	Evaluate, upgrade, and maintain community-wide outdoor Omni-directional voice/siren warning systems	Ongoing	Continue in updated plan, item 12
13	Elevate all generators at county facilities so they are one foot above the 100 year regulatory floodplain	Not started	Continue in updated plan, item 13
14	Purchase and install backup generators for all county facilities	Started	Continue in updated plan, item 14
15	Purchase NOAA Weather radios with specific area message encoding (SAME) technology for each county facility location and identify key staff to monitor radios	Not started	Continue in updated plan, item 15
16	Secure all water heaters to walls at county facilities	Not started	Continue in updated plan, item 16
17	Install remote visual monitoring systems at area dams to monitor situations and enable early warnings to vulnerable populations	Not started	Continue in updated plan, item 17
18	Install protective window film on all county building windows to increase resistance to hazardous events	Ongoing	Continue in updated plan, item 18
19	Develop and maintain a redundant countywide, all hazards, all community, interoperable VHF communications system	Not started	Continue in updated plan, item 19
20	Replace all garage doors at county buildings with wind rated doors and rails if door is not already rated to handle strong wind events	Not started	Continue in updated plan, item 20
21	Develop/ Review/ Update the debris management plan	Not started	Continue in updated plan, item 21
22	Designate individuals in area schools that are educated in storm spotting and safety and who have the authority to take proper action. Equip these individuals with NOAA weather radios.	Not started	Continue in updated plan, item 22
23	Continue compliance with, and participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)	Ongoing	Continue in updated plan, item 23
24	Purchase an air burner system to allow for more efficient debris removal	Not started	Continue in updated plan, item 24
25	Purchase a debris load scanning system to allow for more efficient debris measurement	Not started	Continue in updated plan, item 25

26	Consider and/or implement necessary measures in protecting computer based systems against cyber-attack and other security vulnerabilities during hazardous events.	Not started	Continue in updated plan, item 26
27	Install a mass emergency telephone communication system such as reverse 911 or black board connect, for mass call-outs to targeted areas of the community for emergency notification and/or information	Not started	Continue in updated plan, item 27
28	Install new repeater for outdoor warning system to extend coverage area to cover all the unincorporated area of Tulsa county	Complete	Do not include in updated plan
29	Acquire and remove floodplain and repetitive loss properties where the community's repetitive loss plan and Flood and Drainage Annex to the Hazard Mitigation Plan identify acquisition as the most cost-effective and desirable mitigation measure	Ongoing	Continue in updated plan, item 28
30	Prepare a comprehensive basin wide Flood and Drainage Annex to the Hazard Mitigation Plan for all watersheds within the jurisdiction. The plan should identify all flooding problems within the jurisdiction and recommend the most cost-effective and politically acceptable solutions	Not started	Continue in updated plan, item 29
31	Provide surge and lighting protection for computer reliant critical facilities	Ongoing	Continue in updated plan, item 30
32	Coordinate with Local Emergency Planning Committee (LEPC) to conduct a commodity flow study	Not started	Continue in updated plan, item 31
33	Use amateur radio operators (ham) as a communications source during hazardous events when normal communication methods are non-functional	Not started	Continue in updated plan, item 32
34	Adopt the Firewise program for the vulnerable rural/urban interface areas within the county	Not started	Continue in updated plan, item 33
35	Continue updating appropriate disaster safety information for the 211 system, such as cooling shelters in extreme heat, and heating shelters in severe winter storms	Not started	Continue in updated plan, item 34
36	Create a more aggressive ice and snow removal plan	Not started	Continue in updated plan, item 35
37	Provide maps and chemical details of local Tier II facilities to all fire chiefs operating within Tulsa County	Not started	Continue in updated plan, item 36
38	Work with local chambers of commerce to educate businesses on the need for business continuity planning	Not started	Continue in updated plan, item 37

39	Provide wiring and transfer switches to accommodate emergency generators during disaster power outages for critical facilities including Emergency Operation Centers, County Court House, Dispatch, Sheriff's Offices, Community Centers used for emergency housing during disasters, critical facilities, lift stations, and community medical facilities	Started	Continue in updated plan, item 38
40	Develop and test site emergency plans for correctional facilities	Not started	Continue in updated plan, item 39
41	Modify and/or adopt a land use plan to guide development away from hazardous areas, reduce population density in hazardous areas, implement stronger development restrictions, and encourage natural resource protection	Not started	Continue in updated plan, item 40
42	Work with the fire department to develop contingency plans for firefighting during periods when drought conditions may produce decreased water pressure and supply	Not started	Continue in updated plan, item 41
43	Install lightning rods for protection of critical facilities	Not started	Continue in updated plan, item 42
44	Develop and reinforce hazardous materials emergency equipment and response teams	Not started	Continue in updated plan, item 43
45	Work with USGS to identify potential areas of soil subsidence and develop plans to address key infrastructure in identified areas	Not started	Continue in updated plan, item 44
46	Identify and/or encourage private critical facilities (gas stations, convenience stores, etc.) to have wiring/transfer switches and emergency back-up generators installed, or reliable contracts for the provision of back-up generators, in the event of disasters or power outages	Ongoing	Continue in updated plan, item 45
47	Develop a contingency plan for evacuating populations endangered by a wildfire	Not started	Continue in updated plan, item 46
48	Develop an all-hazard public information, education, and awareness strategy program	Ongoing	Continue in updated plan, item 47
49	Review the possible critical structural "snow load" thresholds on flat-roofed community or critical facilities	Not started	Continue in updated plan, item 48
50	Develop and incorporate warning and evacuation plans and systems for areas at risk from dam failure or large release flooding	Not started	Continue in updated plan, item 49
51	Build or enhance partnerships involving local government officials, civic, business and volunteer groups to work together to mitigate all-hazards	Not started	Continue in updated plan, item 50
52	Construct all new and replacement bridges to pass 100 year regulatory floodplain elevations without overtopping	Not started	Continue in updated plan, item 51
53	Provide covered shelter for county government vehicles	Not started	Continue in updated plan, item 52

54	Inventory inadequate bridges	Not started	Continue in updated plan, item 53
55	Provide lightning warning systems for county owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds	Not started	Continue in updated plan, item 54
56	Train/educate builders, developers, architects and engineers in techniques of disaster-resistant homebuilding , such as the fortified home standards developed by the Insurance Institute for Business & Home Safety (IBHS), the Blueprint for Safety guidelines developed by the Federal Alliance for Safe Homes (FLASH)	Not started	Continue in updated plan, item 55
57	Encourage effective use of regulated flood prone areas below dams	Not started	Continue in updated plan, item 56
58	Compensate for the impacts of new bridges and channel improvements	Not started	Continue in updated plan, item 57
59	Perform the FEMA Full Riverine Module for Cost/Benefit Analysis for Acquisition of 100-year floodplain buildings with first finished floor below the Base Flood Elevation (BFE) to confirm potential candidates for acquisition and removal from the floodplain	Not started	Continue in updated plan, item 58
60	Prepare elevation certificates for acquisition of floodplain candidate properties with positive benefit/cost ratios greater than 1.0	Not started	Continue in updated plan, item 59
61	Obtain elevation certificates for pre-FIRM homes located in the floodplain	Not started	Continue in updated plan, item 60
62	Identify and encourage private critical facilities (financial institutions, long term care facilities, designated/potential community emergency shelters, etc.) to have generator pad, wiring/transfer switches and Emergency Back-up Generators, or reliable contracts to provide back-up generators	Ongoing	Continue in updated plan, item 61
63	Develop and distribute flood and flash flood safety tips to inform citizens of the dangers of flood waters	Ongoing	Continue in updated plan, item 62
64	Construct regional detention ponds to compensate for future urban development	Not started	Continue in updated plan, item 63
65	Ensure that critical facilities are elevated or flood proofed to the 100 year flood elevation, be provided access above the 100 year flood elevation, and that new critical facilities are not located within the 100 year floodplain	Not started	Continue in updated plan, item 64
66	Inform floodplain residents of the availability of flood insurance within eligible NFIP communities	Not started	Continue in updated plan, item 65
67	Establish administrative procedures, and provide maps and information to inform builders about expansive soils when they apply for development and building permits	Not started	Continue in updated plan, item 66

68	Educate residents, building professionals and safe room vendors on the international codes council/national storm shelter association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this Standard into current information and practices	Started	Continue in updated plan, item 67
69	Educate builders on appropriate foundation types for soils with different degrees of shrink-swell potential	Not started	Continue in updated plan, item 68
70	Identify populations around potential fixed-site hazmat hazards, and distribute information and materials to support "Shelter-in-place" actions among home and business owners	Not started	Continue in updated plan, item 69
71	Inventory water moving equipment, including pumps, pipelines, tanker trucks, "water buffaloes" and other resources	Not started	Continue in updated plan, item 70
72	Encourage usage of water conservation policies such as low flow plumbing devices, inverted block water rate structure, moisture sensors, and the use of grey water for irrigation.	Not started	Continue in updated plan, item 71
73	Maintain culverts to adequately allow storm water drainage	Not started	Continue in updated plan, item 72
74	Create fire breaks along fence rows to thwart road jumping	Not started	Continue in updated plan, item 73
75	Conduct waterway channel improvements to prevent sedimentation and improve the ability to transport or store floodwaters, utilizing appropriate native vegetation where management priorities and safety concerns allow	Not started	Continue in updated plan, item 74
76	Continue to work with county extension offices and others to develop information on drought tolerant grass varieties and xeriscapes	Not started	Continue in updated plan, item 75
77	Install street addresses on buildings and curbs	Not started	Continue in updated plan, item 76
78	Continue to monitor drought conditions and moisture measurements to alert officials of increased risk of drought and wildfire.	Not started	Continue in updated plan, item 77
79	Educate the public on the importance of a family disaster plan and supply kit	Ongoing	Continue in updated plan, item 78
80	Provide hail resistant measures/materials to protect existing public infrastructure improvements	Not started	Continue in updated plan, item 79
81	Control erosion during development with vegetation or sediment capture, reducing sedimentation which may fill in channels and lakes, reducing their ability to carry or store floodwaters	Not started	Continue in updated plan, item 80
82	Develop and implement a Capital Improvement Plan that includes hazard mitigation considerations for flooding, expansive soils, earthquakes, severe winter storms, high winds, tornados, and hazardous materials events	Not started	Continue in updated plan, item 81

83	Continue to Educate the community about lightening safety through public service announcements and other media outlets	Not started	Continue in updated plan, item 82
84	Encourage utilities to provide lightning damage prevention information materials and programs to their customers	Not started	Continue in updated plan, item 83
85	Prepare and distribute a public information document letting people know that they reside or work in a dam failure inundation area	Not started	Continue in updated plan, item 84
86	Annually review municipal dam inspections and ensure that emergency action plans are up to date and on file at OWRB	Not started	Continue in updated plan, item 85
87	Identify vulnerable population and individuals at risk from extreme heat	Not started	Continue in updated plan, item 86
88	Develop computer assisted modeling flood inundation mapping, applying GIS modeling for cubic feet per second dam release rates	Not started	Continue in updated plan, item 87
89	Prepare contingency plans for terrorist attacks on local dams	Not started	Continue in updated plan, item 88
90	Develop a wildfire mitigation plan	Not started	Continue in updated plan, item 89
91	Prepare a memo of understanding with private sector gasoline facilities	Ongoing	Continue in updated plan, item 90
92	Update the Tulsa County multi-hazard mitigation plan	Not started	Continue in updated plan, item 91
93	Move County Garage out of the 100 year regulatory floodplain	Not started	Continue in updated plan, item 92

Table 5-2
STATUS OF TOWN OF SPERRY MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	Install a multi-person safe room for essential personnel and first responders at the Town Hall	Started	Continue in updated plan, item 1
2	Prepare a comprehensive master drainage plan for the Town	Not Started	Continue in updated plan, item 2
3	Maintain and install road side culverts in drainage ditches	Not Started	Continue in updated plan, item 3
4	Continue to upgrade the community wide outdoor emergency warning system	Not Started	Continue in updated plan, item 4
5	Purchase an operation center trailer and equipment	Not Started	Continue in updated plan, item 5
6	Prepare a Town of Sperry emergency response and operations procedures plan	Not Started	Continue in updated plan, item 6
7	Improve the water distribution system	Not Started	Continue in updated plan, item 7
8	Place street signs at all street intersections	Not Started	Continue in updated plan, item 8
9	An annex to the Town of Sperry EOP devoted to extreme heat situations	Not Started	Continue in updated plan, item 9
10	Informational literature	Not Started	Continue in updated plan, item 10
11	Promote town employee awareness of the risk of nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event	Not Started	Continue in updated plan, item 11
12	Develop a Continuity of Operations plan for each department within the town. Encourage each municipality within Tulsa County to develop COOP plans for each department	Not Started	Continue in updated plan, item 12
13	Develop an exercise program to test and update COOP plans for all Town departments and municipal departments within the Town	Not Started	Continue in updated plan, item 13
14	Provide employee shelters/safe rooms at critical facilities, such as 911 Center, Fire stations and Sheriff's stations to protect first responders	Not Started	Continue in updated plan, item 14
15	Evaluate, upgrade, and maintain community-wide outdoor Omni-directional voice/siren warning systems	Not Started	Continue in updated plan, item 15
16	Purchase and install backup generators for all Town facilities	Not Started	Continue in updated plan, item 16
17	Purchase NOAA Weather radios with S.A.M.E technology for each Town facility location and identify key staff to monitor radios	Complete	Do not include in updated plan
18	Install protective window film on all Town building windows to increase resistance to hazardous events	Not Started	Continue in updated plan, item 17

19	Replacement all garage doors at Town buildings with wind rated doors and rails if door is not already rated to handle strong wind events	Not Started	Continue in updated plan, item 18
20	Develop/ Review/ Update the debris management plan	Not Started	Continue in updated plan, item 19
21	Continue compliance with, and participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)	Not Started	Continue in updated plan, item 20
22	Provide surge and lighting protection for computer reliant critical facilities	Not Started	Continue in updated plan, item 21
23	Adopt the Firewise program for the vulnerable rural/urban interface area of Town	Not Started	Continue in updated plan, item 22
24	Create a more aggressive ice and snow removal plan	Not Started	Continue in updated plan, item 23
25	Install lightning rods for protection of critical facilities	Not Started	Continue in updated plan, item 24
26	Develop and reinforce hazardous materials emergency equipment and response teams	Not Started	Continue in updated plan, item 25
27	Develop a contingency plan for evacuating populations endangered by a wildfire	Not Started	Continue in updated plan, item 26
28	Build or enhance partnerships involving local government officials, civic organizations, business and volunteer groups to work together to mitigate all hazards	Not Started	Continue in updated plan, item 27
29	Provide covered shelter for Town government vehicles	Not Started	Continue in updated plan, item 28
30	Provide lightning warning systems for town owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds	Not Started	Continue in updated plan, item 29
31	Construct regional detention ponds to compensate for future urban development	Not Started	Continue in updated plan, item 30
32	Educate residents, building professionals and safe room vendors on the International Codes Council/National Storm Shelter Association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this Standard into current information and practices	Not Started	Continue in updated plan, item 31
33	Maintain culverts to adequately allow storm water drainage	Not Started	Continue in updated plan, item 32
34	Educate the public on the importance of a family disaster plan and supply kit	Not Started	Continue in updated plan, item 33

Table 5-3
STATUS OF BERRYHILL PUBLIC SCHOOLS MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	Reclaim existing lagoons, install needed lift station, install sewer line and connect to Tulsa	Not started	Continue in updated plan, item 1
2	Snow plows	Not started	Do not continue in updated plan
3	Safe rooms, number and size appropriate, for each building without safe rooms	Not started	Continue in updated plan, item 2
4	Dissemination of information about mitigating the risk associated with hazards	Not started	Continue in updated plan, item 4
5	Surge protectors to protect large mechanical power equipment, emergency power generators to restore power during an outage	Not started	Continue in updated plan, item 5
6	Installation of water saving fixtures in school facilities	Not started	Continue in updated plan, item 6
7	Develop detailed soils maps	Not started	Continue in updated plan, item 7
8	Energy efficient windows	Not started	Continue in updated plan, item 8
9	Outdoor public address system	Not started	Continue in updated plan, item 9

Table 5-4
STATUS OF KEYSTONE PUBLIC SCHOOLS MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	Safe Room for students and staff	Not started	Continue in updated plan, item 1
2	Replace existing doors with reinforced doors	Not started	Continue in updated plan, item
3	Install speaker systems inside and outdoors	Not started	Continue in updated plan, item 3
4	Emergency Warning Sirens	Not started	Continue in updated plan, item 4
5	Installation of radio communication equipment in buses, buildings and a base station	Not started	Continue in updated plan, item 5
6	Emergency generators at each school	Not started	Continue in updated plan, item 6
7	Dissemination of information about mitigating the risk associated with hazards	Not started	Continue in updated plan, item 7
8	Purchase and install NOAA weather radios in school facilities	Not started	Do not include in updated plan
9	Develop detailed soils maps	Not started	Continue in updated plan, item 8
10	Installation of water saving fixtures in school facilities	Not started	Continue in updated plan, item 9

Table 5-5
STATUS OF LIBERTY PUBLIC SCHOOLS MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	A safe room in or close to all public schools buildings to provide safe shelter for students and staff during a hazard event	Not started	Continue in updated plan, item 1
2	Shatter resistant glass windows in windows and doors in school buildings	Not started	Continue in updated plan, item 2
3	Surge protectors to protect large mechanical power equipment, emergency power generators to restore power during an outage	Ongoing	Continue in updated plan, item 3
4	Weather stripping, insulation and water proofing	Not started	Continue in updated plan, item 4
5	Inventory and prepare an improvement plan for fire hydrants and the water distribution system	Ongoing	Continue in updated plan, item 5
6	Incorporate hazard mitigation practices into school curriculum	Ongoing	Continue in updated plan, item 6
7	A tornado emergency operations plan	Ongoing	Continue in updated plan, item 7
8	Outdoor lightning and warning system	Not started	Continue in updated plan, item 8
9	NOAA weather radios at all school facilities, and 2-way radios for all buses to base station	Ongoing	Continue in updated plan, item 9
10	Intercom system in all school buildings	Not started	Continue in updated plan, item 10
11	Mobile communication equipment	Not started	Continue in updated plan, item 11
12	Stronger committees	Ongoing	Continue in updated plan, item 12
13	Construct new shelters for school owned vehicles to protect them from hail and storm debris	Not started	Continue in updated plan, item 13
14	Increase drainage capacity in areas of the school grounds that are inadequate	Ongoing	Continue in updated plan, item 14
15	Covered walkways between buildings and athletic facilities such as the baseball fields and football stadium	Not started	Continue in updated plan, item 15
16	Preform natural hazard evaluation of schools to determine the most cost effective ways to retrofit or remodel buildings to make them more disaster resistant, specifically to tornadoes and high winds	Not started	Continue in updated plan, item 16
17	Educate the public about various dangers associated with natural hazards, and the benefits of installing residential and commercial storm shelters and safe rooms	Ongoing	Continue in updated plan, item 17

18	Implement an AWOS weather station to provide accurate and current weather information to the school and community emergency management teams	Not started	Continue in updated plan, item 18
19	Snow removal equipment	Not started	Continue in updated plan, item 19
20	Create and maintain a district wide database for tracking declared and non-declared natural disasters and other emergency events	Not started	Continue in updated plan, item 20
21	Secure furniture and equipment to prevent injuries due to falling objects during seismic events	Not started	Continue in updated plan, item 21

Table 5-6
STATUS OF SPERRY PUBLIC SCHOOLS MITIGATION ACTIONS FROM THE PREVIOUS PLAN

Action Plan #	Action Description	Progress on Action	Recommendation for the Action
1	Purchase a tri-fold, colored brochure that provides information on all hazards	Not started	Continue in updated plan, item 1
2	Install water saving fixtures on outdoor faucets or hydrants, toilets and urinals	Ongoing	Do not continue in updated plan
3	Create a digital soils map	Ongoing	Continue in updated plan, item 2
4	Outdoors PA system on all campuses	Ongoing	Continue in updated plan, item 3
5	A large capacity safe room at each school for on-site students and staff use	Not started	Continue in updated plan, item 4
6	Purchase and installation of backup generators and transfer switches at each school building	Not started	Continue in updated plan, item 5

5.2 Mitigation Actions

The previous plan was revised by adding additional activities and this reflects changes in priorities of the committee. As part of the plan update process, this chapter includes mitigation actions that Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools selected to achieve the mitigation goals. The mitigation actions include a minimum of two (2) specific mitigation actions per hazard. Each jurisdiction also selected non-mitigation actions relating to hazard prevention and communications for their own planning purposes. Each action identifies which hazards are targeted by the action, the lead agency and any participating agencies or departments, the anticipated time schedule, an estimated cost, possible funding sources, and the type of work product and expected outcomes. When necessary, a detailed cost/benefit analysis will be performed following the requirements of the funding source prior to mitigation implementation.

Element D3
A local jurisdiction must review and revise its plan to reflect changes in priorities.
44 CFR §201.6(d)(3)

Element C4
The hazard mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
44 CFR §201.6(c)(3)(ii)

The TCHMPC has reviewed and analyzed the risk assessment studies for all of the identified natural hazards and hazardous material events. Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools were equally concerned about each identified hazard and have reviewed the mitigation strategies listed in Chapter 4. All participating jurisdictions based their action items on this updated plan's risk and vulnerability analyses.

The following two tables identify which mitigation action is associated with each hazard for Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools. The jurisdictions also selected non-mitigation actions to be in their action plan, but only the mitigation actions are included in the table.

Table 5-7
TULSA COUNTY, CITY OF BIXBY, CITY OF JENKS, AND TOWN OF SPERRY MITIGATION ACTIONS PER HAZARD
(two per hazard – minimum)

Hazard Type	Tulsa County	City of Bixby	City of Jenks	Town of Sperry
Flood	1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 14, 15, 17, 19, 21, 23, 24, 25, 26, 27, 28, 29, 32, 34, 37, 38, 39, 40, 47, 49, 50, 51, 53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 72, 74, 76, 78, 80, 81, 91, 92	1, 2, 3, 4	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 15, 16, 19, 20, 27, 30, 32, 33
Tornado	2, 6, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 30, 32, 34, 37, 38, 39, 45, 47, 50, 53, 55, 61, 67, 76, 78, 81, 90, 91	5, 6	2, 4, 5, 10	1, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 27, 31, 33
High Wind	2, 6, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 30, 32, 34, 37, 38, 39, 45, 47, 50, 53, 55, 61, 67, 76, 78, 81, 90, 91	7, 8	2, 4, 5, 10	1, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 27, 31, 33
Lightning	2, 9, 10, 14, 15, 19, 22, 26, 27, 30, 32, 34, 37, 38, 39, 42, 45, 47, 50, 53, 54, 55, 61, 76, 78, 81, 82, 83, 90, 91	9, 10	2, 4, 5, 7	1, 4, 5, 6, 8, 10, 12, 13, 16, 21, 24, 27, 29, 33
Hail	2, 9, 10, 15, 18, 19, 21, 22, 26, 27, 32, 34, 37, 39, 47, 50, 52, 53, 55, 61, 76, 78, 79, 81, 91	11, 12	4, 5	1, 4, 5, 6, 8, 10, 12, 13, 17, 19, 27, 28, 33
Winter Storm	2, 9, 10, 14, 15, 18, 19, 21, 24, 25, 26, 27, 30, 32, 34, 35, 37, 38, 39, 45, 47, 48, 50, 52, 53, 55, 61, 76, 78, 81, 90, 91	13, 14	1, 4, 5, 11	1, 5, 6, 8, 10, 12, 13, 16, 17, 19, 21, 23, 27, 28, 33
Extreme Heat	2, 14, 15, 18, 19, 26, 27, 30, 32, 34, 37, 38, 39, 45, 47, 50, 52, 55, 61, 71, 75, 78, 81, 86, 90, 91	15, 16	5, 8	6, 8, 9, 10, 16, 17, 21, 27, 28, 33
Expansive Soil	2, 19, 26, 27, 34, 40, 44, 47, 50, 53, 55, 61, 66, 68, 81, 91	19, 20	5, 13	6, 10, 27
Drought	2, 15, 19, 26, 27, 32, 34, 37, 39, 41, 47, 50, 55, 61, 70, 71, 75, 77, 78, 81, 91	17, 18	5, 9	6, 7, 10, 27, 33
Wildfire	2, 9, 10, 15, 19, 26, 27, 32, 33, 34, 37, 39, 40, 41, 46, 47, 50, 53, 55, 61, 70, 73, 75, 76, 77, 78, 81, 89, 91	21, 22	1, 2, 4, 12	1, 4, 5, 6, 7, 8, 10, 12, 13, 22, 26, 27, 33
Earthquake	2, 7, 8, 9, 10, 12, 14, 16, 18, 19, 21, 24, 25, 26, 27, 30, 32, 34, 37, 38, 39, 45, 47, 50, 53, 55, 61, 76, 78, 81, 90, 91	23, 24	1, 2, 4, 5	1, 4, 5, 6, 8, 10, 11, 12, 13, 15, 16, 17, 19, 21, 27, 33

Hazardous Material Event	2, 6, 9, 10, 12, 19, 24, 25, 26, 27, 31, 32, 34, 36, 37, 39, 40, 43, 47, 50, 53, 55, 61, 69, 76, 78, 81, 91	25, 26	1, 2, 4	1, 4, 5, 6, 8, 10, 12, 13, 15, 25, 27, 33
Dam Break/Levee Failure	1, 2, 3, 5, 6, 9, 10, 12, 14, 17, 19, 23, 24, 25, 26, 27, 29, 32, 34, 37, 38, 40, 47, 49, 50, 53, 55, 56, 58, 59, 61, 62, 65, 76, 78, 81, 84, 85, 87, 88, 91	27, 28, 29	1, 2, 3, 4, 5	not applicable

Table 5-8
SCHOOLS' MITIGATION ACTIONS PER HAZARD
(two per hazard – minimum)

Hazard Type	Berryhill Public Schools	Bixby Public Schools	Jenks Public Schools	Keystone Public Schools	Liberty Public Schools	Sperry Public Schools
Flood	1, 3, 4, 9, 10	1, 3, 4, 10	1, 3, 5, 12, 13	not applicable	not applicable	not applicable
Tornado	2, 3, 4, 5, 9	4, 5, 6, 7, 10	1, 2, 3, 4, 12, 13	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 6, 7, 9, 10, 11, 12, 16, 17, 18, 20	1, 4, 5, 6
High Wind	2, 3, 4, 5, 9	2, 4, 5, 6, 7, 10	1, 2, 3, 4, 12, 13, 17	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 6, 9, 10, 11, 12, 13, 16, 17, 18, 20	1, 4, 5
Lightning	3, 4, 5, 9	4, 5, 6, 7, 10	1, 3, 6, 12, 13	3, 4, 5, 6, 7	1, 3, 6, 8, 9, 10, 11, 12, 16, 17, 18, 20	1, 4, 6
Hail	3, 4, 5, 9	4, 5, 6, 7, 10	1, 3, 7, 12, 13	2, 3, 4, 5, 6, 7	1, 2, 3, 4, 6, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20	1, 4
Winter Storm	3, 4, 5, 8, 10	4, 5, 10	1, 3, 4, 12, 13, 17	5, 6, 7	1, 3, 4, 6, 9, 12, 13, 15, 17, 18, 19, 20	1, 4, 6
Extreme Heat	3, 4, 8	4, 7, 10	1, 3, 8	3, 6, 7	1, 4, 6, 9, 12, 17, 18, 20	1, 4
Expansive Soil	4, 7	4, 8	15, 16	7, 8	6, 12, 17, 20	1, 3
Drought	3, 4, 6	4, 9, 11	1, 3, 10	7, 9	6, 12, 17, 20	1, 2
Wildfire	3, 4, 5, 9	5, 6, 7	1, 3, 9, 12, 13	3, 4, 5, 6, 7	5, 6, 9, 12, 17, 20	1, 4, 6, 9, 10
Earthquake	3, 4, 5	4, 5, 6, 7, 10	1, 3, 4, 12, 13, 14, 17	3, 4, 5, 6, 7	4, 6, 9, 10, 12, 16, 17, 18, 20, 21	1, 4, 6, 7, 8
Hazardous Material Event	3, 4, 9	4, 6, 7	1, 3, 4, 12, 13	3, 4, 5, 7	6, 9, 12, 17, 20	1, 4
Dam Break/Levee Failure	not applicable	1, 4	1, 11, 12, 13	not applicable	not applicable	not applicable

TULSA COUNTY has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method and prioritized the activities as detailed in Section 4.3. When necessary, a detailed cost/benefit analysis will be performed following the requirements of the funding source prior to mitigation implementation.

Action Item # 1	**TULSA COUNTY**
Title	Levee Repair/Replacement
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation (Structural Project)
Lead and participating agencies	USACE TAEMA FEMA Levee District 12 County Engineering City of Tulsa Hydrology OEM Creek Nation
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100 million
Funding source	Local and/or grants
Work product	Repair and enhance levee A, B, and C to comply with current FEMA standards
Expected outcome	Help prevent or lessen the impact of flooding along the Arkansas River Corridor

Action Item # 2	TULSA COUNTY
Title	Regional Interactive Emergency Operations Center
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation (Structural Project)
Lead and participating agencies	TAEMA County Engineering County Commissioners OEM FEMA Oklahoma Dept. of Homeland Security
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10 million
Funding source	Local and/or grants
Work product	Develop Tulsa County regional interactive Emergency Operations Center to provide all-hazards countywide (Oklahoma Homeland Security Region 7) warning, preparedness, response, recovery, and mitigation activities throughout Tulsa County
Expected outcome	Provide a modern Emergency Operation Center (EOC) to better allow for more efficient handling of incidents and events that threaten Tulsa County

Action Item # 3	TULSA COUNTY
Title	Acquisition and removal of repetitive loss property within the 100 year floodplain
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Social Services County Engineering Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15 million
Funding source	Local and/or grants
Work product	Move County Social Services out of the 100 year regulatory floodplain
Expected outcome	Provide better continuity of operations for Tulsa County Social Services following a flood event

Action Item # 4	TULSA COUNTY
Title	Acquisition and removal of repetitive loss property within the 100 year floodplain
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Sheriff Tulsa County Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$45,000,000
Funding source	Local and/or grants
Work product	Move Juvenile Bureau out of the 100 year regulatory floodplain
Expected outcome	Maintain a continuous level of service during flood hazard events

Action Item # 5	TULSA COUNTY
Title	Acquisition and removal of repetitive loss property within the 100 year floodplain
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Parks County Engineering Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10 million
Funding source	Local and/or grants
Work product	Move county parks administration out of the 100 year regulatory floodplain
Expected outcome	Provide better continuity of operations for Tulsa County Parks following a flood event

Action Item # 6	TULSA COUNTY
Title	Outdoor Warning Sirens
Hazard(s) targeted	Floods Tornados High Winds Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA City of Tulsa Radio Shop Board of County Commissioners INCOG
Time schedule	1-5 years or when funding becomes available
Estimated cost	$30,000 per siren
Funding source	Local and/or grants
Work product	Install additional outdoor warning sirens in order to expand coverage area to include all of the unincorporated area of Tulsa County.
Expected outcome	Expand coverage of the outdoor warning system to provide greater warning capacity and decrease loss of life during hazardous incidents

Action Item # 7	TULSA COUNTY
Title	Promote county employee awareness of the risk of injury from falling nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event
Hazard(s) targeted	Earthquakes
Project type	Mitigation (Education)
Lead and participating agencies	TAEMA Tulsa County Building Operations County Safety County HR
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Promote county employee awareness of the risk of injury from falling nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event
Expected outcome	Non-structural elements can fall and injure people during seismic events, causing injury

Action Item # 8	TULSA COUNTY
Title	Securing non-structural elements to walls
Hazard(s) targeted	Earthquakes
Project type	Mitigation
Lead and participating agencies	All County Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Provide equipment to county facilities to allow them to secure nonstructural elements to walls
Expected outcome	Securing non-structural elements to ensure that they do not become hazardous falling objects during seismic events

Action Item # 9	TULSA COUNTY	
Title	Departmental Continuity of Operations Planning	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail	Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	All Tulsa County Departments Municipal Departments	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$10,000	
Funding source	Local and/or grants	
Work product	Develop a Continuity of Operations plan for each department within county government. Encourage each municipality within Tulsa County to develop COOP plans for each department.	
Expected outcome	Clear delineation of responsibility for continuity of departmental operations in the event that current departmental leadership becomes unavailable during hazardous events	

Action Item # 10	TULSA COUNTY
Title	Exercising of Continuity of Operations plans
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	All Tulsa County Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop exercise programs to test and update COOP plans for all county and municipal departments within the county
Expected outcome	Ensure that all responsible parties are familiar with the continuity of operations plans and the plans are workable

Action Item # 11	TULSA COUNTY
Title	Provide locations of refuge for employees at critical facilities
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	All County Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000 per shelter
Funding source	Local and/or grants
Work product	Provide employee shelters/safe rooms at critical facilities, such as 911 Center, Fire stations and Sheriff's stations to protect first responders
Expected outcome	Protect the lives of critical first responders during hazardous events

Action Item # 12	TULSA COUNTY
Title	Upgrade and maintain current outdoor warning system
Hazard(s) targeted	Floods Dam Break/Levee Failure Tornados High Winds Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA City of Tulsa Radio Shop
Time schedule	1-5 years or when funding becomes available
Estimated cost	Up to $30,000 per siren
Funding source	Local and/or grants
Work product	Evaluate, upgrade, and maintain community-wide outdoor Omni-directional voice/siren warning systems
Expected outcome	Ensure that current outdoor warning system capabilities continue to meet population needs

Action Item # 13	TULSA COUNTY
Title	Raising generator placement height
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	All departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000 each
Funding source	Local and/or grants
Work product	Elevate all generators at county facilities so they are 1 foot above the 100 year regulatory floodplain
Expected outcome	Promote continuity of operations by ensuring that dedicated building generators will not be affected by floods within 100 year flood plain

Action Item # 14	TULSA COUNTY
Title	Purchase dedicated generators
Hazard(s) targeted	Floods Tornados High Winds Lightning Winter Storms Extreme Heat Earthquakes Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Tulsa County Building Operations County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$30,000 per generator
Funding source	Local and/or grants
Work product	Purchase and install backup generators for all county facilities
Expected outcome	Promote greater continuity of operations by ensuring that county facilities are not affected by disruptions to local power grid

Action Item # 15	TULSA COUNTY
Title	Purchase NOAA Radios
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA All departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 100 per radio
Funding source	Local and/or grants
Work product	Purchase NOAA Weather Radios for each county facility location, nursing homes, and critical care facilities throughout Tulsa County and identify key staff to monitor radios
Expected outcome	Provide greater awareness and early warnings to county facilities of incoming hazards, ensuring that staff has time to take life preserving measures

Action Item # 16	TULSA COUNTY
Title	Secure water heaters to walls
Hazard(s) targeted	Tornados High Winds Earthquakes
Project type	Mitigation
Lead and participating agencies	Tulsa County Building Operations County Safety Officer County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$200 each
Funding source	Local and/or grants
Work product	secure all water heaters to walls at county facilities
Expected outcome	Protect life and prevent property damage by securing water heaters so they do not move from their base during events thus preventing potential gas and/or water leaks

Action Item # 17	TULSA COUNTY
Title	Install monitoring system at area dams
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA USACE Homeland Security
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ not determined
Funding source	Local and/or grants
Work product	Install remote visual monitoring systems at area dams to allow situation monitoring and awareness for early detection for warning vulnerable populations
Expected outcome	Allow for early detection of dam breaks or heavy release, promoting earlier warnings and greater life and property preservation

Action Item # 18	TULSA COUNTY
Title	Install Protective Window Films
Hazard(s) targeted	Tornados High winds Hail Winter storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$300 per window
Funding source	Local and/or grants
Work product	Install protective window film on all county building windows to increase safety and resistance to hazardous events
Expected outcome	To prevent broken glass causing further injury during hazardous events

Action Item # 19	TULSA COUNTY
Title	Develop interoperable VHF communications system
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA Radio Shop OEM Homeland Security
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000
Funding source	Local and/or grants
Work product	Develop and maintain a redundant countywide, all hazards, all community, interoperable VHF communications system
Expected outcome	To promote greater communication capabilities across jurisdictions during hazardous events

Action Item # 20	TULSA COUNTY
Title	Replace overhead/garage doors
Hazard(s) targeted	Tornadoes High Winds
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 30,000 per door
Funding source	Local and/or grants
Work product	Replacement all garage doors at county buildings with wind rated doors and rails if door is not already rated to handle strong wind events
Expected outcome	Improve building capacity to maintain structural integrity during severe weather

Action Item # 21	TULSA COUNTY
Title	Develop/review/update the debris management plan
Hazard(s) targeted	Floods Tornadoes High Winds Hail Winter Storms Earthquakes
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop/Review/Update the debris management plan
Expected outcome	Promote faster recovery and better health outcomes by efficiently removing debris from areas affected by hazardous events

Action Item # 22	TULSA COUNTY
Title	Purchase NOAA Radios for area schools
Hazard(s) targeted	Tornadoes High Winds Lighting Hail
Project type	Mitigation
Lead and participating agencies	Local Area School Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 100 per radio
Funding source	Local and/or grants
Work product	Designate individuals in area schools that are educated in storm spotting and safety and who have the authority to take proper action. Equip these individuals with NOAA weather radios.
Expected outcome	Promote better warnings and quicker response time to improve safety

Action Item # 23	TULSA COUNTY
Title	Comply with national flood programs
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Continue compliance with, and participation in the National Flood Insurance Program (MFIP) and Community Rating System (CRS)
Expected outcome	Ensuring that losses from flooding is covered helps to promote greater community resilience and lessen the overall long term impact of flooding events

Action Item # 24	TULSA COUNTY
Title	Purchase Air burner system for debris removal
Hazard(s) targeted	Floods Tornados High Winds Winter Storms Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$120,000 each
Funding source	Local and/or grants
Work product	Purchase an air burner system to allow for more efficient debris removal
Expected outcome	Promote faster recovery and better health outcomes by efficiently removing debris from areas affected by hazardous events

Action Item # 25	TULSA COUNTY
Title	Purchase debris load volume scanner
Hazard(s) targeted	Floods Tornados High Winds Winter Storms Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Purchase a debris load scanning system to allow for more efficient debris measurement
Expected outcome	Promote faster recovery and better health outcomes by efficiently removing and tracking debris from areas affected by hazardous events

Action Item # 26	TULSA COUNTY
Title	Implement computer vulnerability protection
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Tulsa County Information Technology
Time schedule	1-5 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Consider and/or implement necessary measures to protect computer based systems from cyber-attack and other security vulnerabilities during hazardous events
Expected outcome	Promote continuity of operations and incident stabilization by ensuring that computer system vulnerabilities are not exploited or created during hazardous events

Action Item # 27	TULSA COUNTY
Title	Purchase and adopt IPAWS system
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA OEM FEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	Install a mass emergency telephone communication system such as reverse 911 or black board connect, for mass call-outs to targeted areas of the community for emergency notification and/or information
Expected outcome	Promote greater community warning capacity in order to deliver potentially lifesaving information in a timely manner.

Action Item # 28	TULSA COUNTY
Title	Floodplain property acquisition
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Acquire floodplain property and remove repetitive loss structures where the community's repetitive loss plan and Flood and Drainage Annex to the Hazard Mitigation Plan identify acquisition as the most cost-effective and desirable mitigation measure
Expected outcome	Removal of these properties from usage that could endanger lives while serving to reduce overall community impact from flood events

Action Item # 29	TULSA COUNTY
Title	Create flood specific annex to mitigation plan
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA INCOG County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	Prepare a comprehensive basin wide Flood and Drainage Annex to the Hazard Mitigation Plan for all watersheds within the jurisdiction. The plan should identify all flooding problems within the jurisdiction and recommend the most cost-effective and politically acceptable solutions.
Expected outcome	Will provide specialized guidance on flood mitigation activities throughout Tulsa County

Action Item # 30	TULSA COUNTY
Title	Install Surge Protection
Hazard(s) targeted	Tornadoes High Winds Lightning Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	Tulsa County Information Technology
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Provide surge and lighting protection for computer reliant critical facilities
Expected outcome	Limit equipment losses from power spikes and lightning strikes

Action Item # 31	TULSA COUNTY
Title	Conduct a commodity flow study
Hazard(s) targeted	Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County LEPC
Time schedule	in 1-5 years or when funding becomes available
Estimated cost	$ 10,000
Funding source	Local and/or grants
Work product	Coordinate with local LEPC to conduct a commodity flow study
Expected outcome	Promote greater understanding for emergency response personnel concerning hazardous material incidents they are likely to face, allowing for greater preparation and promoting better life preservation activities

Action Item # 32	TULSA COUNTY
Title	Build greater relationships with Ham Radio Operators
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop a network of ham operators as a communications source during hazardous events to assist in emergency management activities
Expected outcome	Provide better situational awareness, to allow issuance of more timely warnings to areas potentially affected by hazardous events

Action Item # 33	TULSA COUNTY
Title	Develop a Firewise program
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA Area Fire Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Adopt a Firewise program for the vulnerable rural/urban interface area within the county
Expected outcome	Lessen the overall impact of urban interface fires on Tulsa county residents

Action Item # 34	TULSA COUNTY
Title	Update information with 211
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA 211
Time schedule	1-5 years or when funding becomes available
Estimated cost	$1,000
Funding source	Local and/or grants
Work product	Continue updating appropriate disaster safety information for the 211 system, such as cooling shelters in extreme heat, and heating shelters in severe winter storms
Expected outcome	Provide more effective distribution to the general public of potentially lifesaving information

Action Item # 35	TULSA COUNTY
Title	Devise a more aggressive snow and ice removal plan
Hazard(s) targeted	Winter Storms
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Create a more aggressive ice and snow removal plan
Expected outcome	Lessen the overall impact of winter storms on the general population within Tulsa County

Action Item # 36	TULSA COUNTY
Title	Provide Tier II information to area Fire Chiefs
Hazard(s) targeted	Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA DEQ
Time schedule	1-5 years or when funding becomes available
Estimated cost	$2,500
Funding source	Local and/or grants
Work product	Provide maps and chemical details of local Tier II facilities to all fire chiefs operating within Tulsa county
Expected outcome	Allow for better response to Tier II facilities during hazardous events, promoting greater safety to first responders

Action Item # 37	TULSA COUNTY	
Title	Promote business continuity planning	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	TAEMA Local Chambers of Commerce All Departments	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$100,000	
Funding source	Local and/or grants	
Work product	Work with local chambers of commerce to educate businesses on the need for business continuity planning	
Expected outcome	Create greater community resiliency against long term losses created by hazardous events	

Action Item # 38	TULSA COUNTY
Title	Provide wiring and switches for emergency generators at critical facilities owned by Tulsa county
Hazard(s) targeted	Floods Tornados High Winds Lightning Winter Storms Extreme Heat Earthquakes Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Tulsa County Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Provide wiring and transfer switches to accommodate emergency generators during disaster power outages for critical facilities including Emergency Operation Centers, County Court House, Dispatch, Sheriff's Offices, Community Centers used for emergency housing during disaster, critical facilities, lift stations, and community medical facilities
Expected outcome	Provide for continuity of operations during hazardous events

Action Item # 39	TULSA COUNTY
Title	Develop and test site emergency plans for correctional facilities
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Sheriffs
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop and test site emergency plans for correctional facilities.
Expected outcome	Devise a system that will help minimize loss of life during hazardous events

Action Item # 40	TULSA COUNTY
Title	Adopt/modify a land use plan to guide development away from hazardous areas
Hazard(s) targeted	Floods Expansive Soils Wildfires Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineers
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Modify/adopt a land use plan to guide development away from hazardous areas, reduce population density in hazardous areas, implement stronger development restrictions, and encourage natural resource protection
Expected outcome	Lessen the impact of hazardous events by lessening the likelihood that individuals, residences, or businesses will be in the impacted area

Action Item # 41	TULSA COUNTY
Title	Develop contingency plans for firefighting during periods of drought
Hazard(s) targeted	Drought Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA Area Fire Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Work with fire departments to develop contingency plans for firefighting during periods when drought conditions may result in decreased water pressure and supply
Expected outcome	Ensure that firefighting capacity is maintained despite drought conditions or other issues that might affect water supply

Action Item # 42	TULSA COUNTY
Title	Install lightning rods for protection of critical facilities
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	County Engineering Building Operations TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Install lightning rods for protection of critical facilities
Expected outcome	Protect facilities against lighting strikes

Action Item # 43	TULSA COUNTY
Title	Develop and reinforce hazardous materials emergency equipment and response teams
Hazard(s) targeted	Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA Area Fire Departments INCOG
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop and reinforce hazardous materials emergency equipment and response teams
Expected outcome	Provide better immediate response to hazardous material incidents, promoting safety and lessening long term impacts

Action Item # 44	TULSA COUNTY
Title	Identify potential areas of soil subsidence
Hazard(s) Targeted	Expansive Soils
Project Type	Mitigation
Lead and participating agencies	TAEMA USGS County Engineering
Time schedule	in 1-5 years or when funding becomes available
Estimated Cost	$25,000
Funding source	Local and/or grants
Work product	Work with USGS to identify potential areas of soil subsidence and develop plans to address key infrastructure in identified areas
Expected outcome	Allow for development of key infrastructure to lessen the impact of soil subsidence

Action Item # 45	TULSA COUNTY
Title	Promote better disaster resilience with key private critical facilities
Hazard(s) targeted	Tornadoes High Winds Lightning Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	TAEMA Private industry
Time schedule	1-5 years or when funding becomes available
Estimated cost	N/A
Funding source	Private businesses
Work product	Identify and/or encourage private critical facilities (gas stations, convenience stores, etc.) to have wiring/transfer switches and emergency back-up generators installed (or reliable contracts for the provision of back-up generators) in the event of a disaster or power outage
Expected outcome	Promote greater community resiliency and lessen the impact of hazardous events on the community

Action Item # 46	TULSA COUNTY
Title	Develop a contingency plan for evacuating populations endangered by wildfires
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA Area Fire Departments
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop a contingency plan for evacuating populations endangered by wildfires
Expected outcome	Protect individuals from injury or loss of life due to wildfires

Action Item # 47	TULSA COUNTY
Title	Develop an all-hazard public information, education, and awareness strategy program
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Develop an all-hazard public information, education, and awareness strategy program
Expected outcome	Raise awareness of natural hazards

Action Item # 48	TULSA COUNTY
Title	Review critical structural "snow load" thresholds on flat-roofed community or critical facilities
Hazard(s) targeted	Winter Storms
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000
Funding source	Local and/or grants
Work product	Review critical structural "snow load" thresholds on flat-roofed community or critical facilities
Expected outcome	Ensure that continuity of operations are not disrupted and that further costs are not incurred from snow load

Action Item # 49	TULSA COUNTY
Title	Develop and incorporate warning and evacuation plans and procedures for areas at risk from dam failure or large release flooding
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA All stakeholders
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Develop and incorporate warning and evacuation plans and procedures for areas at risk from dam failure or large release flooding
Expected outcome	Decrease the likelihood that dam failure or flooding will result in catastrophic injury, loss of life or loss of property

Action Item # 50	TULSA COUNTY
Title	Build or enhance partnerships with local governments, civic organizations, businesses and volunteer groups enabling all to work together to mitigate all-hazards
Hazard(s) targeted	Floods Tornados High winds Lightning Hail Winter storms Heat Drought Expansive soils Wildfires Earthquakes Hazard material events Dam breaks
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Build or enhance partnerships with local governments, civic organizations, businesses and volunteer groups enabling all to work together to mitigate all-hazards
Expected outcome	Create a more comprehensive, community wide, resiliency against hazardous events

Action Item # 51	TULSA COUNTY
Title	Construct all new and replacement bridges to pass 100 year regulatory floodplain requirements without overtopping
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Department of Transportation County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 50 million
Funding source	Local and/or grants
Work product	Construct all new and replacement bridges to pass 100 year regulatory floodplain requirements without overtopping
Expected outcome	To ensure that needed bridges and overpasses are available for both responders and evacuees during a flood event

Action Item # 52	TULSA COUNTY
Title	Provide covered shelter for county government vehicles
Hazard(s) targeted	Hail Winter Storms Extreme Heat
Project type	Mitigation
Lead and participating agencies	Tulsa Building Operations
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Provide covered shelter for county government vehicles
Expected outcome	Prevent damage to county vehicles from hazardous events

Action Item # 53	TULSA COUNTY
Title	Inventory bridges for adequacy
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Department of Transportation County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Inventory bridges for adequacy
Expected outcome	Allow repairs to be made and establish evacuation routes that do not utilize inadequate bridges

Action Item # 54	TULSA COUNTY
Title	Provide lightning warning systems for county owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	Tulsa County Parks Expo Square
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Provide lightning warning systems for county owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds
Expected outcome	Allow early warning of lightning events for a faster response and decreased likelihood of injury or loss of life from lightning strikes

Action Item # 55	TULSA COUNTY
Title	Train and educate stakeholders in disaster resistant building methods
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineers
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Train/educate builders, developers, architects and engineers in techniques of disaster-resistant homebuilding , such as the fortified home standards developed by the Insurance Institute for Business & Home Safety (IBHS), the Blueprint for Safety guidelines developed by the Federal Alliance for Safe Homes (FLASH)
Expected outcome	Prevent loss of life and minimize property damage through better building methods

Action Item # 56	TULSA COUNTY
Title	Encourage effective use of regulated downstream areas from dams
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Encourage effective use of regulated downstream areas from dams
Expected outcome	Prevent loss of life and minimize property damage by ensuring that downstream areas are not utilized in a way that would compound issues from hazardous events

Action Item # 57	TULSA COUNTY
Title	Compensate for the impacts of new bridges and channel improvements
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	in 1-5 years or when funding becomes available
Estimated cost	Variable
Funding source	Local and/or grants
Work product	Compensate for the impacts of new bridges and channel improvements
Expected outcome	Prevent current projects from compounding issues caused by hazardous events

Action Item # 58	TULSA COUNTY
Title	Perform the FEMA Full Riverine Module for Cost/Benefit Analysis for Acquisition of 100-year floodplain buildings with first finished floor below the Base Flood Elevation (BFE) to confirm potential candidates for acquisition and removal from the floodplain
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	Perform the FEMA Full Riverine Module for Cost/Benefit Analysis for Acquisition of 100-year floodplain buildings with first finished floor below the Base Flood Elevation (BFE) to confirm potential candidates for acquisition and removal from the floodplain
Expected outcome	Provide a cost/benefit analysis to allow determination of which buildings need to be acquired for removal

Action Item # 59	TULSA COUNTY
Title	Prepare elevation certificates for acquisition of floodplain candidate properties with positive benefit/cost ratios greater than 1.0
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	Prepare elevation certificates for acquisition of floodplain candidate properties with positive benefit/cost ratios greater than 1.0
Expected outcome	Provide elevation certificates for acquisition of floodplain candidate properties with positive benefit/cost ratios greater than 1.0

Action Item # 60	TULSA COUNTY
Title	Obtain elevation certificates for pre-FIRM homes located in the floodplain
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 10,000
Funding source	Local and/or grants
Work product	Obtain elevation certificates for pre-FIRM homes located in the floodplain
Expected outcome	Have elevation certificates for pre-FIRM homes located in the floodplain

Action Item # 61	TULSA COUNTY	
Title	Identify and encourage Private Critical Facilities (financial institutions, long term care facilities, designated/potential community emergency shelters, etc.) to have generator pad, wiring/transfer switches and Emergency Back-up Generators, or reliable contracts to provide back-up generators	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat	Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks
Project type	Mitigation	
Lead and participating agencies	TAEMA	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$10,000	
Funding source	Local and/or grants	
Work product	Identify and encourage Private Critical Facilities (financial institutions, long term care facilities, designated/potential community emergency shelters, etc.) to have generator pad, wiring/transfer switches and Emergency Back-up Generators, or reliable contracts to provide back-up generators	
Expected outcome	Promote greater community resiliency and lessen the impact of hazardous events	

Action Item # 62	TULSA COUNTY
Title	Develop and distribute flood and flash flood safety tips to inform citizens of the dangers of flood waters
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	Develop and distribute flood and flash flood safety tips to inform citizens of the dangers of flood waters
Expected outcome	Decrease number of illnesses and fatalities from floods

Action Item # 63	TULSA COUNTY
Title	Construct regional detention ponds to compensate for future urban development
Hazard(s) targeted	Flood
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available_
Estimated cost	$2,000,000
Funding source	Local and/or grants
Work product	Construct regional detention ponds to compensate for future urban development
Expected outcome	Lessen the impact of heavy rains on the community by retaining potential flood waters

Action Item # 64	TULSA COUNTY
Title	Ensure that critical facilities are elevated or flood proofed to the 100 year flood elevation, be provided access above the 100 year flood elevation, and that new critical facilities are not located within the 100 year floodplain.
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$20 million
Funding source	Local and/or grants
Work product	Ensure that critical facilities are elevated or flood proofed to the 100 year flood elevation, be provided access above the 100 year flood elevation, and that new critical facilities are not located within the 100 year floodplain.
Expected outcome	No critical facilities to be affected by flooding within the 100 year floodplain

Action Item # 65	TULSA COUNTY
Title	Inform floodplain residents of the availability of flood insurance within eligible NFIP communities
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Inform floodplain residents of the availability of flood insurance within eligible NFIP communities
Expected outcome	Increase participation in NFIP to provide individuals with resources to recover rapidly following a flood event

Action Item # 66	TULSA COUNTY
Title	Establish administrative procedures, and provide maps and information to inform builders about expansive soils when they apply for development and building permits
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	County engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Establish administrative procedures, and provide maps and information to inform builders about expansive soils when they apply for development and building permits
Expected outcome	Allow informed decisions in building construction and prevent property damage from improper foundations during a hazardous event

Action Item # 67	TULSA COUNTY
Title	Educate residents, building professionals and safe room vendors on the international codes council/national storm shelter association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this Standard into current information and practices
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Educate residents, building professionals and safe room vendors on the international codes council/national storm shelter association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this Standard into current information and practices
Expected outcome	Provide better standardization for storm shelters and safe rooms throughout the county ensuring that all shelters are built to best industry practices

Action Item # 68	TULSA COUNTY
Title	Educate builders on appropriate foundation types for soils with different degrees of shrink-swell potential
Hazard(s) targeted	Expansive soils
Project type	Mitigation
Lead and participating agencies	Tulsa Building Inspectors
Time schedule	1-5 years or when funding becomes available
Estimated cost	$30,000
Funding source	Local and/or grants
Work product	Educate builders on appropriate foundation types for soils with different degrees of shrink-swell potential.
Expected outcome	Allow informed decisions in building construction, preventing property damage from improper foundations during a hazardous event

Action Item # 69	TULSA COUNTY
Title	Identify populations around potential fixed-site hazmat hazards and distribute information and materials to support "Shelter-in-place" actions among home and business owners
Hazard(s) targeted	Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	TAEMA LEPC
Time schedule	1-5 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Identify populations around potential fixed-site hazmat hazards and distribute information and materials to support "Shelter-in-place" actions among home and business owners
Expected outcome	Prevent loss of life during hazardous events

Action Item # 70	TULSA COUNTY
Title	Inventory water moving equipment, including pumps, pipelines, tanker trucks, "water buffaloes" and other resources
Hazard(s) targeted	Drought Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA Area Fire Departments County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	Inventory water moving equipment, including pumps, pipelines, tanker trucks, "water buffaloes" and other resources
Expected outcome	Allow for more efficient use of resources and provide better response communitywide.

Action Item # 71	TULSA COUNTY
Title	Encourage usage of water conservation policies such as low flow plumbing devices, inverted block water rate structure, moisture sensors, and the use of grey water for irrigation
Hazard(s) targeted	Extreme Heat Drought
Project type	Mitigation
Lead and participating agencies	Tulsa County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Encourage usage of water conservation policies such as low flow plumbing devices, inverted block water rate structure, moisture sensors, and the use of grey water for irrigation
Expected outcome	Ensure preservation of resources during scarcity by promoting reduction of use

Action Item # 72	TULSA COUNTY
Title	Maintain culverts to adequately allow storm water drainage
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Maintain culverts to adequately allow storm water drainage
Expected outcome	Promote better drainage, lessening the impact of flooding

Action Item # 73	TULSA COUNTY
Title	Create fire breaks along fence rows to thwart road jumping on county owned property
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Area Fire Departments County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Create fire breaks along fence rows to thwart road jumping
Expected outcome	Better containment of wildfires, limiting the impact in the community

Action Item # 74	TULSA COUNTY
Title	Conduct waterway channel improvements to prevent sedimentation and improve the ability to transport or store floodwaters, utilizing appropriate native vegetation where management priorities and safety concerns allow
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Conduct waterway channel improvements to prevent sedimentation and improve the ability to transport or store floodwaters, utilizing appropriate native vegetation where management priorities and safety concerns allow
Expected outcome	Allow better water flow throughout the community, lessening the likelihood of regular flooding

Action Item # 75	TULSA COUNTY
Title	Install drought tolerant grass on county properties and add xeriscaping
Hazard(s) targeted	Extreme Heat Drought Wildfires
Project type	Mitigation
Lead and participating agencies	TAEMA OSU Extension County Parks
Time schedule	1-5 years or when funding becomes available
Estimated cost	$200,000
Funding source	Local and/or grants
Work product	Continue to work with county extension offices and others to develop information on drought tolerant grass varieties and xeriscapes
Expected outcome	Promote better choices in flora that requires less water and will stay green during long periods of drought or heat

Action Item # 76	TULSA COUNTY
Title	Install street addresses on county owned buildings and curbs
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	Install street addresses on buildings and curbs
Expected outcome	Provide faster response times for first responders by removing confusion regarding incident locations

Action Item # 77	TULSA COUNTY
Title	Continue to monitor drought conditions and moisture measurements to alert officials of increased risk of drought and wildfire
Hazard(s) targeted	Drought Wildfires
Project type	Mitigation
Lead and participating agencies	National Weather Service Area Fire Departments TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Continue to monitor drought conditions and moisture measurements to alert officials of increased risk of drought and wildfire
Expected outcome	Allow emergency steps to be taken during periods of drought or high fire likelihood that would lessen the impact of hazards on the community

Action Item #78	TULSA COUNTY
Title	Educate the public on the importance of a family disaster plan and supply kit
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Educate the public on the importance of a family disaster plan and supply kit
Expected outcome	Promote greater community resiliency and lessen the impact on individuals

Action Item # 79	TULSA COUNTY
Title	Provide hail resistant measures/materials to protect existing public infrastructure
Hazard(s) targeted	Hail
Project type	Mitigation
Lead and participating agencies	Building Operations County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Provide hail resistant measures/materials to protect existing public infrastructure
Expected outcome	Prevent damage to public infrastructure from hail events.

Action Item # 80	TULSA COUNTY
Title	Control erosion during development with vegetation or sediment capture, reducing sedimentation which may fill in channels and lakes, reducing their ability to carry or store floodwaters
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Control erosion during development with vegetation or sediment capture, reducing sedimentation which may fill in channels and lakes, reducing their ability to carry or store floodwaters
Expected outcome	Help lessen the severity of flood events on the community by ensuring reservoir capacity and rapid water removal from developed areas

Action Item # 81	TULSA COUNTY	
Title	Develop and implement a Capital Improvement Plan that includes hazard mitigation considerations	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat	Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	TAEMA All county departments	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$50,000	
Funding source	Local and/or grants	
Work product	Develop and implement a Capital Improvement Plan that includes hazard mitigation considerations for flooding, expansive soils, earthquakes, severe winter storms, high winds, tornados, and hazardous materials events	
Expected outcome	Promote hazard mitigation considerations in all future capital improvement projects	

Action Item # 82	TULSA COUNTY
Title	Continue to Educate the community about lightening safety through public service announcements and other media outlets
Hazard(s) targeted	Lighting
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	Not determined
Funding source	Local and/or grants
Work product	Continue to Educate the community about lightening safety through public service announcements and other media outlets
Expected outcome	Help prevent loss of life from lightning strikes

Action Item # 83	TULSA COUNTY
Title	Encourage utilities to provide lightning damage prevention information materials and programs to their customers
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Encourage utilities to provide lightning damage prevention information materials and programs to their customers
Expected outcome	Lessen the impact of direct lightning strikes on the community

Action Item # 84	TULSA COUNTY
Title	Prepare and distribute a public information document letting people know that they reside or work in a dam failure inundation area
Hazard(s) targeted	Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA USACE
Time schedule	1-5 years or when funding becomes available
Estimated cost	$250,000
Funding source	Local and/or grants
Work product	Prepare and distribute a public information document letting people know that they reside or work in a dam failure inundation area
Expected outcome	Raise public awareness of hazards so that they can take preparatory actions

Action Item # 85	TULSA COUNTY
Title	Annually review municipal dam inspections and ensure that emergency action plans are up to date and on file at OWRB
Hazard(s) targeted	Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA County Engineering OWRB
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000
Funding source	Local and/or grants
Work product	Annually review municipal dam inspections and ensure that emergency action plans are up to date and on file at OWRB
Expected outcome	Raise awareness of issues prior to emergency situations in order to allow for preparatory actions which will protect infrastructure and lessen the severity of potential dam breaks

Action Item # 86	TULSA COUNTY
Title	Identify vulnerable populations and individuals at risk from extreme heat
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	TAEMA Tulsa County Social Services RMRS EMSA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Identify vulnerable populations and individuals at risk from extreme heat
Expected outcome	Identify those populations that will require the most resources during heat events so that lifesaving actions can be taken

Action Item # 87	TULSA COUNTY
Title	Develop computer assisted modeling flood inundation mapping and apply GIS modeling for cubic feet per second dam release rates
Hazard(s) targeted	Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA USACE County Engineering INCOG
Time schedule	1-5 years or when funding becomes available
Estimated cost	$150,000
Funding source	Local and/or grants
Work product	Develop computer assisted modeling flood inundation mapping and apply GIS modeling for cubic feet per second dam release rates
Expected outcome	Allow mitigation actions to be taken in inundation areas to prevent loss of life and/or lessen the impact

Action Item # 88	TULSA COUNTY
Title	Prepare contingency plans for terrorist attacks on local dams
Hazard(s) targeted	Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA USACE Oklahoma Department of Homeland Security Local Law Enforcement Department of Public Safety
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Prepare contingency plans for terrorist attacks on local dams
Expected outcome	Lessen the impact of intentionally caused dam break events on the community

Action Item # 89	TULSA COUNTY
Title	Develop a wildfire susceptibility analysis and wildfire management plan for vulnerable rural/urban interface areas
Hazard(s) targeted	Wildfire
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$35,000
Funding source	Local and/or grants
Work product	Develop a wildfire mitigation plan
Expected outcome	Identify structures vulnerable to wildfires in the rural/urban interface

Action Item # 90	TULSA COUNTY
Title	Develop a MOU with privately owned gasoline service facilities to provide priority fuel for emergency and critical vehicles during times of power outages
Hazard(s) targeted	Tornados High Winds Lightning Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$0
Funding source	Local and/or grants
Work product	Memo of understanding with private sector gasoline facilities
Expected outcome	Provide priority fuel for emergency vehicles so that emergency personnel can meet the needs of the community

Action Item # 91	TULSA COUNTY
Title	Update the Tulsa County multi-hazard mitigation plan
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	TAEMA
Time schedule	1-5 years or when funding becomes available
Estimated cost	$75,000
Funding source	Local and/or grants
Work product	An updated Tulsa County multi-hazard mitigation plan
Expected outcome	Update the plan every 5 years to meet FEMA requirements or more frequently as the needs of the County or its communities or the school districts change so the plan is current for the County

Action Item # 92	TULSA COUNTY
Title	Acquisition of property and removal of repetitive loss structures within the 100 year floodplain
Hazard(s) targeted	Floods
Project type	Mitigation (Preventative Measures)
Lead and participating agencies	TAEMA Tulsa County Building Operations County Engineering
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10 million
Funding source	Local and/or grants
Work product	Move County Garage out of the 100 year regulatory floodplain
Expected outcome	Provide better continuity of operations during flood events for all Tulsa County departments that rely upon the Tulsa County Garage

The CITY OF BIXBY has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**CITY OF BIXBY**
Title	Reduce the risk of flood hazards in the city and county
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Identify buildings at risk from the 100-year regulatory flood
Expected outcome	Save lives / reduce cost of repetitive flood prone properties

Action Item # 2	**CITY OF BIXBY**
Title	Reduce the risk of flood hazards in the city and county
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Ensure that development does not increase flooding downstream or have off-site adverse impacts
Expected outcome	Save lives / reduce cost of repetitive flood prone properties

Action Item # 3	CITY OF BIXBY
Title	Reduce the risk of flood hazards in the city and county
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Identify and maximize the natural and beneficial uses of the floodplain
Expected outcome	Save lives / reduce cost of repetitive flood prone properties

Action Item # 4	CITY OF BIXBY
Title	Reduce the risk of flood hazards in the city and county
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Implement the best flood control measures to reduce vulnerability of flood-prone properties
Expected outcome	Save lives / reduce cost of repetitive flood prone properties

Action Item # 5	CITY OF BIXBY
Title	Reduce the risk of tornado's in the city
Hazard(s) targeted	Tornado
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Encourage building of individual safe rooms and storm shelters.
Expected outcome	Save lives and reduce the risk of injuries

Action Item # 6	CITY OF BIXBY
Title	Reduce the risk of tornado's in the city
Hazard(s) targeted	Tornado
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Purchase and install NOAA weather radios in schools, nursing homes and other public facilities
Expected outcome	Save lives and reduce the risk of injuries

Action Item # 7	CITY OF BIXBY
Title	Reduce the risk from high winds in the city
Hazard(s) targeted	High Winds
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Educate and encourage the building trades industry about construction standards that are adequate to withstand frequent high winds
Expected outcome	Reduce damage to buildings/structures

Action Item # 8	CITY OF BIXBY
Title	Reduce the risk from high winds in the city
Hazard(s) targeted	High Winds
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Enact ordinance to require the securing of mobile homes and other small structures to reduce damage from high winds
Expected outcome	Reduce damage to buildings/structures

Action Item # 9	CITY OF BIXBY
Title	Reduce the risk from lighting in the city
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Reduce loss of life and property, and injury due to lightning by increased public awareness of measures to prevent and reduce damage, including warnings
Expected outcome	Save lives / protection of essential equipment

Action Item # 10	CITY OF BIXBY
Title	Reduce the risk from lighting in the city
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Install lightning protection and suppression systems protecting radios, computers, and other essential equipment at critical facilities.
Expected outcome	Save lives / protection of essential equipment

Action Item # 11	CITY OF BIXBY
Title	Reduce the risk from hail storms in the city
Hazard(s) targeted	Hail
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Promote construction of hail resistant roofs
Expected outcome	To reduce damage to structures and equipment

Action Item # 12	CITY OF BIXBY
Title	Reduce the risk from hail storms in the city
Hazard(s) targeted	Hail
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Provide shelters for jurisdiction owned emergency vehicles to protect from hail damage
Expected outcome	To reduce damage to structures and equipment

Action Item # 13	CITY OF BIXBY
Title	To reduce the hazards from winter storms in the city
Hazard(s) targeted	Winter Storm
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Purchase and install generators for critical facilities
Expected outcome	Educate and install essential equipment to critical facilities

Action Item # 14	CITY OF BIXBY
Title	To reduce the hazards from winter storms in the city
Hazard(s) targeted	Winter Storm
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Provide public education informing citizens of dangers associated with extreme temperature events, such as hypothermia, frost bite, etc.
Expected outcome	Education and outreach program will minimize cold weather injuries making the community safer

Action Item # 15	CITY OF BIXBY
Title	Reduce risk from extreme heat in the city
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Educating citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur
Expected outcome	Educate the public and possibly save lives

Action Item # 16	CITY OF BIXBY
Title	Reduce risk from extreme heat in the city
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Creating a database to track those individuals at high risk of death, such as the elderly, homeless, etc.
Expected outcome	Educate the public and possibly save lives

Action Item # 17	CITY OF BIXBY
Title	Reduce economic impact of drought hazards to the city and county
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Reduce damage to property and building foundations due to drought by improving building codes
Expected outcome	Better prepared community in the event of a drought

Action Item # 18	CITY OF BIXBY
Title	Reduce economic impact of drought hazards to the city and county
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Conduct a public led campaign to inform the citizens of the dangers associated with drought events, such as water shortages
Expected outcome	Better prepared community in the event of a drought

Action Item # 19	CITY OF BIXBY
Title	Reduce structure susceptibility to soil movement
Hazard(s) targeted	Expansive Soil
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Reduce damage to property and building foundations due to expansive soils by improving building codes
Expected outcome	Better prepared community in the event of expansive soil

Action Item # 20	CITY OF BIXBY
Title	Reduce structure susceptibility to soil movement
Hazard(s) targeted	Expansive Soil
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Inform citizens and developers of the dangers associated with expansive soil events in their jurisdiction
Expected outcome	Better prepared community in the event of expansive soil

Action Item # 21	CITY OF BIXBY
Title	To reduce the threat of wildfire hazards and the financial impact to city and county
Hazard(s) targeted	Wildfire
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Develop a County-wide fire response and support group to facilitate the provisioning of water to fight fires
Expected outcome	Better prepared city/county for wildfires and the ability to respond

Action Item # 22	CITY OF BIXBY
Title	Adopt an Ordinance on International Wildland – Urban Code Language
Hazard(s) targeted	Wildfire
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead / County-Participate
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Adopt an ordinance regulating defensible space around structures and within the wildland /urban interface areas for existing and new buildings.
Expected outcome	Better prepared city/county for wildfires and the ability to respond

Action Item # 23	CITY OF BIXBY
Title	Reduce the risk from earthquakes in the city
Hazard(s) targeted	Earthquake
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Educate and encourage the building trades industry about earthquake resistant construction
Expected outcome	To reduce earthquake damage and be better prepared in the event of earthquakes in the city

Action Item # 24	CITY OF BIXBY
Title	Reduce the risk from earthquakes in the city
Hazard(s) targeted	Earthquake
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Develop detailed fault maps to determine areas most likely to be effected by earthquakes
Expected outcome	To reduce and be better prepared in the event of earthquakes in the city

Action Item # 25	CITY OF BIXBY
Title	Reduce the risk from hazardous material storage facilities in the city
Hazard(s) targeted	Hazardous Material Event
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Identify areas or facilities where hazardous materials are stored and maintained
Expected outcome	A better educated public and a better prepared response for hazardous materials

Action Item # 26	CITY OF BIXBY
Title	Reduce the risk from hazardous material storage facilities in the city
Hazard(s) targeted	Hazardous Material Event
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Provide public education to reduce exposure from hazardous materials events from sites within the community
Expected outcome	A better educated public and a better prepared response for hazardous materials

Action Item # 27	CITY OF BIXBY
Title	To reduce the risk of a dam break hazard in the city
Hazard(s) targeted	Dam Break/Levee Failure
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Develop maps of flood zones showing structures vulnerable to flooding
Expected outcome	To be better prepared to save lives and respond to affected areas

Action Item # 28	CITY OF BIXBY
Title	To reduce the risk of a dam break hazard in the city
Hazard(s) targeted	Dam Break/Levee Failure
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Identify dams that could impact the jurisdiction in the event of a dam failure or rapid water release
Expected outcome	To be better prepared to save lives and respond to affected areas

Action Item # 29	CITY OF BIXBY
Title	To reduce the risk of a dam break hazard in the city
Hazard(s) targeted	Dam Break/Levee Failure
Project type	Mitigation
Lead and participating agencies	City of Bixby-Lead
Time schedule	No longer than 36 months including closeout
Estimated cost	Unknown
Funding source	Local and/or grants
Work product	Provide localized flood control to divert flood waters away from existing critical facilities
Expected outcome	To be better prepared to save lives and respond to affected areas

The CITY OF JENKS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**CITY OF JENKS**	
Title	Map Critical and At-Risk Facilities	
Hazard(s) targeted	Floods Winter Storms Wildfires	Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	Public Works Planning Engineering EOC	
Time schedule	24 months	
Estimated cost	$2,000	
Funding source	City General Funds	
Work product	Develop location listing of critical and at risk facilities on map	
Expected outcome	Enable City to better plan and respond to incidents	

Action Item # 2	**CITY OF JENKS**	
Title	New Aerial and Pumper Trucks/Refurbish Wild Land Fire Truck	
Hazard(s) targeted	Floods Tornados High Winds Lightning	Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	Fire Department	
Time schedule	September 2018 thru January 2019	
Estimated cost	$2.8 million	
Funding source	City Of Jenks General Fund	
Work product	Purchase of New Aerial and pumper trucks as well as refurbishment of wild land fire truck	
Expected outcome	New apparatus and updated equipment will enable Fire Rescue to respond to listed hazards in a much more effective manner	

Action Item #3	CITY OF JENKS
Title	Main Street Improvement Project
Hazard(s) targeted	Flood Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	JPWA Engineering
Time schedule	October of 2018
Estimated cost	$1 million
Funding source	Capital Improvement
Work product	Main street improvement project that includes improvement to storm water management and drainage
Expected outcome	Will allow better management of waters and help alleviate flooding and runoff issues

Action Item # 4	CITY OF JENKS
Title	Expanded EOC Team
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	EOC Police Fire JPWA
Time schedule	September 2017 thru end of HMP Period
Estimated cost	$100,000
Funding source	City funds
Work product	Expand EOC team and provide training for additional members
Expected outcome	Will allow more personnel to respond to incidents with proper training in operation of EOC

Action Item # 5	CITY OF JENKS
Title	Update Building Codes
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storm Extreme Heat Expansive Soils Drought Earthquakes Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Planning Engineering Building Inspection
Time schedule	Ongoing thru the end of HMP as new technology and methods become available
Estimated cost	$10,000
Funding source	City Funds
Work product	Update building codes with current industry standards for safety
Expected outcome	Will better equip future structures to withstand all hazards

Action Item # 6	CITY OF JENKS
Title	New/Additional/Upgraded Stormwater Pumps
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	JPWA City Engineer
Time schedule	July 2021
Estimated cost	$100,000
Funding source	Capital improvement funds
Work product	Install new, additional, and upgraded storm water pumps
Expected outcome	Will increase the ability to pump water from flood areas inside the levee

Action Item # 7	CITY OF JENKS
Title	Weather Opps Subscription
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	EOC
Time schedule	January 2019
Estimated cost	$2,500
Funding source	City Funds
Work product	Purchase Weather Opps Subscription
Expected outcome	Allow more accurate forecasts of lightning for outdoor events

Action Item # 8	CITY OF JENKS
Title	Educate citizens through social media pages
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	Police Fire
Time schedule	Immediately thru end of HMP
Estimated cost	$1,000
Funding source	City funds
Work product	Use departments social media pages to educate citizens of dangers of extreme heat and locations of shelters for those vulnerable to heat related issues
Expected outcome	Will help to lessen effects of extreme heat on vulnerable citizens

Action Item # 9	CITY OF JENKS
Title	Updated Water Rationing Policy
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Engineering
Time schedule	Present thru end of HMP
Estimated cost	$1,000
Funding source	City Funds
Work product	Update water rationing policy for City of Jenks
Expected outcome	Enable the city to better respond to water shortages

Action Item # 10	CITY OF JENKS
Title	Additional Tornado Warning Sirens
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	EOC
Time schedule	January 2020
Estimated cost	$150,000
Funding source	City Funds
Work product	Install additional Tornado warning sirens
Expected outcome	Expand Siren coverage area to include new neighborhoods in the city

Action Item # 11	CITY OF JENKS
Title	New Sand Trucks
Hazard(s) targeted	Winter Storms
Project type	Mitigation
Lead and participating agencies	JPWA
Time schedule	January 2020
Estimated cost	$75,000
Funding source	Public Works Funds
Work product	Purchase new Sand Trucks
Expected outcome	Expand and update sander coverage for snow and ice storms

Action Item # 12	CITY OF JENKS
Title	Refurbished Brush Fire Apparatus
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Jenks Fire Rescue
Time schedule	January 2019
Estimated cost	$5,000
Funding source	City Funds
Work product	Refurbish brush fire apparatus with latest equipment
Expected outcome	Add an additional brush fire apparatus and increase capability to fight wild fires

Action Item # 13	CITY OF JENKS
Title	Expansive Soils Education
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	Engineering Public Works Planning
Time schedule	January 2019 thru end of HMP
Estimated cost	$2,000
Funding source	City Funds
Work product	Educate citizens and developers of the dangers associated with expansive soil
Expected outcome	Reduce future expansive soil issues through education and outreach

The TOWN OF SPERRY has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**TOWN OF SPERRY**	
Title	Safe Room and improved EOC/Communication Center in the Town Hall	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail	Winter Storms Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead and participating agencies	Administration Emergency Management	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$175,000	
Funding source	Local and/or grants	
Work product	A multi-person safe room for essential personnel and first responders at the Town Hall	
Expected outcome	To protect personnel during a hazard event. This room will also function as an emergency operations center in response to an emergency incident	

Action Item # 2	**TOWN OF SPERRY**
Title	Master Drainage Plan
Title	Floods
Hazard(s) targeted	Mitigation
Project type	Administration
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Prepare a comprehensive master drainage plan for the Town
Expected outcome	A comprehensive master drainage plan will identify the flooding problems and provide guidance for actions to rectify the problems, and address future development impacts

Action Item # 3	TOWN OF SPERRY
Title	Maintain and install road side culverts in drainage ditches for local stormwater control
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$450,000
Funding source	Local and/or grants
Work product	Maintain and install road side culverts in drainage ditches
Expected outcome	Creation of a safe internal stormwater drainage system based on the master drainage plan which will provide effective local drainage, and develop a means to adequately maintain the system

Action Item # 4	TOWN OF SPERRY	
Title	Upgrade the community wide outdoor warning siren systems	
Hazard(s) targeted	Floods Tornados High Winds Lightning	Hail Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead and participating agencies	Administration	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$45,000 per siren	
Funding source	Local and/or grants	
Work product	Continue to upgrade the community wide outdoor emergency warning system	
Expected outcome	Provide an up to date emergency notification system to the community	

Action Item # 5	TOWN OF SPERRY
Title	Emergency equipment for Sperry emergency response personnel
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazard Material Events
Project type	Mitigation
Lead and participating agencies	Emergency Management Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$150,000
Funding source	Local and/or grants
Work product	Second SUV and equipment
Expected outcome	Equip a mobile emergency response SUV to respond to local emergencies and manage the emergency response on-site

Action Item # 6	TOWN OF SPERRY
Title	Develop a Town emergency response and operations procedures plan and coordinate the plan with Sperry Public Schools emergency operations plan
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration Emergency Management
Time schedule	1-5 years or when funding becomes available
Estimated cost	not determined
Funding source	Local and/or grants
Work product	A Town of Sperry emergency response and operations procedures plan
Expected outcome	An up to date emergency response plan which will effectively plan for emergency response procedures and coordinate with the Sperry Public School system

Action Item # 7	TOWN OF SPERRY
Title	Upgrade to the Town water system
Hazard(s) targeted	Drought Wildfires
Project type	Mitigation
Lead and participating agencies	Administration Public Works
Time schedule	1-5 years or when funding becomes available
Estimated cost	Not determined
Funding source	Local and/or grants
Work product	An improved water distribution system
Expected outcome	An improved water distribution system will adequately provide water and water pressure town wide and adequately provide a flow to all the fire hydrants. Also construct a connection to the City of Tulsa water system to provide a secondary source of water.

Action Item # 8	TOWN OF SPERRY
Title	Street address signs
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000
Funding source	Local and/or grants
Work product	Street signs at all street intersections
Expected outcome	Installing E-911 addresses on all buildings will allow emergency response personnel to quickly and correctly locate addresses in life threatening situations

Action Item # 9	TOWN OF SPERRY
Title	Develop an extreme heat annex to the emergency operations plan
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$2,000
Funding source	Local and/or grants
Work product	An annex to the Town of Sperry EOP devoted to extreme heat situations
Expected outcome	An annex to the Town of Sperry EOP to mitigate the effect of extreme heat by working with community service agencies and institutions to develop a plan for identifying times of extreme heat and notifying the citizens to take appropriate actions

Action Item # 10	TOWN OF SPERRY	
Title	Safety guidance for natural and manmade hazards	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead and participating agencies	Administration	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$5,000	
Funding source	Local and/or grants	
Work product	Informational literature like a brochure, handout or fact sheet	
Expected outcome	An educational outreach that will better prepare citizens for natural hazards	

Action Item # 11	TOWN OF SPERRY
Title	Promote town employee awareness of the risk of nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event
Hazard(s) targeted	Earthquakes
Project type	Mitigation (Education)
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Promote town employee awareness of the risk of nonstructural elements such as bookcases, file cabinets and other office equipment becoming hazardous during a seismic event
Expected outcome	Fewer injuries from non-structural elements during seismic events because employees will know how to position and secure bookcases, file cabinets, etc.

Action Item # 12	TOWN OF SPERRY
Title	Departmental Continuity of Operations Planning
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop a Continuity of Operations plan for each department
Expected outcome	Clear delineation of responsibility for continuity of departmental operations in the event that customary departmental leadership becomes unavailable during hazardous events

Action Item # 13	TOWN OF SPERRY
Title	Exercising of Continuity of Operations plans
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop exercise program to test and update COOP plans for all Town departments and municipal departments within the Town.
Expected outcome	Ensure that all responsible parties are familiar with the continuity of operations plan and the plan is workable

Action Item # 14	TOWN OF SPERRY
Title	Provide locations of refuge for employees at critical facilities
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$15,000 per shelter
Funding source	Local and/or grants
Work product	Provide employee shelters/safe rooms at critical facilities, such as 911 Center, Fire stations and Sheriff's stations to protect first responders
Expected outcome	Protect lives of critical first responders during hazardous events

Action Item # 15	TOWN OF SPERRY
Title	Upgrade and maintain current outdoor warning system
Hazard(s) targeted	Floods Tornados High Winds Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration Emergency Management
Time schedule	1-5 years or when funding becomes available
Estimated cost	Up to $30,000 per siren
Funding source	Local and/or grants
Work product	Evaluate, upgrade, and maintain community-wide outdoor omni-directional voice/siren warning systems
Expected outcome	Ensure that current outdoor warning systems continue to meet population needs

Action Item # 16	TOWN OF SPERRY
Title	Purchase dedicated generators
Hazard(s) targeted	Floods Tornados High Winds Lightning Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50,000 per generator
Funding source	Local and/or grants
Work product	Purchase and install backup generators for all critical Town facilities
Expected outcome	Promote greater continuity of operations by ensuring that Town facilities are not affected by disruptions to local power grid

Action Item # 17	TOWN OF SPERRY
Title	Install Protective Window Films
Hazard(s) targeted	Tornados High Winds Hail Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration Public Works
Time schedule	1-5 years or when funding becomes available
Estimated cost	$300 per window
Funding source	Local and/or grants
Work product	Install protective window film on all Town building windows to increase resistance to hazardous events
Expected outcome	Prevent broken glass causing further injury during hazardous events

Action Item # 18	TOWN OF SPERRY
Title	Replace overhead/garage doors
Hazard(s) targeted	Tornadoes High Winds
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 30,000 per door
Funding source	Local and/or grants
Work product	Replacement all garage doors at Town buildings with wind rated doors and rails if door is not already rated to handle strong wind events
Expected outcome	Improve building capacity to maintain structural integrity during severe weather

Action Item # 19	TOWN OF SPERRY
Title	Develop/review/update the debris management plan
Hazard(s) targeted	Floods Tornados High Winds Hail Winter Storms Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop/ Review/ Update the debris management plan
Expected outcome	Promote faster recovery healthier outcomes by efficiently removing debris from areas affected by hazardous events

Action Item # 20	TOWN OF SPERRY
Title	Comply with national flood programs
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Continue compliance with, and participation in the National Flood Insurance Program (MFIP) and Community Rating System (CRS)
Expected outcome	Ensuring that flooding losses are covered helps promote greater community resilience and lessen the overall long term impact of flooding events

Action Item # 21	TOWN OF SPERRY
Title	Install Surge Protection
Hazard(s) targeted	Tornadoes High Winds Lightning Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Provide surge and lightning protection for computer reliant critical facilities
Expected outcome	Limit equipment losses from power spikes and lightning strikes

Action Item # 22	TOWN OF SPERRY
Title	Develop a the Firewise program
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Fire Department
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Adopt the Firewise program for the vulnerable rural/urban interface areas of Town
Expected outcome	Lessen the overall impact of urban interface fires on Town residents

Action Item # 23	TOWN OF SPERRY
Title	Devise an aggressive snow and ice removal plan
Hazard(s) targeted	Winter Storms
Project type	Mitigation
Lead and participating agencies	Administration Public Works
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Create a more aggressive ice and snow removal plan
Expected outcome	Lessen the overall impact of winter storms on the general population

Action Item # 24	TOWN OF SPERRY
Title	Install lightning rods for protection of critical facilities
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Install lightning rods for protection of critical facilities
Expected outcome	Protected facilities will not suffer damage from a lightning strike or at least the damage will be lessened

Action Item # 25	TOWN OF SPERRY
Title	Develop and reinforce hazardous materials emergency equipment and response teams
Hazard(s) targeted	Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration Fire Department
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop and reinforce hazardous materials emergency equipment and response teams
Expected outcome	Provide better immediate response to hazardous material incidents, promoting life preservation and lessening long term impact

Action Item # 26	TOWN OF SPERRY
Title	Develop a contingency plan for evacuating population endangered by wildfires
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Administration Fire Department
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Develop a contingency plan for evacuating populations endangered by wildfires
Expected outcome	Protect individuals from injury and loss of life due to wildfires

Action Item # 27	TOWN OF SPERRY	
Title	Build or enhance partnerships involving local governments, civic organizations, business and volunteer groups and encourage them to work together to mitigate all-hazards	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Heat Expansive Soils Drought Wildfires Earthquakes Hazard Material Events
Project type	Mitigation	
Lead and participating agencies	Administration	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$10,000	
Funding source	Local and/or grants	
Work product	Build or enhance partnerships involving local governments, civic organizations, business and volunteer groups and encourage them to work together to mitigate all-hazards	
Expected outcome	Create a more comprehensive, community wide, resiliency against hazardous events	

Action Item # 28	TOWN OF SPERRY
Title	Provide covered shelter for town government vehicles
Hazard(s) targeted	Hail Winter Storms Extreme Heat
Project type	Mitigation
Lead and participating agencies	Public Works
Time schedule	1-5 years or when funding becomes available
Estimated cost	$75,000
Funding source	Local and/or grants
Work product	Provide covered shelter for Town government vehicles
Expected outcome	Prevent damage to Town vehicles from hazardous events

Action Item # 29	TOWN OF SPERRY
Title	Provide lightning warning systems for town owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Provide lightning warning systems for town owned outdoor sports areas, pools, golf courses, ball fields, parks, and fairgrounds
Expected outcome	Provide a more accurate warning system for lightning events, allowing for faster response and decreasing the likelihood that injury or loss of life from lightning strikes will occur

Action Item # 30	TOWN OF SPERRY
Title	Construct regional detention ponds to compensate for future urban development
Hazard(s) targeted	Flood
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available_
Estimated cost	$250,000
Funding source	Local and/or grants
Work product	Construct regional detention ponds to compensate for future urban development
Expected outcome	Lessen the impact of heavy rains on the community by retaining potential flood waters

Action Item # 31	TOWN OF SPERRY
Title	Educate residents, building professionals and safe room vendors on the International Codes Council/National Storm Shelter Association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this standard into current information and practices
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	in 1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Educate residents, building professionals and safe room vendors on the international codes council/national storm shelter association's "Standard for the Design and Construction of Storm Shelters" and consider incorporating this Standard into current information and practices
Expected outcome	Provide better standardization for storm shelters and safe rooms throughout the Town ensuring that all shelters are built to best industry practices

Action Item # 32	TOWN OF SPERRY
Title	Maintain culverts to adequately allow storm water drainage
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Maintain culverts to adequately allow storm water drainage
Expected outcome	Promote better drainage, lessening the impact of flooding.

Action Item # 33	TOWN OF SPERRY
Title	Educate the public on the importance of a family disaster plan and supply kit
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$10,000
Funding source	Local and/or grants
Work product	Educate the public on the importance of a family disaster plan and supply kit
Expected outcome	Promote greater community resiliency and decrease the likelihood of injury during an environmental hazard

BERRYHILL PUBLIC SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**BERRYHILL PUBLIC SCHOOLS**
Title	Connect to City of Tulsa Sanitary Sewer System
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Berryhill Public Schools City of Tulsa
Time schedule	1-5 years or when funding becomes available
Estimated cost	$2,600,000
Funding source	Local and/or Grants
Work product	Reclaim existing lagoons, install needed lift station, install sewer line and connect to Tulsa's sanitary sewer system
Expected outcome	Replace the wastewater lagoon with a connection to Tulsa's sanitary sewer system.

Action Item #2	**BERRYHILL PUBLIC SCHOOLS**
Title	Safe Rooms
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead Agency	Berryhill Public Schools Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$ 2,500,000 for entire project
Funding source	Local and/or grants
Work product	Construct a large capacity safe room at each site for students and staff
Expected outcome	A safe facility for students and staff to shelter in during a hazard event will decrease injury or loss of life in the event of a hazard

Action Item #3	BERRYHILL PUBLIC SCHOOLS	
Title	Full-time Campus Security Officer	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead Agency	Berryhill Public Schools Tulsa County City of Tulsa	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$100,000	
Funding source	Local and/or grants	
Work product	One CLEET certified security officer for campus	
Expected outcome	A safer facility for students and staff during a hazard event	

Action Item #4	BERRYHILL PUBLIC SCHOOLS	
Title	Develop curriculum to educate the school staff, students, and parents about mitigating the risk of life and property associated with the occurrence of hazards	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead Agency	Berryhill Public Schools	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$25,000	
Funding source	Local and/or grants	
Work product	Dissemination of information about mitigating the risk associated with hazards	
Expected outcome	School staff, students and parents educated in hazard risks and proper precautions are less likely to get injured during a hazardous event	

Action Item # 5	BERRYHILL PUBLIC SCHOOLS
Title	Emergency Power Generators, Surge Protectors, and Battery Backups
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes
Project type	Mitigation
Lead and participating agencies	Berryhill Public Schools
Time schedule	1-4 years or when funding becomes available
Estimated cost	$350,000
Funding source	Local and/or grants
Work product	Install surge protectors to protect large mechanical power equipment, emergency power generators to restore power during an outage
Expected outcome	Keep facilities running during power outages

Action Item #6	BERRYHILL PUBLIC SCHOOLS
Title	Water Saving Fixtures
Hazard(s) targeted	Drought
Project type	Mitigation
Lead Agency	Berryhill Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$75 per fixture
Funding source	Local and/or grants
Work product	Installation of water saving fixtures in School facilities
Expected outcome	Reduce the amount of water used in all times of the year, including times of drought

Action Item #7	BERRYHILL PUBLIC SCHOOLS
Title	Map Expansive Soils Risk Area
Hazard(s) targeted	Expansive soils
Project type	Mitigation
Lead Agency	Berryhill Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$125,000
Funding source	Local and/or grants
Work product	Develop detailed soils maps
Expected outcome	Identification of the soils' construction properties, including shrink-swell potential, will help ensure proper foundation design and construction of future improvements and buildings at each school site

Action Item #8	BERRYHILL PUBLIC SCHOOLS
Title	Energy Efficient Windows
Hazard(s) targeted	Winter Storms Extreme Heat
Project type	Mitigation
Lead Agency	Berryhill Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$6,000.00 per window
Funding source	Local and/or grants
Work product	Energy efficient windows
Expected outcome	Improved energy efficiency in the school buildings. Keeps the heat out better during extreme heat events and keeps the cold out during the cold of the winter

Action Item # 9	BERRYHILL PUBLIC SCHOOLS
Title	Outdoor Warning System
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Wildfires Hazardous Material Events
Project type	Mitigation
Lead Agency	Berryhill Public Schools Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$30,000
Funding source	Local and/or grants
Work product	Outdoor public address system
Expected outcome	System will provide immediate notification to students and staff outside of the school buildings of an approaching hazard

Action Item # 10	BERRYHILL PUBLIC SCHOOLS
Title	Replace Gravel Parking Lot at South Elementary with Asphalt
Hazard(s) targeted	Floods Winter Storms
Project type	Mitigation
Lead Agency	Berryhill Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Maintain parking lot to adequately allow water drainage
Expected outcome	Promote better drainage and allow to adequately clear parking lot from snow and ice without damaging parking lot

BIXBY PUBLIC SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**BIXBY PUBLIC SCHOOLS**
Title	Construct Flood control measures to protect school sites
Hazard(s) targeted	Floods Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-3 years
Estimated cost	10,000,000
Funding source	Local and/or grants
Work product	Any flood control to localize waters
Expected outcome	Divert flood waters away from existing critical facilities for existing buildings and NFIP

Action Item # 2	**BIXBY PUBLIC SCHOOLS**
Title	Safe Rooms
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	5+ years or when funding becomes available
Estimated cost	2,500,000
Funding source	Local and/or grants
Work product	Safe Room for students/staff at all sites/buildings.
Expected outcome	Provide protection for students and staff during high winds/tornado

Action Item # 3	BIXBY PUBLIC SCHOOLS
Title	Elevate at Risk Structures in Flood Plain
Hazard(s) targeted	Flood
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	5+ years
Estimated cost	$1,000,000+
Funding source	Local and/or Grants
Work product	Existing Structures in low-lying areas have experienced flooding and are repetitive loss properties by FEMA definitions
Expected outcome	Existing structures will not have damage from future flood issues

Action Item # 4	BIXBY PUBLIC SCHOOLS
Title	Develop instructional curriculum for school staff, students, and parents about risks and mitigation related with the occurrence of hazards
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Expansive Soils Drought Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Broadcasting of information about mitigating the risk linked with hazards
Expected outcome	All staff, students and parents become less at risk and less susceptible to hazards

Action Item # 5	BIXBY PUBLIC SCHOOLS
Title	Emergency Power Generators, Surge Protectors, and Battery Backups
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$500,000+
Funding source	Local and/or grants
Work product	Surge protectors to protect large mechanical power equipment, emergency power generators to restore power during an outage at each BPS building
Expected outcome	Keep all facilities running during power outages

Action Item # 6	BIXBY PUBLIC SCHOOLS
Title	Upgraded Emergency Warning Sirens
Hazard(s) targeted	Tornados High Winds Lightning Hail Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Emergency Warning Siren on North/South buildings
Expected outcome	Provide emergency notification to students and staff during or prior to a hazard event

Action Item # 7	BIXBY PUBLIC SCHOOLS
Title	Upgraded Intercom Systems
Hazard(s) targeted	Tornados High Winds Lightning Hail Extreme Heat Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Install Speaker systems indoors/outdoors of all district buildings.
Expected outcome	To provide real time information to students/staff of impeding hazard

Action Item # 8	BIXBY PUBLIC SCHOOLS
Title	Mapping of expansive soils
Hazard(s) targeted	Expansive soils
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Purchase of targeted maps
Expected outcome	Targeted and identified soils on all properties, (existing and new construction) including shrink-swell potential, to ensure proper plot foundation and future construction (new/existing)

Action Item # 9	BIXBY PUBLIC SCHOOLS
Title	Use of Permeable Surfaces (new construction)
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Install permeable surfaces to reduce water runoff and preserve water table
Expected outcome	Help with drainage, reduce foundation damage and increase available groundwater

Action Item # 10	BIXBY PUBLIC SCHOOLS
Title	Installation of NOAA weather radios in all school facilities
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Earthquakes
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Purchase and installation of NOAA radios in all buildings
Expected outcome	Provide improved and updated warning system for future hazard events and hazard notification in district facilities

Action Item # 11	BIXBY PUBLIC SCHOOLS
Title	Water saving fixtures on future (and existing) buildings
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Bixby Public Schools
Time schedule	1-5+ years or when funding becomes available
Estimated cost	$100-$500 per fixtures
Funding source	Local and/or grants
Work product	Installation of water saving fixtures in all BPS buildings
Expected outcome	Reduce the amount of water used throughout the school year, including times of drought

JENKS PUBLIC SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**JENKS PUBLIC SCHOOLS**		
Title	Educate families on the importance of a family disaster plan and supply kit		
Hazard(s) targeted	Floods Tornados High Winds Lightning	Hail Winter Storms Extreme Heat Drought	Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation		
Lead and participating agencies	Jenks Public School District		
Time schedule	Ongoing		
Estimated cost	None		
Funding source	N/A		
Work product	Educate families on the importance of a family disaster plan and supply kit		
Expected outcome	Promote greater community resiliency and lessen the impact on individuals		

Action Item # 2	**JENKS PUBLIC SCHOOLS**
Title	Purchase and install NOAA radios in all school buildings
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	2 years
Estimated cost	$1,500.00
Funding source	Bond Safety Money
Work product	NOAA radios in all school buildings
Expected outcome	Save lives and reduce injuries

Action Item # 3	JENKS PUBLIC SCHOOLS
Title	Add Hazardous Materials Events to Emergency Response and Operations Procedures Plan and coordinate the plan with the City of Jenks' Emergency Operations Plan
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Heat Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Jenks Public School District
Time schedule	1 year
Estimated cost	None
Funding source	N/A
Work product	Update Jenks Public School EOP to include Hazardous Materials Events
Expected outcome	An up to date emergency response plan and EOP will effectively plan for emergency response procedures and coordinate with the City of Jenks

Action Item # 4	JENKS PUBLIC SCHOOLS
Title	Outdoor warning system
Hazard(s) targeted	Hazardous Material Events Tornado High Winds Earthquake Lightning Winter Storms
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	1 – 20 years
Estimated cost	$7,000,000.00
Funding source	Grants and school bond funds
Work product	Outdoor warning system
Expected outcome	Save lives and prevent injury

Action Item # 5	JENKS PUBLIC SCHOOLS
Title	Install larger culverts and widen drainage ditches
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Jenks School District City of Jenks City of Tulsa
Time schedule	5 – 25 years
Estimated cost	$10,000,000
Funding source	Grants, bonds or tax dollars
Work product	Install larger culverts and widen drainage ditches
Expected outcome	Save buildings/property from damage and save lives/injury

Action Item # 6	JENKS PUBLIC SCHOOLS
Title	Install lightning protection on school buildings
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	2 – 25 years
Estimated cost	$12,000,000
Funding source	Grants and available bond funds
Work product	Install lightning protection on buildings
Expected outcome	Save building/technology damage and lives

Action Item # 7	JENKS PUBLIC SCHOOLS
Title	Promote use of hail resistant shingles and building materials
Hazard(s) targeted	Hail
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	Present day into future
Estimated cost	25% increase to building roofing material cost
Funding source	Grants and bond funds
Work product	Hail resistant shingles and building materials on school buildings
Expected outcome	Longer lasting roof members and money savings over time

Action Item # 8	JENKS PUBLIC SCHOOLS
Title	Provide education for school staff regarding dangers associated with extreme temperature events
Hazard(s) targeted	Extreme Heat
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	Present day into the future
Estimated cost	$750.00
Funding source	General funds
Work product	Heat educational program for staff
Expected outcome	Prevent injury and save lives

Action Item # 9	JENKS PUBLIC SCHOOLS
Title	Provide education to staff about dangers associated with drought events
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Jenks School District OK Department of Agriculture – Forestry Division
Time schedule	1 to 3 years
Estimated cost	$6,500.00
Funding source	Grants
Work product	Education program outlining the dangers of drought events
Expected outcome	Save property, buildings and lives/injury

Action Item # 10	JENKS PUBLIC SCHOOLS
Title	Regulate water usage and enforce preservation of water resources
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	Present day into the future
Estimated cost	None
Funding source	N/A
Work product	Water conservation practices utilized by staff
Expected outcome	Water conservation (wise use)

Action Item # 11	JENKS PUBLIC SCHOOLS
Title	Prevent structures from being built in flood prone areas and Special Flood Hazard Areas
Hazard(s) targeted	Dam Breaks/Levee Failures
Project type	Mitigation
Lead and participating agencies	Jenks Public School District
Time schedule	Present day forward
Estimated cost	N/A
Funding source	N/A
Work product	N/A
Expected outcome	Save facilities from flooding and protecting students/staff

Action Item # 12	JENKS PUBLIC SCHOOLS	
Title	Continuity of Operations Planning	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail	Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	Jenks Public School District	
Time schedule	2 years	
Estimated cost	None	
Funding source	N/A	
Work product	Develop a Continuity of Operations plan for each department within the district	
Expected outcome	Clear delineation of responsibility for continuity of departmental operations in the event that customary departmental leadership becomes unavailable during hazardous events	

Action Item # 13	JENKS PUBLIC SCHOOLS	
Title	Exercising of Continuity of Operations plans	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail	Winter Storms Wildfires Earthquakes Hazardous Material Events Dam Breaks/Levee Failures
Project type	Mitigation	
Lead and participating agencies	Jenks Public School District	
Time schedule	2 years	
Estimated cost	$4,000	
Funding source	General Funds	
Work product	Develop exercise program to test and update COOP plans for all departments within the district	
Expected outcome	Ensure that all responsible parties are familiar with the continuity of operations plan and the plan is workable	

Action Item # 14	JENKS PUBLIC SCHOOLS
Title	Develop fault maps to determine areas most likely to suffer an earthquake
Hazard(s) targeted	Earthquakes
Project type	Mitigation
Lead and participating agencies	Office of Oklahoma Secretary of Energy and Environment
Time schedule	1 – 2 years
Estimated cost	$1,500,000.00
Funding source	Oklahoma taxpayers
Work product	Maps indicating earthquake prone areas
Expected outcome	Save property, buildings and lives/injury

Action Item # 15	JENKS PUBLIC SCHOOLS
Title	Inform District developers of dangers associated with expansive soil events
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	Present day into the future
Estimated cost	None
Funding source	N/A
Work product	Expansive soil information program
Expected outcome	Prevent building damage and prevent injury

Action Item # 16	JENKS PUBLIC SCHOOLS
Title	Generate a Geotechnical Engineering Report for new structures and parking facilities
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	Jenks Public School District
Time schedule	Present day forward
Estimated cost	N/A
Funding source	Grants and school bond funds
Work product	Generate Geotechnical Engineering Reports for new structures and parking facilities and adhere to the engineer's soils stabilization and backfilling recommendations
Expected outcome	Following the Geotechnical Engineering Report's recommendations for soil stabilization and backfilling lessens the impact of high potential shrink-swell potential soils on new structures and parking facilities, which could otherwise cause structural damage over time

Action Item # 17	JENKS PUBLIC SCHOOLS
Title	Purchase and install generators for critical facilities
Hazard(s) targeted	Winter Storms Earthquakes Tornados High Wind
Project type	Mitigation
Lead and participating agencies	Jenks School District
Time schedule	Present day into future
Estimated cost	$13,000,000.00
Funding source	Grants and school bond funds
Work product	Generators installed on critical school facilities
Expected outcome	Continuation of critical educational services during power outages

KEYSTONE PUBLIC SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**KEYSTONE PUBLIC SCHOOLS**
Title	Safe Room
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$2,500,000
Funding source	Local and/or grants
Work product	Safe Room for students and staff
Expected outcome	Provide protection for students and staff during a tornado or high wind event

Action Item # 2	**KEYSTONE PUBLIC SCHOOLS**
Title	Steel Reinforced Doors
Hazard(s) targeted	Tornados High Winds Hail
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$1,000 per door
Funding source	Local and/or grants
Work product	Replace existing doors with reinforced doors
Expected outcome	Improve protection from doors that may break during a hazard

Action Item # 3	KEYSTONE PUBLIC SCHOOLS
Title	Speaker System
Hazard(s) targeted	Tornados High Winds Lightning Hail Extreme Heat Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$35,000
Funding source	Local and/or grants
Work product	Install speaker systems inside and outdoors
Expected outcome	To provide real time information to students and staff of impending hazard

Action Item # 4	KEYSTONE PUBLIC SCHOOLS
Title	Emergency Warning Sirens
Hazard(s) targeted	Tornados High Winds Lightning Hail Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$35,000
Funding source	Local and/or grants
Work product	Emergency Warning Sirens
Expected outcome	Provide emergency notification to students and staff of a hazard event

Action Item # 5	KEYSTONE PUBLIC SCHOOLS
Title	Two Way Radio – VHF system
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$5,000 for base station and $500 per radio, $50,000 for VHF system
Funding source	Local and/or grants
Work product	Installation of radio communication equipment in buses and each building and a base station
Expected outcome	To communication for each building and to each bus to provide hazard information, both in relaying hazard response information and in reporting a hazard

Action Item # 6	KEYSTONE PUBLIC SCHOOLS
Title	Emergency Generators
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Extreme Heat Wildfires Earthquakes
Project type	Mitigation
Lead and participating agencies	Keystone Public School
Time schedule	1-5 years or when funding becomes available
Estimated cost	$1,000,000
Funding source	Local and/or grants
Work product	Emergency generators at each school
Expected outcome	To provide backup power at each school to keep the school operational in the event of a power outage

Action Item # 7	KEYSTONE PUBLIC SCHOOLS
Title	All Media Program to educate students and staff and parents about the risks and mitigation actions associated with hazards
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazard Material Events
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Dissemination of information about mitigating the risk associated with hazards
Expected outcome	School staff, students, and parents become less at risk and less vulnerable to hazards

Action Item # 8	KEYSTONE PUBLIC SCHOOLS
Title	Map expansive soils risk area
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Develop detailed soils maps
Expected outcome	Identification of the soils' construction properties, including shrink-swell potential, to ensure proper foundation design and construction of future improvements and buildings

Action Item # 9	KEYSTONE PUBLIC SCHOOLS
Title	Water saving fixtures
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50 to $500 per fixture
Funding source	Local and/or grants
Work product	Installation of water saving fixtures in School facilities
Expected outcome	Reduce the amount of water used in all times of the year, including times of drought

LIBERTY PUBLIC SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item #1	**LIBERTY PUBLIC SCHOOLS**
Title	Construct dual purpose community safe room to serve campus during both emergency and non-emergency times
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Heat
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$2,500,000
Funding source	Local and/or grants
Work product	A safe room in or close to all public schools buildings to provide safe shelter for students and staff during a hazard event
Expected outcome	Reduces the effects of the hazard, a safe location for students and staff to ride out the hazard

Action Item #2	**LIBERTY PUBLIC SCHOOLS**
Title	Install shatter resistant glass in school building windows
Hazard(s) targeted	Tornados High Winds Hail
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$1,500,000
Funding source	Local and/or grants
Work product	Shatter resistant glass windows in windows and doors in the school buildings
Expected outcome	Reduces the effect of a hazard causing broken glass to spray from the windows injuring staff and students

Action Item # 3	LIBERTY PUBLIC SCHOOLS
Title	Surge protectors, uninterruptable power sources for the school facilities and emergency power generators
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Earthquakes
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$200,000 over four sites
Funding source	Local and/or grants
Work product	Surge protectors to protect large mechanical power equipment, emergency power generators to restore power during an outage
Expected outcome	To keep facilities running during power outages

Action Item #4	LIBERTY PUBLIC SCHOOLS
Title	Weatherize existing facilities
Hazard(s) targeted	High winds Hail Winter storms Heat Expansive Soils
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Weather stripping and insulation and water proofing
Expected outcome	Retrofit the buildings and their interiors to protect from the hazards (keep the hazards outside the building)

Action Item # 5	LIBERTY PUBLIC SCHOOLS
Title	Inventory the flow at fire hydrants and prioritize facility improvements to increase water pressure
Hazard(s) targeted	Wildfires
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Inventory and improvement plan for fire hydrants and water distribution system
Expected outcome	Low water pressure would be detrimental for firefighting. Maintaining water pressure by inventorying flow and preforming needed maintenance will increase effective firefighting.

Action Item # 6	LIBERTY PUBLIC SCHOOLS
Title	Educate staff and students about emergency preparedness and response procedures
Hazard(s) targeted	Tornados High Winds Lightning Hail Winter Storms Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	annually
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	Incorporate hazard mitigation practices into school curriculum
Expected outcome	Staff and students can respond appropriately in the event of a hazard occurrence

Action Item # 7	LIBERTY PUBLIC SCHOOLS
Title	Develop an emergency operations plan for tornadoes
Hazard(s) targeted	Tornados
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$5,000
Funding source	Local and/or grants
Work product	A tornado emergency operations plan
Expected outcome	The plan will outline the procedures to take before, during and after a tornado event

Action Item # 8	LIBERTY PUBLIC SCHOOLS
Title	Lightning hazard alert system for outdoor areas
Hazard(s) targeted	Lightning
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$150,000
Funding source	Local and/or grants
Work product	Outdoor lightning and warning system
Expected outcome	Provide a warning system to all outdoor areas where students and staff may be

Action Item # 9	LIBERTY PUBLIC SCHOOLS
Title	Update School's radio system
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	NOAA weather radios at all school facilities, and 2-way radios for all buses and base station
Expected outcome	Improved communication to buses with improved weather information.

Action Item # 10	LIBERTY PUBLIC SCHOOLS
Title	Replace or upgrade the intercom system in all school buildings
Hazard(s) targeted	Tornados High Winds Lightning Hail Earthquakes
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	Intercom system in all school buildings
Expected outcome	During a hazard event, building will be able to receive immediate information

Action Item # 11	LIBERTY PUBLIC SCHOOLS
Title	Obtain mobile communication equipment for the school's spotters and emergency response team
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$18,000
Funding source	Local and/or grants
Work product	Mobile communication equipment
Expected outcome	Storm spotters and emergency response teams will have the ability to be in contact with others and with school officials/emergency personnel during and after a hazard event

Action Item # 12	LIBERTY PUBLIC SCHOOLS	
Title	Strengthen the school safety committees (district safety coordinator, additional school administrators, and other certified staff members)	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead and participating agencies	Liberty Public Schools	
Time schedule	1-3 years	
Estimated cost	$5,000	
Funding source	Local and/or grants	
Work product	Stronger committees	
Expected outcome	School safety teams will work more closely with administrators to review the school safety plans and recommendations, review potential hazards and risks, conduct campus walk through, and provide relevant information to the stakeholders. They will also develop a quick reference flip-chart for crisis management plans.	

Action Item # 13	LIBERTY PUBLIC SCHOOLS
Title	Construct new shelters for school owned vehicles to protect them from hail and storm debris
Hazard(s) targeted	Hail Winter Storms High Wind
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$500,000
Funding source	Local and/or grants
Work product	Vehicle shelters
Expected outcome	Protection of parked vehicles from hail and storm debris

Action Item # 14	LIBERTY PUBLIC SCHOOLS
Title	Increase drainage capacity in areas of the school grounds that are inadequate
Hazard(s) targeted	Floods
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$300,000
Funding source	Local and/or grants
Work product	Effective drainage ways
Expected outcome	Channelize runoff away from buildings

Action Item # 15	LIBERTY PUBLIC SCHOOLS
Title	Covered walkways between buildings and to athletic facilities such as the baseball fields and football stadium.
Hazard(s) targeted	Hail Winter Storms
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$100,000
Funding source	Local and/or grants
Work product	Covered walkways
Expected outcome	The covered walkways will protect students and staff the must go between buildings during hazard events

Action Item # 16	LIBERTY PUBLIC SCHOOLS
Title	Preform natural hazard evaluation of schools to determine the most cost effective ways to retrofit or remodel buildings to make them more disaster resistant, specifically to tornadoes, high winds, and earthquakes
Hazard(s) targeted	Tornados High Winds Lightning Hail Earthquakes
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$20,000
Funding source	Local and/or grants
Work product	Evaluation plans and drills
Expected outcome	Will determine the appropriate retrofit or remodel to strengthen the existing buildings

Action Item # 17	LIBERTY PUBLIC SCHOOLS	
Title	Educate the public about various dangers associated with natural hazards, and the benefits of installing residential and commercial storm shelters and safe rooms	
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms	Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation	
Lead and participating agencies	Liberty Public Schools	
Time schedule	Annually	
Estimated cost	$5,000/annually	
Funding source	Local and/or grants	
Work product	Education	
Expected outcome	The public will better understand the procedures to take before, during, and after a hazard event	

Action Item # 18	LIBERTY PUBLIC SCHOOLS	
Title	Implement an AWOS weather station to provide accurate and current weather information to the school and community emergency management teams.	
Hazard(s) targeted	Floods Tornados High Winds Lightning	Hail Winter Storms Extreme Heat Earthquakes
Project type	Mitigation	
Lead and participating agencies	Liberty Public Schools	
Time schedule	1-5 years or when funding becomes available	
Estimated cost	$10,000	
Funding source	Local and/or grants	
Work product	AWOS weather station	
Expected outcome	An Automatic Weather Observing System (AWOS) can detect significant changes in weather and display meteorological data. The AWOS would also manage all communication protocols to allow remote access and make school grounds safer.	

Action Item # 19	LIBERTY PUBLIC SCHOOLS
Title	Snow removal equipment
Hazard(s) targeted	Winter Storms
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-3 years or when funding becomes available
Estimated cost	$50,000
Funding source	Local and/or grants
Work product	Snow removal equipment
Expected outcome	More quickly and efficiently bring facilities back into operation after a winter storm event

Action Item # 20	LIBERTY PUBLIC SCHOOLS
Title	Create and maintain a district wide database for tracking declared and non-declared natural disaster and other emergency events
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Expansive Soils Drought Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	Annually
Estimated cost	$500
Funding source	Local and/or grants
Work product	Record of hazards
Expected outcome	An historical record of hazards for future hazard mitigation plans and emergency operations plans. And record funding as appropriate

Action Item # 21	LIBERTY PUBLIC SCHOOLS
Title	Secure nonstructural elements (like computers, filing cabinets, water heaters, etc.) that could tip or fall during a seismic event
Hazard(s) targeted	Earthquakes
Project type	Mitigation
Lead and participating agencies	Liberty Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,000
Funding source	Local and/or grants
Work product	Secure facilities to the building's structure
Expected outcome	Prevent nonstructural elements from tipping or falling and injuring people or creating unsafe conditions like natural gas leaks

SPERRY SCHOOLS has reviewed and analyzed the risk assessment studies for the natural hazards and hazardous material events that may impact their jurisdiction. They reviewed the mitigation activities listed in Chapter 4, incorporated the criteria and principles of the STAPLE+E project evaluation method in their consideration of the mitigation activities, and prioritized the activities as detailed in Section 4.3.

Action Item # 1	**SPERRY SCHOOLS**
Title	Have media program to educate stakeholders on Hazards
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Drought Expansive Soils Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Sperry Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$1,200
Funding source	Local and/or grants
Work product	Purchase a tri-fold colored brochure that provides information on all Hazards
Expected outcome	Educate all stakeholders on potential hazards for our school district.

Action Item # 2	**SPERRY SCHOOLS**
Title	Install water saving fixtures throughout district
Hazard(s) targeted	Drought
Project type	Mitigation
Lead and participating agencies	Sperry Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	$25,500
Funding source	Local and/or grants
Work product	Install water saving fixtures on outdoor faucets or hydrants, sinks, toilets and urinals
Expected outcome	Aid in saving water and reducing water costs throughout the year

Action Item # 3	SPERRY SCHOOLS
Title	Soils Map
Hazard(s) targeted	Expansive Soils
Project type	Mitigation
Lead and participating agencies	Sperry Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	Approx. $150.00/acre to create digital Soils Map
Funding source	Local and/or grants
Work product	Create a digital soils map
Expected outcome	Help in determining location of new structures and runoff of existing slopes created by these structures

Action Item # 4	SPERRY SCHOOLS
Title	Outdoor PA System
Hazard(s) targeted	Floods Tornados High Winds Lightning Hail Winter Storms Extreme Heat Wildfires Earthquakes Hazardous Material Events
Project type	Mitigation
Lead and participating agencies	Sperry Public Schools
Time schedule	1-5 years or when funding becomes available
Estimated cost	Approx. $40,000
Funding source	Local and/or grants
Work product	Outdoors PA system on all campuses
Expected outcome	Have the ability to notify staff and students of an impending hazard when outside of the regular classroom building

Action Item # 5	SPERRY PUBLIC SCHOOLS
Title	Safe Room
Hazard(s) targeted	Tornados High Winds
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$2,500,000 per campus
Funding source	Local and/or grants
Work product	A large capacity safe room at each school for on-site students and staff
Expected outcome	A safe facility for students and staff to shelter in during the hazard event

Action Item # 6	SPERRY PUBLIC SCHOOLS
Title	Backup generators for each school building
Hazard(s) targeted	Tornados Lightning Winter Storms Wildfires Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-5 years or when funding becomes available
Estimated cost	$1,000,000
Funding source	Local and/or grants
Work product	Purchase and installation of backup generators and transfer switches at each school building
Expected outcome	Provide power to each facility when electric service is out

Action Item # 7	SPERRY PUBLIC SCHOOLS
Title	Evaluate Portable Buildings' Foundations
Hazard(s) targeted	Earthquake
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-3 years
Estimated cost	$0 – $17.50 per hour (approximately 3 hours)
Funding source	Local and/or grants
Work product	Evaluate the foundations of the portable buildings to determine whether they are adequate for earthquakes.
Expected outcome	Determine safety of portable buildings in the event of an earthquake

Action Item # 8	SPERRY PUBLIC SCHOOLS
Title	Earthquake Emergency Planning
Hazard(s) targeted	Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	On-going
Estimated cost	$0.00
Funding source	Local and/or grants
Work product	Enhance emergency planning for earthquakes including duck and cover and evacuation drills
Expected outcome	Prepare administrators, teachers, and students to react appropriately in the event of an earthquake

Action Item # 7	SPERRY PUBLIC SCHOOLS
Title	Evaluate Portable Buildings' Foundations
Hazard(s) targeted	Earthquake
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	1-3 years
Estimated cost	$0 – $17.50 per hour (approximately 3 hours)
Funding source	Local and/or grants
Work product	Evaluate the foundations of the portable buildings to determine whether they are adequate for earthquakes.
Expected outcome	Determine safety of portable buildings in the event of an earthquake

Action Item # 8	SPERRY PUBLIC SCHOOLS
Title	Earthquake Emergency Planning
Hazard(s) targeted	Earthquakes
Project type	Mitigation
Lead and participating agencies	Administration
Time schedule	On-going
Estimated cost	$0.00
Funding source	Local and/or grants
Work product	Enhance emergency planning for earthquakes including duck and cover and evacuation drills
Expected outcome	Prepare administrators, teachers, and students to react appropriately in the event of an earthquake

Chapter 6: Plan Maintenance and Adoption

This chapter includes a discussion of the plan maintenance process and documentation of the adoption of the plan by the Tulsa County Hazard Mitigation Planning Committee, Tulsa County Board of County Commissioners, City of Bixby City Council, City of Jenks City Council, Town of Sperry Board of Trustees, Berryhill Public Schools Board of Education, Bixby Public Schools Board of Education, Jenks Public Schools Board of Education, Keystone Public Schools Board of Education, Liberty Public Schools Board of Education, and Sperry Public Schools Board of Education.

Element A6
The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, evaluating, and updating the mitigation plan within a five-year cycle.
44 CFR §201.6(c)(4)(i)

Element C6
The plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements, when appropriate.
44 CFR §201.6(c)(4)(ii)

6.1 Monitoring, Evaluating, and Updating the Plan

The Tulsa Area Emergency Management Agency Director will oversee the day-to-day implementation of the plan. Reports will be submitted from Tulsa County departments involved in mitigation activities for the county and from the following jurisdictions: City of Bixby City Manager, City of Jenks City Manager, Town of Sperry Town Administrator, Berryhill Public Schools Buildings Operations Manager, Bixby Public Schools Buildings Operations Manager, Jenks Public Schools Buildings Operations Manager, Keystone Public Schools Buildings Operations Manager, Liberty Public Schools Buildings Operations Manager, and Sperry Public Schools Buildings Operations Manager. These reports will document progress in implementing projects included in the Action Plan, which fall within the scope of responsibility for Tulsa County, City of Bixby, City of Jenks, Town of Sperry, and the Schools.

The Tulsa County Hazard Mitigation Planning Committee will also evaluate the mitigation plan on an annual basis. The evaluation shall include a review of the goals and objectives of the mitigation plan along with an evaluation of the hazards in the plan. The Tulsa County Hazard Mitigation Planning Committee will complete and provide an annual evaluation of the mitigation plan to: Tulsa County Board of County Commissioners, City of Bixby City Council, City of Jenks City Council, Town of Sperry Board of Trustees, Berryhill Public Schools Board of Education, Bixby Public Schools Board of Education, Jenks Public Schools Board of Education, Keystone Public Schools Board of Education, Liberty Public Schools Board of Education, and Sperry Public Schools Board of Education. This evaluation will summarize the accomplishments of the mitigation activities. The evaluation will include the mitigation action activity, time schedule, and funding source.

Tulsa County will make a comprehensive update to the Multi-Hazard Multi-Jurisdiction Mitigation Plan within five years, from the approval date, as per FEMA requirements, and will resubmit the plan to OEM and FEMA for approval as required. The Multi-Hazard Multi-Jurisdiction Mitigation Plan includes Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools. All jurisdictions will be invited to participate in the plan update and planning update process along with other eligible jurisdictions at the time of the update.

6.2 Incorporating the Multi-Hazard Mitigation Plan

The Tulsa County Multi-Hazard Multi-Jurisdiction Mitigation Plan has been adopted by the Tulsa County Board of County Commissioners, City of Bixby City Council, City of Jenks City Council, Town of Sperry Board of Trustees, Berryhill Public Schools Board of Education, Bixby Public Schools Board of Education, Jenks Public Schools Board of Education, Keystone Public Schools Board of Education, Liberty Public Schools Board of Education, and the Sperry Public Schools Board of Education as a guide to mitigation activities for each jurisdiction. Appropriate Action Plan activities will be incorporated into the planning process, and in the annual county, city, town, and school budgets. As stated in section 6.1, the Tulsa Area Emergency Management Agency Director will oversee the day-to-day implementation of the plan with input from the following: City of Bixby City Manager, City of Jenks City Manager, Town of Sperry Town Administrator, Berryhill Public Schools Buildings Operations Manager, Bixby Public Schools Buildings Operations Manager, Jenks Public Schools Buildings Operations Manager, Keystone Public Schools Buildings Operations Manager, Liberty Public Schools Buildings Operations Manager, and Sperry Public Schools Buildings Operations Manager.

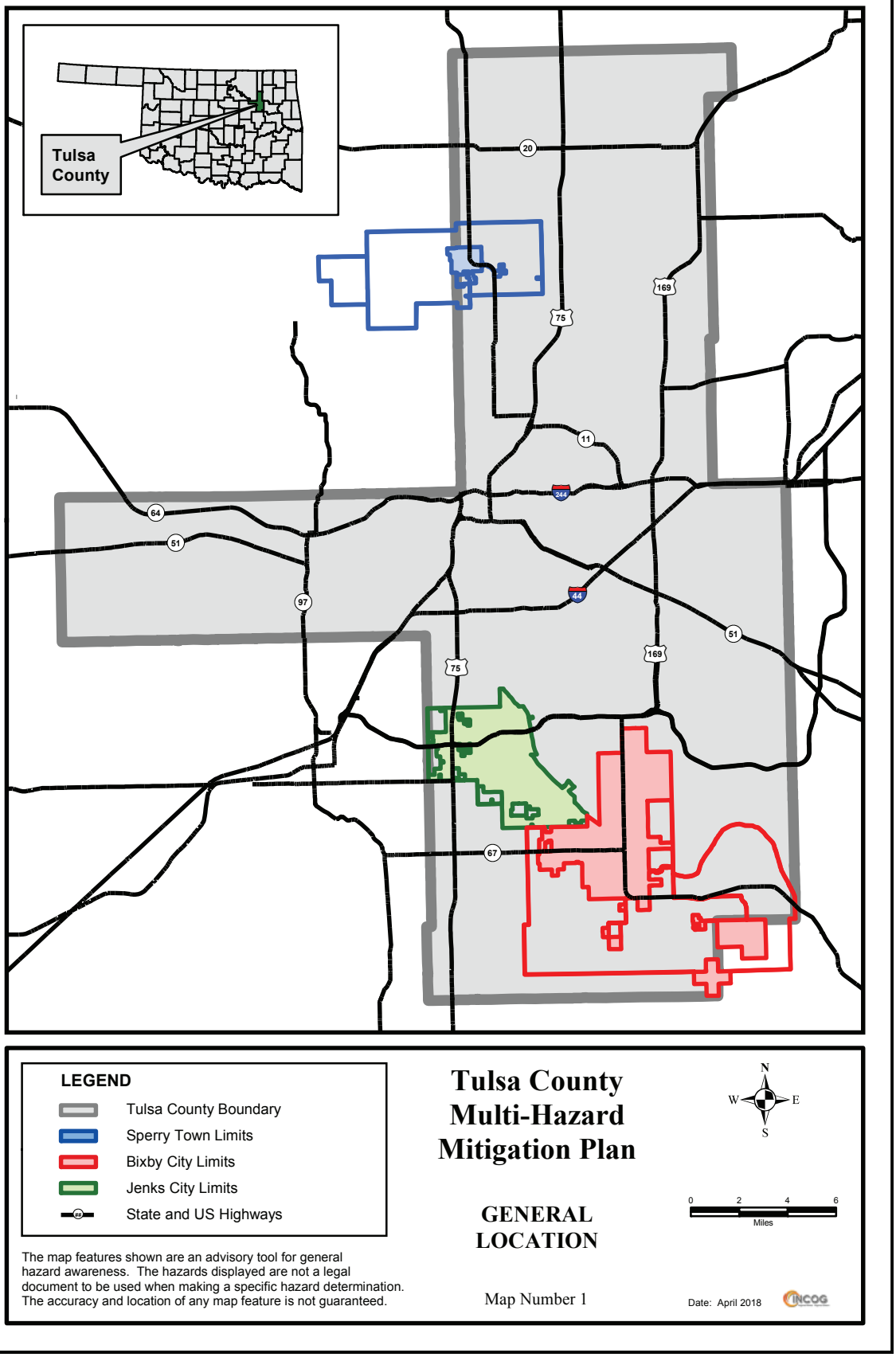
These jurisdictions will work with the TCHMPC to monitor how mitigation activities are incorporated into county, city, town, and school long range plans and other comprehensive plans regarding future activities. Members of the TCHMPC are also department heads responsible for updating and enforcing key plans and policies within the county. Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Jenks Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools currently have capital improvement plans to guide development and future improvements. These plans have mitigation strategy components, and the county, cities, town and schools will incorporate approved mitigation plan strategies into these plans when their particular plan is updated. All plans are updated as needed. The county inspections department enforces the building codes in Tulsa County. Selection of future CIP projects will include consideration of the goals and objectives of the mitigation plan. After adoption of the mitigation plan, the inspections department will continue to enforce the building codes for new construction.

6.3 Public Involvement

Tulsa County, City of Bixby, City of Jenks, Town of Sperry, Berryhill Public Schools, Bixby Public Schools, Keystone Public Schools, Liberty Public Schools, and Sperry Public Schools are committed to involving the public directly in updating and maintaining the Multi-Hazard Multi-Jurisdiction Mitigation Plan. Copies of the Plan will be available at the Tulsa Area Emergency Management Agency Office, City of Bixby City Hall, City of Jenks City Hall, Town of Sperry Town Hall, and each school's administration office. Input from citizens is encouraged, particularly at the annual evaluation for each governing Board. Board meetings and their agendas are posted and open to the public where the public is invited to comment on this or any agenda item. At any time of the year, comments can be made directly to the Tulsa Area Emergency Management Agency Director.

Element A5
The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.
44 CFR §201.6(c)(4)(iii)


TULSA COUNTY
Appendix 1:
Mapping


Tulsa County
20
169
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11
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LEGEND
Tulsa County Boundary
Sperry Town Limits
Bixby City Limits
Jenks City Limits
State and US Highways
Tulsa County Multi-Hazard Mitigation Plan
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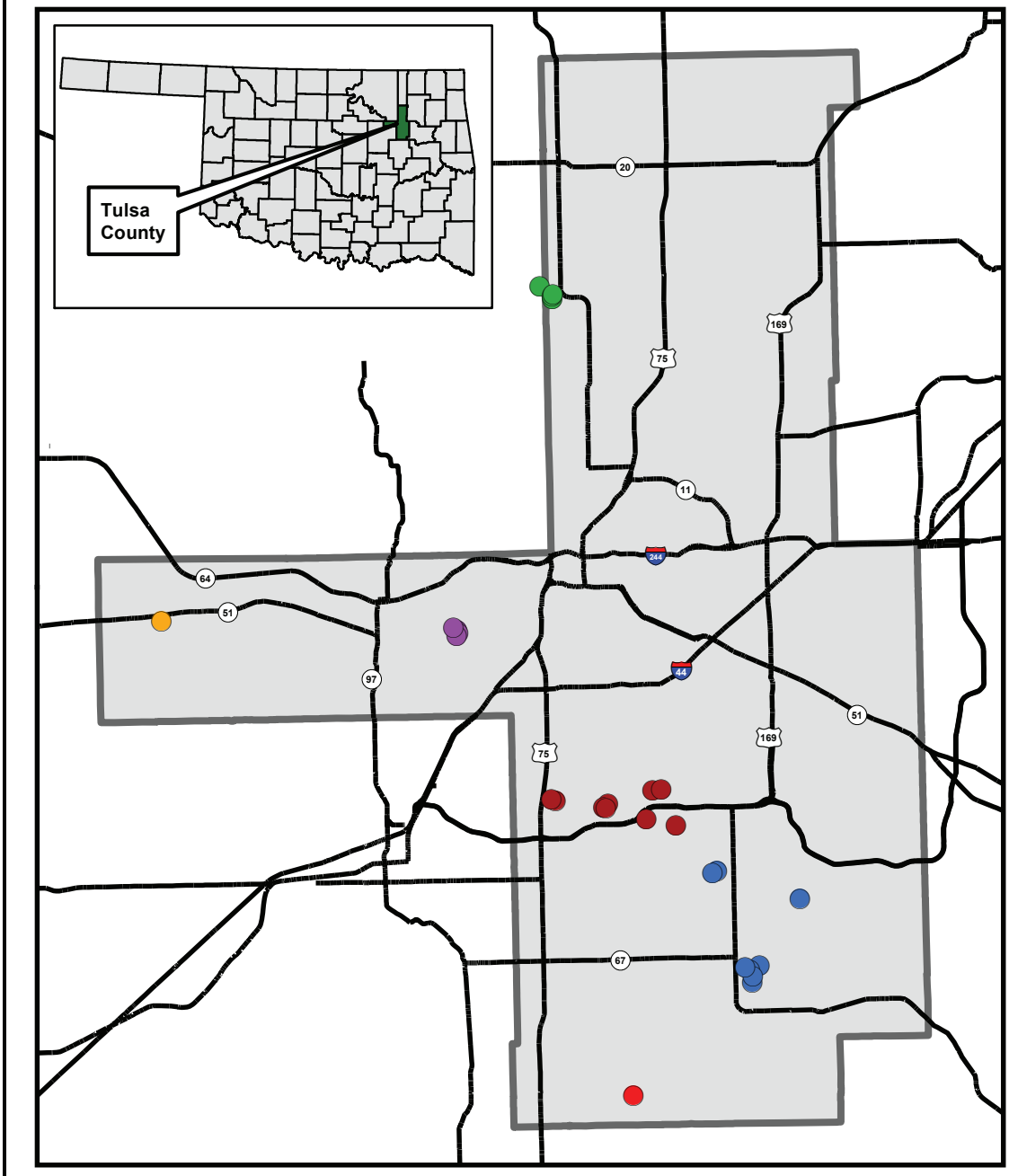
Miles
GENERAL LOCATION
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 1
Date: April 2018
INCOG



LEGEND

Schools:

- Berryhill
- Bixby
- Keystone
- Jenks
- Liberty
- Sperry

Tulsa County

State and US Highways

Tulsa County Multi-Hazard Mitigation Plan

SCHOOL LOCATIONS

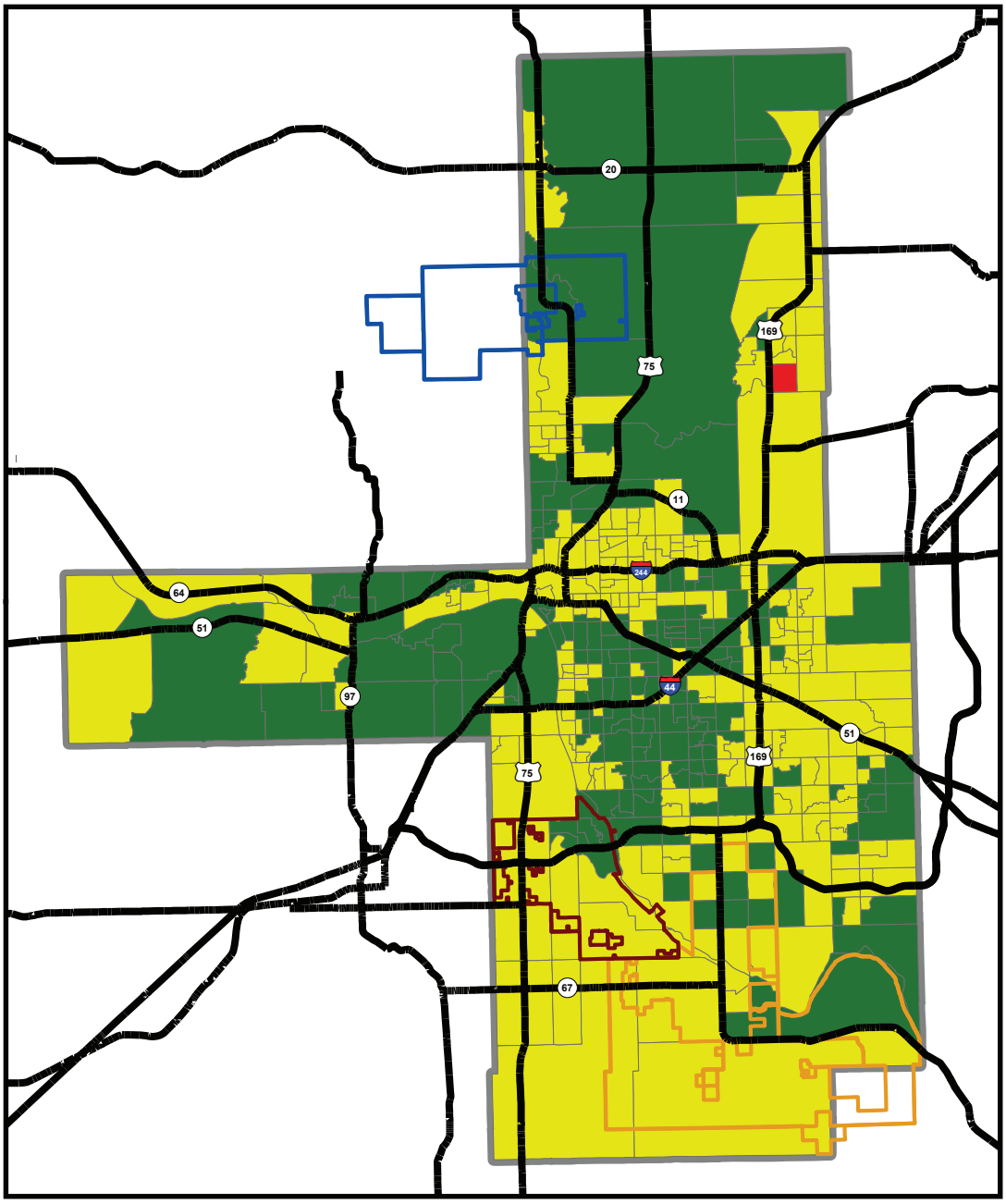
N W E S

0 2 4 6 Miles

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 1A

Date: April 2018 INCOG



LEGEND

Percent of Population over 64 within each Block Group:

- Under 12.5%
- 12.5% to 50%
- Greater than 50%

- Tulsa County
- Town of Sperry
- City of Bixby
- City of Jenks
- Highways

Tulsa County Multi-Hazard Mitigation Plan

ELDERLY POPULATION

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Miles

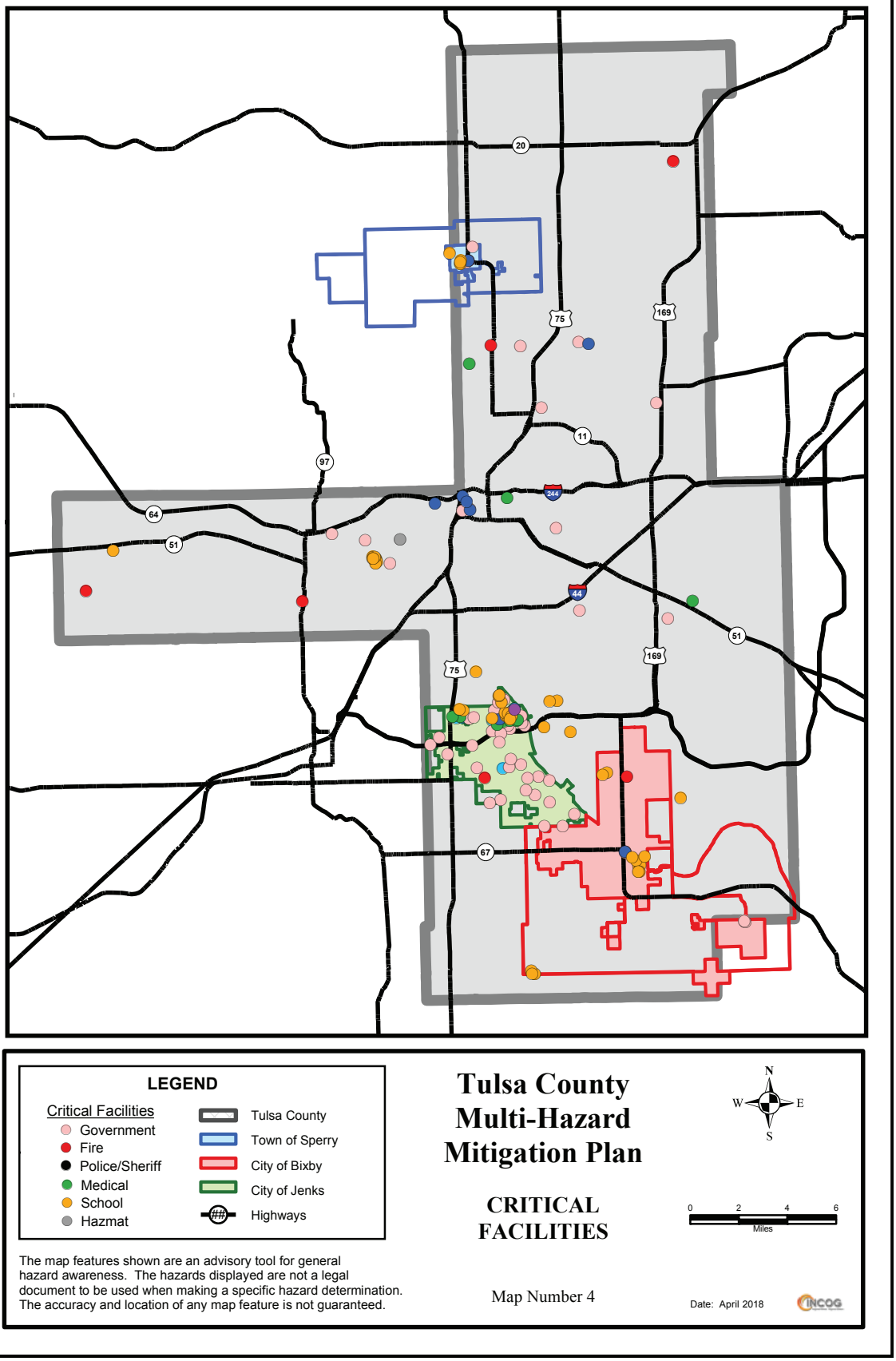
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 2

Date: April 2018

INCOG

Map Number 3 reserved for future use


20
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LEGEND
Critical Facilities
Government
Fire
Police/Sheriff
Medical
School
Hazmat
Tulsa County
Town of Sperry
City of Bixby
City of Jenks
Highways
Tulsa County Multi-Hazard Mitigation Plan
CRITICAL FACILITIES
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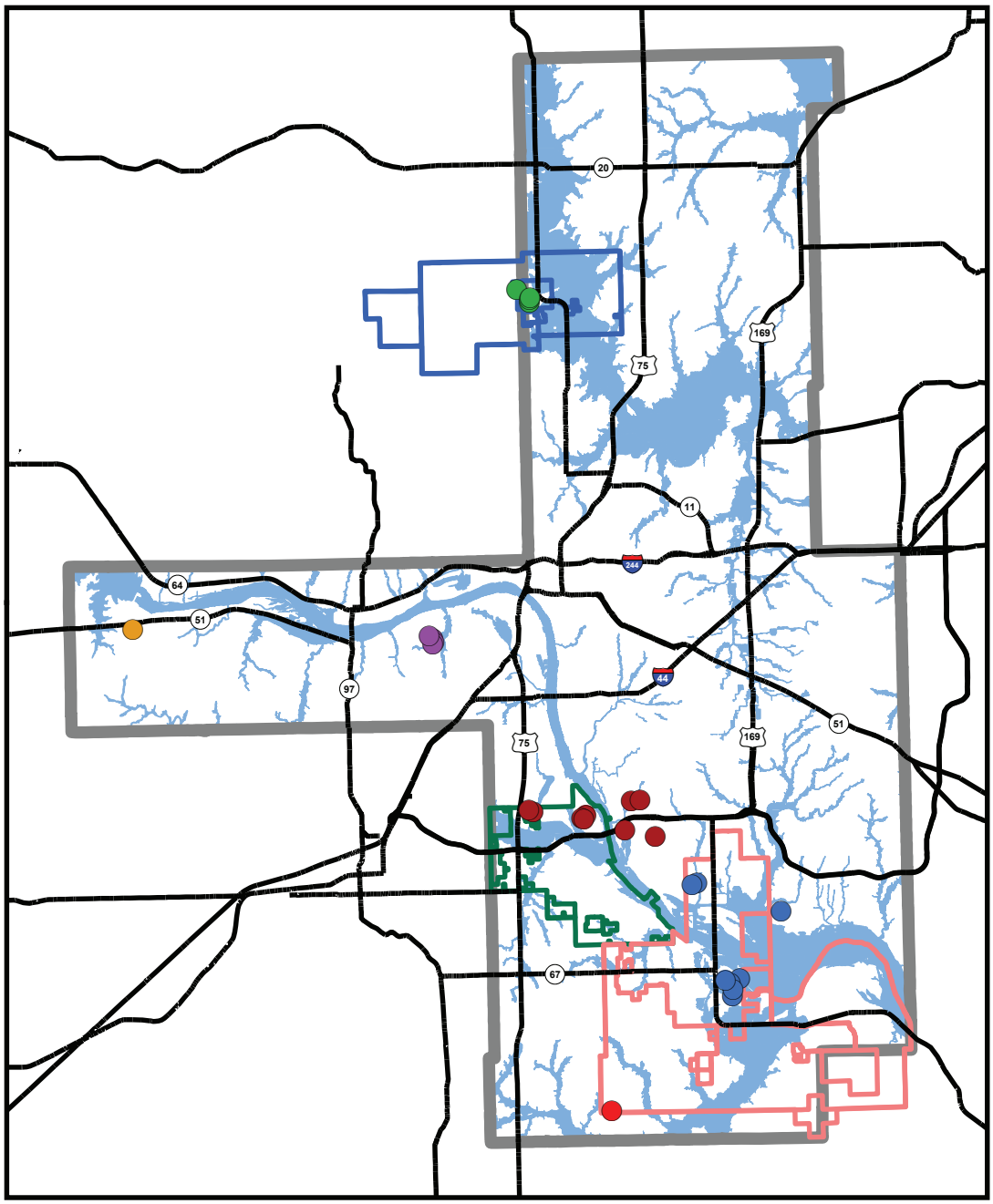
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 4
Date: April 2018
INCOG



LEGEND

- Regulatory Floodplain
- Tulsa County
- Town of Sperry
- City of Jenks
- City of Bixby
- State and US Hwys

Schools:

- Berryhill
- Bixby
- Jenks
- Keystone
- Liberty
- Sperry

Tulsa County Multi-Hazard Mitigation Plan

FLOOD HAZARD

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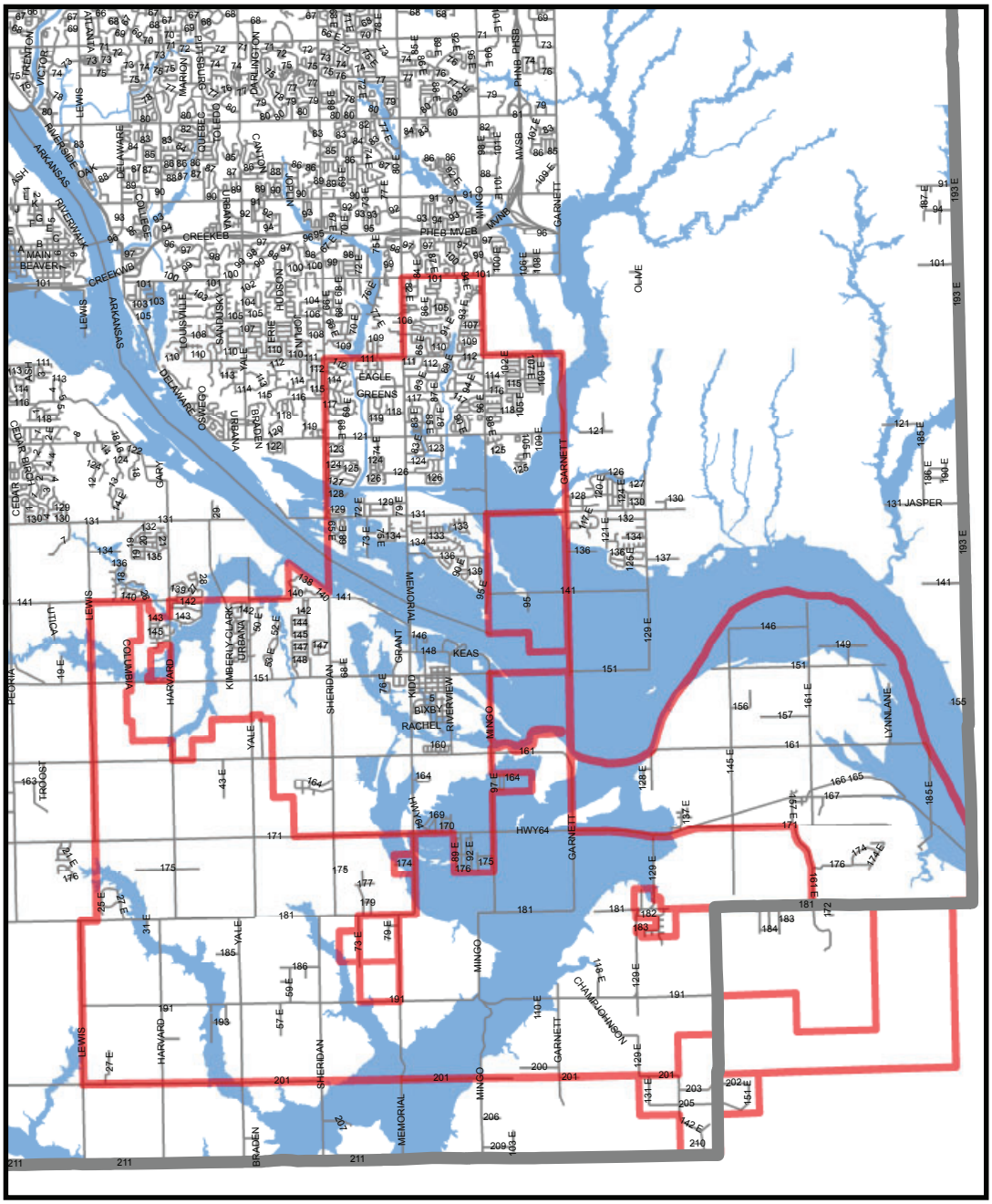
Miles

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 5

Date: April 2018

INCOG



LEGEND

- Flood Hazard Area
- Tulsa County Line
- City of Bixby
- name — Streets

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

City of BIXBY FLOOD HAZARD

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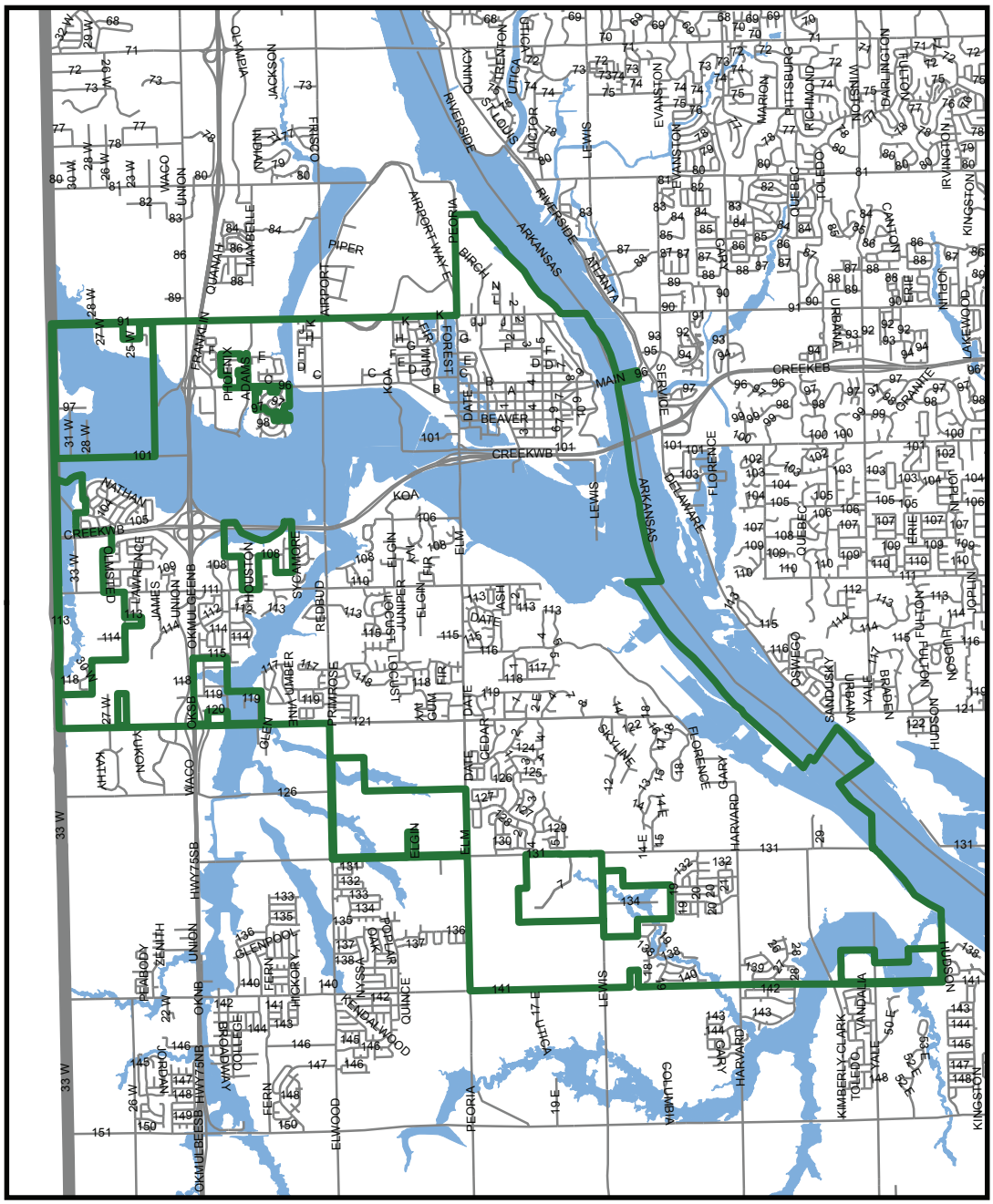
Miles

Map Number 5A

Date: April 2018

INCOG


LEGEND
Flood Hazard Area
Tulsa County Line
City of Jenks
Streets
Tulsa County
Multi-Hazard
Mitigation Plan
City of JENKS
FLOOD HAZARD
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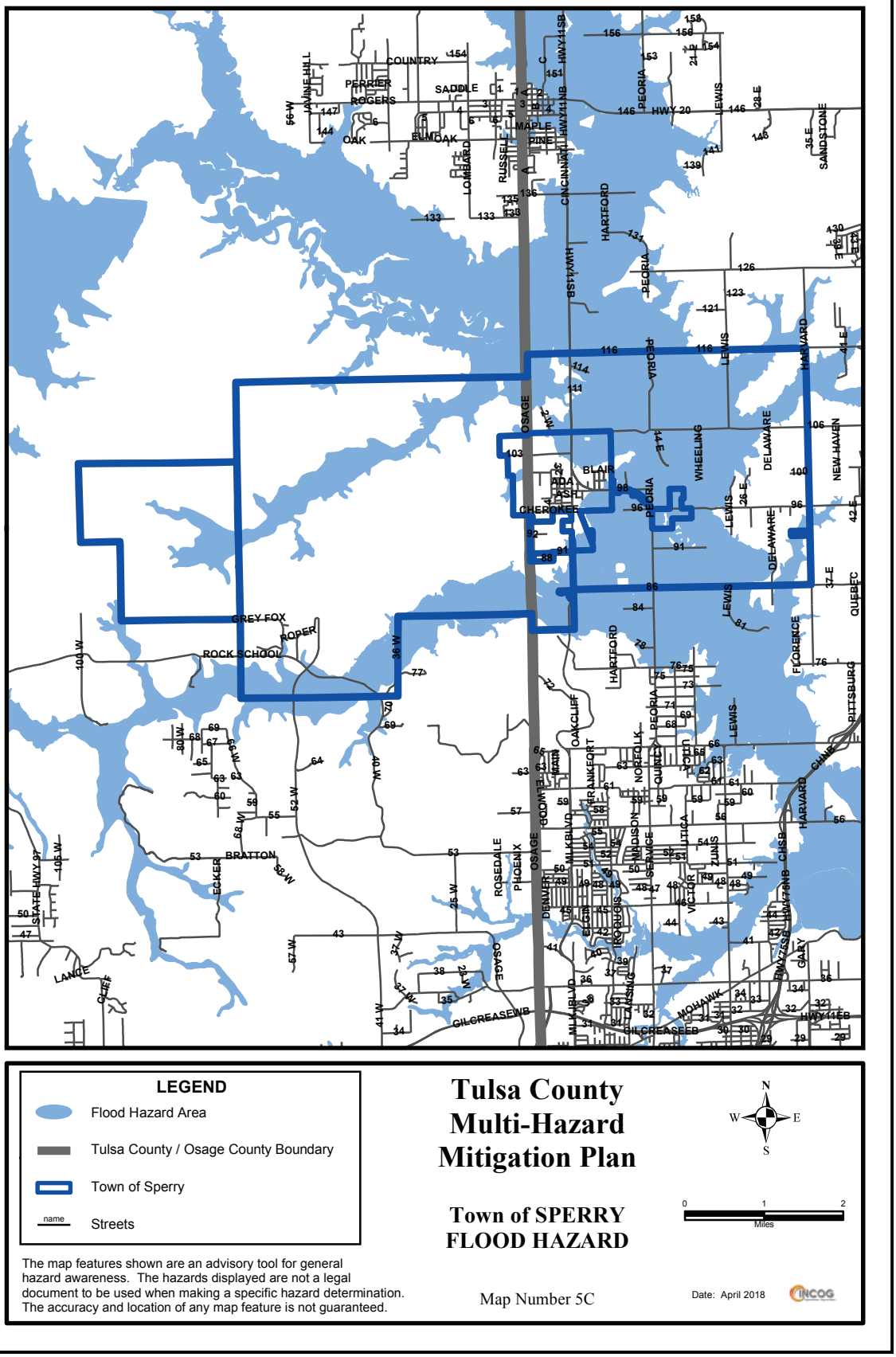
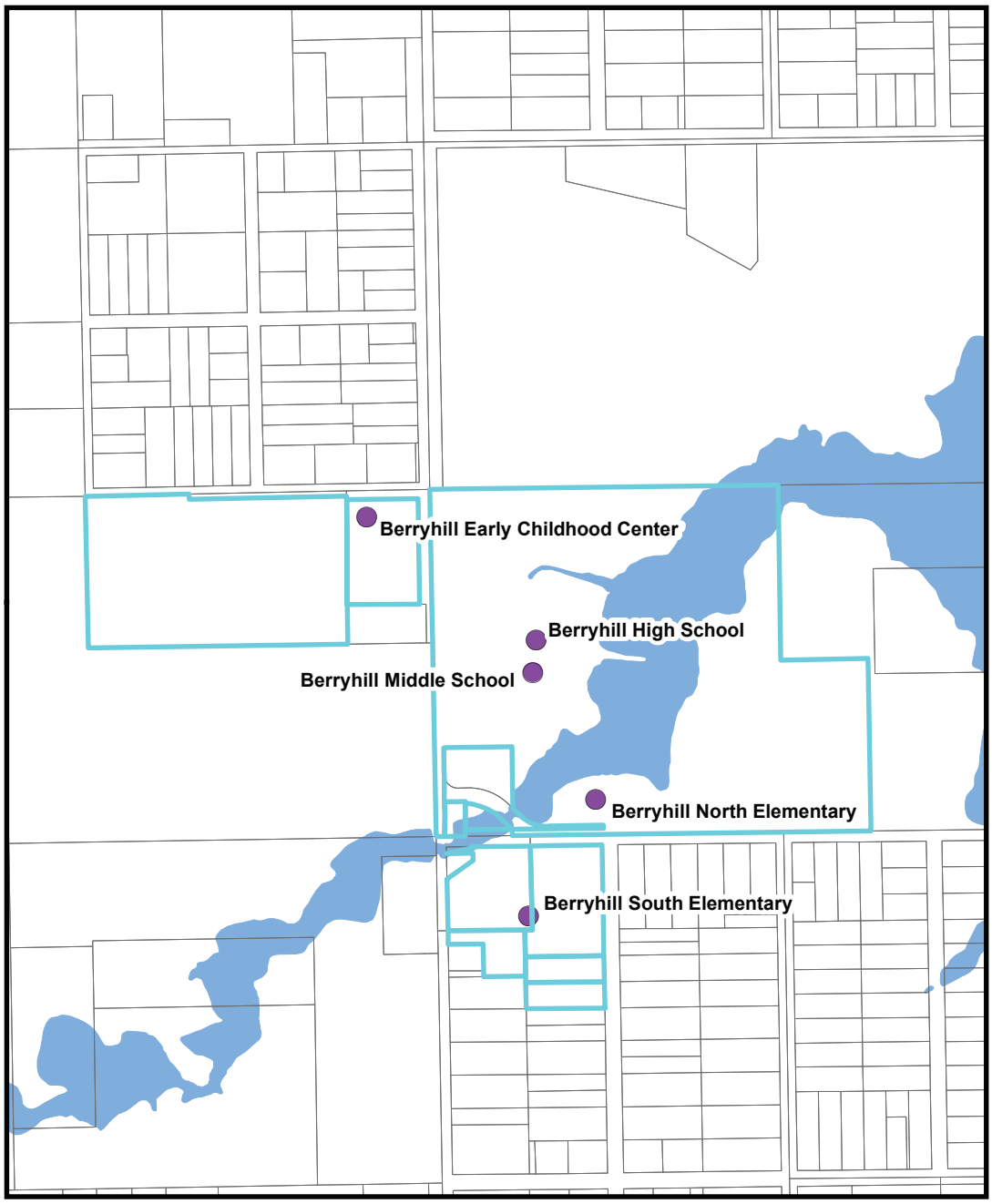
Miles
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 5B
Date: April 2018
INCOG


LEGEND
Flood Hazard Area
Tulsa County / Osage County Boundary
Town of Sperry
name
Streets
Tulsa County
Multi-Hazard
Mitigation Plan
Town of SPERRY
FLOOD HAZARD
N
W
E
S
0
1
2
Miles
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 5C
Date: April 2018
INCOG



LEGEND

- Flood Hazard Area
- Berryhill Schools
- Berryhill School Properties
- Street ROW and Property Lines

Tulsa County Multi-Hazard Mitigation Plan

BERRYHILL SCHOOLS FLOOD HAZARD

N
W E
S

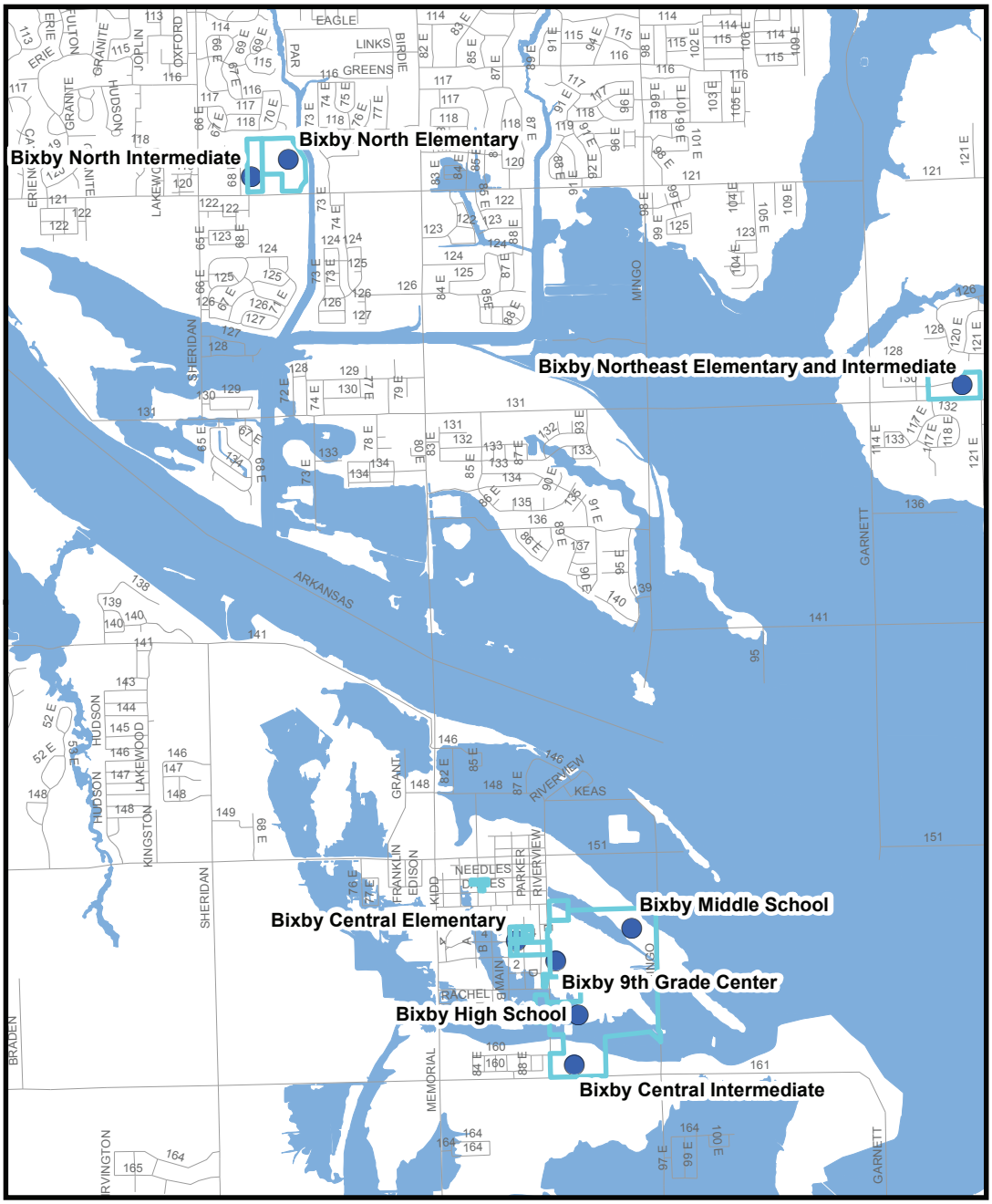
0 280 560
Feet

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 5D

Date: April 2018

INCOG



LEGEND

- Flood Hazard Area
- Bixby Schools
- Bixby School Properties
- name — Streets

Tulsa County Multi-Hazard Mitigation Plan

BIXBY SCHOOLS FLOOD HAZARD

N W E S

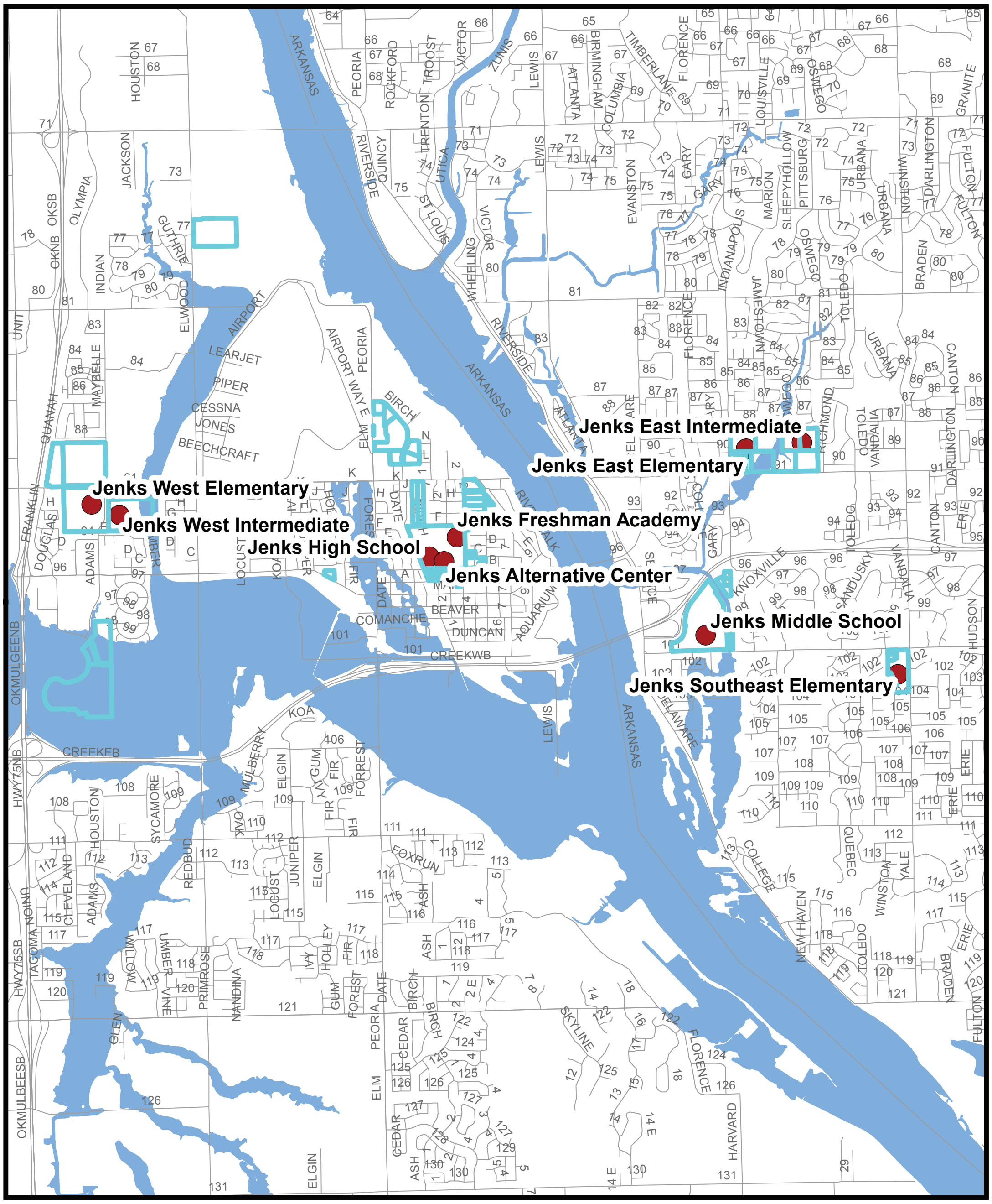
0 2,000 4,000 Feet

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 5E

Date: April 2018

INCOG



LEGEND

- Flood Hazard Area
- Jenks Schools
- Jenks School Properties
- Streets

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

JENKS SCHOOLS FLOOD HAZARD

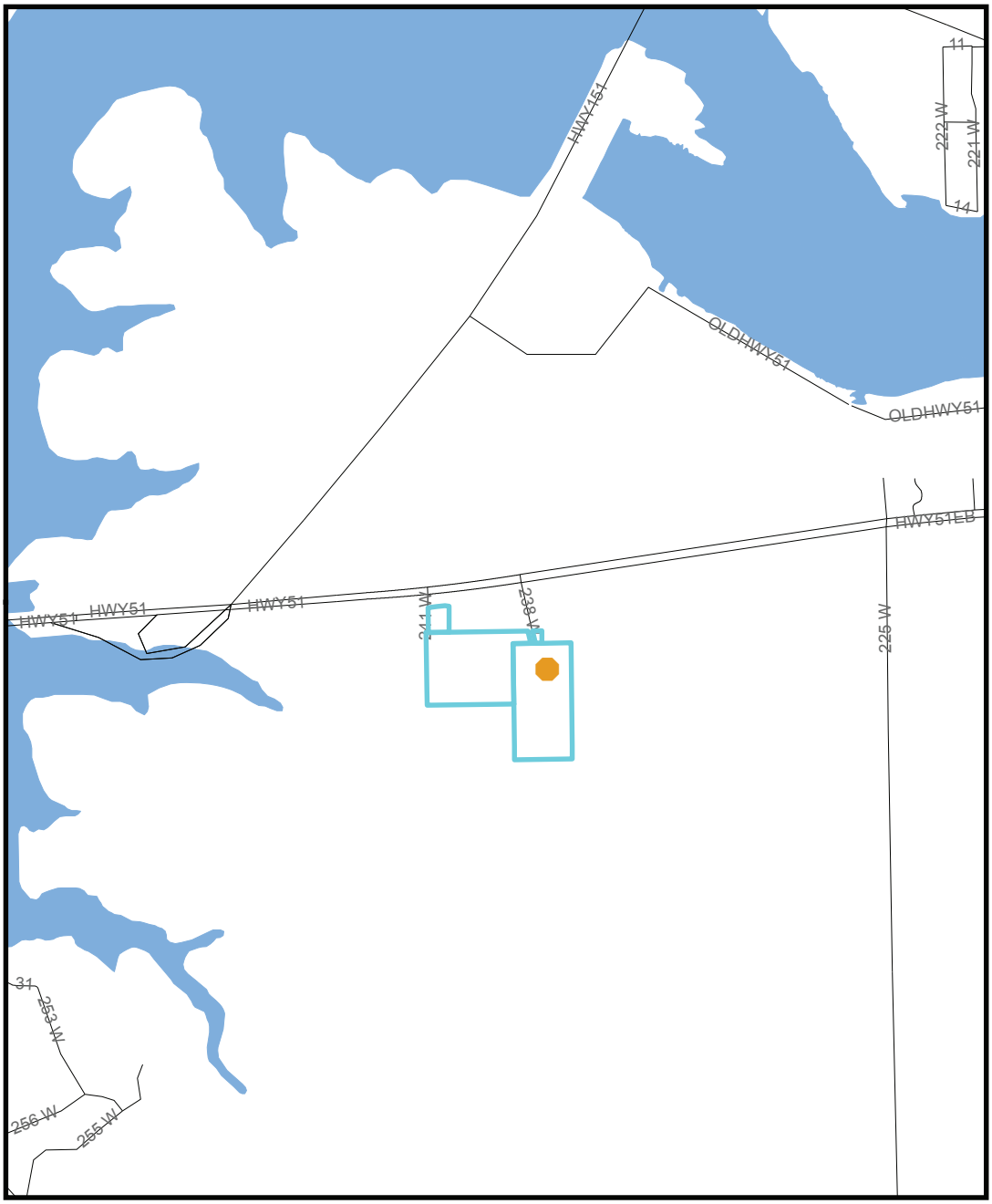
Map Number 5F

N W E S

0 2,500 5,000 Feet

Date: April 2018

INCOG



LEGEND

- Flood Hazard Area
- Keystone Schools
- Keystone School Property
- Streets

Tulsa County Multi-Hazard Mitigation Plan

KEYSTONE SCHOOLS FLOOD HAZARD

N
W E
S

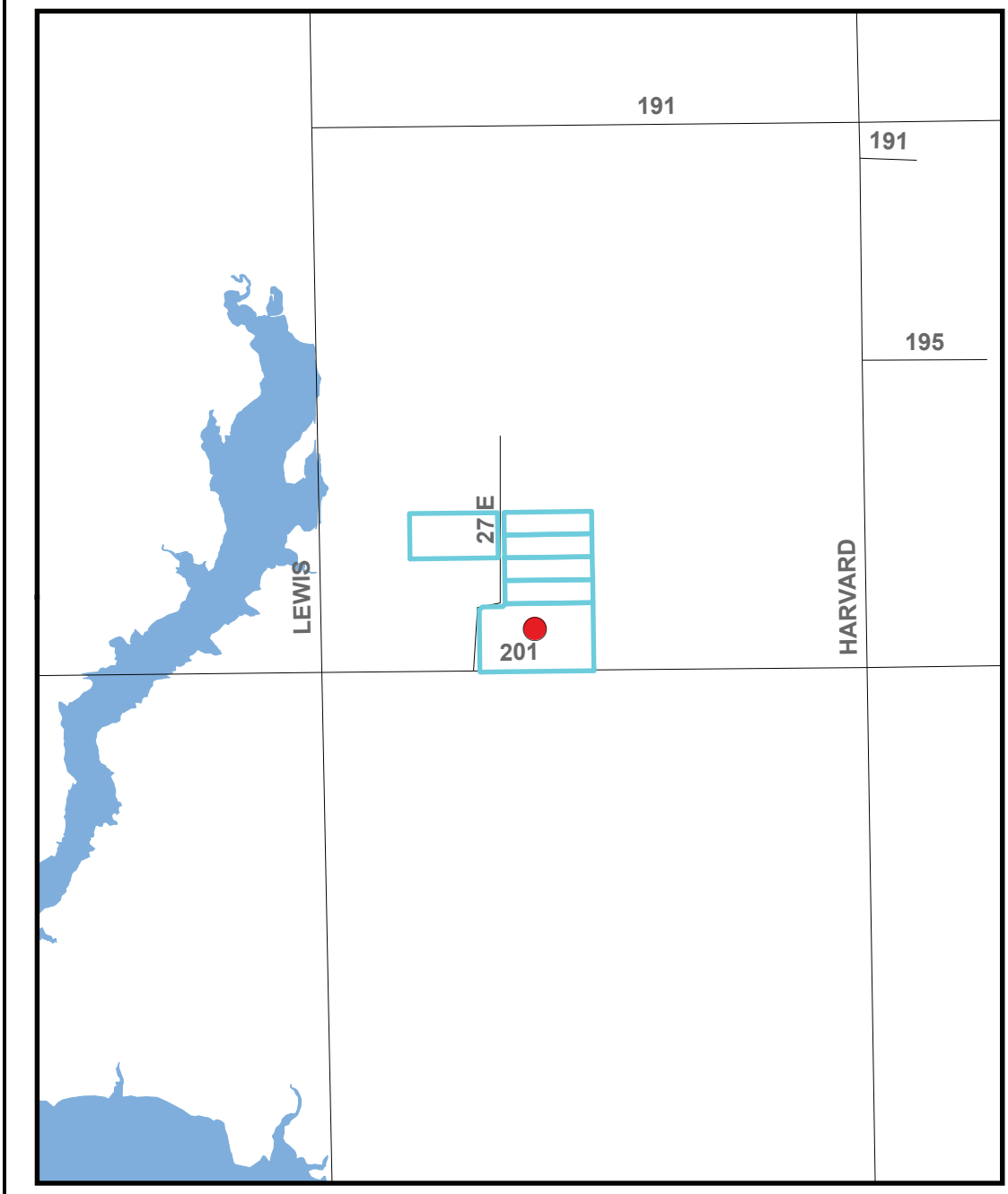
0 1,000 2,000
Feet

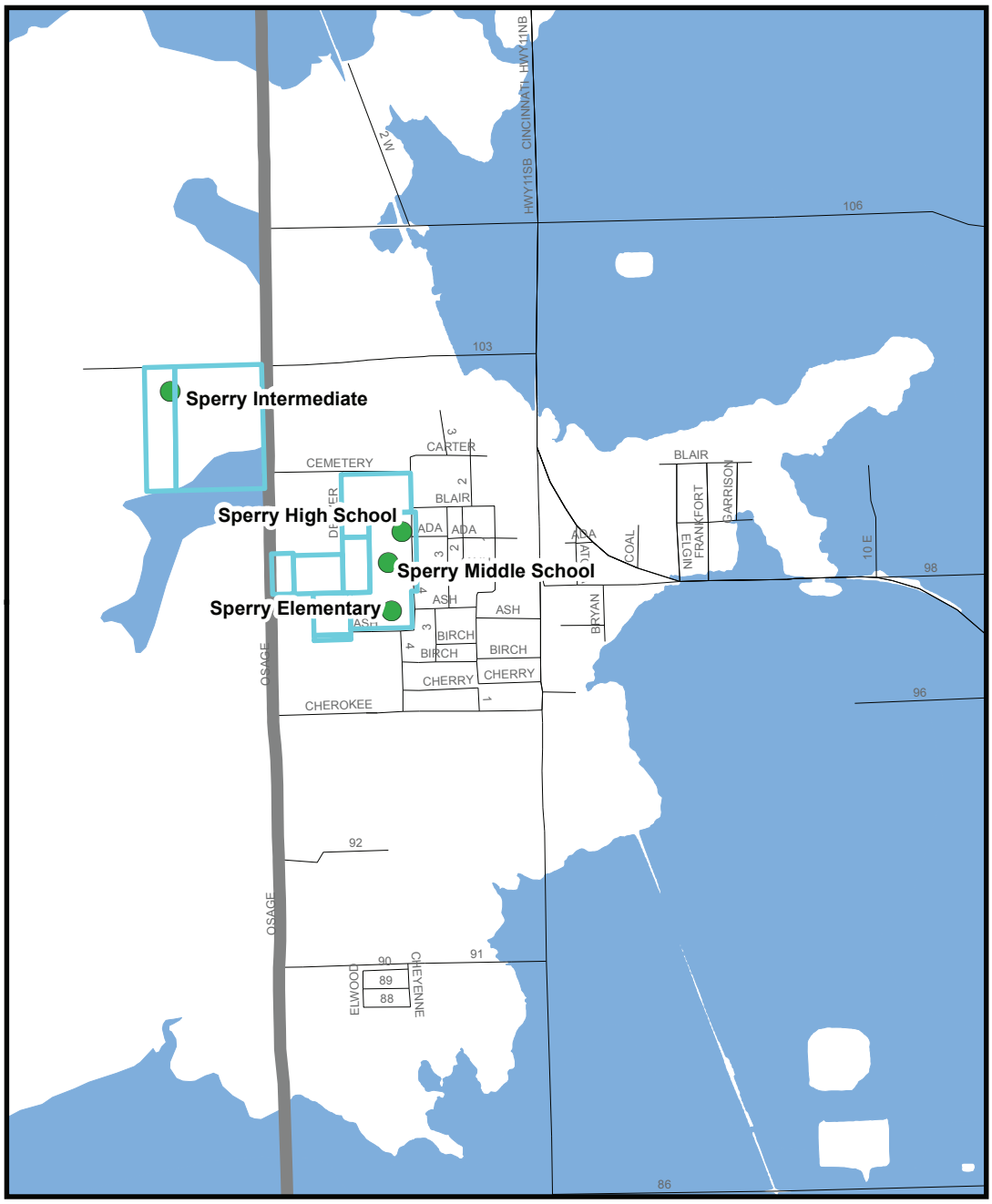
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 5G

Date: April 2018

INCOG


191
191
195
LEWIS
27 E
HARVARD
201
LEGEND
Flood Hazard Area
Liberty Schools
Liberty School Property
Streets
Tulsa County
Multi-Hazard
Mitigation Plan
LIBERTY SCHOOLS
FLOOD HAZARD
N
W
E
S
0
500
1,000
1,500
Feet
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 5H
Date: April 2018
INCOG



LEGEND

- Flood Hazard Area
- Sperry Schools
- Sperry School Property
- Streets
- Tulsa County / Osage County Line

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

SPERRY SCHOOLS FLOOD HAZARD

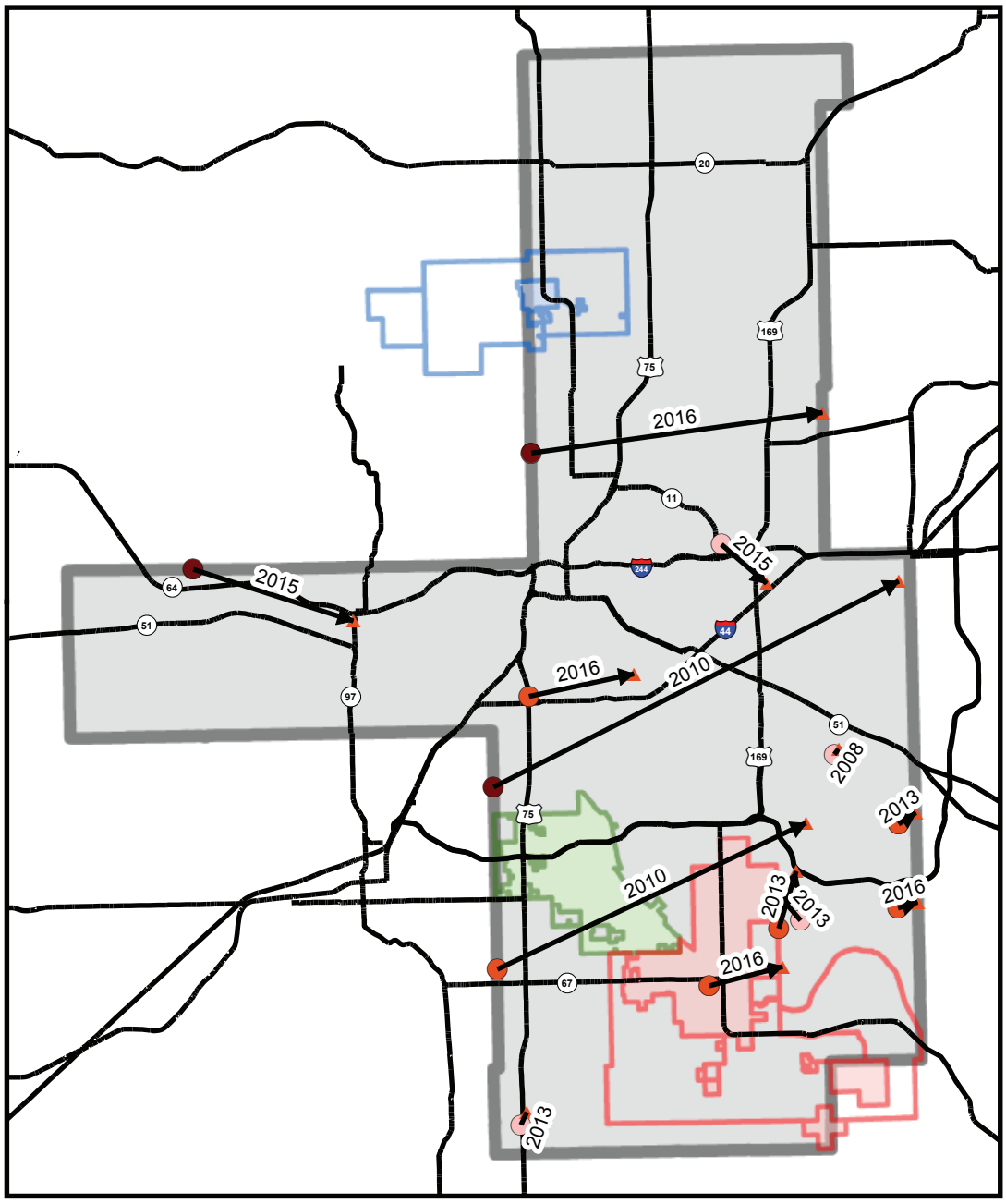
N W E S

0 800 1,600 Feet

Map Number 5J

Date: April 2018

INCOG



LEGEND

- Tulsa County
- Town of Sperry
- City of Bixby
- City of Jenks
- Highways

Tornadoes

- Magnitude EF0 -
- Magnitude EF1 -
- Magnitude EF2 -
- Tornado Path (year)

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

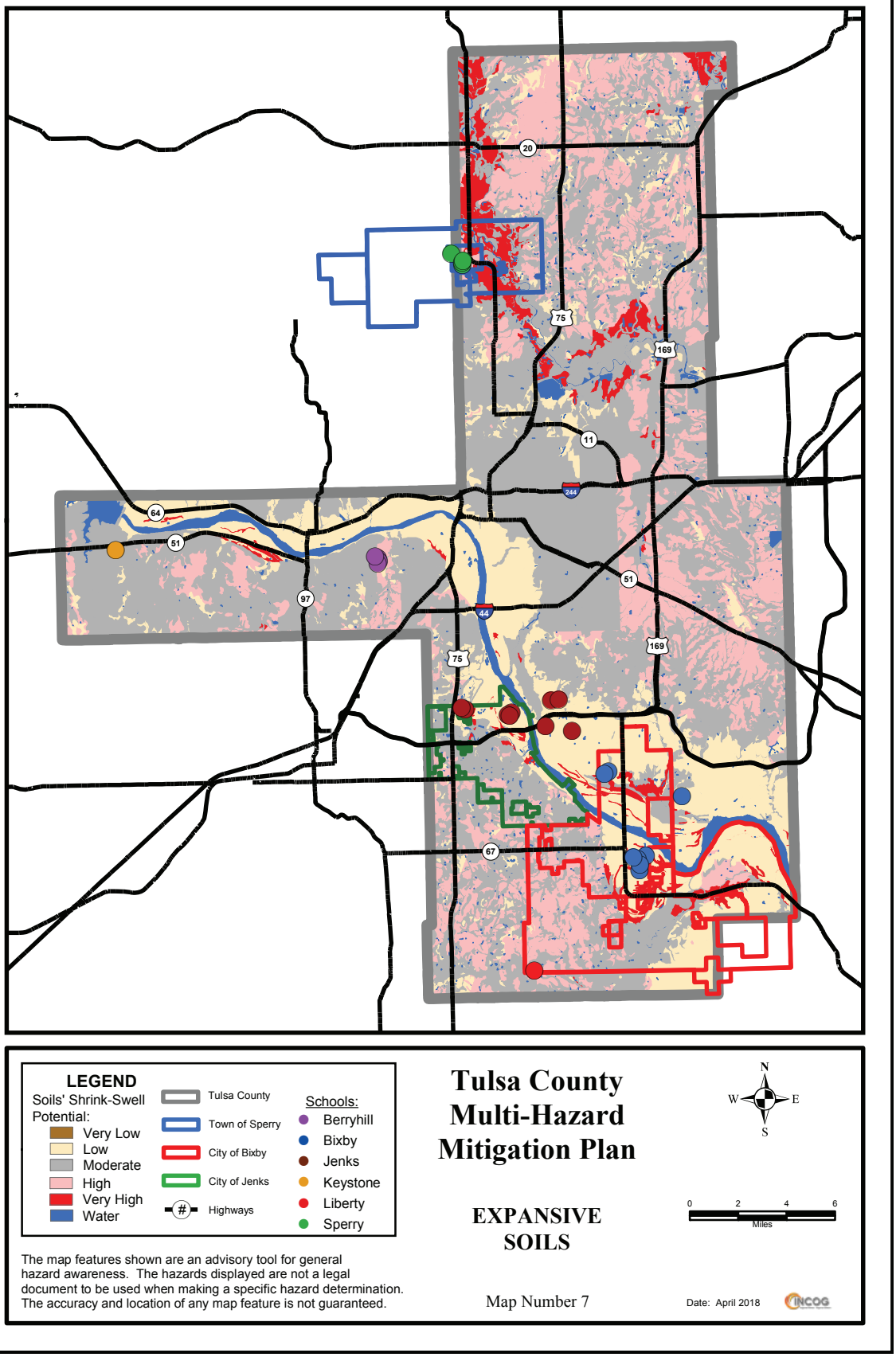
PREVIOUS TORNADOES (2007-2016)

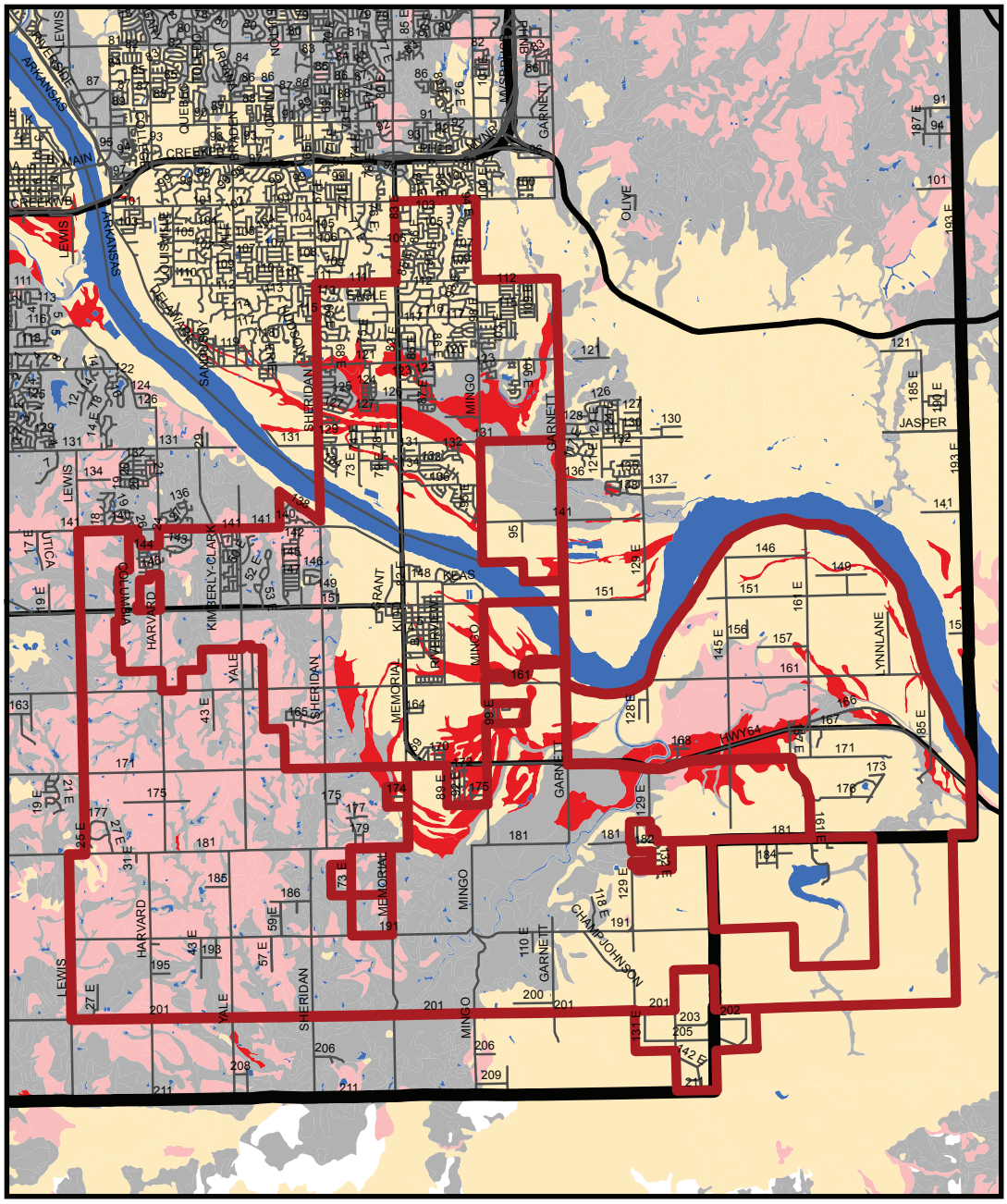
N W E S

0 2 4 6 Miles

Map Number 6

Date: April 2018 INCOG


20
75
169
11
244
64
51
97
44
51
169
75
67
LEGEND
Soils' Shrink-Swell Potential:
Very Low
Low
Moderate
High
Very High
Water
Tulsa County
Town of Sperry
City of Bixby
City of Jenks
Highways
Schools:
Berryhill
Bixby
Jenks
Keystone
Liberty
Sperry
Tulsa County Multi-Hazard Mitigation Plan
EXPANSIVE SOILS
N
W
E
S
0 2 4 6
Miles
The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.
Map Number 7
Date: April 2018
INCOG



LEGEND

- Tulsa Count Boundary
- City of Bixby
- Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

City of BIXBY EXPANSIVE SOILS

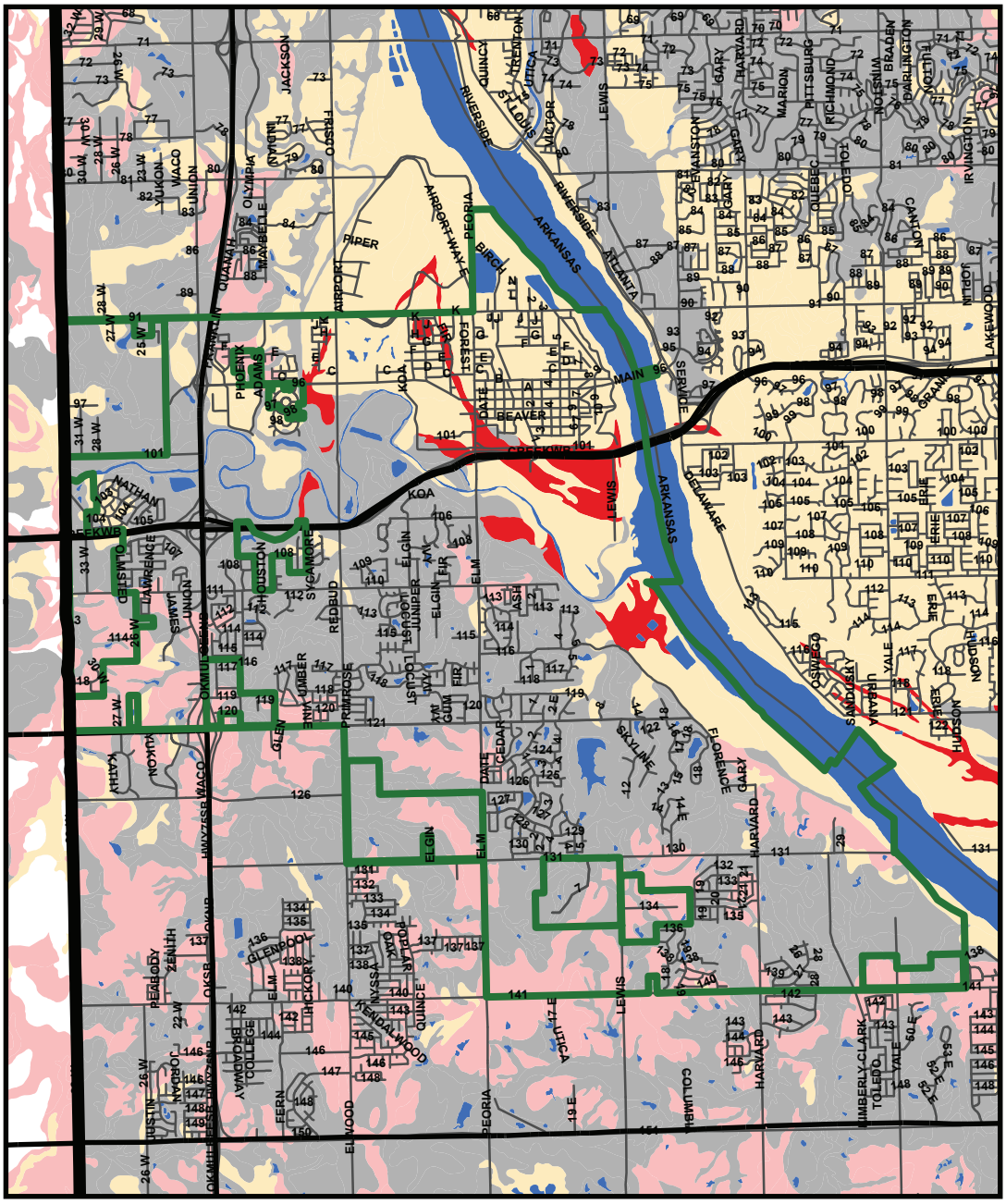
N W E S

0 4,900 9,800 Feet

Map Number 7A

Date: April 2018

INCOG



LEGEND

Tulsa County/Creek County Boundary

City of Jenks

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

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Tulsa County Multi-Hazard Mitigation Plan

City of JENKS EXPANSIVE SOILS

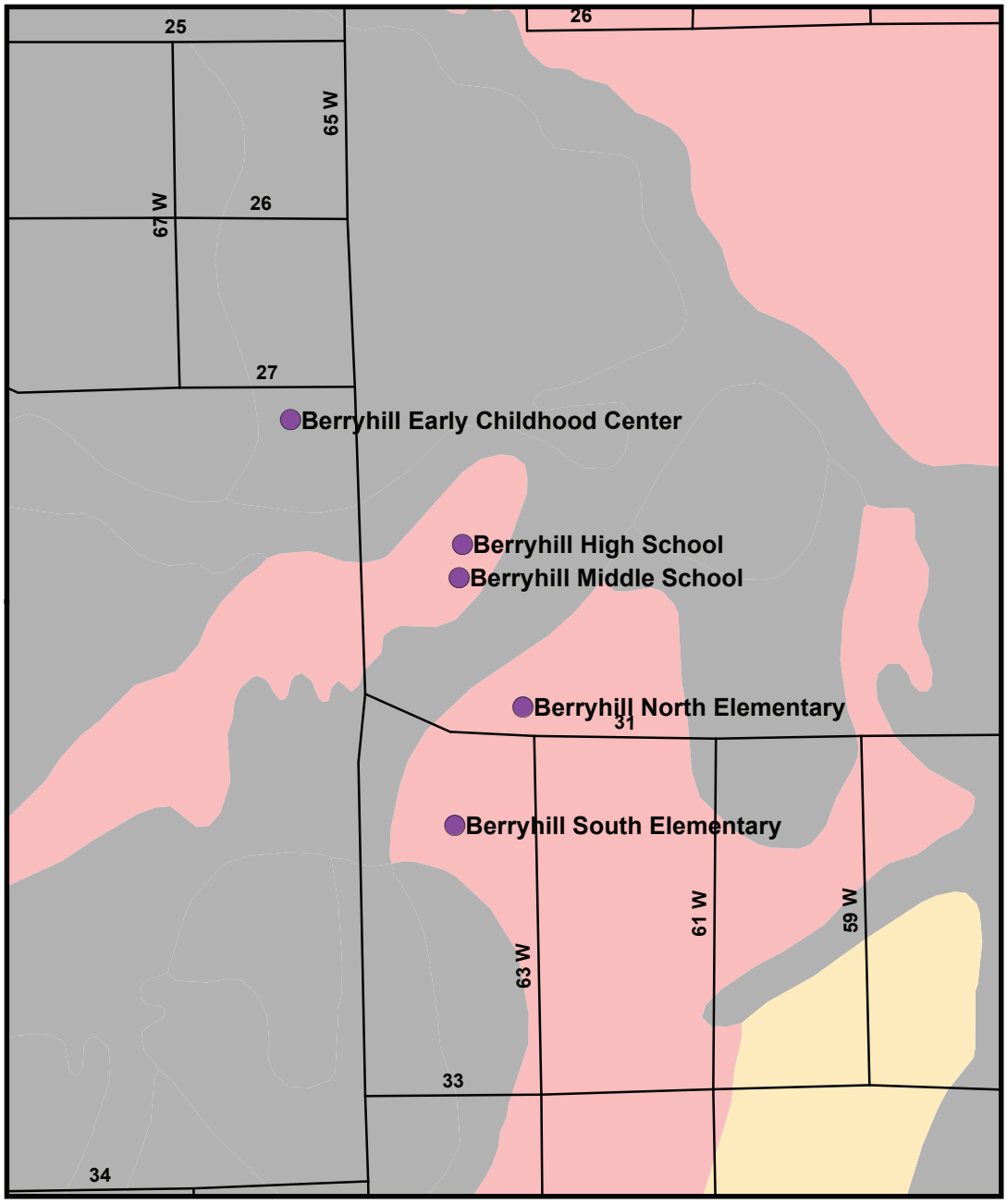
N W E S

0 0.5 1 Miles

Map Number 7B

Date: April 2018

INCOG



LEGEND

Berryhill Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

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Tulsa County Multi-Hazard Mitigation Plan

BERRYHILL Public Schools EXPANSIVE SOILS

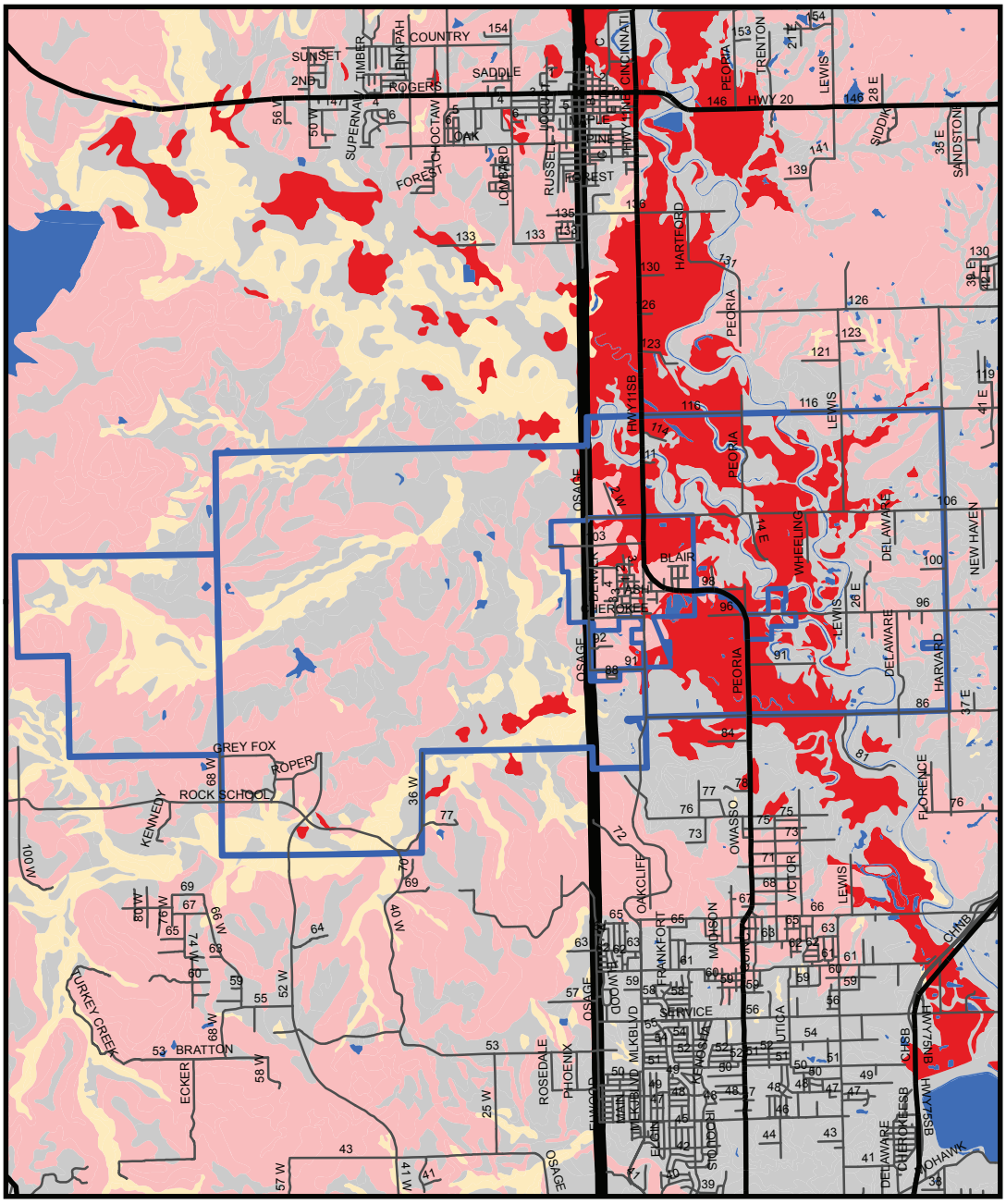
Map Number 7D

N W E S

0 300 600 Feet

Date: April 2018

INCOG



LEGEND

- Tulsa County/Osage County Boundary
- Town of Sperry
- Streets and Roads (name)

Soils' Shrink-Swell Potential:

Very Low	High
Low	Very High
Moderate	Water

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Tulsa County Multi-Hazard Mitigation Plan

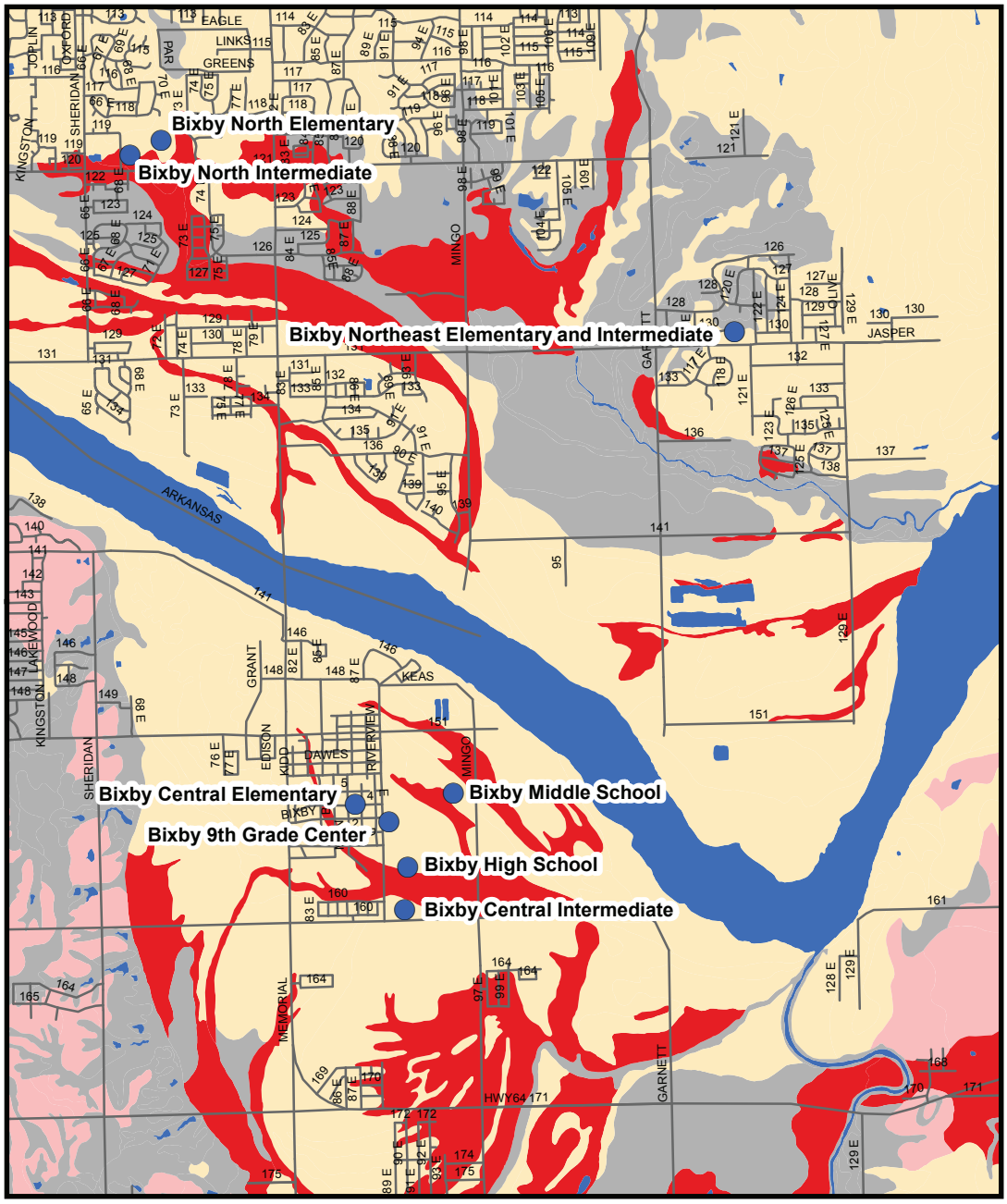
Town of SPERRY EXPANSIVE SOILS

Map Number 7C

N W E S

0 4,000 8,000 Feet

Date: April 2018 INCOG



LEGEND

Bixby Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

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Tulsa County Multi-Hazard Mitigation Plan

BIXBY Public Schools EXPANSIVE SOILS

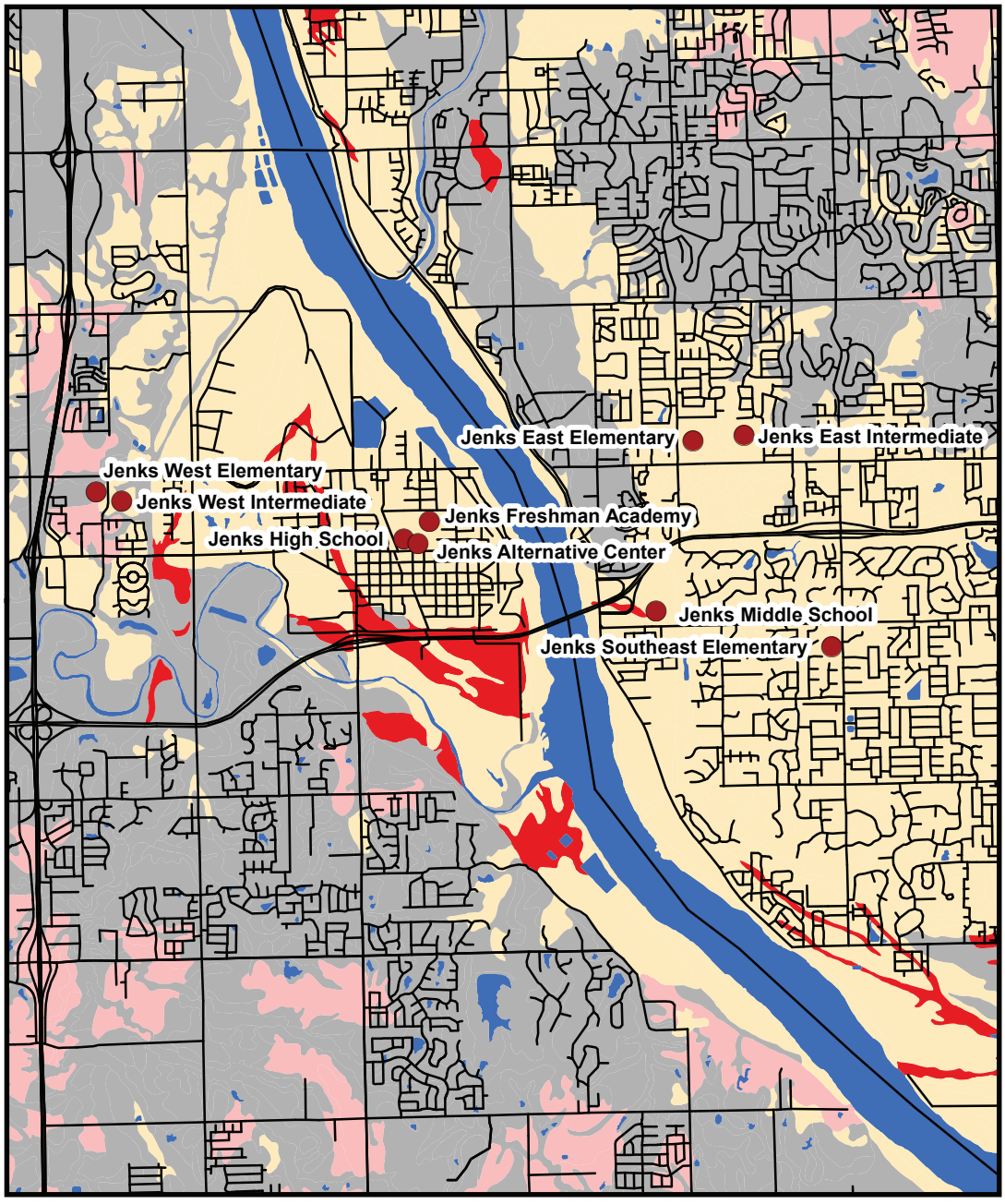
Map Number 7E

N W E S

0 2,000 4,000 Feet

Date: April 2018

INCOG



LEGEND

Jenks Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

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Tulsa County Multi-Hazard Mitigation Plan

JENKS Public Schools EXPANSIVE SOILS

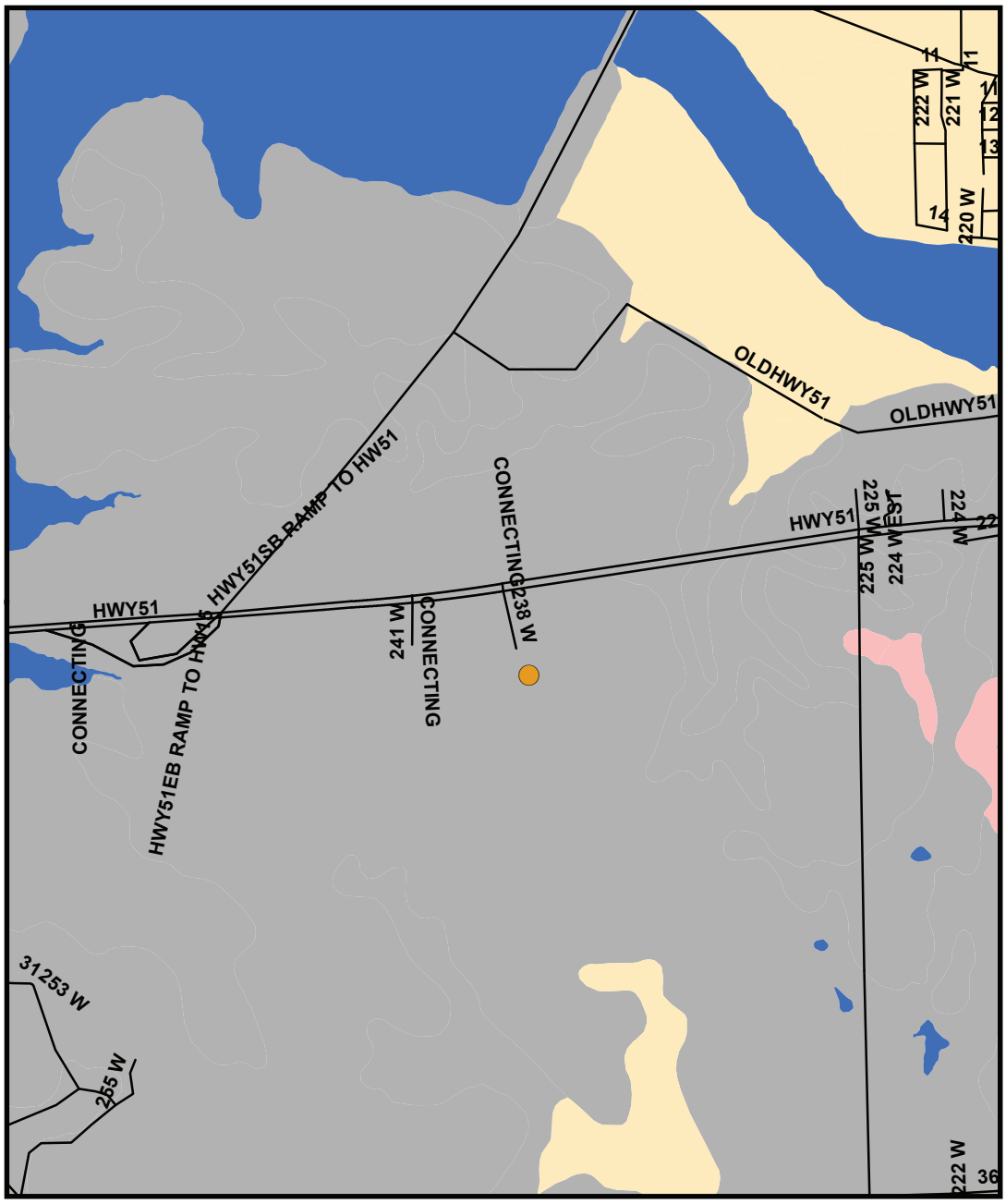
Map Number 7F

N W E S

0 3,000 6,000 Feet

Date: April 2018

INCOG



LEGEND

Keystone Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

Very Low	High
Low	Very High
Moderate	Water

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Tulsa County Multi-Hazard Mitigation Plan

KEYSTONE Public Schools EXPANSIVE SOILS

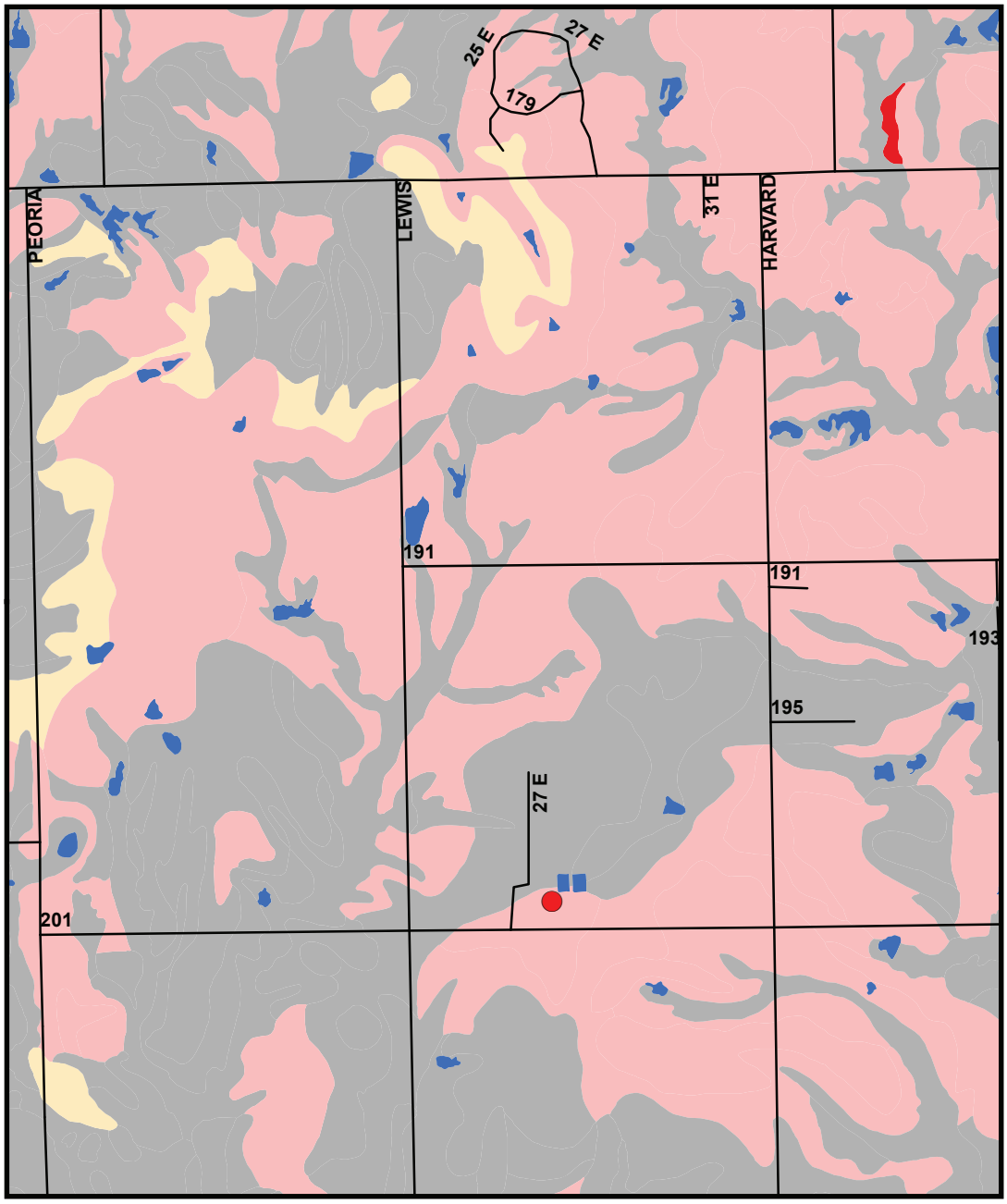
Map Number 7G

N W E S

0 1,000 2,000 Feet

Date: April 2018

INCOG



LEGEND

Liberty Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

LIBERTY Public Schools EXPANSIVE SOILS

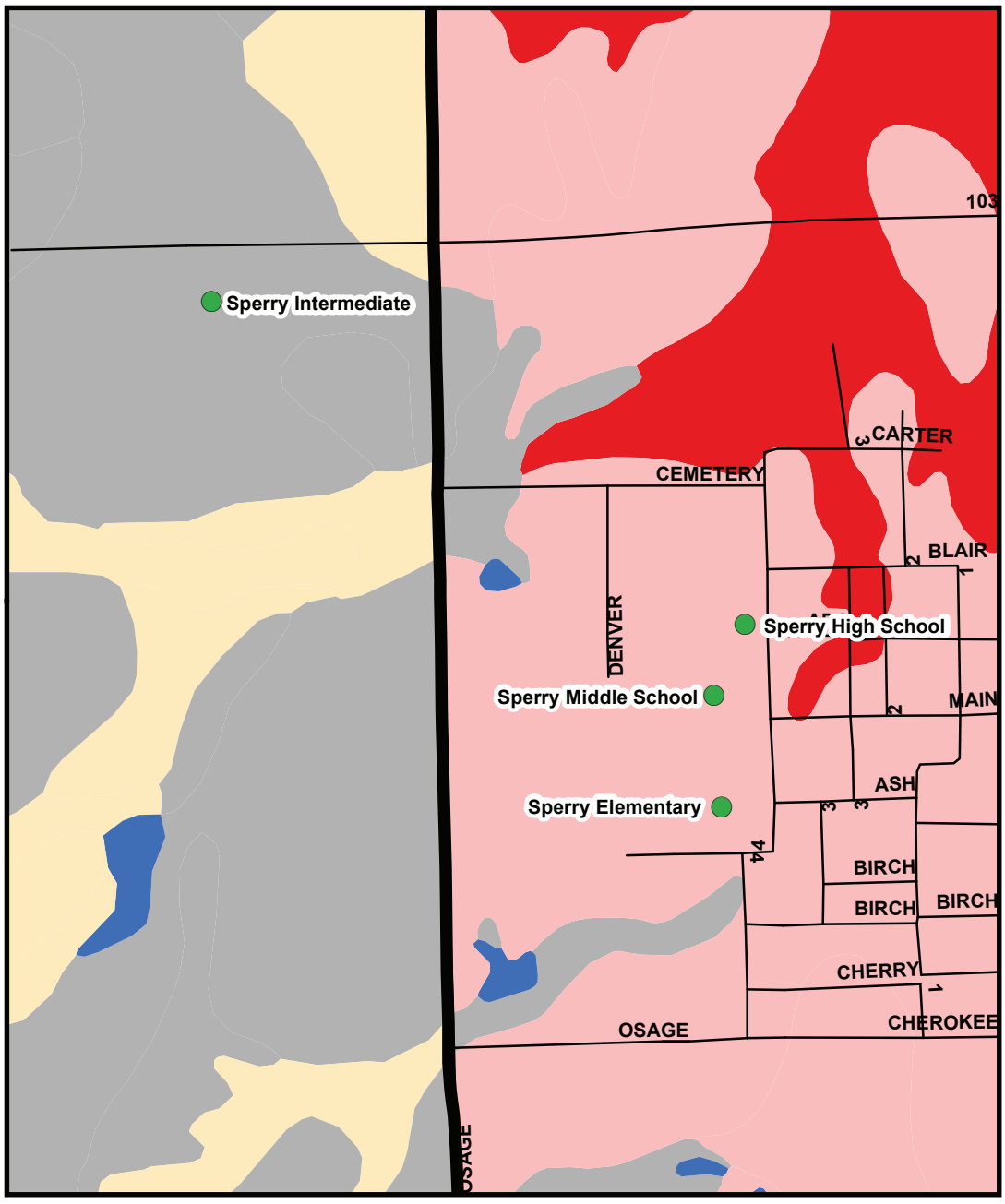
Map Number 7H

N W E S

0 1,000 2,000 Feet

Date: April 2018

INCOG



LEGEND

Sperry Schools

Streets and Roads — name

Soils' Shrink-Swell Potential:

- Very Low
- Low
- Moderate
- High
- Very High
- Water

Tulsa County/Osage County Boundary

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Tulsa County Multi-Hazard Mitigation Plan

SPERRY Public Schools EXPANSIVE SOILS

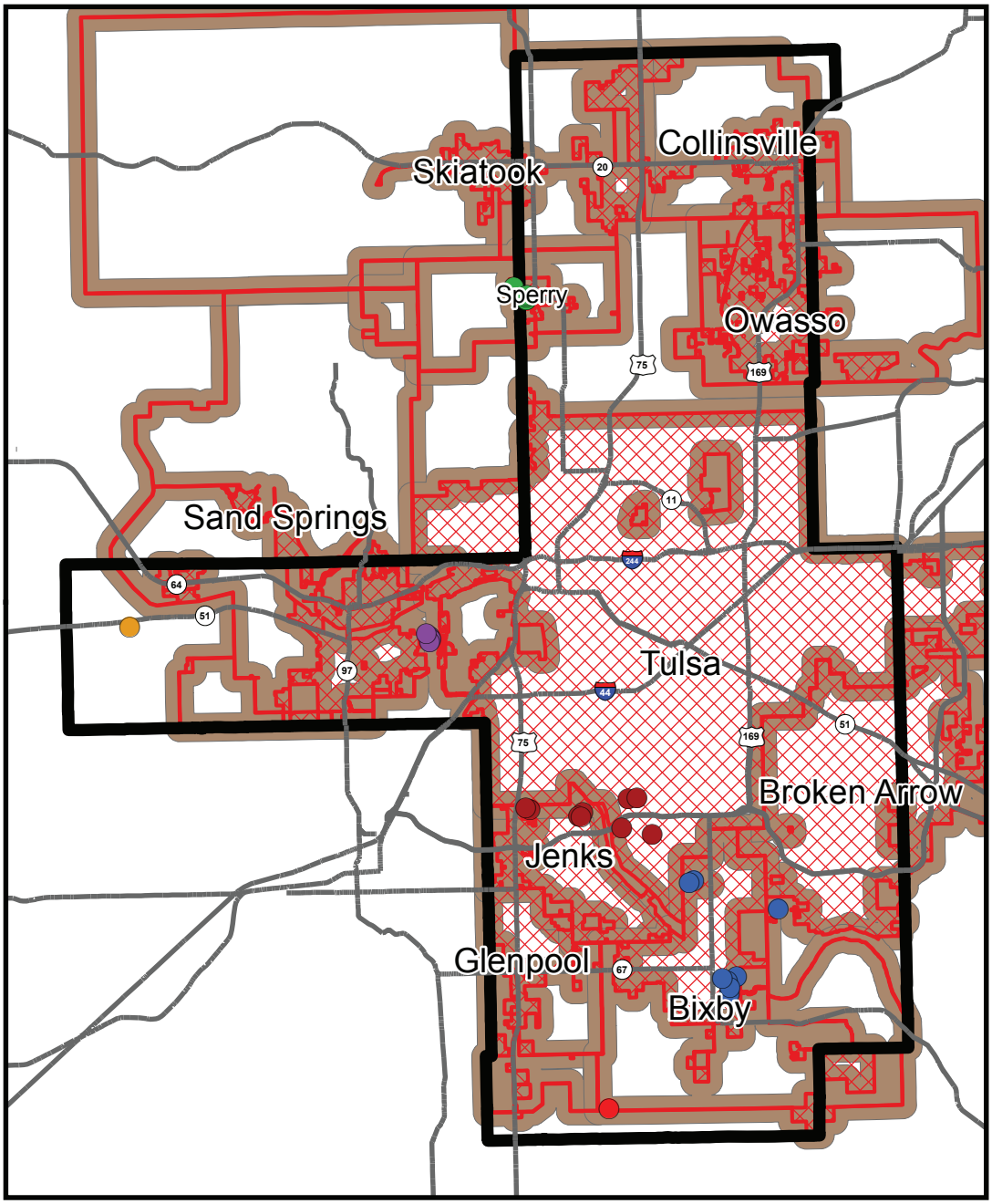
Map Number 7J

N W E S

0 400 800 Feet

Date: April 2018

INCOG



LEGEND

- Wildland-Urban Interface around Tulsa County Cities
- Tulsa County Boundary
- City Name — Tulsa County Urbanized Communities
- State and US Highways

Schools:

- Berryhill
- Bixby
- Jenks
- Keystone
- Liberty
- Sperry

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Tulsa County Multi-Hazard Mitigation Plan

WILDLAND URBAN INTERFACE

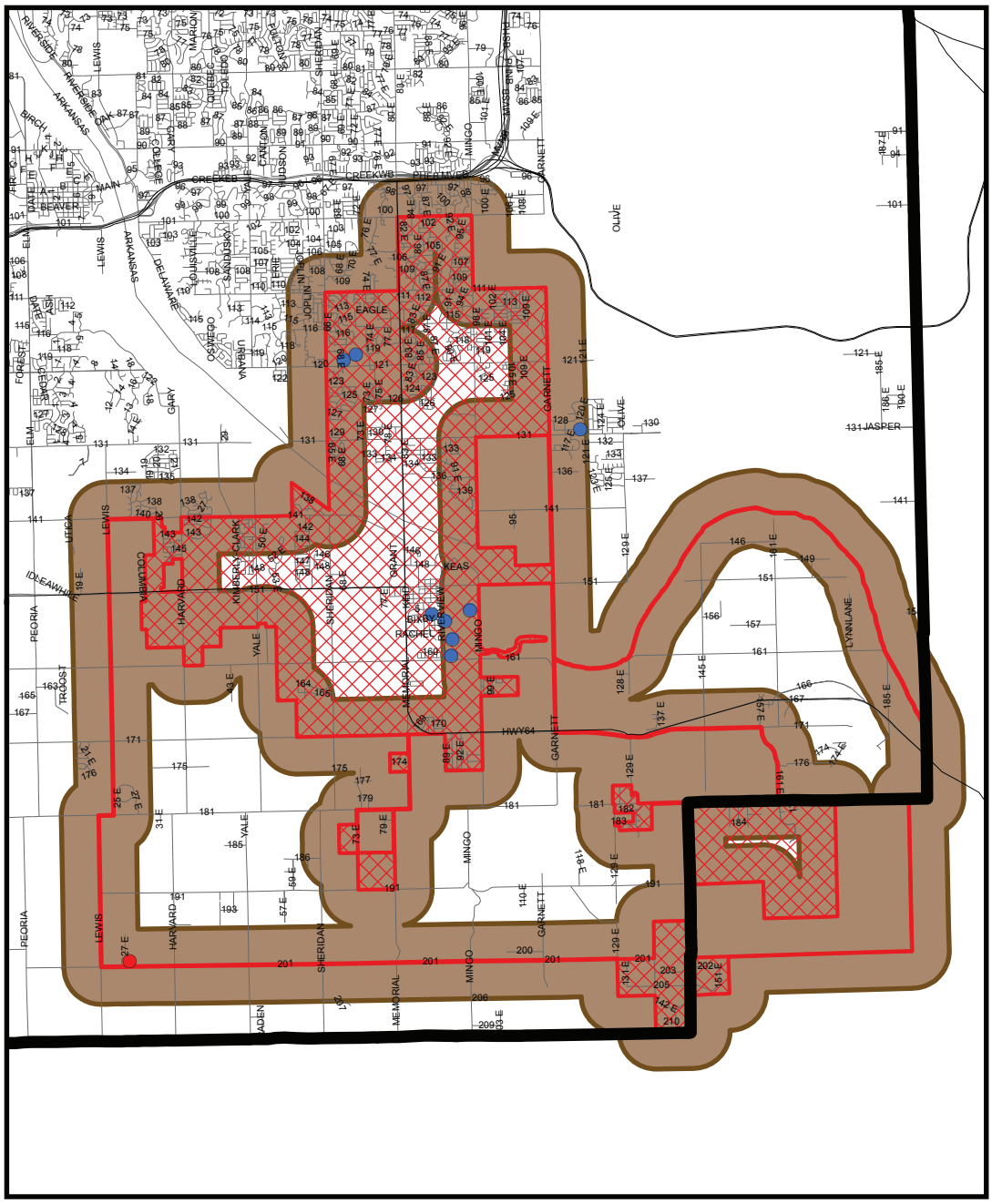
Map Number 8

N W E S

0 2 4 6 Miles

Date: April 2018

INCOG



LEGEND

- Wildland-Urban Interface around the City of Bixby
- Tulsa County Boundary
- City of Bixby
- Bixby Public Schools
- Liberty Public Schools
- street name — Streets

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

WILDLAND URBAN INTERFACE
City of Bixby, Bixby Schools Liberty Schools

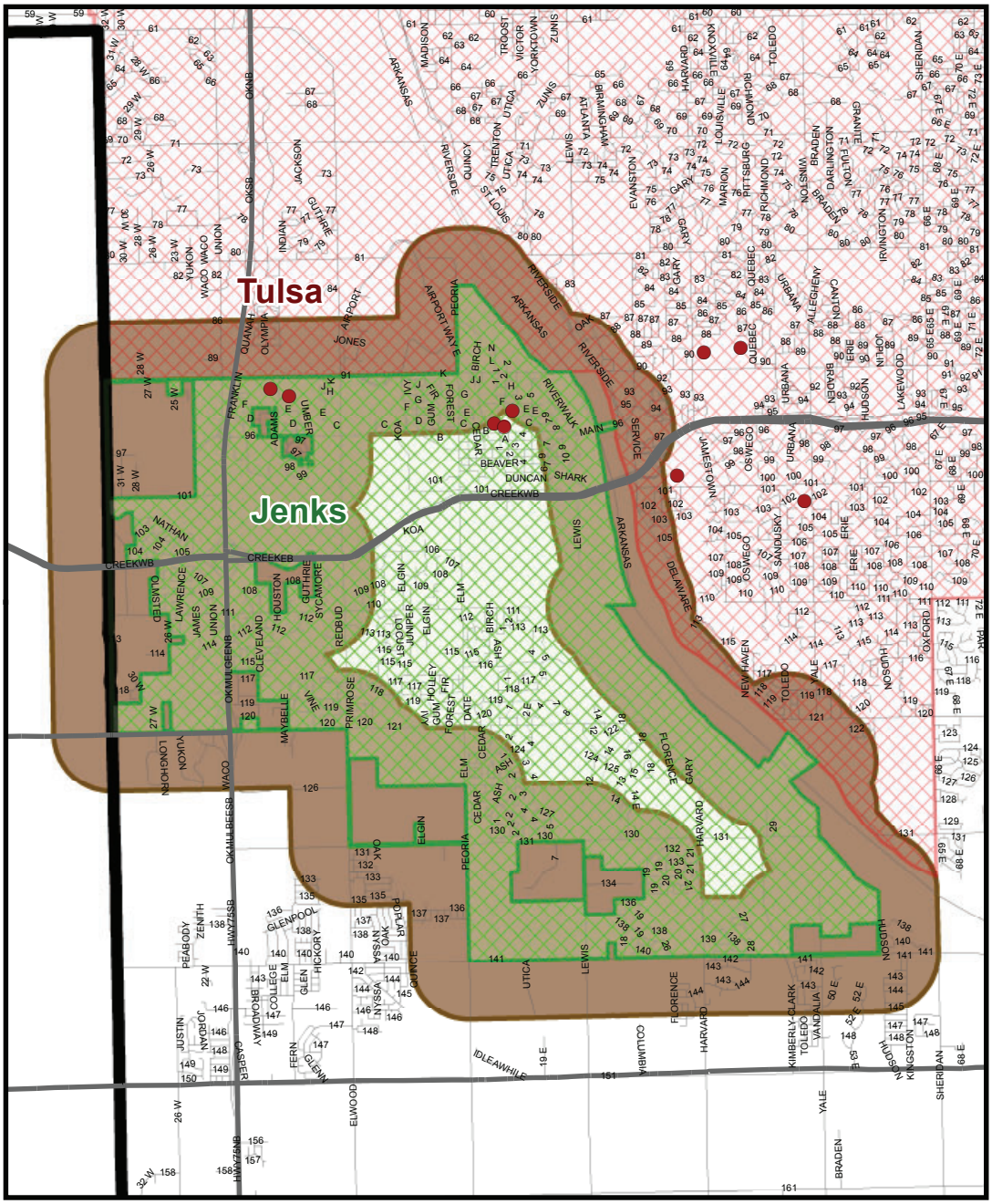
Map Number 8A

N
W E
S

0 1 2
Miles

Date: April 2018

INCOG



LEGEND

- Wildland-Urban Interface around the City of Jenks
- Tulsa County Boundary
- City of Jenks
- City of Tulsa
- Jenks Public Schools
- street name — Streets

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

WILDLAND URBAN INTERFACE
City of Jenks
Jenks Schools

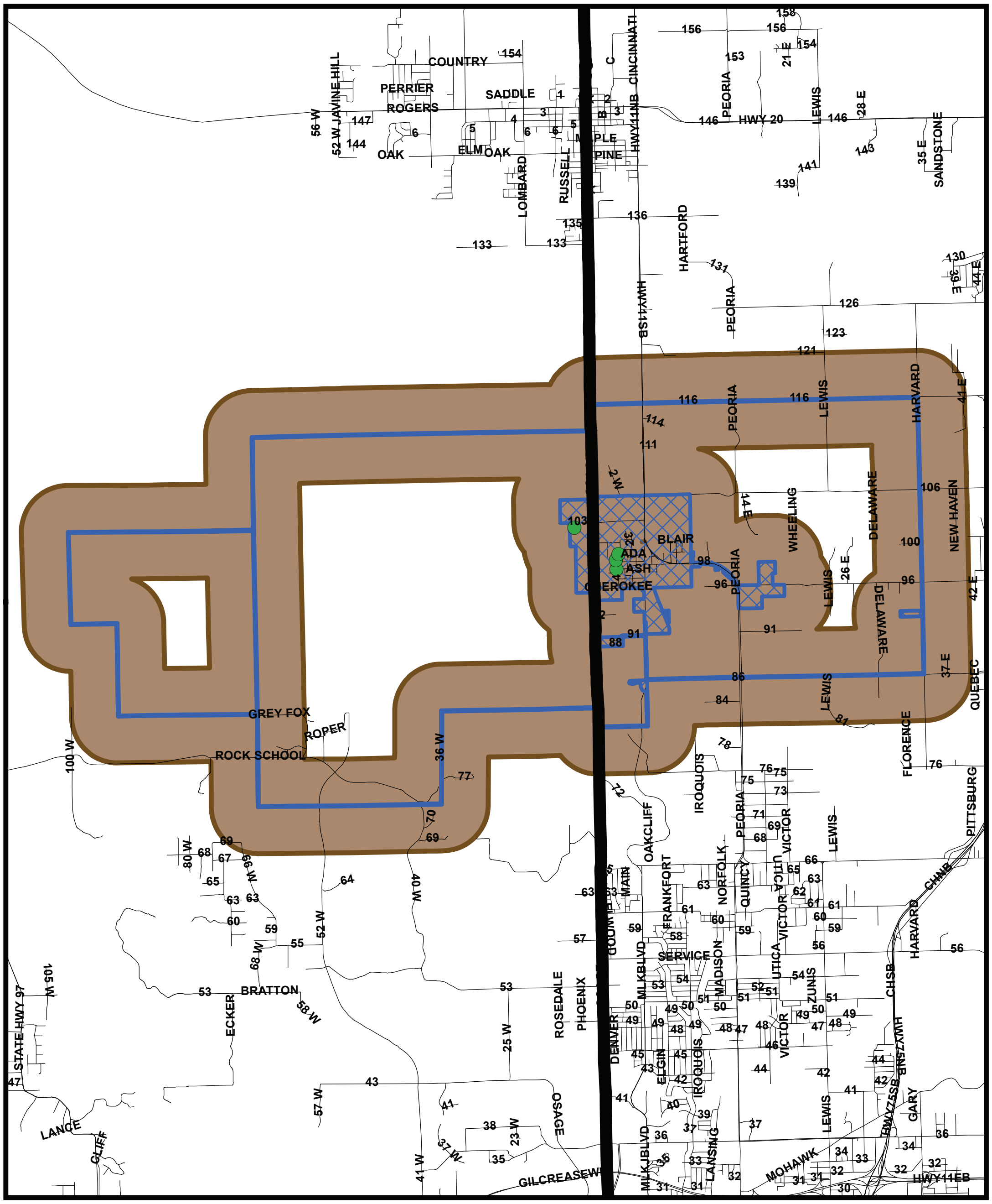
Map Number 8B

N W E S

0 4,000 8,000 Feet

Date: April 2018

INCOG



LEGEND

- Wildland-Urban Interface around the Town of Sperry
- Tulsa County Boundary
- Town of Sperry
- Sperry Public Schools
- street name — Streets

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

WILDLAND URBAN INTERFACE
Town of Sperry
Sperry Schools

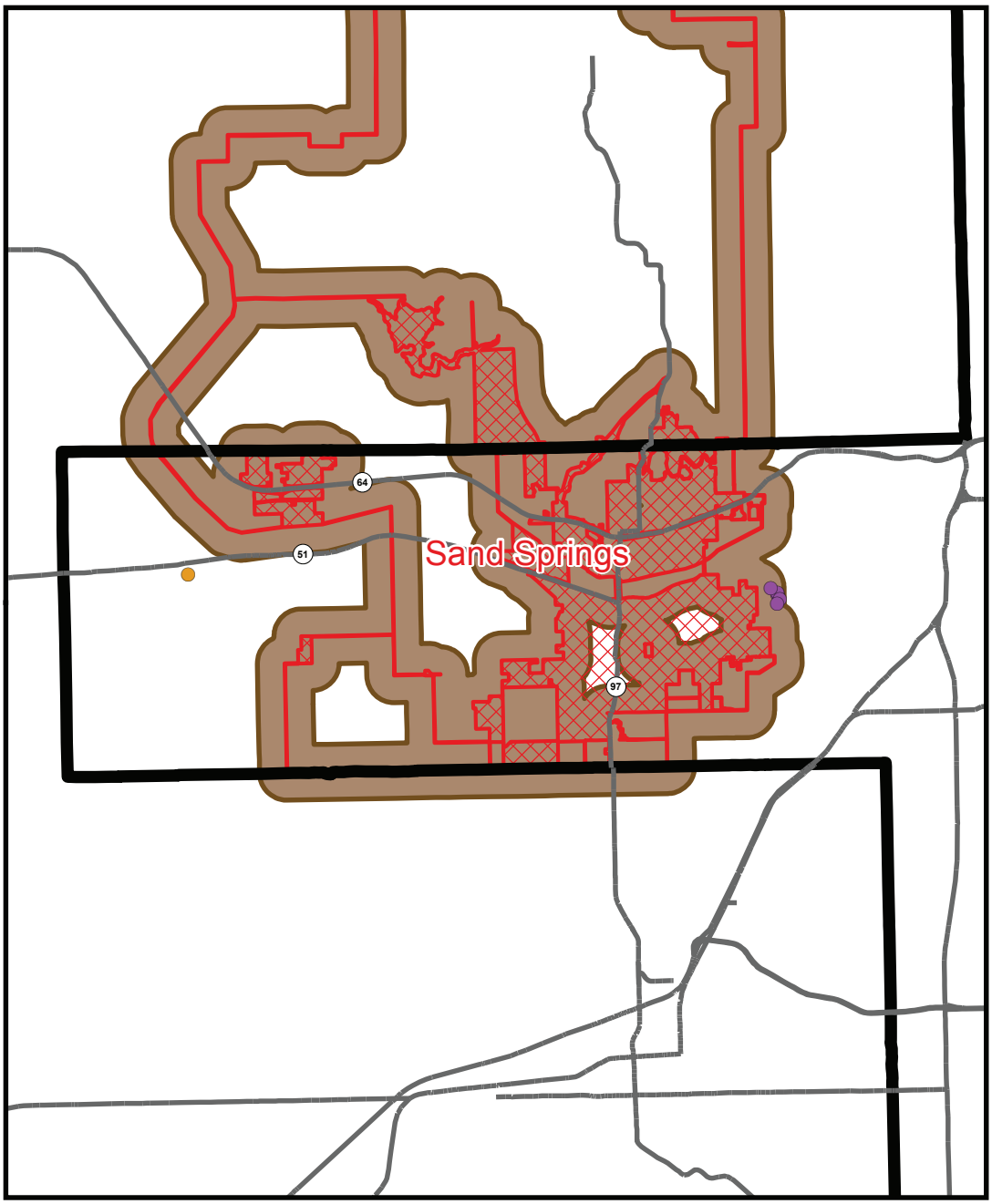
Map Number 8C

N W E S

0 5,000 10,000
Feet

Date: April 2018

INCOG



LEGEND

- Wildland-Urban Interface around the City of Sand Springs
- Tulsa County Boundary
- City of Sand Springs
- Berryhill Public Schools
- Keystone Public Schools
- Highways

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

WILDLAND URBAN INTERFACE
Berryhill Schools
Keystone Schools

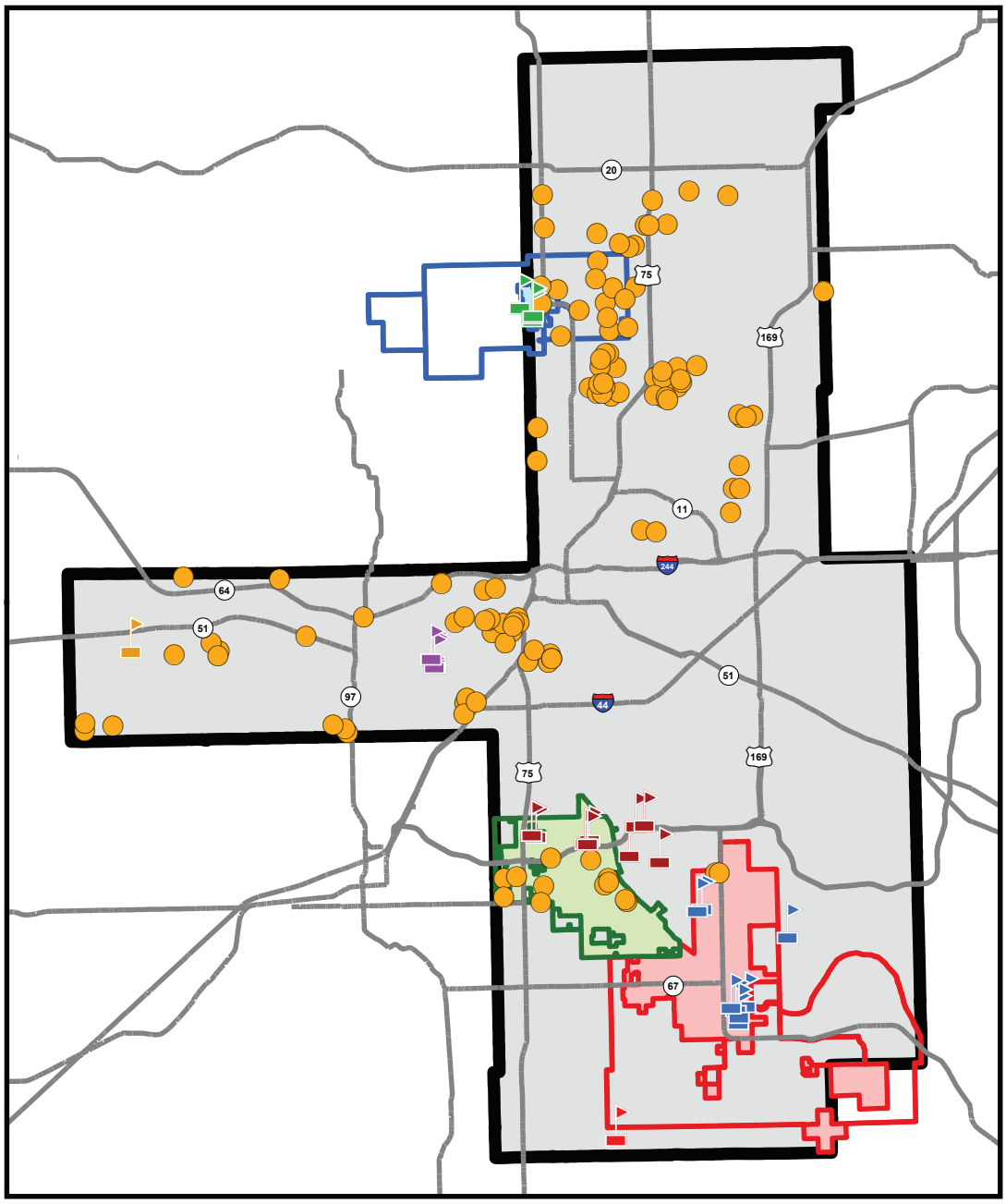
Map Number 8D

N
W E
S

0 1 2 3
Miles

Date: April 2018

INCOG



LEGEND

- Tier 2 Facilities
- Tulsa County Boundary
- State and US Highways

City Limits
- Bixby
- Jenks
- Sperry

Schools
- Berryhill
- Bixby
- Jenks
- Keystone
- Liberty
- Sperry

Tulsa County Multi-Hazard Mitigation Plan

HAZARDOUS MATERIAL LOCATIONS

N
W E
S

0 2 4 6
Miles

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Map Number 9

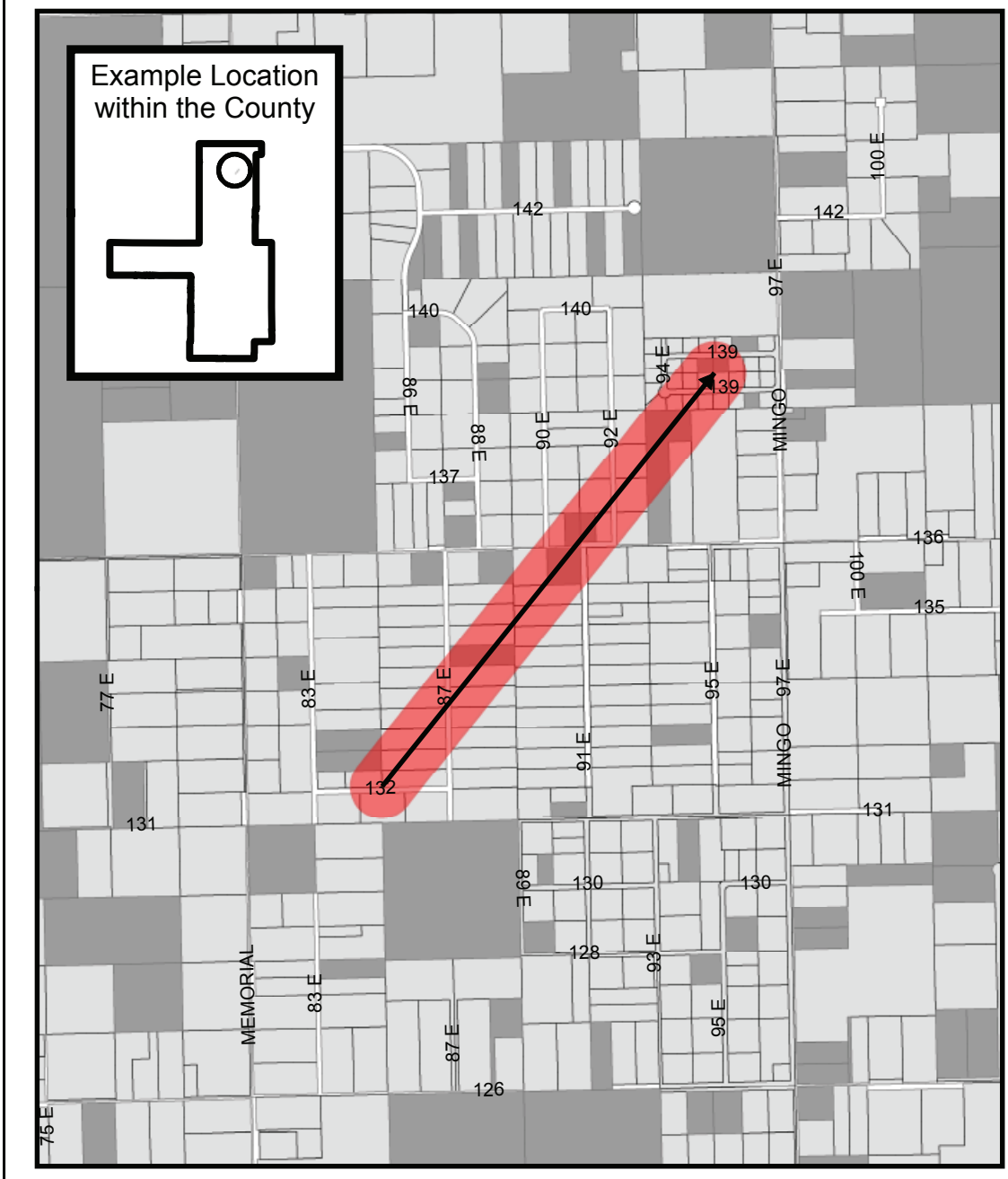
Date: April 2018

INCOG

Map Number 10 reserved for future use

Map Number 11 reserved for future use

Map Number 12 reserved for future use



LEGEND

- Hypothetical Tornado Path
- 300 ft Buffer along Tornado Path
- Undeveloped Parcels of Property
- Developed Parcels of Property

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

N W E S

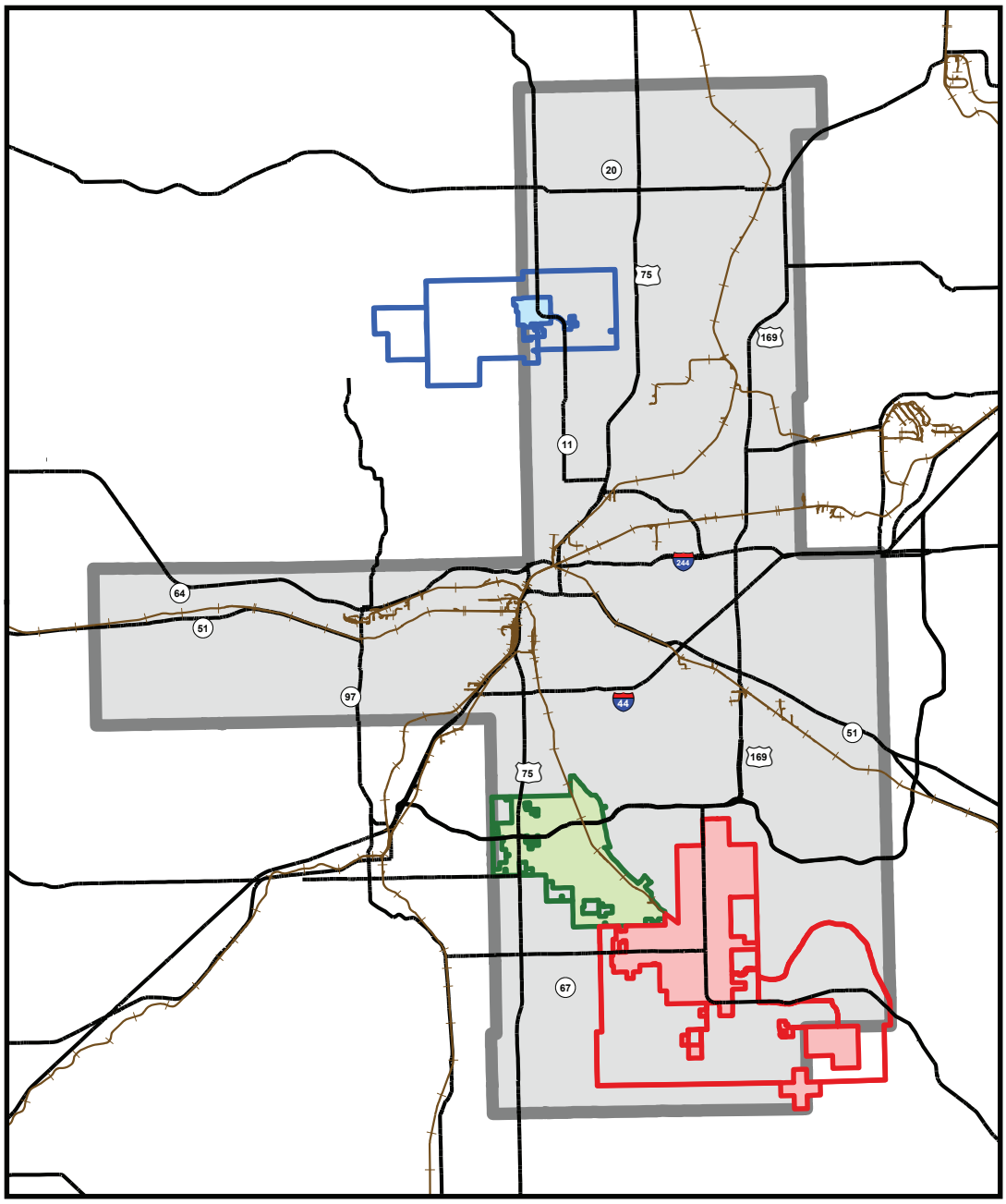
0 800 1,600 Feet

TORNADO EXAMPLE

Map Number 13

Date: April 2018 INCOG

Map Number 14 reserved for future use



LEGEND

- Tulsa County Boundary
- State and US Highways
- Railroads
- Town of Sperry
- City of Bixby
- City of Jenks

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

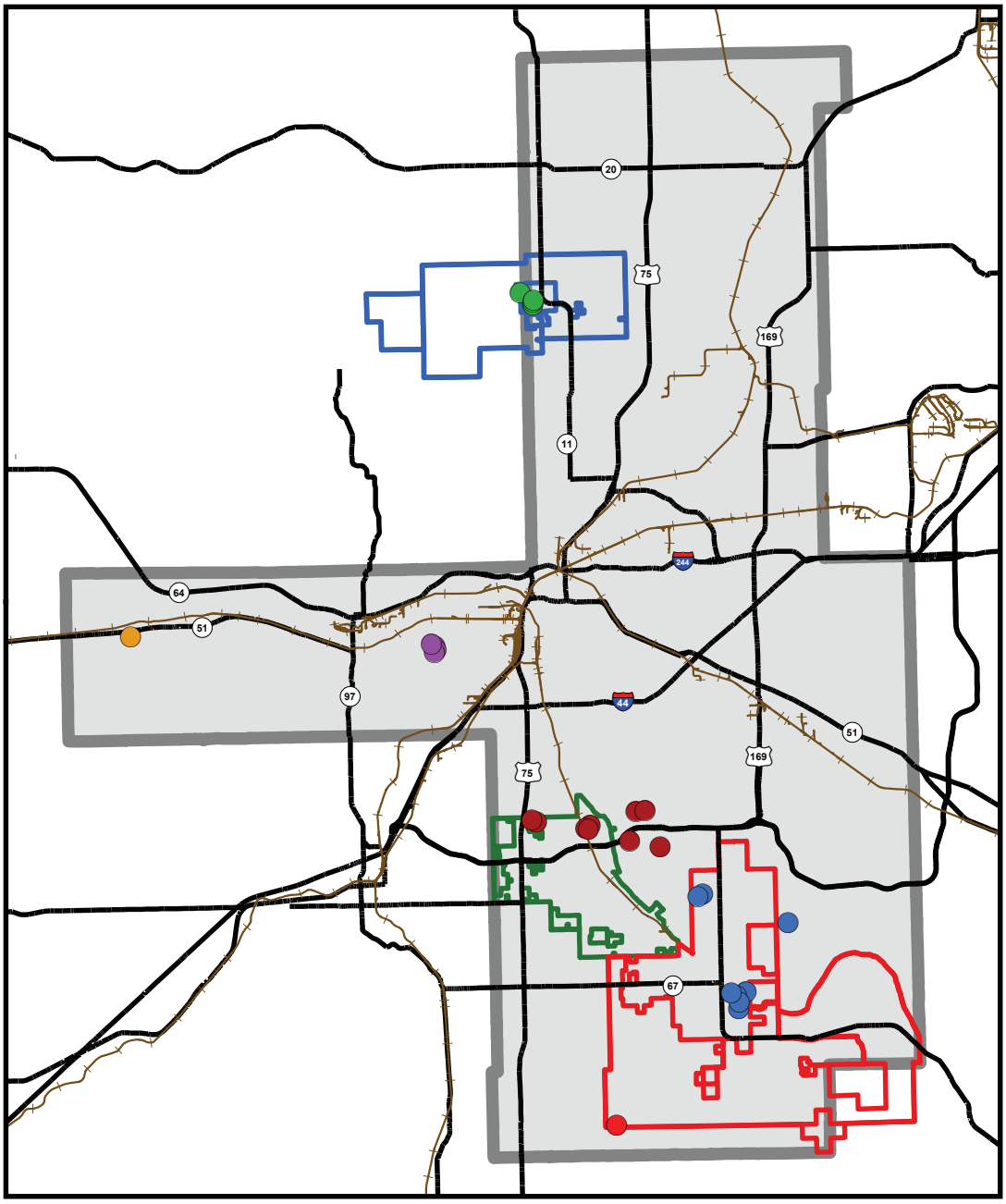
TULSA COUNTY MAJOR TRANSPORTATION ROUTES

Map Number 15

N W E S

0 2 4 6
Miles

Date: April 2018 INCOG



LEGEND

- Tulsa County
- Town of Sperry
- City of Bixby
- City of Jenks
- State and US Highways

Schools:

- Berryhill
- Bixby
- Keystone
- Jenks
- Liberty
- Sperry

Railroads

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

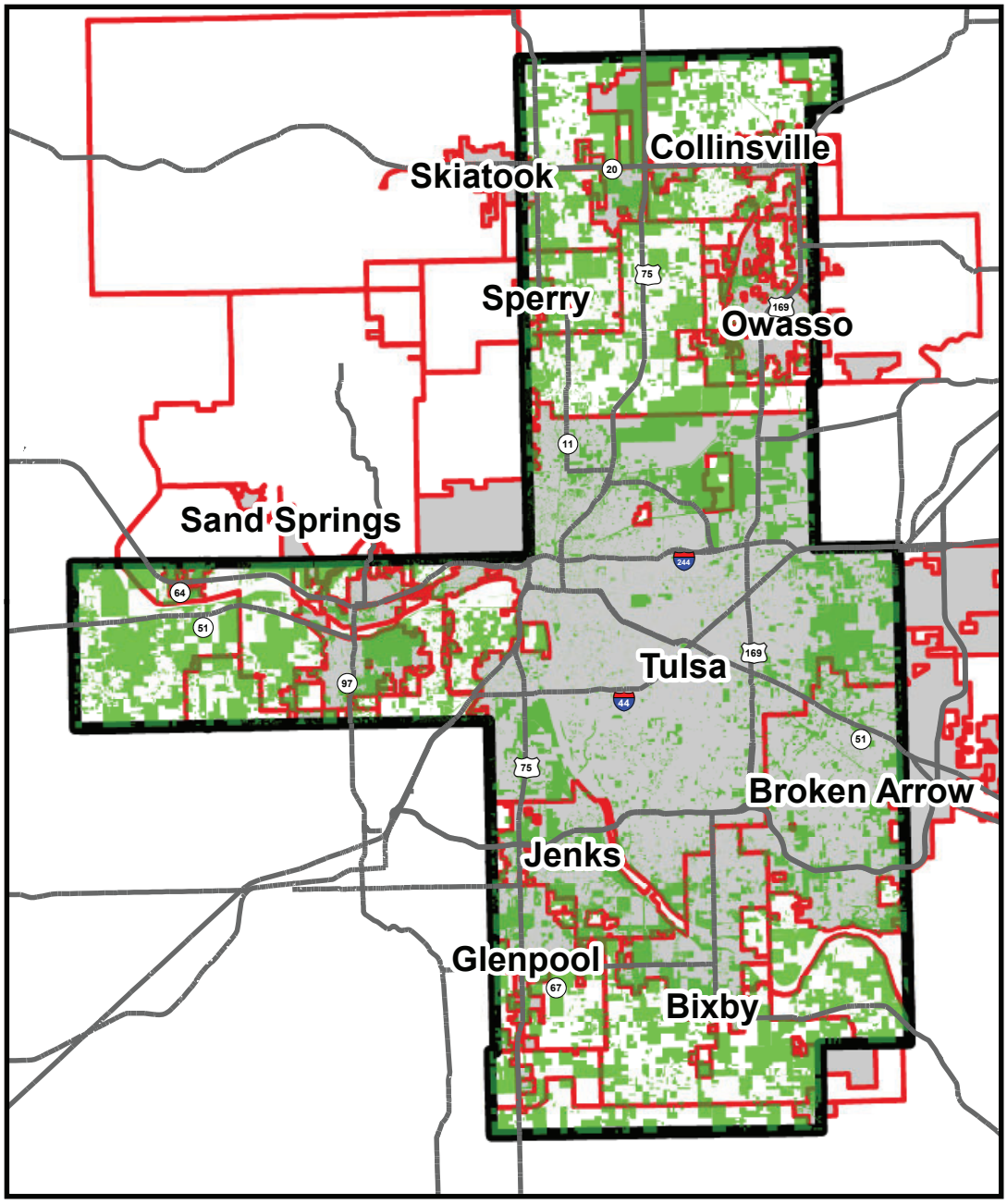
MAJOR TRANSPORTATION ROUTES and Schools

Map Number 16

N
W E
S

0 2 4 6
Miles

Date: April 2018 INCOG



LEGEND

- Undeveloped Property in Tulsa County
- Tulsa County Boundary
- City Name — Tulsa County Communities
- State and US Highways

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

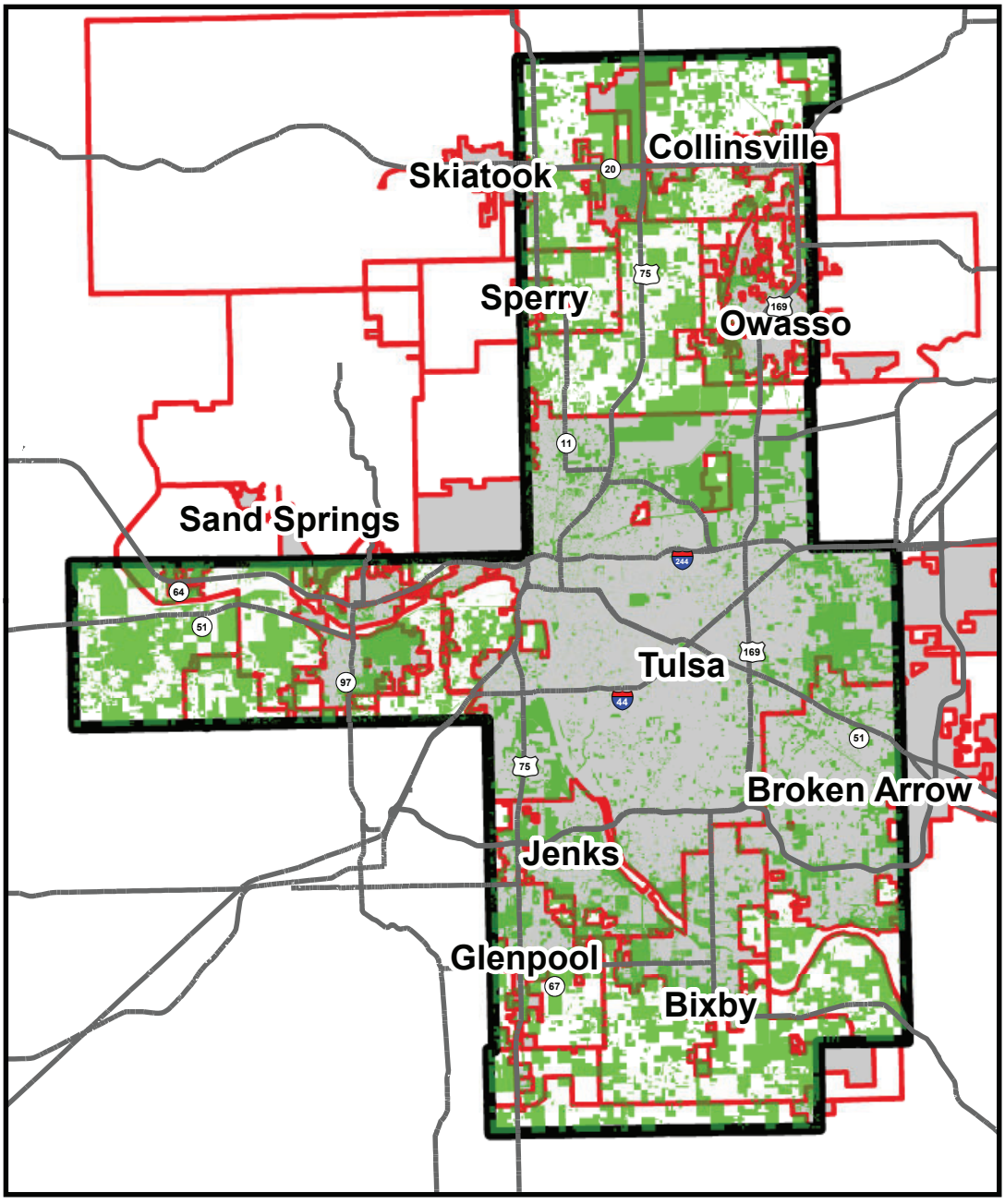
UNINCORPORATED TULSA COUNTY UNDEVELOPED PROPERTY

N W E S

0 2 4 6 Miles

Map Number 17

Date: April 2018 INCOG



LEGEND

- Undeveloped Property in Tulsa County
- Tulsa County Boundary
- City Name — Tulsa County Communities
- State and US Highways

The map features shown are an advisory tool for general hazard awareness. The hazards displayed are not a legal document to be used when making a specific hazard determination. The accuracy and location of any map feature is not guaranteed.

Tulsa County Multi-Hazard Mitigation Plan

UNINCORPORATED TULSA COUNTY UNDEVELOPED PROPERTY

N W E S

0 2 4 6 Miles

Map Number 17

Date: April 2018 INCOG


TULSA COUNTY
Appendix 2:
Committee
Meetings

Tulsa County Hazard Mitigation Plan Update Special Meeting

Sharp Center
301 East "B" Street
Jenks, OK

September 6, 2017
2:00 pm

Meeting Agenda

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to order.
2. Introductions.
3. Discussion on the need for a multi-hazard mitigation plan.
4. Discussion on the involvement of the jurisdictions participating in the plan.
5. Establishment of a committee to facilitate the update of the Tulsa County Multi-Jurisdictional Multi-Hazard Mitigation Plan.
6. Review the draft introduction to the plan and identify information needed. Gather information to complete the introduction
7. Review the planning process. Discuss the required planning process for the plan update and the hazard awareness survey and methods of dissemination and collection.
8. Summarize the information needed from the participating jurisdictions.
9. Determine meeting schedule and locations.
10. Adjourn.

TAEMA

Event: Hazard Mitigation Plan Meeting Date: 9/06/17

NAME	AGENCY	CONTACT NUMBER	EMAIL
Allison Whitsitt	TAEMA	918 596 9897	awhitsitt@tulsacounty.org
Joe Kralicek	TAEMA	918-596-9891	JKralicek@Tulsacounty.org
ROGER JOLLIFF	TAEMA	9185969898	RJOLLIFF@TULSACOUNTY.ORG
Jennifer Handley	DEQ	405-702-6185	jennifer.handley@deq.ok.gov
Michael Chad Keller	DEQ	918-293-1604	Chad.Keller@deq.OK.gov
IKE SHIRLEY	BIXBY P.D.	918 344 8510	ishirley@bixbyok.gov
Matthew Rollins	OEM	918 496-3004	Matthew.rollins@OEM.OK.gov
Mellanee Roberts	Jenks Fire	918.298.1491	mroberts@jenksok.org
JEFF BROWN	ODWC	918 331 5078	Jeff.brown@ODWC.OK.gov
JUSTIN DOWDS	INCOG	918-579-9440	JDOWDS@INCOG.ORG
Ann Domin	INCOG	918-579-9480	adomin@incog.org
ROGER C. WRIGHT	JENKS SCHOOLS	918.299.4411 EXT. 2411	roger.wright@jenksps.org
MATTHEW SWEET	Liberty public schools	918-366-8784 X133	MATTHEW.SWEET@LIBERTYPS.ORG

Minutes of the First Meeting
September 6, 2017 2:00 pm
Sharp Center, 301 East "B" Street, Jenks, OK

Present:
Roger Jolliff, TAEMA
Joe Kralicek, TAEMA
Allison Whitsitt, TAEMA
Matt Rollins, OEM
Jennifer Handley, DEQ
Michael Chad Keller, DEQ
Jeff Brown, ODWC
Ike Shirley, City of Bixby
Mellanee Roberts, City of Jenks
Roger Wright, Jenks Public Schools
Matthew Sweet, Liberty Public Schools
Justin Dowd, INCOG
Ann Domin, INCOG

Call to order and Introductions
Roger Jolliff called the meeting to order and introduced Justin Dowd from INCOG who will draft the update to the Tulsa County Hazard Mitigation Plan. Everyone introduced themselves and stated the agency they represented.

Discussion on the need for a multi-hazard mitigation plan

Roger Jolliff and Justin Dowd reviewed the need for a plan update and the addition of the cities of Jenks and Bixby and their school districts to the current Tulsa County Plan.

Discussion on the involvement of the jurisdictions participating in the plan

Roger Jolliff and Justin Dowd explained FEMA is no longer offering planning grants to communities with populations under 25,000, which is the reason Jenks and Bixby are joining the County plan. In joining the County plan, all participating jurisdictions are able to address hazards in a way that is unique to their community.

Establishment of a committee to facilitate the update of the Tulsa County Multi-Jurisdictional Multi-Hazard Mitigation Plan.

Justin Dowd explained that a committee with representatives from each of the participating jurisdictions would guide the development of the plan. Several jurisdictions were not represented at the meeting. Additionally, community members from the participating jurisdictions can sit on the committee. Several representatives stated they would ask key community members from their jurisdictions to participate. The committee will be fully constituted at the next meeting when all jurisdictions and new community members can participate.

Review the draft introduction to the plan and identify information needed. Gather information to complete the introduction

Justin Dowd distributed a draft of Chapter 1 - Introduction to the update for the Tulsa County Plan and pointed out information that was needed to fully describe each jurisdiction and to complete Chapter 1. Each jurisdiction was asked to provide the needed information.

Review the planning process. Discuss the required planning process for the plan update and the hazard awareness survey and methods of dissemination and collection.

Justin Dowd explained the use of a community survey in updating the plan. A draft survey was distributed and discussion followed regarding questions to include on the survey and methods each jurisdiction would use to obtain community input. Jurisdictions and school districts agreed to distribute the survey in the form and format that best fits their community.

Summarize the information needed from the participating jurisdictions

Justin Dowd distributed a list of information needed from each of the participating jurisdictions

Determine meeting schedule and locations

A meeting schedule was discussed, and the group agreed to meet again on October 12, 2017. Chief Shirley offered to find a meeting location in Bixby.

Adjourn – There being no further business, the meeting was adjourned.

Tulsa County Hazard Mitigation Plan Update Special Meeting

Bixby City Hall
116 W. Needles, Bixby, OK

October 12, 2017
10:00 am

Meeting Agenda

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to order.
2. Introductions.
3. Review and Approve minutes of September 6, 2017 committee meeting.
4. Discuss outstanding data to complete Chapter 1.
5. Present general population hazard awareness survey.
6. Review draft of Chapter 3, Risk and Vulnerability Analysis.
7. Review draft of Chapter 4, Mitigation Strategies.
   a. Discuss goals and objectives of the hazards' mitigation actions.
   b. Discuss mitigation activities. Identify activities for each jurisdiction.
8. Review items needed for next meeting.
9. Set date and time for next meeting.
10. Adjourn.

Event: Hazard Mitigation Meeting Date: 10.12.17

NAME	AGENCY	CONTACT NUMBER	EMAIL
Allison Whitsitt	TAEMA	918 596 9897	awhitsitt@tulsacounty.org
ROGER JULIFF	TAEMA	9185969898	RJULIFF@TULSACOUNTY.ORG
Jean McBride-Samuels	citizen Jenks cert	918 728 9828	dmcbridesamuels99@yahoo.com
Mellanee Roberts	City of Jenks	918.298.1491	mroberts@jenksok.org
Jeremy Hairrell	Jenks Public Schools	918-804-4006	jeremy.hairrell@jenksps.org
Dawn Nipps	Bixby PS	918-798-3394	dnipps@bixbyps.org
Rhett Bynum	Keystone PS	918 363-8711	rbynum@keystone.k12.ok.us
IKE SHIRLEY	BIXBY	9183660421	ishirley@bixbyok.gov
Laura Konshak	Bixby	918513-1225	lkonshak@dlp.net
Ann Domin	INCOG	918 579 9480	adomin@incog.org
Vernon Seaman	INCOG	918-579-9451	VSeaman@incog.org
JUSTIN DOWD	INCOG	918-579-9440	JDOWD@INCOG.ORG

Tulsa County Hazard Mitigation Planning Committee
Minutes of the Special Meeting
October 12, 2017 10:00 AM
116 W. Needles, Bixby, OK

Members Present:
Chair: Roger Jolliff, TAEMA
Allison Whitsitt, TAEMA
Ike Shirley, Bixby
Laura Konshak, Bixby Citizen
Mellanee Roberts, Jenks
D. Jean McBride-Samuels, Jenks Citizen
Dawn Nipps, Bixby PS
Jeremy Hairrell, Jenks PS
Rhett Bynum, Keystone PS

Others Present:
Ann Domin, INCOG
Justin Dowd, INCOG
Vernon Seaman, INCOG

Call to order and Introductions
Roger Jolliff called the meeting to order and asked for introductions.

Review and Approval of Minutes of September 6, 2017 Meeting

The Committee was asked to review the minutes of the September 6, 2017 meeting. Upon motion by Roger Jolliff and second by Ike Shirley, the committee voted unanimously to approve the minutes.

Discussion of Outstanding Data to Complete Chapter 1

Justin Dowd explained that demographic data, fire department ISO ratings, economic and industry data, school information, and flood plain data in Chapter 1 had been updated. He reviewed the remaining sections of Chapter 1 and highlighted the information needed to complete the Chapter. He stated he would email Chapter 1 to the committee once it is completed.

Presentation and Discussion of Hazard Awareness Survey

Justin Dowd stated that about 500 community hazard awareness surveys have been received. He has tabulated results from about 225 of the surveys and will continue to analyze the remaining surveys as they arrive. Results of the 225 surveys include the following:

- 92% of respondents live in Tulsa County
- The hazards of most concern are: tornadoes, high winds, hail, severe winter storms, and earthquakes
- The hazards of least concern are: dam break, expansive soil, and hazardous materials event
- News sources most often used are: social media and television news
- The public's greatest concerns are: protecting critical facilities, strengthening emergency services, protecting private property, and disclosing natural hazard risks during real estate transactions
- Actions most often taken by the public are: installing smoke detectors and talking with household members about what to do in a disaster

- The majority of respondents had never heard of the County's HMP or its need for FEMA funding
- The majority of respondents had never heard of the Tulsa Ready app

Review Draft of Chapter 3, Risk and Vulnerability Analysis

Justin Dowd distributed a draft of Chapter 3 describing each type of disaster and the data available to analyze the frequency of occurrence and severity of each disaster. Information need to complete the chapter was pointed out. The necessity of including dam and levee breaks in the analysis was discussed. This chapter also identifies local assets and potential losses. That data is still being gathered and analyzed. Once complete, Chapter 3 will be sent out for final review. Justin asked each jurisdiction to review the chapter to make sure local concerns and vulnerabilities are included.

Set Date and Time for Next Meeting

After brief discussion, it was decided that the next meeting will be on December 7, 2017 at 10:00 AM in Berryhill with the exact meeting location to be determined and sent out with the next agenda.

Adjourn – There being no further business, the meeting was adjourned.

STATE OF OKLAHOMA
TULSA COUNTY
RECEIVED
2017 DEC -5 AM 7:55

MICHAEL WILLIS
TULSA COUNTY CLERK

Tulsa County Hazard Mitigation Plan Update
Planning Committee Special Meeting
Berryhill Administration Offices
2900 S. 65th West Avenue

December 7, 2017
10:00 am

AGENDA

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to Order and Introductions
2. Approval of Minutes of October 12, 2017 Meeting
3. INCOG Staff Update
4. Presentation and Discussion of Survey Results
5. Distribution of Final Draft of Chapter 1
6. Discussion of Updates to Chapter 3
7. Next Meeting – Discussion of Next Steps and Schedule Meeting
8. Adjourn

12/07/17

Hazard Mitigation Plan meeting

Name	Organization	Email
Joe Kralicek	TAEMA	JKralicek@TulsaCounty.org
Allison Whitsitt	TAEMA	awhitsitt@tulsacounty.org
ROGER JOLLIFF	TAEMA	RJOLLIFF@TULSACOUNTY.ORG
Mike Campbell	Berryhill	mike.campbell@berryhillschools.org
Rhett Bynum	Keystone	rbynum@keystone.k12.ok.us
IKE SHIRLEY	Bixby	ishirley@bixbyok.gov
Tracy Keeley	OEM	tracy.keeley@oem.ok.gov
Vernon Seaman	INCOG	vseaman@incog.org
Jeremy Hairrell	Jenks Schools	jeremy.hairrell@jenksps.org
ROGER WRIGHT	" "	roger.wright@jenksps.org
MATTHEW SWEET	Liberty Schools	MATTHEW.SWEET@LIBERTYPS.ORG
Mike Juby	Sperry Schools	mjuby@sperry.k12.ok.us
JUSTIN DOWD	INCOG	JDOWD@INCOG.ORG
Ann Donin	INCOG	

Tulsa County Hazard Mitigation Planning Committee
Minutes of the Special Meeting
December 7, 2017 10:00 AM
Berryhill Administrative Offices
Berryhill Public Schools

Members Present:
Chair: Roger Jolliff, TAEMA
Joe Kralicek, TAEMA
Allison Whitsitt, TAEMA
Ike Shirley, Bixby
Mike Campbell, Berryhill Public Schools
Roger Wright, Jenks Public Schools
Jeremy Hairrell, Jenks Public Schools
Rhett Bynum, Keystone Public Schools
Matthew Sweet, Liberty Public Schools
Mike Juby, Sperry Public Schools

Others Present:
Justin Dowd, INCOG
Vernon Seaman, INCOG
Ann Domin, INCOG
Tracy Keeley, OID

Call to order and Introductions
Roger Jolliff called the meeting to order and asked for introductions. Mr. Jolliff announced that he was retiring from the Tulsa Area Emergency Management Agency (TAEMA) as of December 8th. He asked that Joe Kralicek, TAEMA Deputy Director, serve in his place as Chair of the Planning Committee.

Review and Approval of Minutes of October 12, 2017 Meeting
The Committee was asked to review the minutes of the October 12, 2017 meeting. Upon motion for approval by Joe Kralicek and second by Ike Shirley, the minutes were unanimously approved.

INCOG Staff Update
Justin Dowd advised the committee that since the last committee meeting in October, staff had met with Sperry and Sperry Public Schools to discuss the update to the Tulsa County Hazard Mitigation Plan and the data needed from those entities. They also met separately with Liberty Public Schools for the same purpose.

Presentation and Discussion of Hazard Awareness Survey
Justin Dowd stated that he had received 465 community surveys. The survey results had been tabulated and graphed, and those graphs were distributed. Results of the 465 surveys include the following:

- The hazards of most concern are: tornadoes, high winds and severe winter storms
- The hazards of least concern are: dam break, expansive soil, and drought
- News sources most often used are: television news and social media
- The public's greatest concerns are: protecting critical facilities, strengthening emergency services, and protecting private property
- Actions most often taken by the public are: installing smoke detectors and developing a household emergency plan
-

Distribution of Final Draft of Chapter 1
Justin Dowd distributed a completed Chapter 1 advising that required data had been collected and included in the chapter. While several entities may develop additional data they wish to add

to the chapter, it is complete unless INCOG is advised of changes by the committee. Committee members were encouraged to review the chapter to ensure accuracy and their satisfaction with it.

Discussion of Updates to Chapter 3, Risk and Vulnerability Analysis
Justin Dowd reminded the committee that Chapter 3 describes each type of disaster and contains the data available to analyze the frequency of occurrence and severity of disasters, local assets and potential losses from each disaster. Discussion regarding the value of school buildings was discussed. Information needed from each jurisdiction to complete the chapter was distributed. A completed copy of Chapter 3 will be distributed at the next meeting for final review.

Set Date and Time for Next Meeting
After brief discussion, it was decided that the next meeting will be held on February 22, 2018 at 9:00 AM in Bixby. A brief list of hazard mitigation activities was distributed with an explanation of the next step of the plan, i.e. to develop mitigation activities for each hazard identified earlier in the plan.

Adjourn – There being no further business, the meeting was adjourned.

Tulsa County Hazard Mitigation Plan Update
Planning Committee Special Meeting

Bixby City Hall
116 W Needles, Bixby, OK 74008

February 27, 2018
2:00 pm

AGENDA

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to Order and Introductions
2. Approval of Minutes of December 7, 2017 Meeting
3. Letters of Participation
4. INCOG Staff Update
5. Evaluate and Reaffirm or Change Hazard Mitigation Goals
6. Mitigation Actions – Current and Proposed
7. Next Meeting – Discussion of Next Steps and Schedule Meeting
8. Adjourn

Event: Hazard Mitigation Meeting Date: 2-27-18

NAME	AGENCY	CONTACT NUMBER	EMAIL
Allison Whitsitt	TAEMA	596 9897	awhitsitt@tulsacounty.org
Laura Konshak	Bixby	918.513.1225	lkonshak@olp.net
Rhett Bynum	Keystone	918 231-9206	rbynum@keystone.k12.ok.us
Justin Dowd	INCOG	918 579-9440	JDOWD@INCOG.ORG
Joe Kralicek	TAEMA	918-596-9891	Jkralicek@tulsacounty.org
Vernon Seaman	INCOG	918-579-9451	vseaman@incog.org
Jeremy Hairrell	Jenks School	918-804-4006	jeremy.hairrell@jenksps.org
Dawn Nipps	Bixby	918-798-3394	dnipps@bixbyps.org
IKE SHIRLEY	BIXBY P.D.	9183660421	ishirley@bixbyok.gov
Jason Jackson	Jenks PD	918-946-3914	jjackson@jenksok.org

Tulsa County Hazard Mitigation Planning Committee
Minutes of the Special Meeting
February 27, 2018 2:00 PM
Bixby City Hall
116 W. Needles Bixby, OK

Members Present:
Chair: Joe Kralicek, TAEMA
Allison Whitsitt, TAEMA
Ike Shirley, Bixby
Laura Konshak, Bixby
Jason Jackson, Jenks
Dawn Nipps, Bixby Schools
Jeremy Hairrell, Jenks Schools
Rhett Bynum, Keystone Schools

Others Present:
Justin Dowd, INCOG
Vernon Seaman, INCOG

Call to order and Introductions
Joe Kralicek, Chair, called the meeting to order at 2:00 PM and asked members to introduce themselves.

Approval of Minutes of December 7, 2017 Meeting

The Committee was asked to review the minutes of the October 12, 2017 meeting. Upon motion for approval by Rhett Bynum and second by Ike Shirley, the minutes were unanimously approved.

Letters of Participation

Justin Dowd pointed out that Letters of Participation indicating the intent to participate in the Tulsa County Hazard Mitigation planning process were needed for jurisdictions that had not provided those. A sample letter was provided to Rhett Bynum from the Keystone School District. Sample letters will be sent to the Town of Sperry and to the Berryhill, Liberty, and Sperry School Districts.

INCOG Staff Update

Justin Dowd explained that Chapters 1 and 2 of the Tulsa County Hazard Mitigation Plan were completed. He explained the purpose of Chapter 3, and he advised that the first section of Chapter 3 is essentially complete. Completion of the second section of that chapter requires information from committee members. The list of required information was reviewed with the committee.

Evaluate, Reaffirm or Change Hazard Mitigation Goals

Justin Dowd distributed and reviewed draft Goals and Objectives of the Hazard Mitigation Plan and asked for feedback. Committee members were asked to submit changes or comments regarding the goals and objectives within 2 weeks.

Discussion of Mitigation Actions

Mitigation actions were discussed. Mitigation actions listed in the existing Tulsa County Hazard Mitigation Plan developed by Tulsa County, Town of Sperry and the four original participating school districts were distributed. It was noted that at least two actions per hazard are required for the updated plan. Committee members were asked to review the examples of mitigation activities and within four weeks to return to Justin any edits to the examples as well as new mitigation actions.

Set Date and Time for Next Meeting

After brief discussion, it was decided that the next meeting would be held during the first week of May. An exact meeting date, time and location will be determined.

Adjourn – There being no further business, Joe Kralicek moved that the meeting be adjourned. The motion was seconded by Ike Shirley and passed unanimously.

Tulsa County Hazard Mitigation Plan Update
Planning Committee Special Meeting

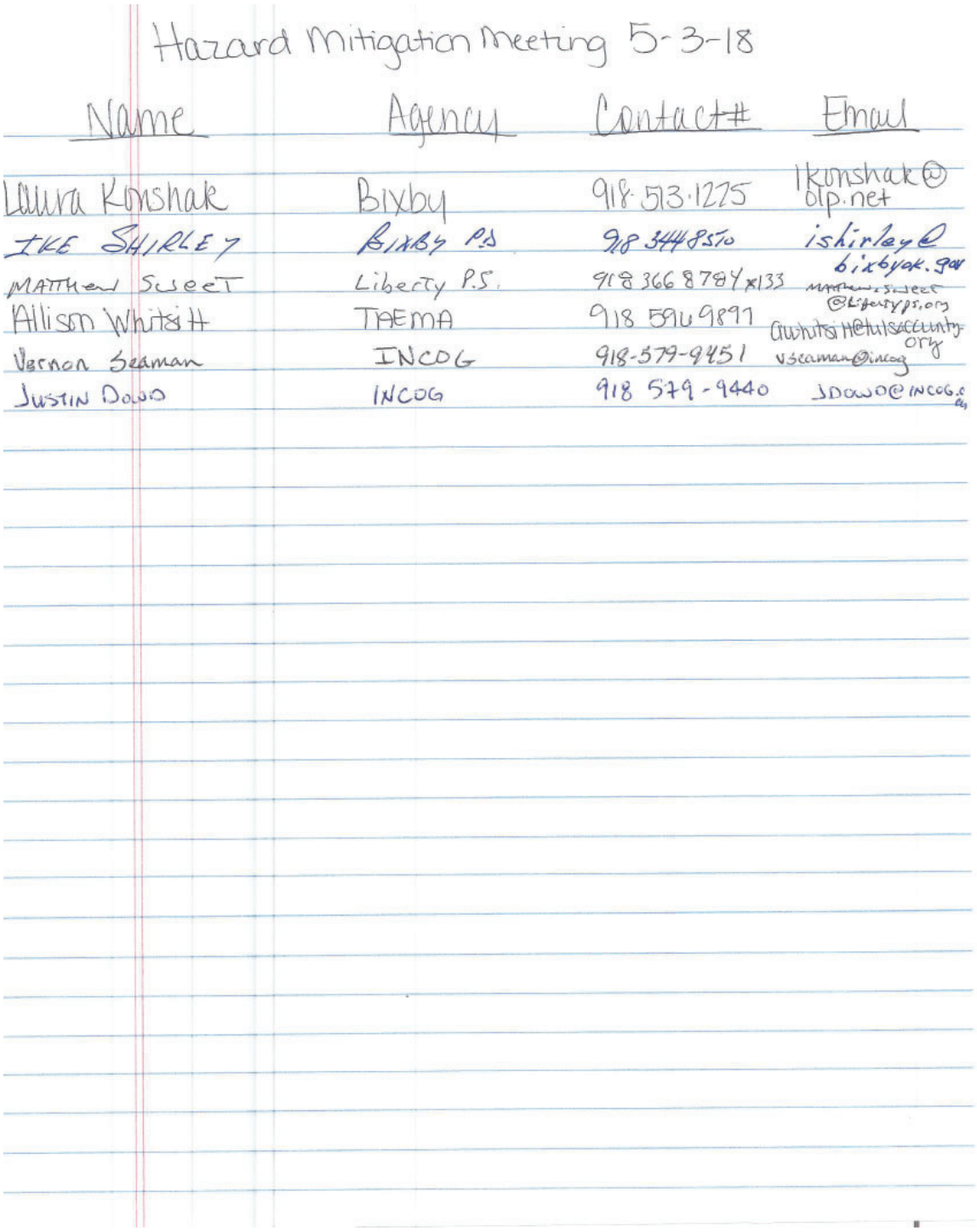
Bixby City Hall
116 W Needles, Bixby, OK 74008

May 3, 2018
2:00 pm

AGENDA

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to Order and Introductions
2. Approval of Minutes of February 27, 2018 Meeting
3. INCOG Staff Update
4. Mitigation Actions (Ch. 5) – Current and Proposed
5. Plan Maintenance (Ch. 6)
6. Summer Contact Info for School Jurisdictions
7. Next Meeting – Discussion of Next Steps and Schedule Meeting
8. Adjourn



Hazard Mitigation Meeting 5-3-18

Name	Agency	Contact#	Email
Laura Konshak	Bixby	918-513-1275	lkonshack@olp.net
IKE SHIRLEY	BIXBY PS	918 3448570	ishirley@bixbyok.gov
MATTHEW SWEET	Liberty P.S.	918 366 8784 x133	MATTHEW.SWEET@LIBERTYPS.ORG
Allison Whitsitt	TAEMA	918 591 9891	awhitsitt@tulsacounty.org
Vernon Seaman	INCOG	918-579-9451	vseaman@incog
JUSTIN DOOD	INCOG	918 579-9440	JDOW0@INCOG.org

Tulsa County Hazard Mitigation Planning Committee
Minutes of the Special Meeting
May 3, 2018 2:00 PM
Bixby City Hall
116 W. Needles Bixby, OK

Members Present:
Allison Whitsitt, TAEMA
Ike Shirley, Bixby
Laura Konshak, Bixby
Matthew Sweet, Liberty Public Schools

Others Present:
Justin Dowd, INCOG
Vernon Seaman, INCOG

Call to order and Introductions
Justin Dowd called the meeting to order at 2:10 PM and asked members to introduce themselves.

Approval of Minutes of December 7, 2017 Meeting

The Committee was asked to review the minutes of the February 27, 2018 meeting. Upon motion for approval by Ike Shirley and second by Allison Whitsitt, the minutes were unanimously approved.

INCOG Staff Update

Justin Dowd explained that Chapter 3 of the Tulsa County Hazard Mitigation Plan was completed. He presented the maps created in conjunction with the hazard analysis in Chapter 3. He explained that Chapter 4 was complete, but he had received a request the week of the meeting to make edits. Once edits were completed, Chapter 4 would be distributed to the committee for review.

Mitigation Actions (Chapter 5) – Current and Proposed

Justin Dowd opened the meeting for question and answers regarding each jurisdiction's action plan. Mitigation actions were discussed. Justin Dowd handed out each jurisdiction's current action plan for review. He explained each jurisdiction needed to review the actions and determine the status of each item and whether or not to include it in the update. Lastly, he explained each jurisdiction needed to look over their action plan and review the priority of each action to the jurisdiction.

Plan Maintenance (Chapter 6)

Justin Dowd reviewed the plan maintenance plan, which explains what each jurisdiction will do to keep their plan up-to-date.

Set Date and Time for Next Meeting

After brief discussion, it was decided that the next meeting would be held early September. An exact meeting date, time and location will be determined.

Adjourn – There being no further business, Ike Shirley moved that the meeting be adjourned. The motion was seconded by Laura Konshak and passed unanimously.

Tulsa County Hazard Mitigation Plan Update
Planning Committee Special Meeting

Bixby City Hall
116 W Needles, Bixby, OK 74008

October 11, 2018
2:00PM

AGENDA

CONSIDER, DISCUSS, AND/OR TAKE ACTION ON:

1. Call to Order and Introductions
2. Approval of Minutes of May 3, 2018 Meeting
3. INCOG Staff Update
4. Discussion of Costs and Damages Associated with Hazard Events
5. Planning Process (Chapter 2)
6. Mitigation Actions (Chapter 5)
7. Next Steps
8. Next Meeting Discussion
9. Adjourn

Tulsa County Hazard Mitigation Plan Update Planning Meeting

October 11, 2018

Name	Agency	Phone #	Email
Justin Dowd	INCOG	918-574-9440	jdowd@incog.org
Vernon Seaman	INCOG	918-579-9451	vseaman@incog.org
Matthew Sweet	Liberty PS	918 779 5761	Matthew.Sweet @LibertyPS.org
Roger C. Wright	Jenks Schools	918.299.4411, Ext. 2411	roger.wright @ jenksps.org
Lydia Wilson	Bixby Schools	918-366-2240	lwilson@bixbyps.org
Mike Campbell	Berryhill Schools	918-445-6000	mike.campbell@ berryhillschools.org
Laura Konshak	Bixby CERT	918.513.1225	LKonshak@ DLP.NET
Ike Shirley	City of Bixby	9183448510	ishirley@ bixbyok.gov
Mike Juby	Sperry Schools	918-284-1865	mjuby@ sperry.k12.ok.us
Tony Rodda	TAEMA	918-596-9891	trodda@tulsacounty.org
Joe Kralick	TAEMA	918-596-9898	Skralick@tulsacounty.org
Allison Whitsitt	TAEMA	918 596 4897	awhitsitt@tulsacounty.org

Tulsa County Hazard Mitigation Planning Committee
Minutes of the Special Meeting
October 11, 2018 2:00 PM
Bixby City Hall
116 W. Needles Bixby, OK

Members Present:
Joe Kralicek, TAEMA
Tony Roda, TAEMA
Allison Whitsitt, TAEMA
Ike Shirley, Bixby
Laura Konshak, Bixby
Mike Campbell, Berryhill Public Schools
Lydia Wilson, Bixby Public Schools
Roger Wright, Jenks Public Schools
Matthew Sweet, Liberty Public Schools
Mike Juby, Sperry Public Schools

Others Present:
Justin Dowd, INCOG
Vernon Seaman, INCOG

Call to order and Introductions

Justin Dowd called the meeting to order at and asked members to introduce themselves.

Approval of Minutes of May 3, 2018 Meeting

The Committee was asked to review the minutes of the May 3, 2018 meeting. Upon motion for approval by Ike Shirley and second by Allison Whitsitt, the minutes were unanimously approved.

INCOG Staff Update

Justin Dowd explained to the committee that he met with Roger Wright (Jenks Public Schools), Jason Jackson (City of Jenks), and John Carr (Town of Sperry) to discuss and give guidance to their individual jurisdictions' action plans. In addition, Chapter 2 (Planning Process) was complete and distributed to the committee for review. The Appendices were also compiled and Chapter 5 (Mitigation Actions) was also compiled and ready for review and discussion.

Discussion of Costs and Damages Associated with Hazard Events

Vernon Seaman explained to the committee that INCOG had looked through various sources to find data on hazard occurrences and the damage associated with those hazard occurrences; however, INCOG wanted additional input from the committee. The committee was asked to review a list of hazard occurrences and damages and provide any additional information they could find on damages associated with those hazard events as well as any hazard events not recorded by the sources INCOG reviewed.

Planning Process (Chapter 2)

Justin Dowd reviewed the Planning Process, which explains the planning process the committee undertook to develop the plan update.

Mitigation actions (Chapter 5)

Justin Dowd explained INCOG received all the requested information needed from the committee to complete this chapter. In addition, INCOG made revisions to each jurisdiction's submitted actions to standardize the writing style and asked the committee to review the changes to ensure the intent was not changed.

Next Steps

Justin Dowd reviewed the next steps the committee must complete in order to submit the completed plan for State and Federal review.

Set Date and Time for Next Meeting

After brief discussion, it was decided the next meeting would be held after the public hearing to review submitted comments and potentially approve the completed plan for submittal to the Oklahoma Emergency Management for State review.

Adjourn – There being no further business, Joe Kralicek moved that the meeting be adjourned. The motion was seconded by Laura Konshak and passed unanimously.

Page reserved for public hearing notice.

Page reserved for public hearing attendance.

Page reserved for public hearing minutes.

Page reserved for meeting agenda.

Page reserved for meeting attendance.

Page reserved for meeting minutes.

Appendix 3: Sample Comment Letter

Tulsa Area Emergency Management Agency
600 Civic Center, E.O.C
Tulsa, OK 74103

August 22, 2017

Rich Brierre
Executive Director
INCOG
2 W Second Street, Suite 800
Tulsa, OK 74103

RE: Tulsa County Hazard Mitigation Plan

Dear Mr. Brierre:

The Federal Emergency Management Agency through the Oklahoma Department of Emergency Management has awarded Tulsa County a grant through the hazard mitigation grant program to update the County's Multi-Hazard Mitigation Plan. This is an opportunity to add the City of Jenks, City of Bixby, Bixby Public Schools, and Jenks Public Schools to the Tulsa County Multi-Hazard Mitigation Plan while resetting the 5-year plan renewal time clock for the County's plan per Tulsa County's Multi-Hazard Mitigation Plan Maintenance Agreement. This grant also ensures Tulsa County and its participating members can produce a Multi-Hazard Mitigation Plan at no cost to themselves.

The initial meeting in the planning process to update the Tulsa County Multi-Hazard Mitigation Plan will be held on September 6, 2017 from 2:00-3:00 p.m. The meeting will be held at Jenks High School on the 3rd Floor of the Sharp Center located on the north side of the football stadium, 301 East "B" Street, Jenks, OK. We would like you to attend and participate in the planning process. If unable to attend, please consider sending a representative to participate in the planning process.

If you have any questions, please contact me at (918) 596-9898, or Justin Dowd, INCOG, at (918) 584-7526.

Sincerely,

Roger Jolliff
Director, TAEMA

Page reserved for invitation to provide comments.

Appendix 4: Questionnaire

Tulsa County Hazard Mitigation Public Opinion Survey

Do you live in Tulsa County? Yes □ No □ Do you work in Tulsa County? Yes □ No □

Tulsa County is in the process of updating its Multi-Hazard Mitigation Plan. This plan is a strategic planning guide to reduce the impact of natural hazards and hazardous material events on the County. This survey is intended to understand the citizen's awareness and level of concern of hazards that could impact the Tulsa County area.

1. How concerned are you about the following natural disasters affecting your county?
(Check the corresponding box for each hazard)

Natural Disaster	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
Dam Break	□	□	□	□	□
Drought	□	□	□	□	□
Earthquake	□	□	□	□	□
Expansive Soil	□	□	□	□	□
Extreme Heat	□	□	□	□	□
Flood	□	□	□	□	□
Hailstorm	□	□	□	□	□
Hazardous Materials Event	□	□	□	□	□
High Wind	□	□	□	□	□
Lightning	□	□	□	□	□
Severe Winter Storm	□	□	□	□	□
Tornado	□	□	□	□	□
Wildfire	□	□	□	□	□
Other: _____	□	□	□	□	□

2. What is the most effective way for you to receive information about how to make your household and home safer from natural disasters?
(Please check up to three)

Newspapers:
- □ Newspaper stories
- □ Newspaper ads

Television:
- □ Television news
- □ Television ads

Radio:
- □ Radio news
- □ Radio ads

Internet:
- □ Email newsletters
- □ Online news outlets
- □ Social media (e.g. Facebook)

Other methods
- □ Schools
- □ Outdoor advertisements (billboards, etc.)
- □ Books
- □ Mail
- □ Fire Department/Rescue
- □ Fact sheet/brochure
- □ Chamber of Commerce
- □ Public workshops/meetings
- □ Magazine
- □ University or research institution
- □ Other: _____

3. Natural Hazards can have a significant impact on a community, but planning for these events can help lessen the impacts. The following statements will help determine citizen priorities regarding planning for natural hazards in you county. **Please tell us how important each one is to you.**

Statements	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Protecting private property	□	□	□	□	□
Protecting critical facilities (e.g. transportation networks, hospitals, fire stations)	□	□	□	□	□
Preventing development in hazard areas	□	□	□	□	□
Enhancing the function of natural features (e.g. streams, wetlands)	□	□	□	□	□
Protecting historical and cultural landmarks	□	□	□	□	□
Protecting and reducing damage to utilities	□	□	□	□	□
Strengthening emergency services (e.g. police, fire, ambulance)	□	□	□	□	□
Disclosing natural hazard risks during real estate transactions	□	□	□	□	□
Promoting cooperation among public agencies, citizens, non-profit organizations, and businesses	□	□	□	□	□

4. Households can mitigate and prepare for natural hazards in order to prevent damage to property, injuries, and loss of life. The precautions you take and training you receive can make a big difference in your ability to recover from a natural disaster or emergency. Access to basic services, such as electricity, gas, water, telephones and emergency care may be cut off temporarily, or you may have to evacuate at a moment's notice.

   In the following list, please check those activities that you have done in your household, plan to do in the near future, have not done, or are unable to do.

In your household, have you or someone in your household:	Have Done	Plan To Do	Not Done	Unable To Do
Attended meetings or received written information on natural disasters or emergency preparedness?	☐	☐	☐	☐
Talked with members in your household about what to do in case of a natural disaster or emergency?	☐	☐	☐	☐
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	☐	☐	☐	☐
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries, or other emergency supplies)?	☐	☐	☐	☐
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	☐	☐	☐	☐
Prepared your home by having smoke detectors on each level of the house	☐	☐	☐	☐
Discussed or created a utility shutoff procedure in the event of a natural disaster?	☐	☐	☐	☐

5. Prior to receiving this survey, were you aware of your county's Hazard Mitigation Plan?

   ☐ Yes

   ☐ No

6. Prior to receiving this survey, were you aware that the Federal Emergency Management Agency (FEMA) requires your county to update the Hazard Mitigation Plan every five years in order for your county to be eligible for federal pre- and post-disaster hazard mitigation funds?

   ☐ Yes

   ☐ No

7. Are you familiar with the "Tulsa Ready" personal preparedness app for mobile devices that you can download from http://readydl.com/tulsa-ready?

   ☐ Yes

   ☐ No

If you have any comments, suggestions, or additional concerns, please note them below:

Please return to Justin Dowd of INCOG at jdowd@incog.org or 2 West Second Street, Suite 800, Tulsa, OK 74103

Survey Results

Responses: 465 persons responded to the survey

Scoring:

Not Concerned	= 1 point (minimum score per hazard)
Not Very Concerned	= 2 points
Neutral	= 3 points
Somewhat Concerned	= 4 points
Very Concerned	= 5 points (maximum score per hazard)

Hazard	Average Survey Score
Tornado	4.27
Severe Winter Storm	3.62
Earthquake	3.58
High Wind	3.55
Hailstorm	3.54
Flood	3.52
Lightning	3.38
Extreme Heat	3.35
Wildfire	3.30
Hazardous Materials Event	3.18
Drought	3.10
Expansive Soil	2.69
Dam Break	2.61

News Outlet	Average Survey Response
Television News	67.40%
Social Media	54.63%
Email Newsletters	36.78%
Radio News	35.90%
Mail	22.91%
Online News Outlets	22.47%
Schools	16.74%
Newspaper Stories	15.20%
Fact Sheet/Brochure	11.45%
Television Ads	9.03%
Radio Ads	7.27%
Fire Department/Rescue	6.83%
Outdoor Advertisements	5.95%
Public Workshops/Meetings	5.95%
Chamber of Commerce	3.08%
Books	1.98%
University or Reseach Institution	1.54%
Newspaper Ads	1.32%
Magazine	1.32%

Citizen Priorities	Average Survey Score
Protecting private property	4.89
Promoting cooperation among public agencies, citizens, non-profit organizations, and businesses	4.7
Protecting critical facilities	4.64
Disclosing natural hazard risks during real estate transactions	4.6
Protecting historical and cultural landmarks	4.53
Enhancing the function of natural features	4.42
Strengthening emergency services	4.3
Preventing development in hazard areas	4.17
Protecting and reducing damage to utilities	4.1

Citizen Preparedness				
	Have Done	**Plan to Do**	**Not Done**	**Unable to Do**
Attended Meetings or received written info on natural disaster or emergency preparedness	36.0%	9.2%	53.3%	1.4%
Talked with members in your household about what to do in case of a natural disaster or emergency	73.5%	11.7%	13.5%	1.4%
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster	55.9%	24.0%	19.2%	0.9%
Prepared a "Disaster Supply Kit"	34.9%	29.0%	35.6%	0.5%
In the last year, was trained in First Aid or CPR	51.7%	6.2%	40.9%	1.1%
Prepared home by having smoke detectors on each level of the house	94.3%	2.8%	3.0%	0.0%
Discussed or created a utility shutoff procedure in the event of a natural disaster	23.1%	20.8%	20.8%	23.1%

Citizen Awareness of Hazard Mitigation Planning Efforts		
	Yes	**No**
Aware of the Tulsa County HMP	10.3%	89.7%
Aware of FEMA's requirement to update HMP's every 5 years to remain eligible for pre- and post-disaster hazard mitigation funds	17.4%	82.6%
Aware of the "Tulsa Ready" personal preparedness app for mobile devices	10.3%	89.7%


TULSA COUNTY
Appendix 5:
Plan Resolutions

Page reserved for Tulsa County Plan Adoption Resolution.

Page reserved for City of Bixby Plan Adoption Resolution.

Page reserved for Town of Sperry Plan Adoption Resolution.

Page reserved for Berry Hill Public Schools Plan Adoption Resolution.

Page reserved for Bixby Public Schools Plan Adoption Resolution.

Page reserved for Berry Hill Public Schools Plan Adoption Resolution.

Page reserved for Keystone Public Schools Plan Adoption Resolution.

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Page reserved for Sperry Public Schools Plan Adoption Resolution.

Appendix 6: Hazard Summary

Natural Hazard Assessments

Each hazard is assigned a likelihood rating based on the criteria and methods described below.

Likelihood of Event "Rating" is based on the following definitions	
Highly likely (HL)	Event is probable within the calendar year.
Likely (L)	Event is probable within the next three years.
Occasional (O)	Event is probable within the next five years.
Unlikely (UL)	Event is possible within the next ten years.

Based on History, and using the information described above, Likelihood of Event is "Quantified" as follows:		
Highly Likely (HL)	Event has 1 in 1 year chance of occurring	1/1 = 100%
Likely (L)	Event has 1 in 3 years chance of occurring	1/3 = 33%
Occasional (O)	Event has 1 in 5 years chance of occurring	1/5 = 20%
Unlikely (UL)	Event has 1 in 10 years chance of occurring	1/10 = 10%

"Ranges" of Likelihood:
Event is "Highly Likely" to occur – History of events is greater than 33%.
Event is "Likely" to occur – History of events is greater than 20%, but less than or equal to 33%.
Event could "Occasionally" occur – History of events is greater than 10%, but less than or equal to 20%.
Event is "Unlikely" to occur – History of events is less than 10%.

Example: NWS-NCDC records show that 38 tornados were reported in Example County between 01/01/1950 and 12/31/2003. 38 events divided by 53 years = 0.72(72%) which would make future occurrences "Highly Likely" to happen.

This table's format, categories, and the criteria for completing the table, was supplied by the Oklahoma Department of Emergency Management, 06/29/2004.

Hazard Summary
Tulsa County
Summary of Hazards for the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA), except wildfires and hazmat events which came from Tulsa Area Emergency Management Agency

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	28 County events, 2007-2016	No Data	No Data	28/10>100%	HL
Tornado	13 County events, 2007-2016	5,480,000	421,923	13/10>100%	HL
High Wind	5 County events, 2007-2016	2,000	400	5/10=50%	HL
Lightning	8 County events, 2007-2016	975,000	121,875	8/10=80%	HL
Hail	100 County events, 2007-2016	1,870,000	18,700	100/10>100%	HL
Winter Storm	17 County events, 2007-2016	No Data	No Data	17/10>100%	HL
Extreme Heat	3 County events, 2007-2016	No Data	No Data	3/10=30%	L
Drought	4 County events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (1)	0 County events, 2007-2016	0	0	0/10=0%	UL
Wildfire (2)	682 County events, 2007-2016	No Data	No Data	682/10>100%	HL
Earthquake	0 County events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event (2)	282 County events, 2007-2016	No Data	No Data	282/10>100%	HL
Dam Break/Levee Failure	0 County events, 2007-2016	0	0	0/10=0%	UL

(1) No reports of this hazard
(2) No County data available, use Bixby, Jenks, and Sperry data

Hazard Summary
City of Bixby
Summary of Hazards for the City of Bixby in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA)

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	0 Bixby events, 2007-2016	0	0	0/10=0%	UL
Tornado	3 Bixby events, 2007-2016	400,000	133,333	3/10=30%	L
High Wind	8 Bixby events, 2007-2016	60,855	7,607	8/10=80%	HL
Lightning/Thunderstorm	0 Bixby events, 2007-2016	0	0	0/10=0%	UL
Hail	8 Bixby events, 2007-2016	125,000	15,625	8/10=80%	HL
Winter Storm (1)	17 Bixby events, 2007-2016	108,120	6360	17/10>100%	HL
Extreme Heat (1)	3 Bixby events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 Bixby events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 Bixby events, 2007-2016	0	0	0/10=0%	UL
Wildfire	368 Bixby events, 2007-2016	No Data	No Data	368/10>100%	HL
Earthquake	0 Bixby events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	51 Bixby events, 2007-2016	No Data	No Data	51/10>100%	HL
Dam Break/Levee Failure	0 Bixby events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes City of Bixby
(2) No events reported in County; therefore, none in City of Bixby

Hazard Summary
City of Jenks
Summary of Hazards for the City of Jenks in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA)

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	0 Jenks events, 2007-2016	0	0	0/10=0%	UL
Tornado	0 Jenks events, 2007-2016	0	0	0/10=0%	UL
High Wind	0 Jenks events, 2007-2016	0	0	0/10=0%	UL
Lightning/Thunderstorm	2 Jenks events, 2007-2016	350,000	175,000	2/10=20%	O
Hail	3 Jenks events, 2007-2016	No Data	No Data	3/10=30%	L
Winter Storm (1)	17 Jenks events, 2007-2016	No Data	No Data	17/10>100%	HL
Extreme Heat (1)	3 Jenks events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 Jenks events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 Jenks events, 2007-2016	0	0	0/10=0%	UL
Wildfire	149 Jenks events, 2009-2016	No Data	No Data	149/8>100%	HL
Earthquake	0 Jenks events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	151 Jenks events, 2007-2016	No Data	No Data	151/8>100%	HL
Dam Break/Levee Failure	0 Jenks events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes City of Jenks
(2) No events reported in County; therefore, none in City of Jenks

Hazard Summary
Town of Sperry
Summary of Hazards for the Town of Sperry in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA)

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	3 Sperry events, 2007-2016	No Data	No Data	3/10=30%	L
Tornado	0 Sperry events, 2007-2016	0	0	0/10=0%	UL
High Wind	0 Sperry events, 2007-2016	0	0	0/10=0%	UL
Lightning/Thunderstorm	0 Sperry events, 2007-2016	0	0	0/10=0%	UL
Hail	1 Sperry event, 2007-2016	25,000	25,000	1/10=10%	UL
Winter Storm (1)	17 Sperry events, 2007-2016	No Data	No Data	17/10>100%	HL
Extreme Heat (1)	3 Sperry events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 Sperry events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 Sperry events, 2007-2016	0	0	0/10=0%	UL
Wildfire	165 Sperry events, 2010 thru 2014	No Data	No Data	165/5>100%	HL
Earthquake	0 Sperry events, 2007 thru 2016	0	0	0/10=0%	UL
Hazmat Event	80 Sperry events, 2010 thru 2014	No Data	No Data	80/5>100%	HL
Dam Break/Levee Failure	0 Sperry events, 2007 thru 2016	0	0	0/10=0%	UL

(1) County wide event, includes Town of Sperry
(2) No events reported in County; therefore, none in Town of Sperry

Hazard Summary
Berryhill Public Schools (BPS)
Summary of Hazards for Berryhill Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA)

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	0 BPS events, 2007-2016	0	0	0/10=0%	UL
Tornado	0 BPS events, 2007-2016	0	0	0/10=0%	UL
High Wind	2 BPS events, 2007-2016	No Data	No Data	2/10=20%	O
Lightning/Thunderstorm	0 BPS events, 2007-2016	0	0	0/10=0%	UL
Hail	0 BPS events, 2007-2016	0	0	0/10=0%	UL
Winter Storm (1)	17 BPS events, 2007-2016	No Data	No Data	17/10>100%	HL
Extreme Heat (1)	3 BPS events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 BPS events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 BPS events, 2007-2016	0	0	0/10=0%	UL
Wildfire	0 BPS events, 2007-2016	0	0	0/10=0%	UL
Earthquake	0 BPS events, 2007-2017	0	0	0/10=0%	UL
Hazmat Event	0 BPS events, 2007-2017	0	0	0/10=0%	UL
Dam Break/Levee Failure	0 BPS events, 2007-2017	0	0	0/10=0%	UL

(1) County wide event, includes Berryhill Public Schools
(2) No events reported in County; therefore, none in Berryhill Public Schools

Hazard Summary
Bixby Public Schools
Summary of Hazards for Jenks Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center (NOAA)

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Tornado	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
High Wind	2 Bixby PS events, 2007-2016	163,207	81,604	2/10=20%	O
Lightning/Thunderstorm	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Hail	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Winter Storm (1)	17 Bixby PS events, 2007-2016	96,938	5,702	17/10>100%	HL
Extreme Heat (1)	3 Bixby PS events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 Bixby PS events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Wildfire	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Earthquake	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL
Dam Break/Levee Failure	0 Bixby PS events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes Bixby Public Schools
(2) No events reported in County; therefore, none in Bixby Public Schools

Hazard Summary
Jenks Public Schools (JPS)
Summary of Hazards for Jenks Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	12 JPS events, 2007-2016	225,000	18,750	12/10>100%	HL
Tornado	0 JPS events, 2007-2016	0	0	0/10=0%	UL
High Wind	7 JPS events, 2007-2016	460,000	65,714	7/10=70%	HL
Lightning/Thunderstorm	8 JPS events, 2007-2016	190,000	23,750	8/10=80%	HL
Hail	3 JPS events, 2007-2016	368,000	122,666	3/10=30%	O
Winter Storm (1)	17 JPS events, 2007-2016	61,000	8,714	17/10>100%	HL
Extreme Heat (1)	3 JPS events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 JPS events, 2007-2016	25,000	6,250	4/10=40%	HL
Expansive Soil	4 JPS events, 2007-2016	210,000	52,500	4/10=40%	HL
Wildfire	0 JPS events, 2007-2016	0	0	0/10=0%	UL
Earthquake	0 JPS events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	1 JPS events, 2007-2016	1,200	1,200	1/10=10%	UL
Dam Break/Levee Failure	0 JPS events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes Jenks Public Schools

Hazard Summary
Keystone Public Schools (KPS)
Summary of Hazards for Keystone Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Tornado	0 KPS events, 2007-2016	0	0	0/10=0%	UL
High Wind	1 KPS events, 2007-2016	No Data	No Data	1/10=10%	UL
Lightning/Thunderstorm	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Hail	1 KPS events, 2007-2016	No Data	No Data	1/10=10%	UL
Winter Storm (1)	17 KPS events, 2007-2016	No Data	No Data	17/10>100%	HL
Extreme Heat (1)	3 KPS events, 2007-2016	No Data	No Data	3/10=30%	L
Drought (1)	4 KPS events, 2007-2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Wildfire	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Earthquake	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	0 KPS events, 2007-2016	0	0	0/10=0%	UL
Dam Break/Levee Failure	0 KPS events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes Keystone Public Schools
(2) No events reported in County; therefore, none in Keystone Public Schools

Hazard Summary
Liberty Public Schools (LPS)
Summary of Hazards for Liberty Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	1 LPS event, 2007-2016	50,000	50,000	1/10=10%	UL
Tornado	0 LPS events, 2007-2016	0	0	0/10=0%	UL
High Wind	1 LPS events, 2007-2016	25,000	25,000	1/10=10%	UL
Lightning/Thunderstorm	0 LPS events, 2007-2016	0	0	0/10=0%	UL
Hail	1 LPS events, 2007-2016	25,000	25,000	1/10=10%	UL
Winter Storm (1)	17 LPS events, 2007-2016	5,000	295	17/10>100%	HL
Extreme Heat (1)	3 LPS events, 2007-2016	5,000	1,667	3/10=30%	L
Drought (1)	4 LPS events, 2007-2016	5,000	1,250	4/10=40%	HL
Expansive Soil (2)	0 LPS events, 2007-2016	0	0	0/10=0%	UL
Wildfire	0 LPS events, 2007-2016	0	0	0/10=0%	UL
Earthquake	0 LPS events, 2007-2016	0	0	0/10=0%	UL
Hazmat Event	0 LPS events, 2007-2016	0	0	0/10=0%	UL
Dam Break/Levee Failure	0 LPS events, 2007-2016	0	0	0/10=0%	UL

(1) County wide event, includes Liberty Public Schools
(2) No events reported in County; therefore, none in Liberty Public Schools

Hazard Summary
Sperry Public Schools (SPS)
Summary of Hazards for Sperry Public Schools in the Tulsa County Multi-Hazard Mitigation Plan
Source: National Climatic Data Center

Hazard Event	History	Estimated Total Dollar Loss ($$)	Average Cost Per Event ($$)	Likelihood Percentage	Likelihood Rating
Flood	1 SPS event, 2007 thru 2016	No Data	No Data	1/10=10%	UL
Tornado	0 SPS events, 2007 thru 2016	0	0	0/10=0%	UL
High Wind	1 SPS events, 2007 thru 2016	No Data	No Data	1/10=10%	UL
Lightning/Thunderstorm	0 SPS events, 2007 thru 2016	0	0	0/10=0%	UL
Hail	0 SPS events, 2007 thru 2016	0	0	0/10=0%	UL
Winter Storm (1)	17 SPS events, 2007 thru 2016	No Data	No Data	17/10>100%	HL
Extreme Heat (1)	3 SPS events, 2007 thru 2016	No Data	No Data	3/10=30%	L
Drought (1)	4 SPS events, 2007 thru 2016	No Data	No Data	4/10=40%	HL
Expansive Soil (2)	0 SPS events, 2007 thru 2016	0	0	0/10=0%	UL
Wildfire	0 SPS events, 2007 thru 2017	0	0	0/10=0%	UL
Earthquake	0 SPS events, 2007 thru 2018	0	0	0/10=0%	UL
Hazmat Event	0 SPS events, 2007 thru 2019	0	0	0/10=0%	UL
Dam Break/Levee Failure	0 SPS events, 2007 thru 2020	0	0	0/10=0%	UL

(1) County wide event, includes Sperry Public Schools
(2) No events reported in County; therefore, none in Sperry Public Schools