July 2021

City of McKinney, Texas

Hazard Mitigation Plan

CITY OF MCKINNEY
HAZARD MITIGATION PLAN

The plan was prepared under the direction of the City of McKinney Hazard Mitigation Steering Committee. For additional information, please contact the City of McKinney Office of Emergency Management.

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EXECUTIVE SUMMARY

Mitigation should form the foundation of every emergency management agency's plans and procedures. Emergency management agencies must adopt mitigation practices to reduce, minimize, or eliminate hazards in their community. The City of McKinney Hazard Mitigation Plan (HMP) identifies the hazards faced in the community, certain vulnerabilities to these hazards, and mitigation strategies for the future. The plan fulfills the requirements of the Federal Disaster Mitigation Act as administered by the Texas Division of Emergency Management and the Federal Emergency Management Agency.

Employees and citizens from the City of McKinney attended public meetings to discuss the hazards their community faces and the vulnerabilities those hazards present. Representatives from each participating McKinney department reviewed drafts of the HMP and added input to the mitigation strategies presented in the plan. City of McKinney citizens were also active participants in the development of the plan. Citizens attended public meetings that were advertised online and in news articles to share their concerns about hazards faced in the community and how to mitigate the effects of these hazards.

The City of McKinney understands the benefits of developing and implementing mitigation plans and strategies. Elected officials, public safety organizations, planners, private entities, and many others have worked together to develop and implement this HMP, proving that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their community.

Hazard Analysis

The process of developing the City of McKinney HMP began with a review of the hazards faced in the community. The below ranking of hazards was conducted by assigning a score to each hazard based on the frequency of the hazard, impact potential, severity of damage, and overall economic disruption. Several hazards received the same score. The City of McKinney Hazard Mitigation Steering Committee discussed those hazards in which the score was tied and determined the order in which the hazards should be ranked.

Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
Tornadoes	Moderate	None-Minimal	Community-wide	Major	13	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure, businesses, residential homes	Utility lines down, medical care disruption, transportation routes impaired

Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
Windstorm	High	3-6 hours	Countywide	Moderate	13	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Utility lines down, livestock threatened
Hailstorms	High	None – Minimal	Community-wide	Moderate	12	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure	Utility systems disrupted, business and residential impact, hail damage to crops, roads damaged/closed
Flooding	High	3-6 hours	Community-wide	Moderate	12	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Businesses, roads damaged/closed, utilities affected
Wildfires	Moderate	None-Minimal	Local	Major	12	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Agricultural, residential impact, road closures, utility impacts

Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
Hazardous Materials Release	High	None-Minimal	Localized	Moderate	12	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry and residential impact, evacuation, environmental impact
Extreme Heat	High	More than 12 hours	Countywide	Moderate	11	Medical care facilities, elderly care facilities	Businesses, roads damaged/closed, utilities affected
Infectious Disease Outbreak	Moderate	More than 12 hours	Countywide	Major	11	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry impact, health care system impact, and communications impact
Water transmission failure	Moderate	None-Minimal	Community-wide	Minor	11	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry and residential impact, evacuation, environmental impact
Aircraft accident /incident	High	None-Minimal	Localized	Minor	11	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry and residential impact, evacuation, environmental impact, roads damaged/closed, utilities affected

Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
Lightning	High	None - Minimal	Localized	Minor	11	Communications, schools, medical care facilities, hospital, water/sewer/electric, transportation infrastructure	Utility systems disrupted, business and residential impact, roads damaged/closed
Severe Winter Storms	High	More than 12 hours	Countywide	Minor	10	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Utility lines down, livestock threatened
Terrorism	Very Low	None-Minimal	Localized	Major	10	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Utility systems disrupted, business and residential impact, evacuations, roads damaged/closed
Earthquakes	Very Low	None-Minimal	Localized	Major	10	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business/industry and residential impact, evacuation, environmental impact, roads damaged/closed, utilities affected
Drought	Moderate	More than 12 hours	Countywide	Minor	9	Agri-business	Agriculture, business and residential impact, fire suppression

Hazard	Frequency of Occurrence	Warning Time	Geographic Extent	Potential Impact	Hazard Score	Vulnerable Critical Facilities	Economic Disruption
Dam and Levee Failure	Very Low	3-6 hours	Localized	Moderate	8	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Businesses, roads damaged/closed, utilities affected
Energy/fuel shortage	Very Low	More than 12 hours	Countywide	Minor	7	Communications infrastructure, transportation infrastructure, medical care facilities, hospitals, schools, businesses, residential homes	Business and residential impact
Expansive Soils	High	More than 12 hours	Localized	Negligible	7	Pipelines, sewers, and pavements.	Businesses, roads damaged/closed, utilities affected

Mitigation Vision for the Future

Mitigation should be the very foundation of every emergency management agency's plans and procedures. Emergency management agencies must adopt mitigation practices to reduce, minimize, or eliminate hazards in their community. The Disaster Mitigation Act of 2000 (PL 106-390) outlines the criteria for communities to successfully implement hazard mitigation practices.

The City of McKinney realizes the benefits achieved by the development and implementation of mitigation plans and strategies. City of McKinney elected officials, public safety organizations, planners, private entities, and many others have worked together in the development and implementation of this hazard mitigation plan, proving that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their community.

City of McKinney
HAZARD MITIGATION PLAN

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Section 1
PLAN, BACKGROUND, AND PURPOSE

1.1 Overview

The City of McKinney Hazard Mitigation Plan (HMP) fulfills the requirements of the Disaster Mitigation Act of 2000, which is administered by the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act provides federal assistance to state and local emergency management to mitigate the effects of disasters. The HMP also encourages cooperation among various organizations and crosses political subdivisions.

1.2 Authority

Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act Title 44 CFR as amended by Section 102 of the Disaster Mitigation Act of 2000 gives state and local governments the framework to evaluate and mitigate all hazards as a condition of receiving federal disaster funds. The City of McKinney HMP is a requirement of the law. In Texas, federal regulatory authority for hazard mitigation planning resides with FEMA Region VI.

1.3 Scope

The scope of the City of McKinney HMP encompasses all areas of the City of McKinney. The plan will identify the natural and technological hazards that could threaten life and property in our communities. The scope of this plan includes both short-term and long-term mitigation strategies, implementation, and possible sources of project funding.

The plan also contains the following information:

- General information about the plan (Executive Summary)
- The vision for mitigation in our community (Preface)
- The profile of the City of McKinney, its geography, history, physical features, and other community indicators (Section 2: Community Profile)
- The planning process and the involvement of all levels of governments, the public, the private sector, and other community players (Section 3: Planning Process)
- Documentation of the City of McKinney's past and predicted exposure to natural hazards and the potential risks that include the impacts on critical infrastructure with anticipated losses (Section 4: Risk and Vulnerability Assessment)
- An overview of the City of McKinney's capabilities to implement hazard mitigation goals, objectives, and policies that will effectively mitigate risks to our community (Section 5: Mitigation Strategies)

- Procedures for maintaining an effective, long-range HMP and the strategy to implement it (Section 6: Executing the Plan)
- Critical facilities information (Section 2: Community Profile)
- Documentation of the process (Appendixes)

1.4 Purpose

The purpose of the City of McKinney HMP is to identify risks and vulnerabilities and to formulate a plan of action to reduce damage and loss of life from natural and technological disasters. This plan shall serve as a benchmark for future mitigation activities and will identify mitigation goals and objectives for the City of McKinney. The plan will also prioritize potential risks and vulnerabilities in an effort to minimize the effects of disasters in the community.

Realizing that identifying the community's risks and working collectively toward the prevention of disasters is in everyone's best interest, The City of McKinney Office of Emergency Management has taken a lead role in the development of the City of McKinney HMP.

Mitigation planning is imperative to lessen the impact of disasters in the City of McKinney. The written plan is an excellent method by which to organize the City of McKinney's mitigation strategy. The implementation of the plan and its components is vital to achieve a community that is resistant to the effects of a disaster. The implementation of the plan will reduce loss of life and property and allow the community to prosper with minimal disruption of vital services to its citizens. The plan provides a risk assessment of the hazards the City of McKinney is exposed to and puts forth several mitigation goals and objectives that are based on that risk assessment. This plan has been formally adopted and is required to be updated every five years.

1.5 Consistency with Federal and State Mitigation Policies

The plan is intended to enhance and complement state and federal recommendations for the mitigation of natural and technological hazards in the following ways:

- Substantially reduce the risk of loss of life, injuries, economic loss, and hardship from the destruction of natural and technological disasters on an ongoing basis.
- Improve the public's awareness of the need for individual preparedness and building safer, more disaster-resilient communities.
- Develop strategies for long-term community sustainability during community disasters.
- Develop governmental and business continuity plans that will continue essential private sector and governmental activities during disasters.

FEMA publishes many guidance documents for local governments for mitigating natural disasters. The City of McKinney HMP fully recognizes, adopts, incorporates, and endorses the following principles:

- Develop a strategic mitigation plan for the City of McKinney.
- Enforce current building codes.

- Develop incentives to promote mitigation.
- Incorporate mitigation of natural hazards into land use plans.
- Promote awareness of mitigation opportunities and programs throughout our community on a continual basis.
- Identify potential funding sources for mitigation projects.

The private sector is often an overlooked segment of the community during disasters. It is vital that this sector of a community is included in mitigation efforts that are consistent with state and federal recommendations such as the following:

- Develop mitigation incentives with insurance agencies and lending institutions.
- Encourage the creation of a business continuity plan for the continuance of commerce during disasters.
- Partner with businesses in an effort to communicate with customers about the hazards in our community and possible solutions.

Individual citizens must be made aware of the hazards they face. Additionally, they must be educated in how to protect themselves from the hazards they face. They must be shown that mitigation is an important part of reducing loss of life and property in their community. Their support is critical to the success of any mitigation effort. The City of McKinney HMP supports the following FEMA recommendations regarding individual citizens:

- Become educated on the hazards that you and your community face.
- Become part of the process by supporting and encouraging mitigation programs that reduce vulnerability to disasters.
- Take individual responsibility for safeguarding yourself and your family prior to a disaster.

1.6 Goals and Objectives

The following goals and objectives are the basis of this plan and summarize what the City of McKinney Hazard Mitigation Steering Committee will accomplish as a result of implementing this plan.

- Maximize the use of all resources by promoting intergovernmental coordination and partnerships in the public and private sectors.
- Harden our communities against the effects of disasters through the development of new mitigation strategies and strict enforcement of current regulations that have proved effective.
- Reduce and, where possible, eliminate repetitive damage, loss of life, and property from disasters.
- Bring greater awareness throughout the community about potential hazards and the need for community preparedness.
- Continue city training for City of McKinney departments.

Section 2
COMMUNITY PROFILE

2.1 Overview

One of the tasks of the HMSC was to review and update the City of McKinney Community Profile in order to ensure that the most current development and future conditions are considered. The HMSC determined that the City of McKinney's vulnerability has increased with continued development. The information contained in this section has been updated to reflect the most current development and conditions that may have an impact on the vulnerability of the community.

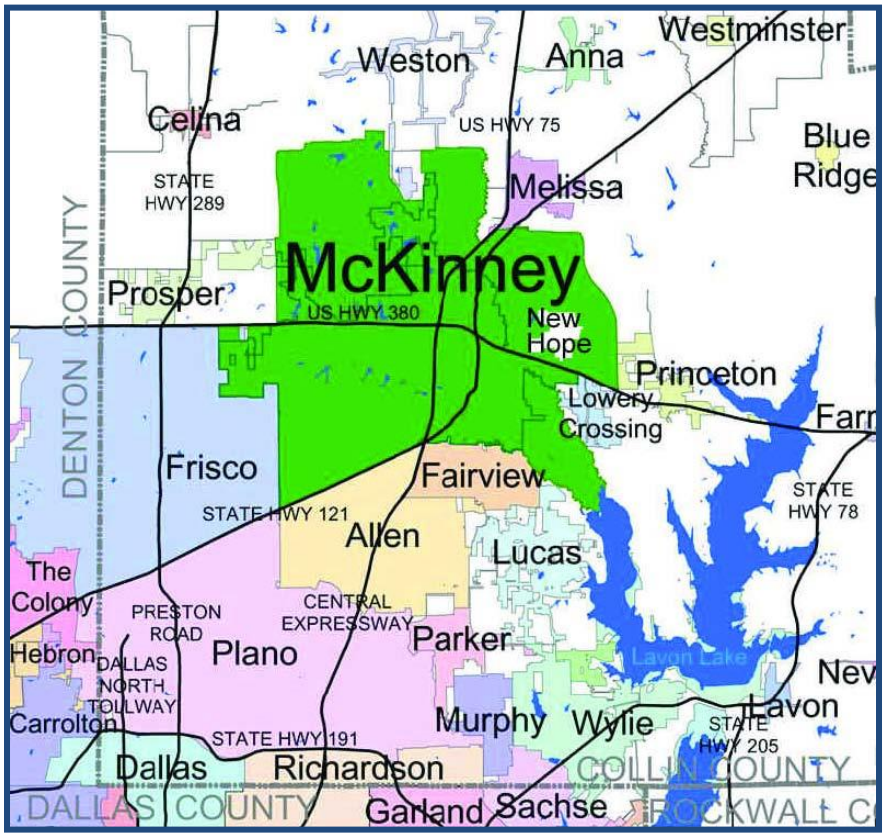
The City of McKinney is located in North Texas and in Collin County. Collin County is one of the fastest-growing counties in Texas and the nation. In the last two decades, the City of McKinney has shared in this rapid growth. The City of McKinney, located on the northeastern quadrant of the Dallas-Fort Worth Metroplex, is approximately 30 miles north of downtown Dallas on the Central Expressway (US 75) and approximately 35 miles northeast of Dallas-Fort Worth (DFW) International Airport on State Highway 121. Figure 2-1 shows a map of the City of McKinney's location within the Dallas-Fort Worth area.

Figure 2-1[1]
McKinney's Location within the Dallas-Fort Worth Area

[1] City of McKinney, Comprehensive Plan, August 2003

The City of McKinney is surrounded by many other cities: Frisco and Prosper to the west; Celina, Weston, and Melissa to the north; Princeton and Lowry Crossing to the east; with Fairview and Allen to the immediate south. In addition, the City of New Hope is surrounded by the City of McKinney's Extra Territorial Jurisdiction (ETJ). Figure 2-2 shows the general vicinity map for the City in relationship to surrounding communities. The City of McKinney is located at the northern apex of a triangular regional growth pattern defined historically by these two roadways. In the last three decades, communities along each roadway have experienced strong population and economic growth.[2]

Figure 2-2[3]
McKinney's Incorporated Area and E.T.J. in Relation to Surrounding Communities

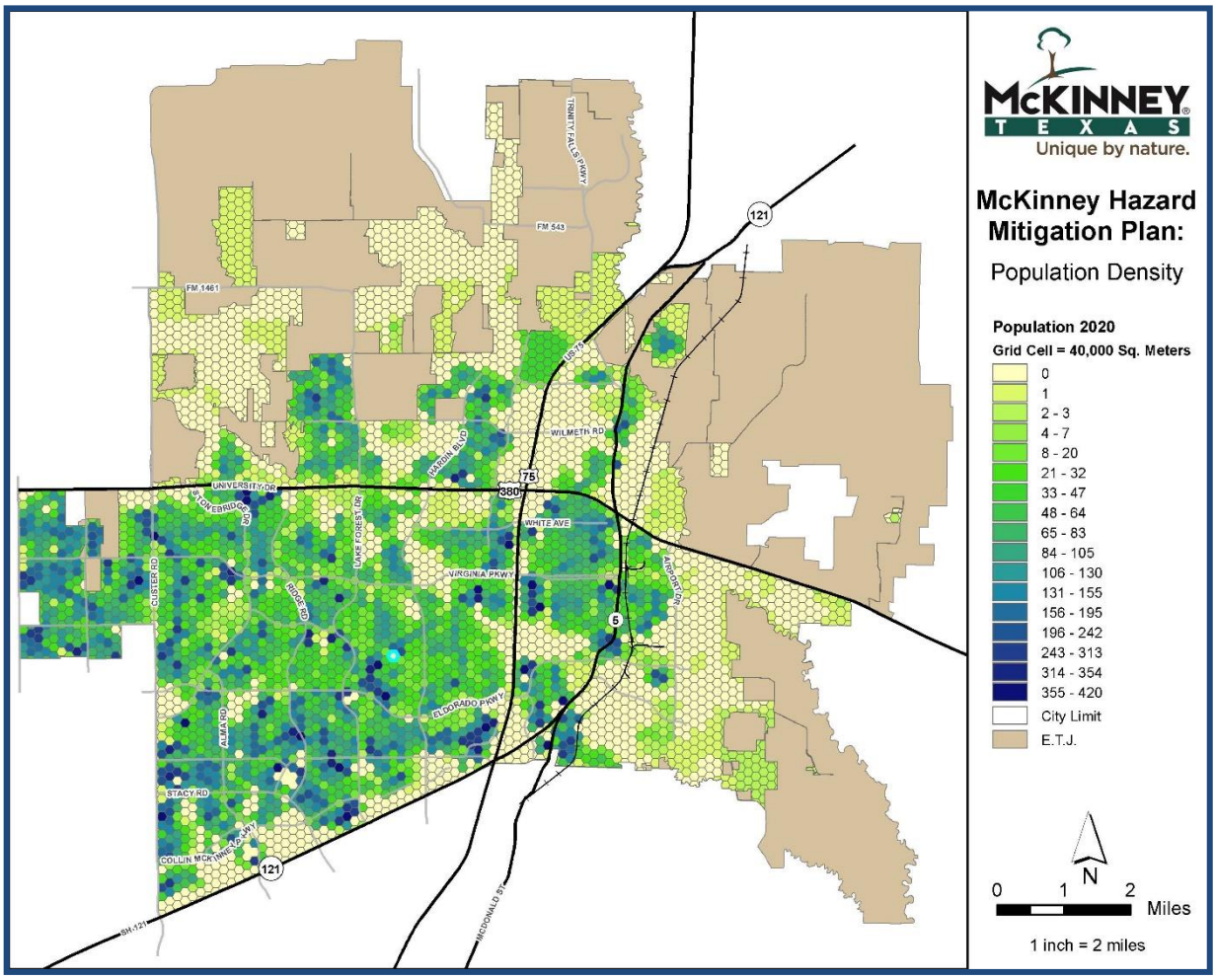


The City of McKinney population growth rate is much higher than the state average rate of 15.3 percent and is much higher than the national average rate of 6.3 percent. The City of McKinney population density is 2,107.7 people per square mile, which is much higher than the state average

[2] City of McKinney, Office of Emergency Management
[3] City of McKinney, Comprehensive Plan, August 2003

density of 96.3 people per square mile and is much higher than the national average density of 87.4 people per square mile.[4] Figure 2-3 depicts the City of McKinney's population densities.

Figure 2-3



Population Densities

McKinney was named for Collin McKinney, signer of the Texas Declaration of Independence and author of a bill establishing counties in the northern part of the state. On March 24, 1849, William Davis, who owned 3,000 acres where McKinney now stands, donated 120 acres for the town site. Ten years later McKinney was incorporated, and in 1913, the town adopted the council manager form of government.[5]

[4] US Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report

[5] ,USA Business Intelligence, http://www.usa.com/mckinney-tx-population-and-races.htm#PopulationGrowth

For the first 125 years of its history, McKinney served as the principal commercial center for the county. The county seat provided farmers with flour, corn, and cotton mills, cotton gins, a cotton compress and cottonseed oil mill, as well as banks, churches, schools, newspapers, and, from the 1880s, an opera house. Businesses also came to include a textile mill, an ice company, a large dairy farm, and a garment-manufacturing company.[6]

The population grew from 35 in 1848 to 4,714 in 1912. By 1953 McKinney had a population of more than 10,000 and 355 businesses. The town continued to serve as an agribusiness center for the county until the late 1960s. By 1970, McKinney was surpassed in size by Plano. McKinney experienced moderate population growth, from 15,193 in the 1970 census to 21,283 in the 1990 census. By the mid-1980s, the town had become a commuter center for residents who worked in Plano and Dallas. In 1985, it had a population of just over 16,000 and supported 254 businesses. Since then, McKinney's rate of increase has been much more dramatic. In the 2000 census, McKinney had grown to 54,369 with 2,005 businesses. Based on the annual population estimates retrieved from the American Community Survey, the City of McKinney grew from a population of 104,853 in 2006 to 173,460 in 2018.[7] Appendix E provides the full reports of the American Community Survey for the City McKinney.

The nation continues to recognize McKinney as a standout community. “Money Magazine” ranked McKinney Number 2 on its list of the Best Places to Live in American in 2012 and moved up the list to Number 1 in 2014. Factors considered included employment, schools, crime and safety as well as overall quality of life aspects, including a feeling of community pride. This adds to the accolades already received from Forbes, Best Life Magazine, CNN Money, and more.[8]

2.2 Demographics

The City of McKinney’s 2019 population estimate is 199,177, which represents a 51.9 percent increase from the 2010 population count. The U.S. Census Bureau statistics indicate that the City of McKinney was the 6th fastest-growing city in the nation between July 2017 and July 2018[9]. The City of McKinney is the 16th most populated city in the State of Texas.[10]

The following statistical data from the U. S. Census Bureau represents the demographics of the City of McKinney, Texas.

[6] Collin County Station, http://collincountystation.com/mckinneyh.html
[7] American Community Survey, 2018: ACS 5-Year Estimates Data Profiles, McKinney, Texas
[8] City of McKinney, http://www.mckinneytexas.org/130/Accomplishments
[9] US Census Bureau, Fastest-Growing Cities Primarily in the South and West.
https://www.census.gov/newsroom/press-releases/2019/subcounty-population-estimates.html
10 Texas Demographics. Texas Cities by Population. https://www.texas-demographics.com/cities_by_population

Table 2-1
Demographics[11][12]

People Quick Facts	McKinney	Texas
Population, 2019 estimate	199,177	28,995,881
Population, 2010 (April 1) estimates base	131,117	25,145,561

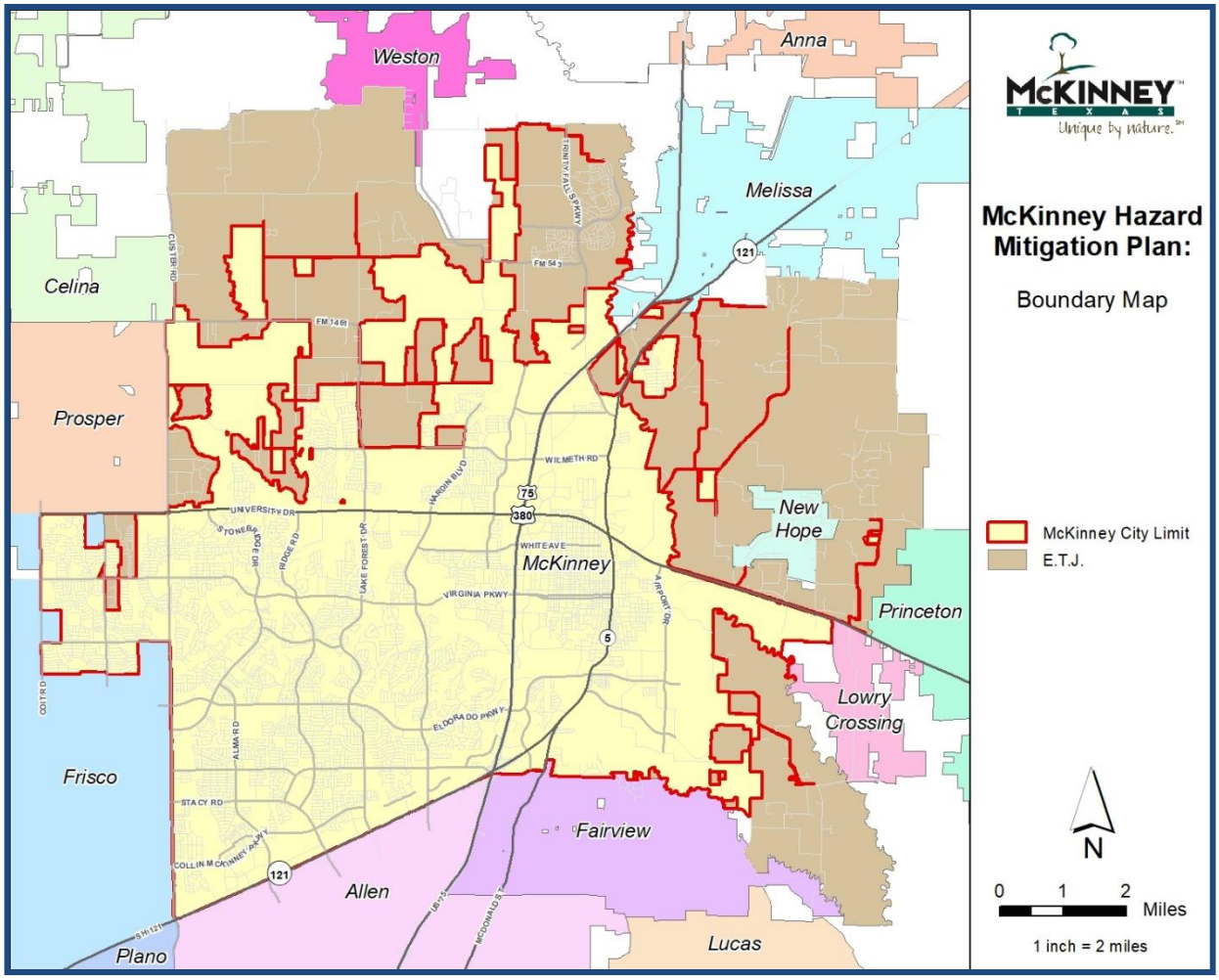
Geography QuickFacts	McKinney	Texas
Land area in square miles, 2010	62.21	261,231.71
Persons per square mile, 2010	2,107.7	96.3
FIPS Code	4845744	48
Counties	Collin County	

Business QuickFacts	McKinney	Texas
Total number of firms, 2012	12,723	2,356,748
Minority-owned firms, percent, 2012	3,185	1,070,392
Women-owned firms, percent, 2012	4,698	866,678
Manufacturers shipments, 2012 ($1000)	4,106,207	702,603,073
Merchant wholesaler sales, 2012 ($1000)	705,948	691,242,607
Retail sales, 2012 ($1000)	2,507,318	356,116,376
Retail sales per capita, 2012	$17,506	$13,666
Accommodation and food services sales, 2012 ($1000)	233,563	54,480,811

[11] US Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report

[12] US Census Bureau: State and County QuickFacts Key: (a) Includes persons reporting only one race; (b) Hispanics may be of any race, so also are included in applicable race categories; FN: Footnote on this item for this area in place of date; NA: Not available; D: Suppressed to avoid disclosure of confidential information; X: Not applicable; S: Suppressed; does not meet publication standards; Z: Value greater than zero but less than half unit of measure shown; F: Fewer than 100 firms

Figure 2-4
City of McKinney Boundaries



2.3 Economy

The City of McKinney boasts a strong climate for commerce due to its workforce talent and incentive program. The workforce is highly educated, with 45.7 percent of residents holding a bachelor's degree or higher.[13]

As of 2019, the City of McKinney's labor force size is 102,478 with 99,247 citizens employed.[14] The industries that call McKinney home are diverse. McKinney is the largest city in Collin County and in 2018 WalletHub rated McKinney as one of the top 10 fastest growing in economic growth in the Nation.[15]

United States Census Data shows 59,580 households in the City of McKinney with an average household size of 3 people. As of 2018, the median household income for City of McKinney is

[13] American Community Survey, 2018: ACS 5-Year Estimates Data Profiles, McKinney, Texas
[14]Texas Workforce Commission, https://texaslmi.com/LMIbyCategory/LAUS
[15] City of McKinney, http://www.mckinneytexas.org/130/Accomplishments

$89,964. The poverty rate for City of McKinney is 6.9 percent, much lower than the 13.6 percent poverty rate throughout the State of Texas.

2.4 Climate

According to the National Weather Service, the Dallas/Fort Worth climate is humid subtropical with hot summers. It is also continental, characterized by a wide annual temperature range. Precipitation also varies considerably, ranging from less than 20" to more than 50". Winters are mild, but blue northers occur about three times each month. Blue northers refers to a swift-moving cold frontal passage in the southern Great Plains, marked by a dark, blue-black sky with strong wintery winds from the northwest or north and temperatures that may drop 20°F to 30°F in a few minutes.[16]. Average low temperatures drop to 33°F in early to mid-January. Periods of extreme cold that occasionally occur are short-lived, so even in January, mild weather occurs frequently.

The highest temperatures of summer are associated with fair skies, westerly winds, and low humidity. Characteristically, hot spells in summer are broken into three-to-five day periods by thunderstorm activity. There are only a few nights each summer when the low temperature exceeds 80°F. Summer daytime temperatures occasionally exceed 100°F. For over three weeks from late July to mid-August, average high temperatures are at their peak of 96°F.

Throughout the year, rainfall occurs more frequently during the night. Usually, periods of rainy weather last for only a day or two and are followed by several days with fair skies. A large part of the annual precipitation results from thunderstorm activity with occasional heavy rainfall over brief periods of time. Thunderstorms occur throughout the year but are most frequent in the spring. May and October are the wettest months, averaging 5.15 and 4.11 inches of rainfall respectively. Hail falls about 20 to 25 days a year, ordinarily with only slight and scattered damage. Windstorms occurring during thunderstorm activity are sometimes destructive. Snowfall is rare.

The United States Environmental Protection Agency conducted the Intergovernmental Panel on Climate Change Fourth Assessment Report to determine how climate change would impact Region 6, which includes the State of Texas. Their basic findings are listed below.[17]

- A shift toward a warmer climate with an increase in extreme high temperatures and a reduction in extreme low temperatures. These changes have been especially apparent in the western half of North America.
- Abnormally hot days and nights and heat waves are very likely to become more frequent. Cold days and cold nights are very likely to become much less frequent.
- Increasing stress due to heat waves. This may lead to more illness and death, particularly among the young, elderly, and frail.
- Respiratory disorders may be exacerbated by warming-induced deterioration in air quality.
- It is likely that droughts will become more severe in the southwestern United States, in part because precipitation in the winter rainy season is projected to decrease.
- The growing season length is expected to increase. However, as temperature rises, crops grown in the Southwestern United States will increasingly experience temperatures above

[16] The Weather Channel, http://www.weather.com/glossary/b.html
[17] "Climate Change 2007: The Physical Science Basis," Intergovernmental Panel on Climate Change, 2007.

their optimum, and animal production of meat or dairy products will be impacted by temperature extremes.

- Weeds and other invasive plants will continue to migrate northward.
- Arid areas are very likely to experience increases in erosion and fire risk.
- An increase in the length of the forest fire season and the area subject to forest fires may increase.
- Additional stress to ground water and surface water sources that are already overtaxed in many areas may occur.
- Changes in the abundance and spatial distribution of species and expanded ranges of tree killing insects, vector-borne, and tick-borne diseases may occur.
- Precipitation is likely to be less frequent but more intense, and precipitation extremes are very likely to increase.
- Management of Western reservoir systems is very likely to become more challenging as runoff patterns continue to change.
- Increased weather related losses of property may result.
- The Gulf Coast area may experience rising sea levels.
- It is likely that hurricane intensity will increase in response to human-caused warming, but this requires further study.

2.5 Land Use

2.5.1 Current Land Use

The ONE McKinney 2040 Comprehensive Plan was originally adopted on October 2, 2018 and amended on October 20, 2020. Over the course of three years, City staff, industry experts, and concerned citizens worked diligently to draft the ONE McKinney 2040 plan on behalf of the people of McKinney.

One McKinney 2040 is the City of McKinney's first major comprehensive plan update since 2004. The foundation of the overall policy direction for the ONE McKinney 2040 Comprehensive Plan is built upon two important components; a vision statement and a set of guiding principles.

FEMA Requirement 44 CFR Requirement 201.6 (c)(2)(ii)(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The vision statement describes the future that is desired by the McKinney community in terms of its physical, social and economic conditions. It was developed by stakeholders and represents the goals and aspirations envisioned by the community. The current vision statements states: "We are ONE McKinney - a united community that supports the Diversity of its economy and people. We celebrate our natural & cultural Assets & invite private developments that create Places of lasting value. Smart public &

private Investments ensure that McKinney remains a top choice for people to live, work, play & visit through 2040 & beyond."[18]

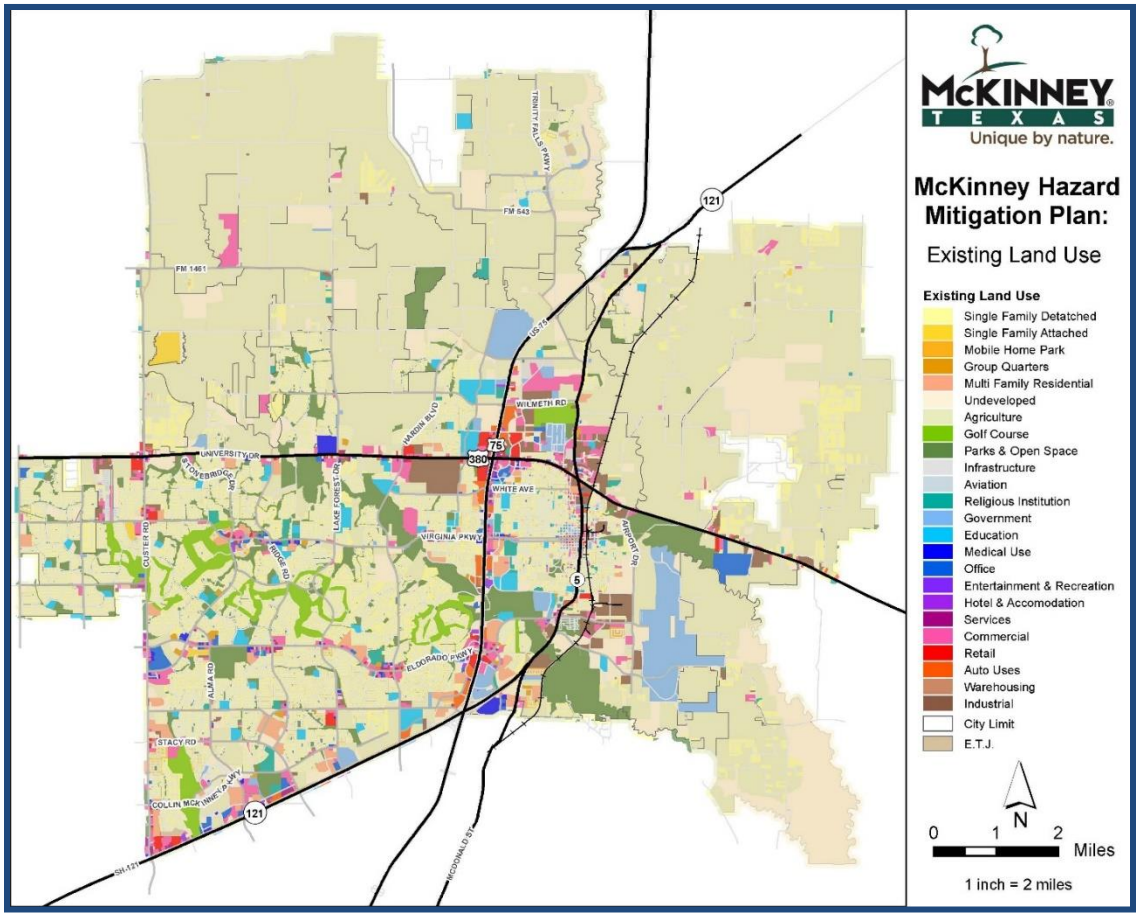
The guiding principles provide overall guidance across all plan components and explain the most important general principles that should be followed in order to achieve the vision described in the plan. The guiding principles includes plan elements in Diversity, Assets, Places, and Investments.

The ONE McKinney 2040 Land Use and Development component is intended to provide direction related to desired development patterns around the City, and to inform decisions related to the timing and phasing of future infrastructure investments in the City. The component is built upon a series of districts, and each district consists of a series of placetypes. Placetypes identify a predominate land use, as well as supporting uses allowed within each type.

Currently, the City of McKinney provides a good balance between residential and commercial land use. There is little area left that is utilized as agricultural space, but the City does provide robust parks and open space structure for their citizens.

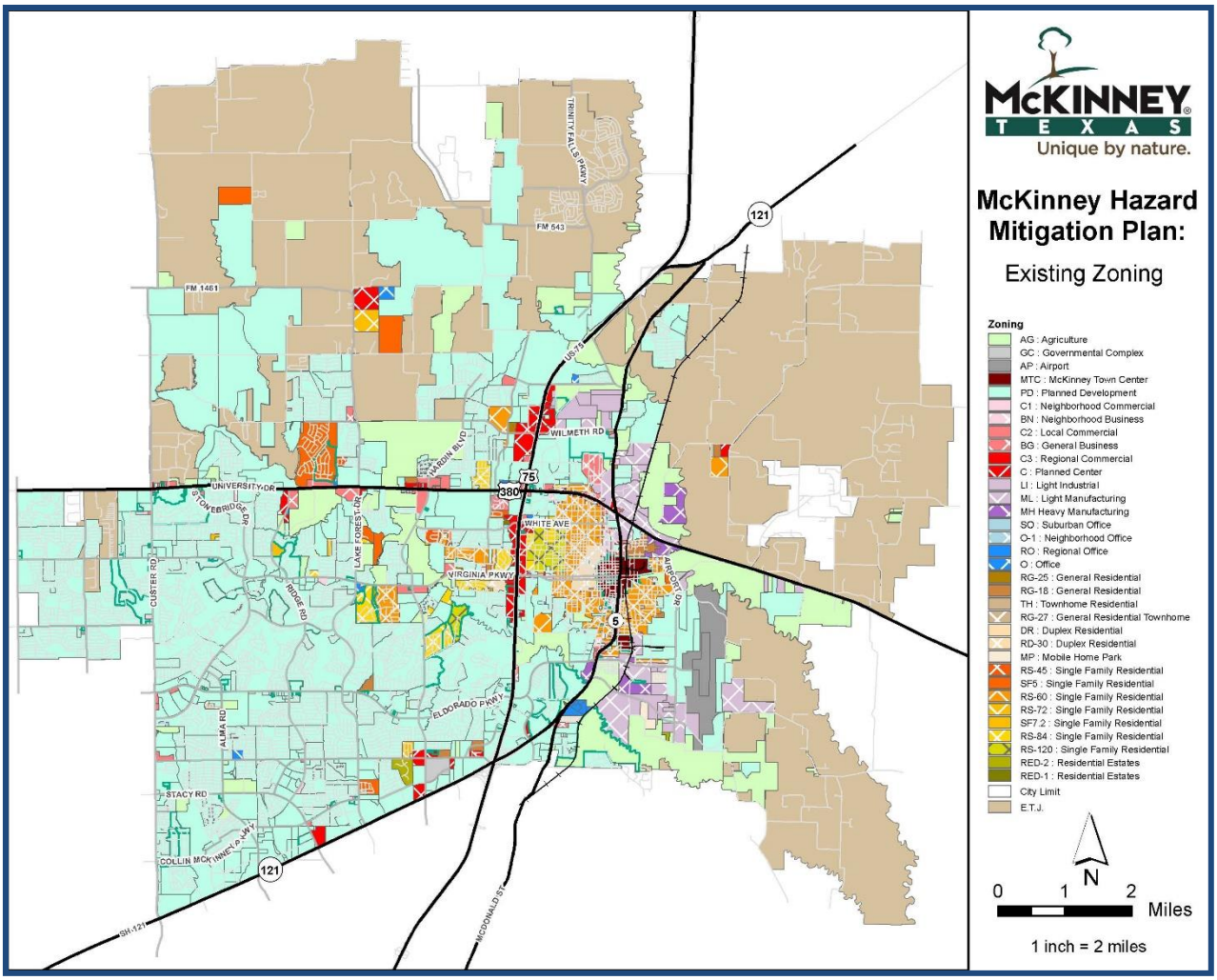
Figure 2-5 is a map of the current land use in City of McKinney and figure 2-6 is a map of the current zoning districts.

Figure 2-5
City of McKinney Current Land Use



[18] One McKinney 2040 Comprehensive Plan

Figure 2-6
City of McKinney Zoning



2.5.2 Future Land Use

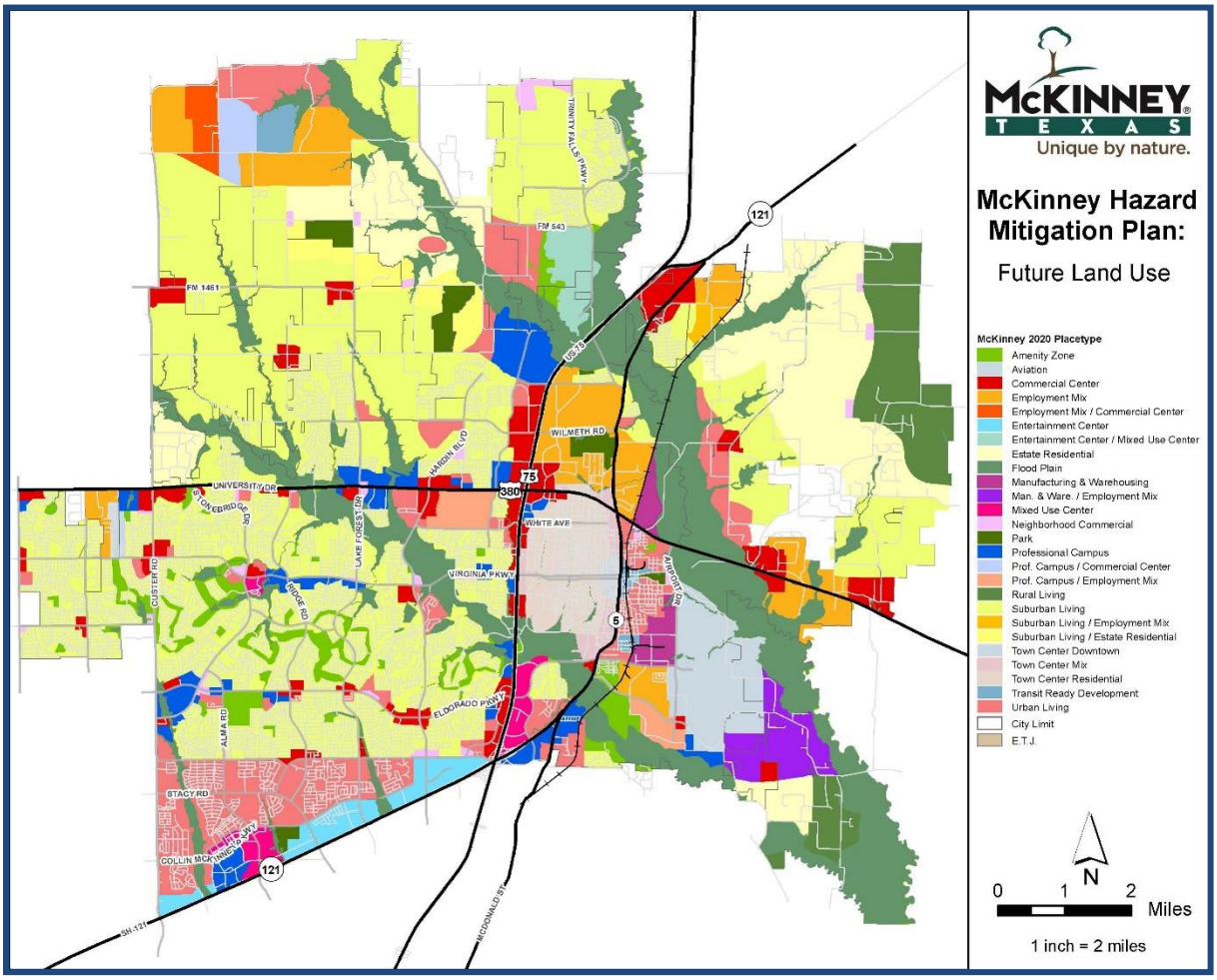
2.5.2.1 Development Trends

The City of McKinney is centrally located in Collin County, one of the fastest-growing counties in Texas and the country. The community has developed in the rolling hills on the northeast fringe of the Dallas-Fort Worth Metroplex. McKinney has been experiencing continual residential growth over the last nine years and expects to continue this growth for the foreseeable future. These development trends are located in the Land Use & Development Strategy, which is Chapter 3 of the City McKinney Comprehensive Plan. In addition, the 2018-2019 City of McKinney Land Use Assumptions Report can be found in appendix F. For the purpose of future planning efforts, the planning area has been divided into 17 Unique Districts that represent the Preferred Scenario.

Commercial development is occurring citywide in areas currently dominated by residential subdivisions. Concentrations of commercial uses are found along the US 75 corridor and at

intersections of major thoroughfares throughout the community. Industrial development is currently occurring on the east side of US 75 north of US 380 as well as the area immediately surrounding the McKinney National Airport. Figure 2-7 illustrates the City of McKinney's future land use plan. As the community continues to grow, the REC and the northwest sector should experience the greatest amount of development activity over the next 10 years.

Figure 2-7
Future Planned Land Use



2.5.2.2 Watersheds

Seven major watersheds are located within the City of McKinney. A full detailed description of each watershed can be found in the following sections. With the exception of the East Fork Trinity River, these creeks have been studied in detail and determination of design discharge is based on fully developed conditions contained within the study. The watersheds are shown in figure 2-8. In addition, McKinney is in the Upper Trinity River Basin, which covers an area of 17,696 square miles, contains 14 major reservoirs, and receives an average of 30 to 40 inches of rainfall per year.

East Fork Trinity River

The East Fork Trinity River covers a large area and needs to be studied in detail. At the confluence of the East Fork and US 380, the drainage area is 190 acres. The City of McKinney listed the East Fork Trinity River as a watershed to be studied in detail by the Federal Emergency Management Agency (FEMA) with the issuance of the Digital Flood Insurance Rate Maps.

Wilson Creek

The Wilson Creek watershed drains about 75.8 square miles of land into Lavon Lake, a flood control reservoir constructed by the US Army Corps of Engineers. The watershed is located in central Collin County, Texas. Wilson Creek flows 24 miles from its headwaters to Lavon Lake. Its major tributaries are Sloan Creek, Jeans Creek, Herndon Branch, Franklin Branch, Gray Branch, Stover Creek, Rutherford Branch, and Gentle Creek. Within Wilson Creek watershed are 13 Natural Resources Conservation Service (NRCS) floodwater retarding structures. These structures control a total of 25.3 square miles or 43.8 percent of the watershed upstream from the Southern Pacific Railroad.

Rowlett Creek

Rowlett Creek is located within the Cities of McKinney, Frisco, Allen, Plano, Richardson, Garland, and Rowlett in Collin and Dallas Counties, Texas. It flows in a southerly direction with the open channel originating upstream of the Collin County Road 115 culverts in the City of McKinney. The creek and its tributaries drain an area of approximately 137 square miles. The confluence of Rowlett Creek with Lake Ray Hubbard is located in Rowlett, Texas.

Cottonwood Creek

Cottonwood Creek is located within the Cities of McKinney, Allen, Plano, and Parker in Collin County, Texas. It flows in a southward direction with the open channel originating upstream of the Lake Forest Drive culverts in the City of McKinney. The creek and its tributaries drain an area of approximately 19.26 square miles. The confluence of Cottonwood Creek with Rowlett Creek is located upstream of FM 544 in Parker, Texas.

Franklin Branch

The Franklin Branch watershed, a tributary to Wilson Creek is 5.1 miles long and drains 3.91 square miles of land into Wilson Creek. A NRCS floodwater retarding structure is located on the stream and controls 3.45 square miles of the watershed.

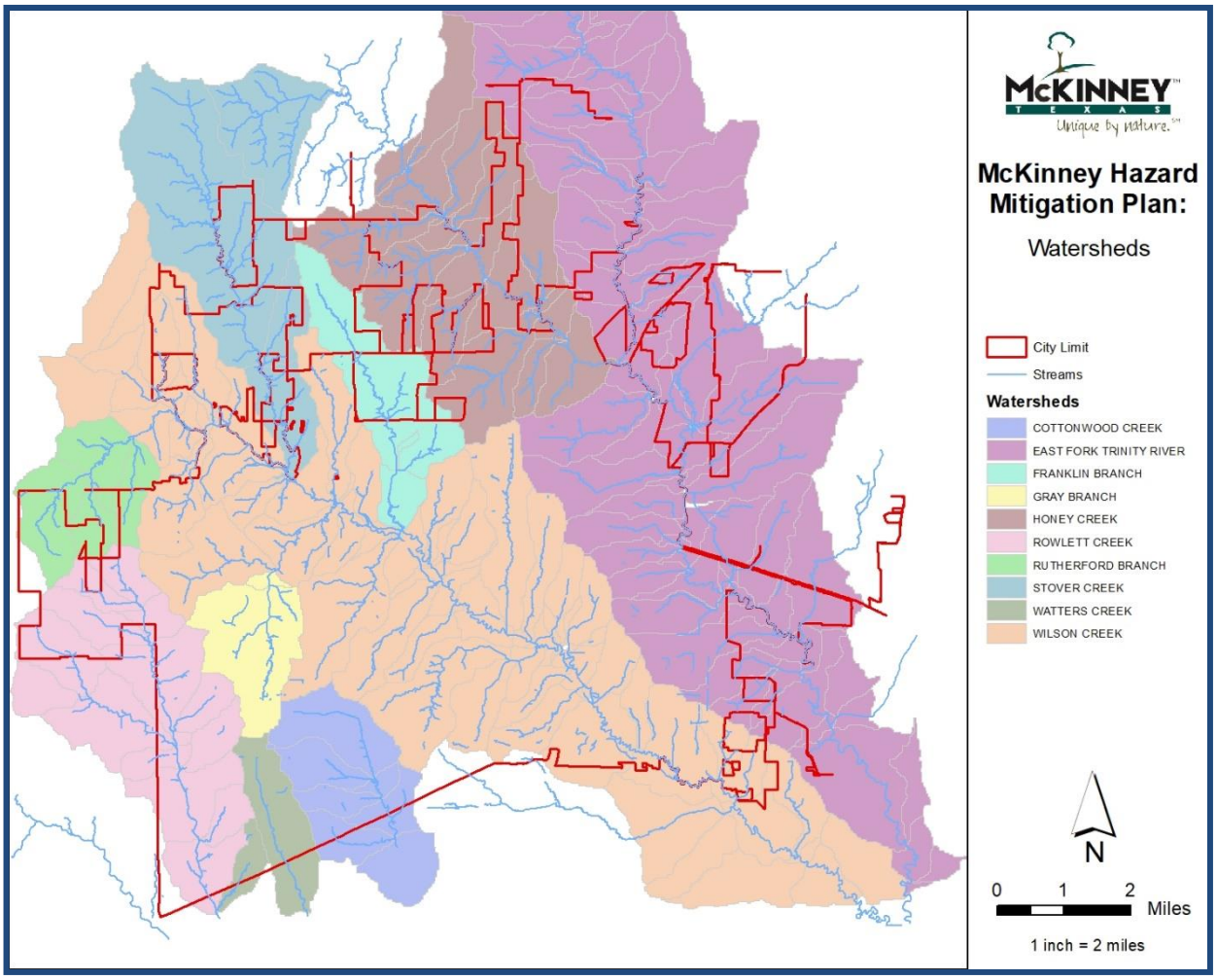
Stover Creek

The Stover Creek watershed is 7.0 miles long and drains 8.04 square miles of land into the East Fork of the Trinity River. The watershed is located in north central Collin County and south central Grayson County.

Honey Creek

The Honey Creek watershed is 16.9 miles long, with 17 NRCS floodwater retarding structures. These structures control a total of 30.5 square miles or 62 percent of the watershed at the confluence of the East Fork of the Trinity River.

Figure 2-8

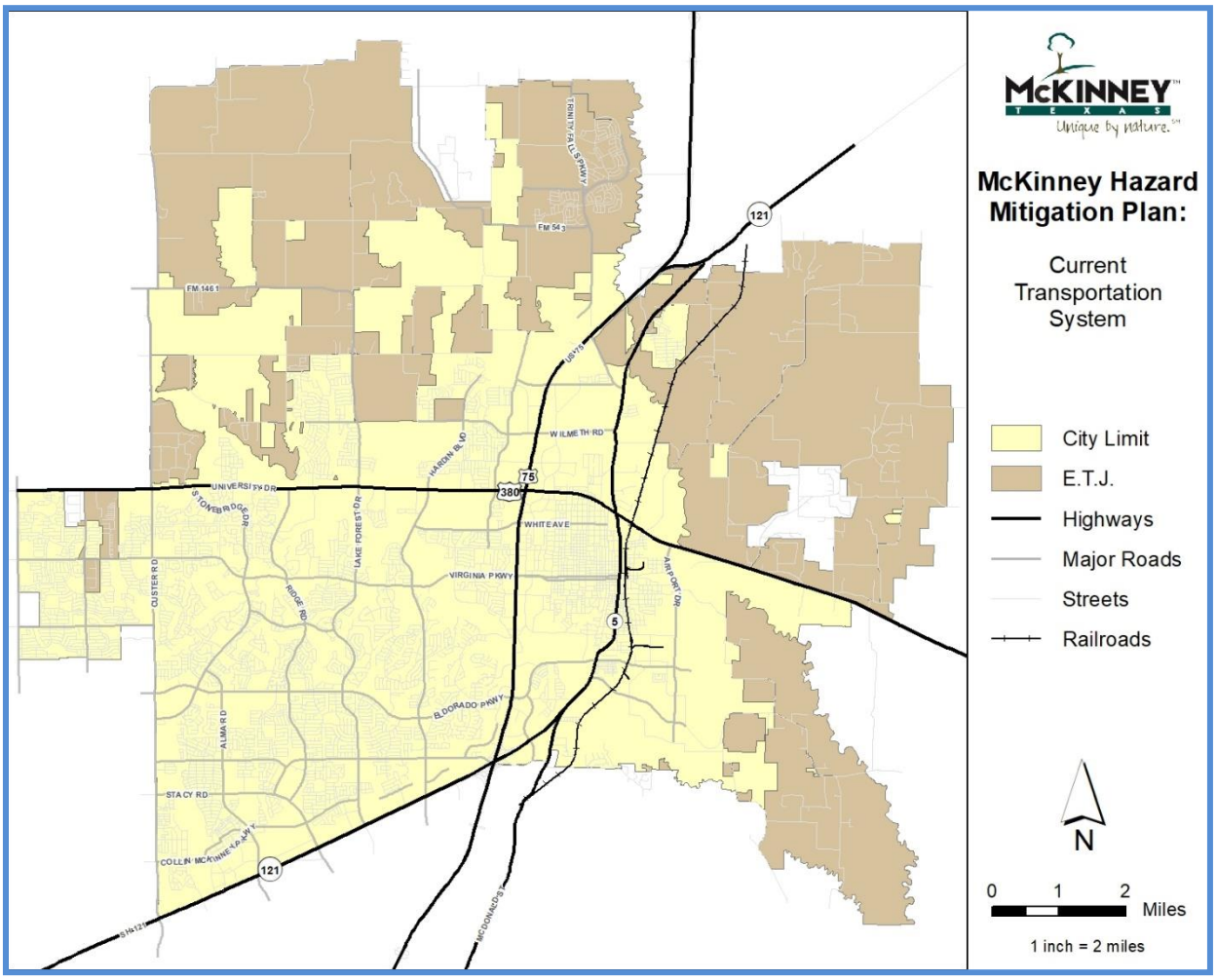


City of McKinney Water Sheds

2.5.2.3 Transportation

The City of McKinney offers many transportation avenues for both people and cargo, including major highways, railroads, and a national airport. Figure 2-9, reveals the City of McKinney current transportation system while figure 2-10 illustrates the City of McKinney's future transportation system.

Figure 2-9
Current Transportation System

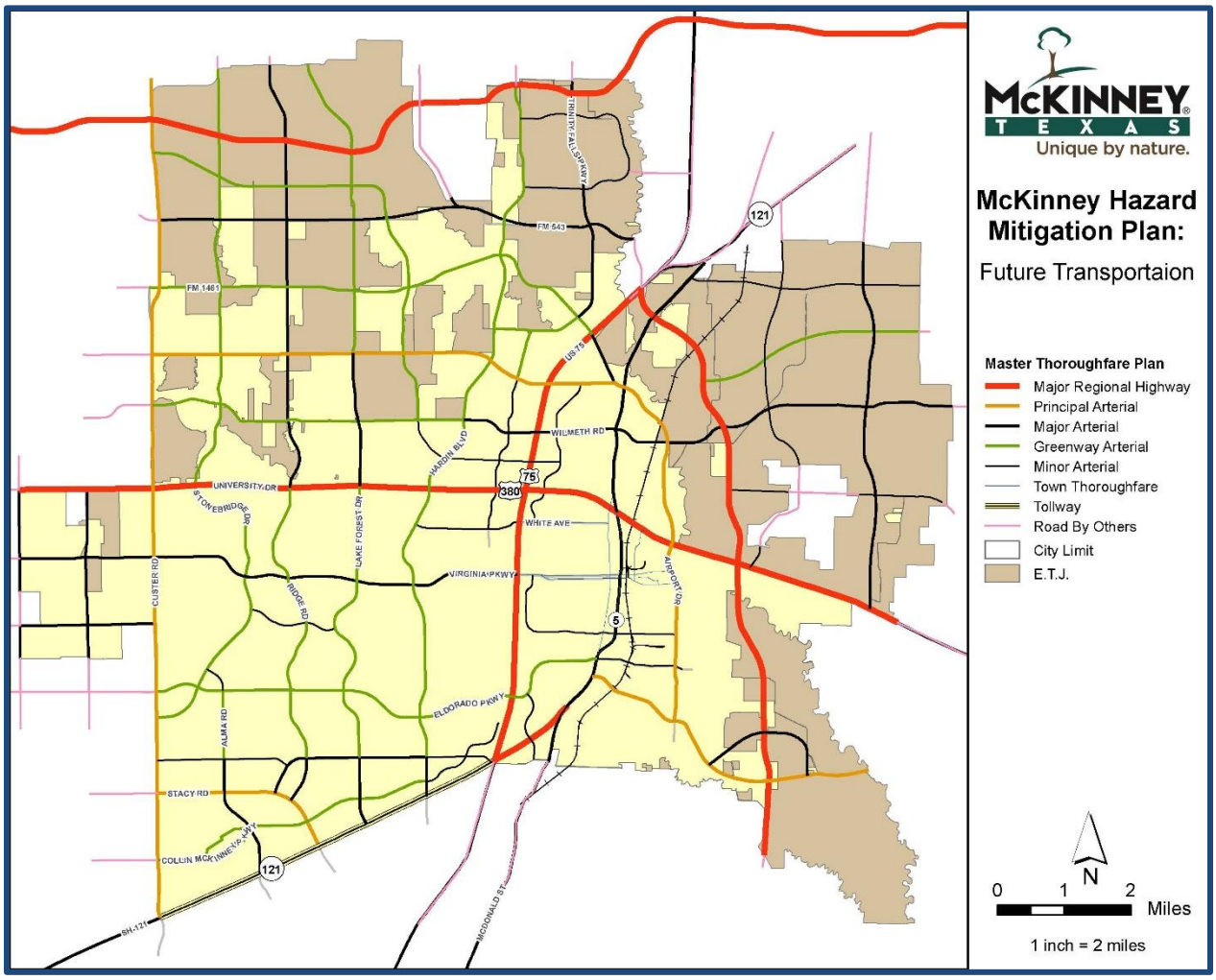


2.5.2.4 Highways

The City of McKinney is dissected by US 75, Central Expressway, a major thoroughfare that runs north and south; and US 380, University Drive that runs east and west. Additionally, State Highway 5, McDonald Street, runs north and south through the downtown portion of the City linking to State Highway 121 at both ends. Other notable roadways include FM 2478, Custer Road that runs north and south bordering McKinney to the west; Virginia Parkway that runs east and west virtually the entire length of the city limits; El Dorado Parkway that runs from US 75 west past Custer Road; and Industrial Boulevard that runs from US 75 east to the McKinney Municipal Airport.[19]

[19] City of McKinney Development Services, November 2013.

Figure 2-10
Future Transportation System



2.5.2.5 Railroad

The Dallas-Garland and Northeastern Railroad (DGNR) runs north and south dissecting the City of McKinney just to the east of State Highway 5. The DGNR transports freight to businesses in the City of McKinney including polyvinyl, lead ingots, plastics, diammonium phosphate, and lumber.[20]

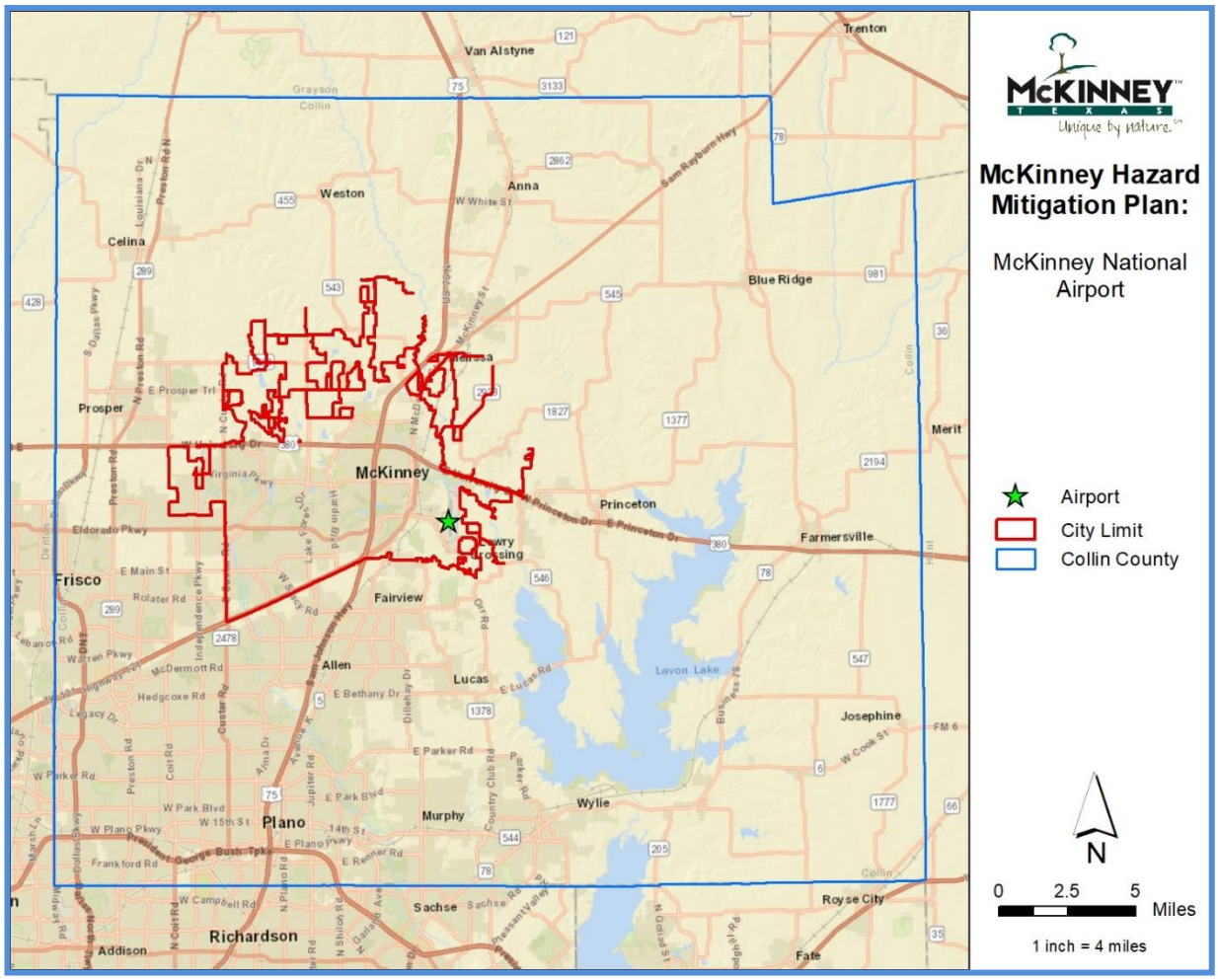
2.5.2.6 Airport

Established in 1979, the McKinney National Airport, formally known as Collin County Regional Airport, is located in the Southeastern portion of the City of McKinney and is fully serviced by the City of McKinney. The airport is located on approximately 580 acres of land and is nearly 35 miles from downtown Dallas. The airport maintains 110 private aircraft hangers, various navigational aids, an Automated Surface Observation System (ASOS), a Federal Aviation Administration Contract Air Traffic Control Tower, and a 7002-by-150 foot runway. Fire Station 4, owned and

[20] Dallas-Garland and Northeastern Railroad, Staff Conversation, September 18, 2001.

operated by the City of McKinney, is adjacent to the airport and provides Aircraft Rescue and Fire Fighting (ARFF) services. Figure 2-11 provides a detailed map of McKinney National Airport and surrounding roads and major roads.

Figure 2-11
City of McKinney Airport



Currently, McKinney National Airport has over 200 based aircraft. The airport serves corporate and private craft consisting of jets, light aircraft, and helicopters. The airport handled over 140,800 aircraft operations in 2020 and expects steady increases in the future.[21]

2.6 McKinney Capabilities

The planning and response capabilities of any municipality are vital to its success in hazard mitigation. A few keys areas to ensure strong capabilities include having plans and policies in place to guide development and mitigation projects, understanding and identifying critical infrastructure, and having trained staff to assist with mitigation planning and respond to disasters.

[21] McKinney National Airport, November 2020

For continued growth and improvement, actions that can expand and improve existing authorities, plans, policies, and resources for mitigation include budgeting and passing policies and procedures for mitigation actions, adopting and implementing stricter mitigation regulations, approving the hiring and training of staff for mitigation activities, and approving mitigation updates to existing plans as new needs are recognized.

The City of McKinney Hazard Mitigation Steering Committee (HMSC) conducted a review of its legal, staffing, and financial capabilities; as well as the City of McKinney ability to expand on and improve existing policies and programs related to hazard mitigation planning and the results are shown in table 2-2.

2.6.1 Legal and Regulatory Capabilities

The table below provides an overview of the legal and regulatory capabilities in the City of McKinney.

Table 2-2
Legal and Regulatory Capabilities

City of McKinney Legal and Regulatory Capability						
Regulatory Tools/Plans	**Reference Number**	**Date Adopted**	**Local Authority**	**State Prohibited**	**Higher Authority**	**Electronic Copy Included**
Building Codes-International Codes	McKinney, Texas – Code of Ordinances Chapter 122 Ord. No. 2008-05-050, § 2018-01-001	2018	Y	Y		
Building Codes-National Electric	McKinney, Texas – Code of Ordinances Chapter 122	2020				
Fire Prevention Code	McKinney, Texas – Code of Ordinances Chapter 42	2020				
Capital Improvements Plan	Capital Improvement Plan	2019	Y	Y		
Comprehensive Plan	ONE McKinney 2040 Comprehensive Plan	2018	Y	Y		
Economic Development Plan	ONE McKinney 2040 Comprehensive Plan	2018	Y	Y		
Emergency Management Accreditation Program Certified	Not Applicable					
Comprehensive Emergency Plan	Annual Update per Texas Division of Emergency Management Requirement					N
Storm Water Management Ordinance	McKinney, Texas -Code of Ordinances Chapter 130 Article IV Ord. No. 2014-09-063, § 2, 9-2-2014	2014	Y			
Growth Control Ordinance	N/A					
Erosion Hazard Setback Ordinance	McKinney, Texas -Code of Ordinances Chapter 130 Article IV Ord. No. 2014-09-063, § 2, 9-2-2014	2014				
Hillside Ordinance	N/A					

City of McKinney Legal and Regulatory Capability						
Regulatory Tools/Plans	Reference Number	Date Adopted	Local Authority	State Prohibited	Higher Authority	Electronic Copy Included
Historic Preservation Overlay District	Article III Section 146 Ord. No. 2013-04-044	2013	Y			
Post-Disaster Ordinance	N/A					
Post-Disaster Recovery Plan	N/A					
Real Estate Disclosure	N/A					
Site Plan Requirements	Site Plan Requirement and Checklist	2013	Y			
Subdivision Regulations	Chapter 142 Ord. No. 2008-08-077	2012	Y			
Wildfire Ordinance	N/A					
Zoning Ordinances	Chapter 146 Ord. No. 2008-07-066	2012	Y			

N = No
S = State Provides
Y = Yes

2.6.2 Staffing Capabilities

A review of staffing capabilities within the City of McKinney was conducted to determine what staff levels exist for supporting mitigation activities.

Table 2-3

Mitigation Staffing Capabilities

City of McKinney Critical Mitigation Staffing Capabilities			
Staff	Have Capability	Full-time (FT) or Part-time (PT)	Is Staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Chief Building Official	Yes	FT	**Yes, Yes, Yes**
Floodplain Administrator	Yes	FT	**Yes, Yes, Yes**
Emergency Manager	Yes	FT	**Yes, Yes, Yes**
Assistant Emergency Manager	Yes	FT	**Yes, Yes, Yes**

City of McKinney Critical Mitigation Staffing Capabilities			
Staff	**Have Capability**	**Full-time (FT) or Part-time (PT)**	**Is Staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Emergency Management Planner	Yes	FT	**Yes, Yes, Yes**
Community Planner	Yes	FT	**Yes, Yes, Yes**
Civil Engineer	Yes	FT	**Yes, Yes, Yes**
GIS Coordinator	Yes	FT	**Yes, Yes, Yes**
Other:	No	N/A	**Yes, Yes, Yes**

Table 2-4
Land Administrative and Technical Capabilities

City of McKinney Legal and Regulatory Capability						
Regulatory Tools/Plans	**Reference Number**	**Date Adopted**	**Local Authority**	**State Prohibited**	**Higher Authority**	**Electronic Copy Included**
Building Codes	2018 International Codes 2017 National Electrical Code	2020	**Y**			
Capital Improvements Plan	ONE McKinney 2040 Comprehensive Plan	2018	**Y**			
Comprehensive Plan	ONE McKinney 2040 Comprehensive Plan	2018	**Y**			
Economic Development Plan	ONE McKinney 2040 Comprehensive Plan	2018	**Y**			
Emergency Management Accreditation Program Certified	Not Applicable					
Emergency Disaster Plan	N/A					
Flood Management, Plan	McKinney, Texas -Code of Ordinances Chapter 130 Article IV Ord. No. 2014-09-063, § 2, 9-2-2014	2014	**Y**			
Growth Control Ordinance	N/A					
Hazard Setback Regulations	N/A					
Hillside Ordinance	N/A					
Historic Ordinance	Article III Section 146 Ord. No. 2013-04-044	2013	**Y**			

City of McKinney Legal and Regulatory Capability						
Regulatory Tools/Plans	Reference Number	Date Adopted	Local Authority	State Prohibited Higher Authority		Electronic Copy Included
Post-Disaster Ordinance	N/A					
Post-Disaster Recovery Plan	N/A					
Real Estate Disclosure	N/A					
Site Plan Requirements	Site Plan Requirement and Checklist	2013	Y			
Subdivision Regulations	Subdivision Regulations 142	2012	Y			
Wildfire Ordinance	N/A					
Zoning Ordinances	Zoning Regulations Chapter 146	2012	Y			

N/A = Not applicable
Unk = Unknown

2.6.3 Fiscal Capabilities

The City of McKinney HMSC provided a list of the community grants received to assist with activities in the emergency management cycle, including mitigation activities.

Table 2-5
Fiscal Capabilities

City of McKinney Fiscal Capabilities					
Financial Resources	Description	Eligible			
		Yes	No	TBD	Used
Wildlife Assessment	Wildlife Assessment	X			X
Community Development Block Grant	Community Development Block Grant	X			X
UASI	Vertical Rescue Training	X			X
UASI	Debris Monitoring Plan	X			X
UASI	Web Emergency Operations Center Support Tech	X			X
Hazard Mitigation Plan	Hazard Mitigation Plan	X			X
Brownfield Hazardous	Brownfield Hazardous	X			X

City of McKinney Fiscal Capabilities					
Financial Resources	Description	Eligible			
		Yes	No	TBD	Used
Sustainable Development	Sustainable Development	X			X
UASI	Law Enforcement Terrorism Prevention Activities	X			X

TBD = To Be Determined
UASI = Urban Areas Security Initiative

2.7 Critical Asset Inventory

A critical asset is defined as a government asset that provides essential City of McKinney services, including government facilities, police departments, fire departments, and emergency medical services. Critical facilities and infrastructure in McKinney are all vulnerable to hazards. The City of McKinney identified the facilities below as critical assets. Table 2-5 lists the City of McKinney critical asset inventory followed by GIS maps illustrating detailed information regarding these critical assets.

Table 2-6
City of McKinney Critical Facilities

FEMA Requirement 44 CFR 201.6(c) (2) (ii)(A)(B). The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area. (B) An estimate of the potential dollar losses to vulnerable structures identified this section and a description of the methodology used to prepare the estimate.

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Healthcare Facilities									

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Baylor Medical Center	5252 W University Dr	75071	Hospital	Yes	No	Yes	497,335		
Craig Ranch Hospital	6045 Alma Rd	75071	Hosptial	Yes	No	Yes	119,818	$ 20,210,978	
Medical City McKinney	4500 Medical Center Dr	75069	Hospital	Yes	No	Yes	393,547		
Medical City McKinney Wysong Campus	130 S Central Expy	75070	Hospital	Yes	No	Yes	85,318	$ 879,675	
Methodist McKinney Hospital	8000 Eldorado Pkwy	75070	Hospital	Yes	No	Yes	66,450	$ 15,129,853	
Bella Births, Center for Birth & Health	2417 Virginia Pkwy	75071	Other Medical Facility	Yes	No		2,400	$ 186,073	
Collin County Mental Health Ctr	1515 Hertage Dr	75069	Other Medical Facility	Yes	No		64,784	$ 10,384,525	
Dermatology/Skin Cancer Surgery Center	1790 Stonebridge Dr	75070	Other Medical Facility	Yes	No		8,850	$ 1,384,439	
E Care Urgent Care Center	2810 S Hardin Blvd	75070	Other Medical Facility	Yes	No		10,985	$ 2,524,284	
Exult Healthcare Solutions	4801 Medical Center Dr	75069	Other Medical Facility	Yes	No		6,320	$ 1,180,944	
Care Now	809 N Central Expy	75070	Other Medical Facility	Yes	No		5,492	$ 656,772	
Occumed Plus	130 S Central Expy	75070	Other Medical Facility	Yes	No		85,318	$ 879,675	
Emerus 24HR Emergency Room	6045 Alma Rd Ste 110	75070	Other Medical Facility	Yes	No		119,818	$ 20,210,978	
FNC McKinney Dialysis Center	1831 Harroun Ave	75069	Other Medical Facility	Yes	No		6,527	$ 1,228,792	
Grace to Change	1216 N Central Expy Ste 104	75070	Other Medical Facility	Yes	No		12,608	$ 639,156	
Hansen Industries, Inc.	1575 Redbud Blvd Ste 201	75070	Other Medical Facility	Yes	No		10,374	$ 721,359	

McKinney Dialysis	4717 Medical Center Dr	75069	Other Medical Facility	Yes	No		6,872	$ 1,258,755	
McKinney on 380 Dialysis	5329 W University Dr	75071	Other Medical Facility	Yes	No		7,000	$ 1,809,981	
McKinney Outpatient Surgery	1505 Harroun Ave	75069	Other Medical Facility	Yes	No		13,163	$ 730,307	
McKinney Regional Cancer Center	4601 Medical Center Dr	75069	Other Medical Facility	Yes	No		33,981	$ 3,310,943	
McKinney Surgery Center	4510 Medical Center Dr	75069	Other Medical Facility	Yes	No		122,210		
Medical Center at Craig Ranch	8080 SH 121	75070	Other Medical Facility	Yes	No		50,951	$ 6,072,470	
New Path Treatment & Recovery	4817 Medical Center Dr Ste 3A	75069	Other Medical Facility	Yes	No		3,278	$ 563,498	
North Central Medical Center: Rex David	4500 Medical Center Dr	75069	Other Medical Facility	Yes	No		393,547		
Primacare Urgent Care Center	1798 Eldorado Pkwy	75069	Other Medical Facility	Yes	No		19,769	$ 3,305,912	
Stonebridge Surgery Center	8855 Synergy Dr	75070	Other Medical Facility	Yes	No		5,230	$ 912,084	
Government Facilities									
Apex Center	3003 Alma Rd	75070	City of McKinney Facilities	Yes	No		113,065	$ 16,686,390	
Building Maintenance & Meters, Historic McKinney Water Tower	131 S Chestnut St	75069	City of McKinney Facilities	Yes	Yes		6,708	$ 2,198,300	
Chestnut Commons Parking Garage	202 N Chestnut St	75069	City of McKinney Facilities	Yes	No			$ 2,605,157	
Facility/Asset Name or Description	**Address**	**Zip**	**Facility Type**	**Economic Asset**	**Historic Asset**	**Emergency Gen.**	**Square Feet**	**Structure Value**	**Content Value**
City Hall - Elected Officials, Finance, Budget, Payroll, City Secretary & City Manager	222 N Tennessee St	75069	City of McKinney Facilities	Yes	No		21,105	$ 2,381,800	$ 500,000

Code Enforcement, Community & Housing Development	410 N Tennessee St	75069	City of McKinney Facilities	Yes	No		7,000	$ 2,204,900	$ 204,000
Communications and Marketing	216 N Tennessee St	75069	City of McKinney Facilities	Yes	No		1,560	$ 192,063	
Community Center	2001 S Central Expy	75069	City of McKinney Facilities	Yes	No		29,611	$ 2,204,900	$ 204,000
Development Services, Planning, Engineering & Inspections	221 N Tennessee St	75069	City of McKinney Facilities	Yes	No		11,248	$ 21,376,000	$ 459,000
Dr Pepper StarCenter	6993 Collin McKinney Pkwy	75070	City of McKinney Facilities	Yes	No		84,438	$ 10,687,939	
Facilities Maintenance	115B Industrial Blvd	75069	City of McKinney Facilities	Yes	No		43,153	$ 2,538,600	
Facilities Service Complex Public Works, Water, Fleet, Purchasing & Solid Waste	1550 S College St Bldg B	75069	City of McKinney Facilities	Yes	No		76,146	$ 8,365,086	$ 250,000
Fire Station 1	301 N McDonald St	75069	City of McKinney Facilities	Yes	No		21,160	$ 3,239,858	$ 750,000
Fire Station 2	2001 Community Ave	75071	City of McKinney Facilities	Yes	No		5,144	$ 792,346	$ 500,000
Fire Station 3	4269 Eldorado Pkwy	75070	City of McKinney Facilities	Yes	No		5,448	$ 846,063	$ 500,000
Fire Station 4 (Airport)	1401 Industrial Blvd	75069	City of McKinney Facilities	Yes	No		6,984	$ 1,453,400	$ 500,000
Fire Station 5	6600 Virginia Pkwy	75071	City of McKinney Facilities	Yes	No		12,020	$ 2,747,500	$ 500,000
Facility/Asset Name or Description	**Address**	**Zip**	**Facility Type**	**Economic Asset**	**Historic Asset**	**Emergency Gen.**	**Square Feet**	**Structure Value**	**Content Value**
Fire Station 6	1890 Marketplace Dr	75069	City of McKinney Facilities	Yes	No		12,096	$ 2,187,700	$ 900,000
Fire Station 7	861 S Independence Pkwy	75072	City of McKinney Facilities	Yes	No		15,884	$ 2,354,300	$ 750,000

Fire Station 8	3445 Alma Rd	75070	City of McKinney Facilities	Yes	No		15,375	$ 2,201,800	$ 650,000
Fire Station 9	4900 Summit View Dr	75071	City of McKinney Facilities	Yes	No		16,130	$ 2,244,027	
Fire Station 10	1150 Olympic Xing	75071	City of McKinney Facilities	Yes	No		14,755	$ 5,402,885	
Hall Memorial Library	101 E Hunt St	75069	City of McKinney Facilities	Yes	No		21,744	$ 8,874,300	$3,570,000
Human Resources and Risk Management	201 W Louisiana St	75069	City of McKinney Facilities	Yes	No		4,000	$ 591,019	
Information Technology & Utility Billing	210 N Tennessee St	75069	City of McKinney Facilities	Yes	No		16,898	$ 2,424,425	
John and Judy Gay Library, Elevated Storage Tank (Alma), Sewer Lift Station (Gabe Nesbitt Park)	6861 Eldorado Pkwy	75070	City of McKinney Facilities	Yes	No		969,940	$ 8,087,435	$1,200,000
Juanita Maxwell Aquatic Center	1701 N McDonald St	75069	City of McKinney Facilities	Yes	No			$ 192,700	$ 1,400
McKinney Convention and Visitors Bureau	200 W Virginia St	75069	City of McKinney Facilities	Yes	No		2,997	$ 5,300,000	
McKinney National Airport	1500 Industrial Blvd	75069	City of McKinney Facilities	Yes	No		277,366	$ 12,117,276	
McKinney Performing Arts Center	111 N Tennessee St	75069	City of McKinney Facilities	Yes	No		35,848	$ 1,145,362	
MEDC & MCDC	5900 S Lake Forest Dr Ste 110	75070	City of McKinney Facilities	Yes	No		115,930	$ 14,189,657	
Facility/Asset Name or Description	**Address**	**Zip**	**Facility Type**	**Economic Asset**	**Historic Asset**	**Emergency Gen.**	**Square Feet**	**Structure Value**	**Content Value**
Municipal Court Building	130 S Chestnut St.	75069	City of McKinney Facilities	Yes	No		15,104	$ 1,950,000	$1,683,000
Oak Hollow Golf Course	3005 N McDonald St	75069	City of McKinney Facilities	Yes	No		14,152	$ 1,337,476	

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Old Settler's Recreation Center	1201 E Louisiana St	75069	City of McKinney Facilities	Yes	No		50,678	$ 1,111,756	$ 1,000
Old Water Building	701 Rockwall St	75069	City of McKinney Facilities	Yes	No				
Parks and Recreation Admin	1611 N Stonebridge Dr	75071	City of McKinney Facilities	Yes	No		4,238	$ 570,700	$ 75,000
Police Gun Range	506 Interchange St	75071	City of McKinney Facilities	Yes	No				
Police Store Front	120 S Kentucky St	75069	City of McKinney Facilities	Yes	No				
Public Safety Building	2200 Taylor-Burk Dr	75071	City of McKinney Facilities	Yes	No		126,197	$ 17,399,300	
Elevated Storage Tank (Hardin)	3800 Virginia Pkwy	75071	City of McKinney Public Works	Yes	No			$ 1,071,840	
Elevated Storage Tank (Independence)	10153 Westridge Blvd	75072	City of McKinney Public Works	Yes	No			$ 1,584,000	
Elevated Storage Tank (Industrial)	109 Industrial Blvd	75069	City of McKinney Public Works	Yes	No			$ 1,240,800	
Elevated Storage Tank (University)	1800 W University Dr	75069	City of McKinney Public Works	Yes	No		1,250,000	$ 3,300,000	
Elevated Storage Tank (Virginia)	9251 Virginia Pkwy	75072	City of McKinney Public Works	Yes	No		240	$ 1,242,518	
Elevated Storage Tank (Wilmeth)	2890 CR 943	75071	City of McKinney Public Works	Yes	No			$ 1,240,800	
Elevated Storage Water Tank (Trinity Falls)	4710 FM 453	75071	City of McKinney Public Works	Yes	No				
Pump Station (Gerrish)	1001 Gerrish St	75069	City of McKinney	Yes	No		2,275,336	$ 6,007,552	

			Public Works						
Pump Station (McKinney Ranch or 720)	3250 McKinney Ranch	75070	City of McKinney Public Works	Yes	No		2,592	$ 7,674,236	
Pump Station (Redbud)	3601 Redbud Blvd	75071	City of McKinney Public Works	Yes	No		97,993	$ 975,028	
Pump Station (University)	7560 W University Dr	75071	City of McKinney Public Works	Yes	No		7,820	$ 11,919,848	
Sewer Lift Station (Erwin Farms)	3031 Erwin Farms Blvd	75071	City of McKinney Public Works	Yes	No				
Sewer Lift Station (Hollow Creek)	2405 Avalon Creek Way	75071	City of McKinney Public Works	Yes	No		3,603	$ 264,083	
Sewer Lift Station (Monticello)	1397 Monticello Dr	75071	City of McKinney Public Works	Yes	No				
Sewer Lift Station (Rutherford Ranch East)	9311 W University Blvd	75071	City of McKinney Public Works	Yes	No				
Sewer Lift Station (Rutherford Ranch West)	10365 W University Dr	75071	City of McKinney Public Works	Yes	No		5,712	$ 468,843	
Sewer Lift Station (Sloan Creek)	4440 SH 121	75070	City of McKinney Public Works	Yes	No				
Sewer Lift Station (Stonebridge)	1995 N Stonebridge Dr	75071	City of McKinney Public Works	Yes	No				

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Collin County Administration Building	2352 Bloomdale Rd	75071	Collin County	Yes	No		1,326,768	$ 134,838,319	
Collin County Appraisal District	250 Eldorado Pkwy	75069	Collin County	Yes	No		60,000	$ 4,859,030	

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Collin County Public Works, Medical Examiner & Communication Tower	700 Wilmeth Rd	75071	Collin County	Yes	No		33,996	$ 1,573,451	
Collin County Elections Center	2010 Redbud Blvd	75069	Collin County	Yes	No		67,425	$ 4,515,269	
Collin County Records & Health Dept	825 N McDonald St	75069	Collin County	Yes	No		47,964	$ 745,493	
Myers Park Event Center, Barns & Collin County Farm Museum	7117 CR 166	75071	Collin County	Yes	No		18,350	$ 1,104,139	
Department of Health and Human Services	901 N McDonald St Ste 800	75069	State Governm ent	Yes	No		95,310	$ 5,397,177	
North Central Texas Workforce Solutions	1701 W Eldorado Pkwy Ste 250	75069	State Governm ent	Yes	No		54,086	$ 4,375,438	
Texas Department of Public Safety	400 Power House St.	75071	State Governm ent	Yes	No		7,559	$ 478,942	
TXDOT Maintenance Facility	2205 S McDonald St	75069	State Governm ent	Yes	No		13,696	$ 217,218	
Unemployment Tax Office	1713 W Louisiana St	75069	State Governm ent	Yes	No		4,520	$ 207,686	
Greater Texoma Utility Authority Bloomdale Pump Station	3944 N McDonald St	75071	Public Utility District	Yes	No		1,408	$ 228,405	
NTMWD Landfill - 121 Regional Disposal Facility	3824 Sam Rayburn Hwy	75454	Public Utility District	Yes	No				
NCSUD Water Storage	1045 CR 278		Public Utility District	Yes	No		670,392	$ 1,770,854	
NCSUD Water Storage	1044 CR 278		Public Utility District	Yes	No		270,320	$ 714,477	
NTMWD Water Storage	490 Justin Trl	75071	Public Utility District	Yes	No				

North Texas Job Corps Center	1701 N Church St	75069	Federal Government	Yes	No		285,589	$ 3,540,223	
US Post Office	550 N Central Expy	75069	Federal Government	Yes	No		40,200	$ 6,883,077	
US Post Office (Linkside Park)	7210 Virginia Pkwy Ste 100	75071	Federal Government	Yes	No		56,001	$ 9,146,130	
US Social Security Administration	3250 Craig Dr	75070	Federal Government	Yes	No		16,564	$ 2,032,543	
USDA Office of Rural Development	1404 N McDonald St	75071	Federal Government	Yes	No		14,040	$ 1,281,468	
Education Facilities									
Bennett Elementary	7760 Coronado Dr	75072	McKinney ISD	Yes	No		61,728	$ 5,110,210	
Burks Elementary	1801 Hill St	75069	McKinney ISD	Yes	No		58,996	$ 2,695,166	
Caldwell Elementary	601 W Louisiana St	75069	McKinney ISD	Yes	No		78,374	$ 2,662,869	
Cockrill Middle School	1351 N Hardin Blvd	75071	McKinney ISD	Yes	No		216,591	$ 22,915,067	
Dowell Middle School	301 S Ridge Rd	75072	McKinney ISD	Yes	No		202,095	$ 15,095,497	
Eddins Elementary	311 Peregrine Dr	75072	McKinney ISD	Yes	No		61,692	$ 5,862,023	
Evans Middle School	6998 Eldorado Pkwy	75072	McKinney ISD	Yes	No		224,254	$ 21,853,591	
Faubion Middle School	2000 Rollins St	75069	McKinney ISD	Yes	No		272,773	$ 9,413,899	
Finch Elementary	1205 S Tennessee St	75069	McKinney ISD	Yes	No		70,852	$ 2,026,829	
Glen Oaks Elementary	6100 Glen Oaks Dr	75072	McKinney ISD	Yes	No		73,000	$ 5,971,826	
Johnson Elementary	3400 Ash Ln	75070	McKinney ISD	Yes	No		71,588	$ 8,570,187	
Facility/Asset Name or Description	**Address**	**Zip**	**Facility Type**	**Economic Asset**	**Historic Asset**	**Emergency Gen.**	**Square Feet**	**Structure Value**	**Content Value**
Lawson Early Childhood School	500 Dowell St	75071	McKinney ISD	Yes	No		92,284	$ 10,400,646	
Malvern Elementary	1100 Eldorado Pkwy	75069	McKinney ISD	Yes	No		95,544	$ 8,703,036	

McClure Elementary	1753 N Ridge Rd	75071	McKinney ISD	Yes	No		97,956	$ 11,082,895	
McGowen Elementary	4300 Columbus Dr	75070	McKinney ISD	Yes	No		103,120	$ 10,182,736	
McKinney Alternative Learning Center, Serenity Learning Center	2100 W White Ave	75069	McKinney ISD	Yes	No		27,399	$ 727,220	
McKinney Boyd High School	600 N Lake Forest Dr	75071	McKinney ISD	Yes	No		691,266	$ 95,224,702	
McKinney High School	1400 Wilson Creek Pkwy	75069	McKinney ISD	Yes	No		725,224	$ 41,169,242	
McKinney North High School	2550 Wilmeth Rd	75071	McKinney ISD	Yes	No		582,987	$ 90,661,569	
McNeil Elementary	3650 S Hardin Blvd	75070	McKinney ISD	Yes	No		81,614	$ 6,912,886	
Minshew Elementary	300 Joplin Dr	75071	McKinney ISD	Yes	No		90,448	$ 8,468,023	
Press Elementary	4101 Shawnee Dr	75071	McKinney ISD	Yes	No		90,448	$ 9,187,391	
Scott Johnson Middle School	3400 Community Blvd	75071	McKinney ISD	Yes	No		149,812	$ 12,661,280	
Slaughter Elementary	2706 Wolford St	75071	McKinney ISD	Yes	No		104,768	$ 6,804,735	
Valley Creek Elementary	2800 Valley Creek Trl	75072	McKinney ISD	Yes	No		73,000	$ 6,573,738	
Vega Elementary	2511 Cattleman Dr	75071	McKinney ISD	Yes	No		88,270	$ 8,781,319	
Walker Elementary	4000 Cockrill Dr	75072	McKinney ISD	Yes	No		81,158	$ 7,674,179	
Webb Elementary	810 E Louisiana St	75069	McKinney ISD	Yes	No		81,148	$ 1,660,137	
Wilmeth Elementary	901 La Cima Dr	75071	McKinney ISD	Yes	No		97,648	$ 8,739,926	
Wolford Elementary	6951 Berkshire Rd	75072	McKinney ISD	Yes	No		73,000	$ 7,114,010	

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Comstock Elementary (FISD)	7152 Silverado Trl	75070	Frisco ISD	Yes	No		81,054	$ 9,449,684	
Elliot Elementary (FISD)	3721 Hudson Crossing	75070	Frisco ISD	Yes	No		79,968	$ 8,125,139	

Emerson High School (FISD)	6300 Collin McKinney Pkwy	75070	Frisco ISD	Yes	No		387,378	$ 3,385,853	
Mooneyham Elementary (FISD)	2301 Eden Dr	75072	Frisco ISD	Yes	No		78,432	$ 7,787,343	
Ogle Elementary (FISD)	4200 Big Fork Trl	75070	Frisco ISD	Yes	No		79,048	$ 7,387,076	
Scoggins Middle School (FISD)	7070 Stacy Rd	75070	Frisco ISD	Yes	No		166,517	$ 16,953,062	
Scott Elementary (FISD)	10550 Millbend Dr	75072	Frisco ISD	Yes	No		82,189	$ 10,407,193	
Sonntag Elementary School (FISD)	2001 Reagan Dr	75072	Frisco ISD	Yes	No		79,164	$ 8,434,125	
Baker Elementary (PISD)	3125 Blue Wood Dr	75071	Prosper ISD	Yes	No		96,076	$ 10,229,278	
Furr Elementary (PISD)	551 S Bluestem Dr	75072	Prosper ISD	Yes	No		94,327	$ 24,918,751	
Hughes Elementary (PISD)	1551 Prestwick Hollow Dr	75071	Prosper ISD	Yes	No		96,484	$ 16,894,508	
Lindsey Elementary (AISD)	5730 Wilford Dr	75070	Allen ISD	Yes	No		112,325	$ 11,552,917	
Imagine International Academy of North Texas	2860 Virginia Pkwy	75071	Public Charter School	Yes	No		81,072	$ 18,241,760	
Collin College (McKinney Campus)	2200 W University Dr	75071	Higher Education	Yes	No		715,931	$ 92,654,985	
Collin College Higher Education Center	3452 Spur 399	75069	Higher Education	Yes	No		119,230	$ 21,756,466	
Collin College Public Safety Training Center	3600 Redbud Ave	75071	Higher Education	Yes	No		140,804	$ 19,374,462	
Texas A&M AgriLife Extension	825 N McDonald St Ste 150	75069	Higher Education	Yes	No				

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Abundance of Faith Childcare Center	1107 Lindsey St	75069	Private School	Yes	No		2,140	$ 212,555	
Adventure Kids	3300 Eldorado Pkwy Ste 900	75072	Private School	Yes	No		14,290	$ 1,929,991	

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Always Believe in Children	8200 Texian Trl	75070	Private School	Yes	No		3,673	$ 340,467	
Castle Montessori	6151 Virginia Pkwy	75072	Private School	Yes	No		17,468	$ 1,704,548	
Centennial Montessori Academy	7508 Eldorado Pkwy	75072	Private School	Yes	No		9,033	$ 1,319,741	
Children's Courtyard	3153 Stonebridge Dr	75070	Private School	Yes	No		14,459	$ 1,339,045	
Children's Lighthouse	4095 Eldorado Pkwy	75070	Private School	Yes	No		14,017	$ 1,123,005	
Concordia Christian Academy	2708 Virginia Pkwy	75071	Private School	Yes	No		52,925	$ 1,064,228	
Cornerstone Christian Academy	401 W Erwin Ave	75069	Private School	Yes	No		20,202	$ 391,554	
Crossing Point School	1800 W Hunt St	75069	Private School	Yes	No		45,044	$ 1,274,300	
Crosspoint Clubhouse	2101 Stonebridge Dr	75072	Private School	Yes	No		52,773	$ 4,459,564	
Daffodils Preschool	4901 Arroyo Trl	75070	Private School	Yes	No		7,353	$ 606,287	
Discovery Learning Center	1815 W White Ave	75069	Private School	Yes	No		9,150	$ 555,648	
Divine Children Christian Center	1799 N Graves St Ste B	75069	Private School	Yes	No		3,708	$ 104,106	
Faith Christian Academy	115A Industrial Blvd	75069	Private School	Yes	No		43,153	$ 2,538,600	
First Baptist Learning Center	1615 W Louisiana St	75069	Private School	Yes	No		178,093	$ 12,797,958	
Goddard School	3952 Ridge Rd	75070	Private School	Yes	No		8,064	$ 900,343	
Good Shepherd Montessori	7701 Virginia Pkwy	75072	Private School	Yes	No		6,644	$ 85,987	
Guidepost Montessori	6800 Bountiful Grove Dr	75070	Private School	Yes	No		12,423	$ 1,203,753	

Facility/Asset Name or Description	Address	Zip	Facility Type	Economic Asset	Historic Asset	Emergency Gen.	Square Feet	Structure Value	Content Value
Heritage Learning Center	200 Jordan Rd	75071	Private School	Yes	No		16,889	$ 1,020,817	
Holy Family School	500 N Throckmorton St	75069	Private School	Yes	No		10,480	$ 425,636	
Hope School	315 N Church St	75069	Private School	Yes	No		24,374	$ 849,713	
Inchworm Child Development Center	215 E University Dr Ste 200	75069	Private School	Yes	No		18,692	$ 625,841	
Keep Kids Learning Center	2519 High Pointe Blvd	75071	Private School	Yes	No		1,992	$ 190,167	
Kids R Kids	2910 Eldorado Pkwy	75072	Private School	Yes	No		12,177	$ 738,948	
Kids R Kids of West McKinney	9070 Westridge Blvd	75072	Private School	Yes	No		16,808	$ 3,384,222	
Little Acorn	3904 Temecula Creek Trl	75070	Private School	Yes	No		2,601	$ 244,077	
Little Hearts	100 Hopewell Dr	75071	Private School	Yes	No		1,946	$ 186,778	
Little Professors Montessori	520 N McDonald St	75069	Private School	Yes	No		1,528	$ 22,697	
Little Saints School	2000 W White Ave	75069	Private School	Yes	No		17,654	$ 395,477	
McKinney Christian Academy	3601 Bois D'Arc Rd	75071	Private School	Yes	No		108,220	$ 12,020,883	
McKinney Montessori	513 N Central Expy	75071	Private School	Yes	No		4,284	$ 321,197	
Merryhill Preschool	6050 Eldorado Pkwy	75072	Private School	Yes	No		7,942	$ 479,461	
Miss Gwen's Home Daycare	6001 Calloway Dr	75070	Private School	Yes	No		2,168	$ 191,000	
Montessori Academy at Westridge	9421 Westridge Blvd	75072	Private School	Yes	No		14,782	$ 1,503,753	
North Texas Christian Academy	3201 N Central Expy	75071	Private School	Yes	No		56,274	$ 2,000,020	
Parkway Christian	5600 Virginia Pkwy	75071	Private School	Yes	No		29,221	$ 1,795,788	

Playschool at Westridge	9605 Zaharias Dr	75072	Private School	Yes	No		1,531	$ 164,211	
Primrose School of Eldorado	3999 Eldorado Pkwy	75070	Private School	Yes	No		8,323	$ 411,429	
Primrose School of Stone Brooke	5651 Virginia Pkwy	75072	Private School	Yes	No		8,580	$ 515,059	
Promiseland Mothers Day Out	2801 Orchid Dr	75072	Private School	Yes	No		81,511	$ 6,382,388	
Spanish Schoolhouse	2421 Virginia Pkwy	75072	Private School	Yes	No		5,000	$ 282,634	
Sprouts Preschool	5733 N Custer Rd	75071	Private School	Yes	No		41,393	$ 1,528,869	
St Gabriel's Little Angels Preschool	110 St Gabriel Way	75071	Private School	Yes	No		78,099	$ 8,154,697	
Stacy's Studio of Music & Arts	2490 W White Ave	75071	Private School	Yes	No		3,069	$ 316,597	
Stonebridge Academy	1921 Grassmere Ln	75071	Private School	Yes	No		13,157	$ 1,592,819	
Sunrise Learning Center	1424 S Tennessee St	75069	Private School	Yes	No		6,400	$ 291,715	
Sunshine Kids Preschool	1800 S Stonebridge Dr	75072	Private School	Yes	No		66,871	$ 4,644,254	
The Prep School of McKinney	5317 W University Dr	75071	Private School	Yes	No		12,698	$ 2,125,580	
Top of the World Preschool	451 S Lake Forest Dr	75072	Private School	Yes	No		6,208	$ 362,540	
Wesley Christian Preschool	2705 Virginia Pkwy	75072	Private School	Yes	No		26,888	$ 1,636,552	
Wonderland Montessori Academy	3132 Hudson Crossing	75070	Private School	Yes	No		17,826	$ 1,627,335	

Figure 2-12
Critical Facilities

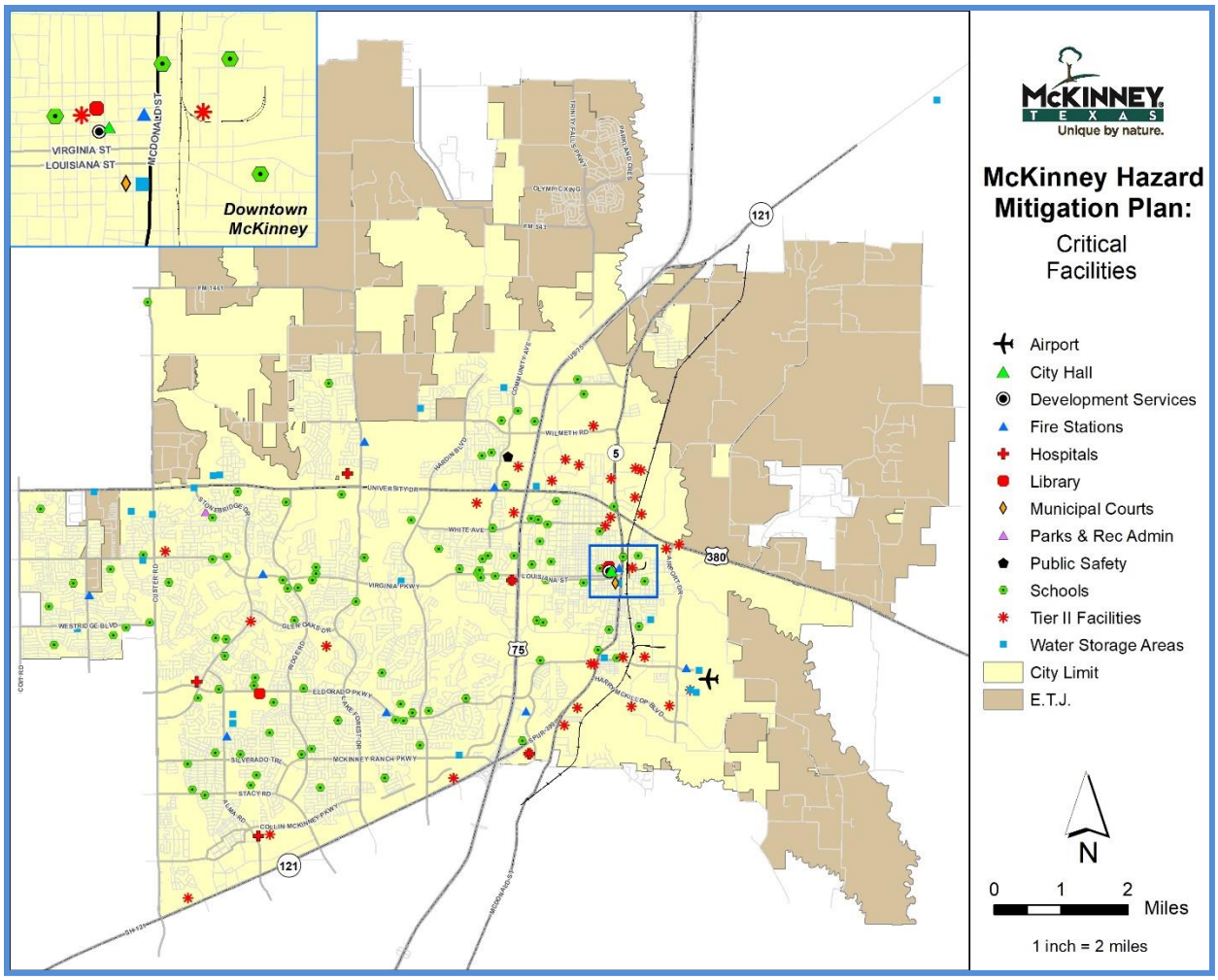


Figure 2-13
Government Facilities

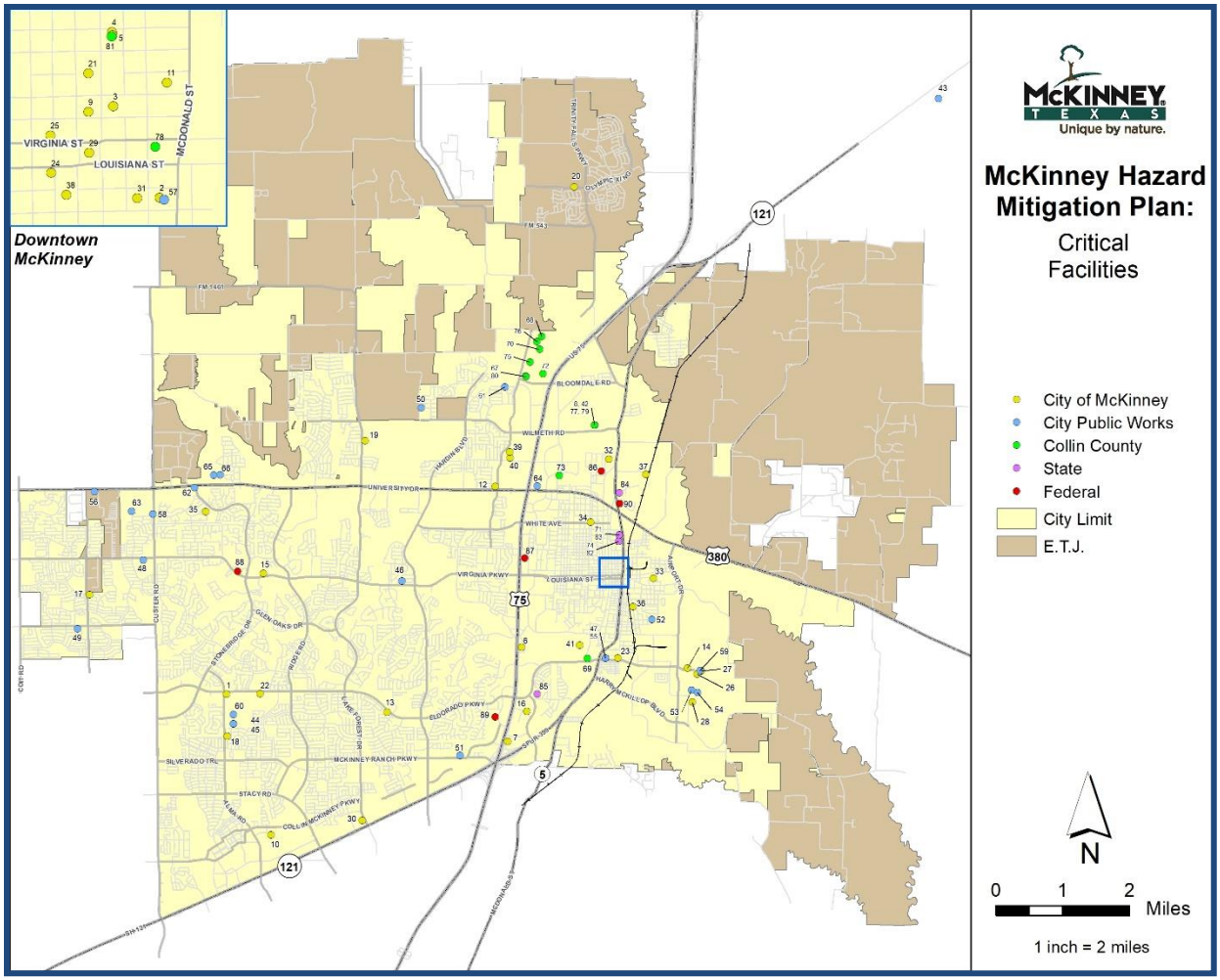


Figure 2-14
City of McKinney Fire Station/EMS Locations

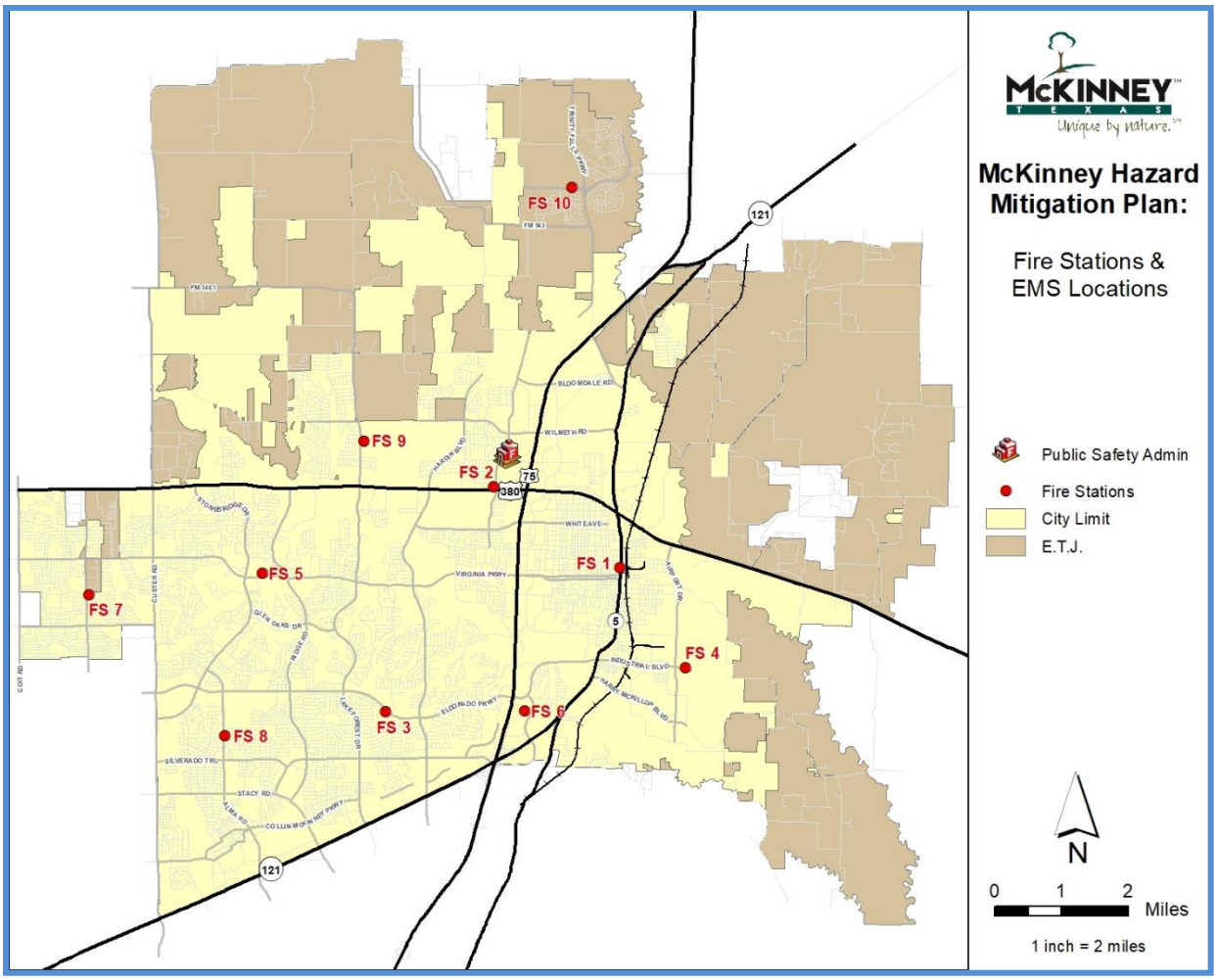


Figure 2-15
City of McKinney Police Department

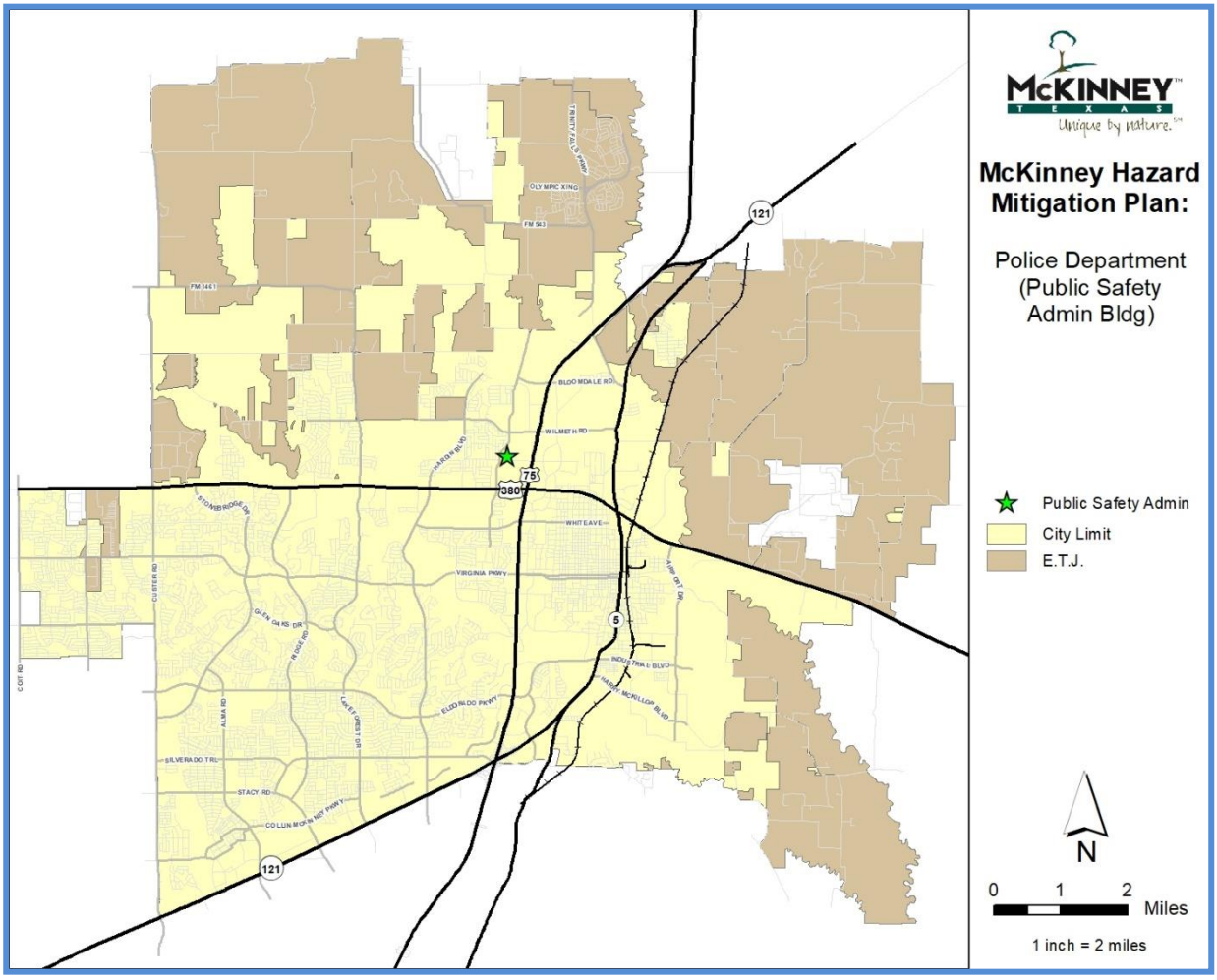
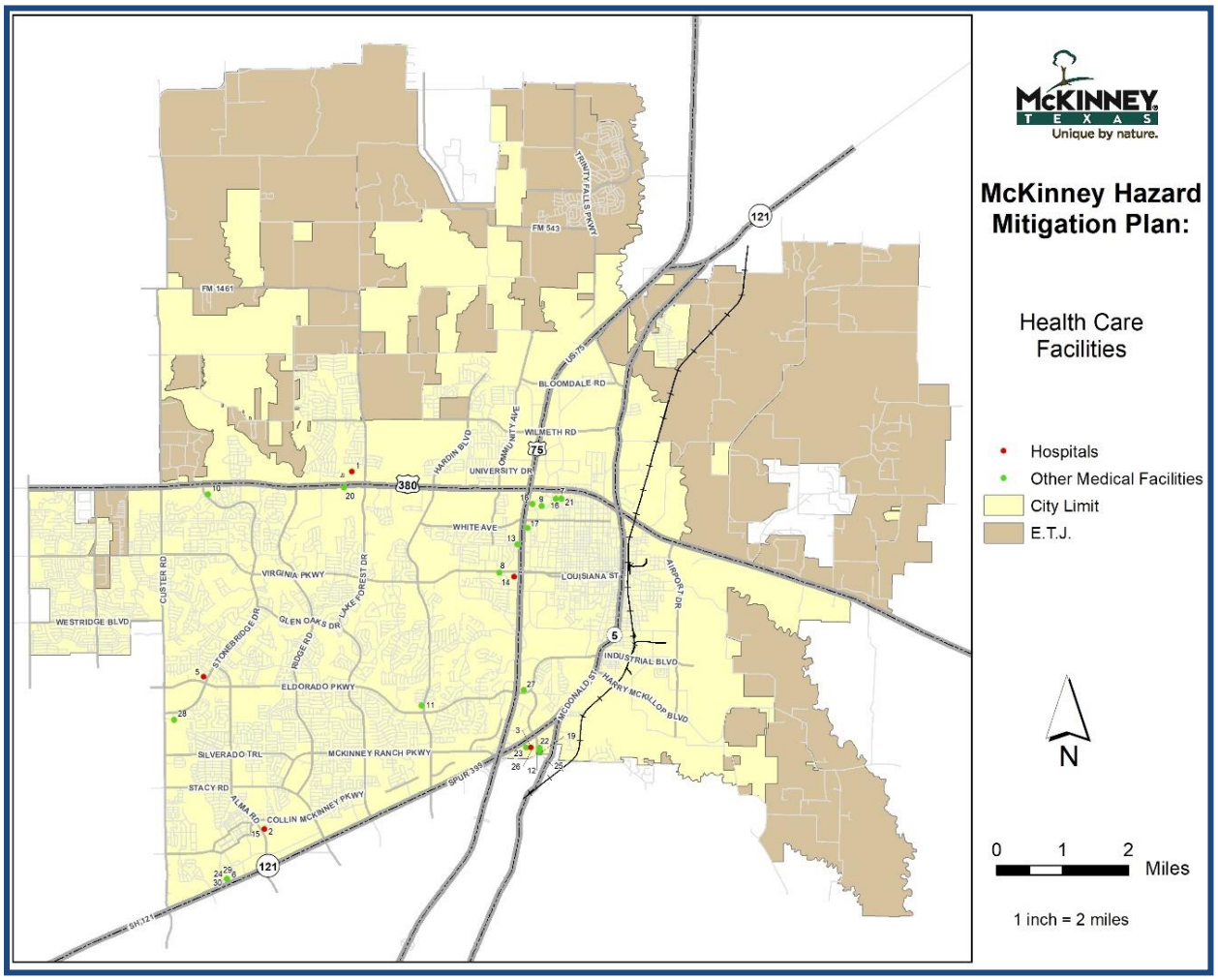


Figure 2-16
Healthcare Facilities



City of McKinney Schools

The City of McKinney contains 38 schools, including public, private, and higher education institutions.

Figure 2-17
City of McKinney Area Schools

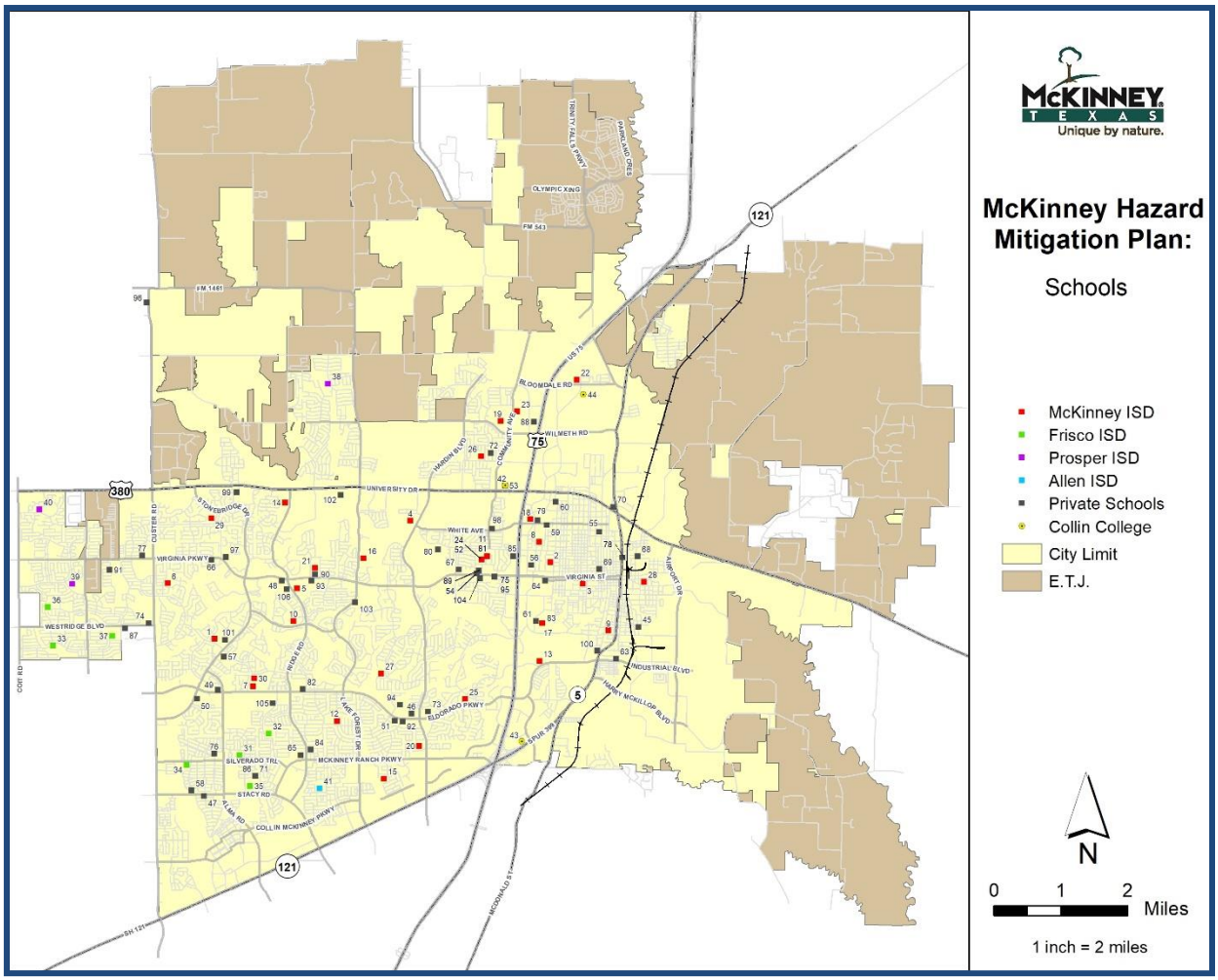


Figure 2-18
Religious Institutions

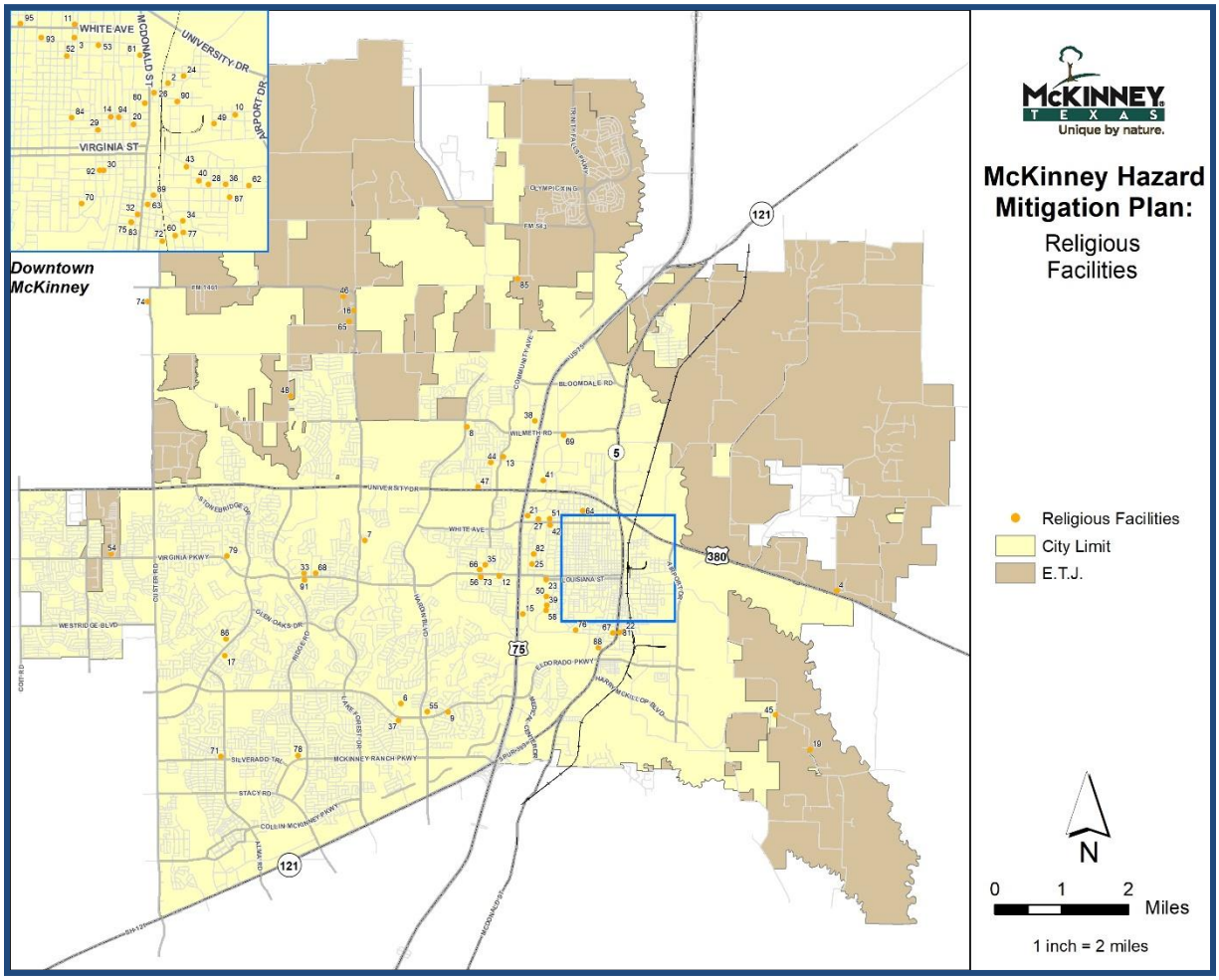
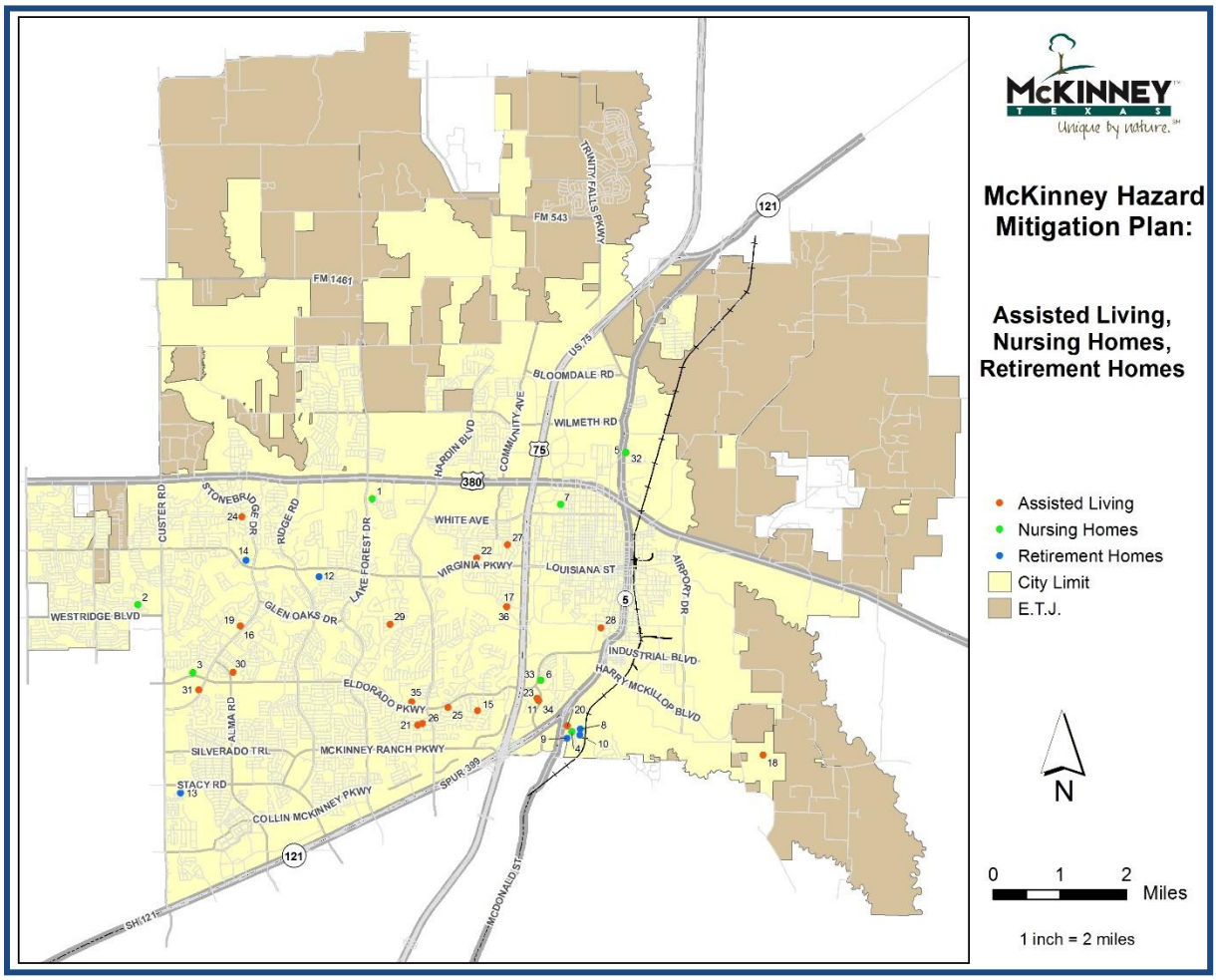


Figure 2-19
Retirement Homes, Assisted Living, and Nursing Homes



2.8 Government

The City of McKinney is organized via a council manager form of government, the most successful and popular form of government in cities with a population over 10,000. In this government organization, all council members have equal rights; the power is assigned to the council as a whole, as opposed to a single point of power. The city manager is responsible for providing day-to-day public services to citizens.

The role of the City Council includes appointing a city manager, approving the City budget, establishing City policies, and acting as a legislative body. The role of the City Manager includes appointing and removing employees, enforcing laws and ordinances, making recommendations to the City County on general welfare of the City, preparing the City budget, and managing all day-to-day affairs.

Section 3
PLANNING PROCESS

3.1 City of McKinney Hazard Mitigation Steering Committee

FEMA Requirement 44 CFR 201.6(c)(1)
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.

The Office of Emergency Management was tasked with developing the City of McKinney Hazard Mitigation Steering Committee (HMSC). The City of McKinney HMSC was tasked with the development and completion of the hazard mitigation plan (HMP) as required per state and federal guidelines. The Office of Emergency Management oversaw the project, organized the data, set meeting dates, documented in-kind services, and worked with the Texas Division of Emergency Management to complete the HMP.

The table below lists the members of the City of McKinney HMSC.

Name	Position
Karen E. Adkins	Emergency Management Coordinator
Jeremy Cuddeback	Emergency Management Planner
Ryan Gillingham	Public Works Director
Paul Sparkman	Assistant Director of Public Works
Craig Sherwood	Water Utilities Superintendent
Gary West	Wastewater Utilities Superintendent
Edward Garza	Street/Drainage Superintendent
Stephen Bonner	Drainage Supervisor
Patricia Jackson	Facilities Construction Manager
Jennifer Arnold	Director of Planning
Jason Smith	Assistant Building Official
Jeff Harris	Chief Plans Examiner
Gary Graham	Director of Engineering
Michael Hebert	Assistant City Engineer

Name	Position
Nick Ataie	CIP Manager
Daniel Still	Civil Engineer II
Trevor Minyard	Strategic Services Manager
Sid Hudson	Chief Information Officer
Haripriya Madabushi	GIS Analyst Supervisor
Janay Tieken	Housing and Community Development Manager
Ryan Mullins	Parks Maintenance Supervisor, PARD
Lisa Littrell	Procurement Services Manager
Rosanne Lemus	Contract Administrator, Procurement Services
Denise Lessard	Communications & Media Manager
Jeff Patterson	Airport Operations Manager
Mike Smith	Fire Marshal
Jody Morse	Deputy Chief of Police

Additional Partners

The City of McKinney HMSC relied on the assistance of various public and private organizations to compile the data, maps, and other vital components of the plan.

A range of stakeholders were invited and encouraged to participate in the development of the HMP. Stakeholder involvement was encouraged through notifications and invitations to agencies and individuals to participate. These included representatives from the City of McKinney government, private sector businesses, voluntary agencies, citizens neighboring communities, and Collin County. The City of McKinney invited representatives of these various agencies to attend public meetings in which to give feedback about the development of the plan. In addition to HMSC meetings, the City of McKinney encouraged open and widespread participation in the mitigation planning process through the publication of newspaper notices promoting open public meetings. These media advertisements provided local officials, residents,

FEMA Requirement 44 CFR 201.6(b)(2)
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) 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 nonprofit interests to be involved in the planning process.

businesses, academia, and other private interests in the City of McKinney the opportunity to be involved and offer input throughout the local mitigation planning process.

The City of McKinney believes that participation from all levels of government as well as public sector partners is of the utmost importance in hazard mitigation planning. In addition, the City of McKinney involved their utility providers in the planning process. These utilities providers included Atmos Energy, CoServe gas and electric, Grayson-Collin Electric Cooperative, and Oncor.

The City of McKinney engaged Collin College, McKinney Independent School District (ISD), Frisco ISD, and Allen ISD to address hazard mitigation in educational facilities located within city boundaries.

The HMSC was responsible for the organization, data collection, and completion of the plan. The HMSC conducted several meetings and involved all available departments and resources in an effort to gain any information that would increase the effectiveness of the plan.

The HMSC was also tasked with including any external organizations that could benefit from the overall effectiveness of the plan. The HMSC is aware of the importance of including a variety of external and internal organizations. Their input is vital to the short-term and long-term success of the plan. External organizations include but are not limited to Texas Division of Emergency Management, the Federal Emergency Management Agency (FEMA), National Weather Service, CCISD, local citizens, other businesses and industry, media outlets, the National Flood Insurance Program representatives, and others. These agencies and organizations were invited to the public meetings, provided information for data collection, and provided feedback on documents throughout the planning process.

The plan is based on the data gathered and identified by all HMSC members, the public, and all jurisdictions in an effort to prioritize mitigation projects in order of severity in an effort to reduce loss of property and life.

3.2 Planning Team Goals and Objectives

Early in the process, the City of McKinney HMSC established a set of goals to ensure the effectiveness of this plan. These goals established the paradigm for the planning process. These goals are as follows:

- Actively involve and gain support from all city and township governments and the City of McKinney for the reduction of disasters in our community.
- Prioritize identified mitigation projects.
- Seek and implement any grant funding for the reduction of disasters in the City of McKinney and its cities and townships.
- Monitor, evaluate, and update the progress of the plan as needed.
- Form partnerships among local, state, and federal agencies to make the City of McKinney more resistant to the effects of disasters.

The following table is the timeline agreed upon by the planning team for the development of the City of McKinney HMP.

Table 3-1
Calendar of Events

Date	Task
October 30, 2020	Hazard Mitigation Steering Committee (HMSC) kickoff meeting
December 10, 2020	Collect and analyze public input surveys
January 6, 2020	HMSC meeting #2/Final risk assessment and mitigation strategies developed
June 8, 2021	HMSC #3 meeting
June 24, 2021	Public Input meeting
July 9, 2021	Draft updated City of McKinney Hazard Mitigation Plan with changes required from public meeting for submittal to Texas Division of Emergency Management and the Federal Emergency Management Agency (FEMA) for official review
TBD	State review period
TBD	FEMA review period
TBD	Final draft updated plan based on State of Texas and FEMA recommendations
TBD	Final approval obtained from the City of McKinney and forwarded to FEMA

3.3 Review of Existing Technical/Planning Information

An important aspect of the planning process involved the review of existing federal, state, and local plans, studies, reports, and technical information as well as the ordinances, regulations, and resolutions of each participating jurisdiction for incorporation into the City of McKinney HMP. Plans and documents reviewed by various members of the committee include:

State/Federal Data, Reports, and Plans Utilized

- 2011 United States Census Data
- Texas Department of Natural Resources, water and land cover data
- National Oceanic and Atmospheric Administration data
- Special Hazards Event List Database for the United States
- FEMA regulations and guidance
- State of Texas HMP

County/Regional Plans, Ordinances, Data Utilized

- City of McKinney Comprehensive Plan

FEMA Requirement 44 CFR 201.6(b)(3)
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

- City of McKinney Future Land Use
- City of McKinney Hazard and Vulnerability Analysis
- City of McKinney Development Services Data

These documents are on file at the Office of Emergency Management in electronic or hard copy format and provide valuable guidance in the planning process. Some served to acquaint HMSC members with the many roles of emergency management. Planning guides helped to tie together the phases of mitigation planning for committee members from a broad range of backgrounds outside mitigation and emergency management.

State and federal response and homeland security documents were referenced to ensure the City of McKinney's goals supported these plans and promoted compliance with requirements. The State of Texas HMP formed the basis for identifying and analyzing the natural hazards and technological hazards that could affect the City of McKinney.

3.4 Public Involvement

To be an effective plan, input from the public is vital. The HMSC recognizes the valuable input that the public can provide on the plan. Additionally, public input builds support, ensures a strong base for future mitigation activities, and allows City of McKinney citizens the opportunity to have their interests included in the plan. The public was invited to participate in the development of this plan via the internet and social media posts.

The public was invited to participate in a survey early on in the planning process. This allowed the public to provide comments on the plan during the drafting stage. Additionally, the public was invited to a public meeting where they could learn about the hazard mitigation planning process and contribute ideas about the City of McKinney's risks, vulnerabilities, and mitigation strategies to the plan.

A survey was distributed on November 19, 2020. The survey was designed to learn ideas, help gauge local household and business preparedness for disaster, identify actions that would reduce risk and loss from natural and other hazards, and provide an opportunity to provide comments to the HMSC.

A public meeting was held on June 24, 2021, prior to the approval of this plan, to present an overview to city residents and solicit input to the final draft. In addition, a review of all hazard profiles, vulnerabilities, and mitigation strategies was conducted. Meeting notes and notices for this meeting can be found in appendix B.

FEMA Requirement 44 CFR 201.6(b)(1)
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

Section 4
RISK AND VULNERABILITY ASSESSMENT

4.1 Risk and Vulnerability Assessment Process

The City of McKinney Hazard Mitigation Steering Committee (HMSC) conducted a comprehensive hazard, risk, and vulnerability assessment of the City of McKinney.

FEMA Requirement 44 CFR 201.6(c) (2) (ii)
The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

FEMA Requirement 44 CFR 201.6(c) (2) (i)
The risk assessment shall include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

To develop effective hazard mitigation strategies, the HMSC identified, profiled, and assessed the hazards facing the community. A risk assessment measures the potential loss of life, personal injury, economic injury, and property damage resulting from natural and technological hazards by assessing the vulnerability of people, buildings, and infrastructure to natural and technological disasters. Several methods were used to identify risks to the community. These methods included:

- Evaluating historical data from scientific and news media sources
- Soliciting opinions and experiences from participating jurisdictions and City of McKinney residents
- Surveying risks identified in the State of Texas Hazard Mitigation Plan that were pertinent to City of McKinney

Following the risk assessment, the City of McKinney HMSC conducted a vulnerability assessment. The vulnerability assessment predicted the extent of damage that could result from a hazard of a given intensity in a given area on the existing and future build environment. Determining the community's vulnerability involved identifying threats posed to people, property, and the environment. This also included identifying critical facilities that could be affected by each hazard. Table 4-1 presents the natural and technological hazards included in the risk and vulnerability assessment.

Table 4-1
Hazards Included in the Risk and Vulnerability Assessment

Hazard	Justification for Inclusion
Tornadoes	Frequency, previous incidents, County-wide hazard
Windstorm	Frequency, previous incidents, County-wide hazard
Flooding	Frequency, previous incidents
Wildfires	Frequency, potential adverse impact
Hazardous material releases	Frequency, potential adverse impact
Hailstorms	County-wide hazard
Severe Winter Storms/Extreme Cold	Frequency, previous incidents, County-wide hazard
Lightning	Frequency, previous incidents, County-wide hazard
Drought	Previous incidents, County-wide hazard
Extreme Heat	Frequency, County-wide hazard
Water transmission	Potential adverse impact
Terrorism	Potential adverse impact
Infectious disease outbreak	Previous incidents, potential adverse impact
Earthquakes	Low occurrence, low vulnerability
Aircraft accident/incident	Previous incidents, potential adverse impact
Dam failure	Potential adverse impact
Energy/fuel shortage	Frequency, previous incidents, County-wide hazard
Expansive soils	Potential adverse impact

The following hazards found in table 4-2 were not profiled due to geographic location, low occurrence, or low potential for damage.

Table 4-2
Hazards Not Included in the Risk and Vulnerability Assessment

Hazard	Justification for Omission
Avalanche	Geographic proximity
Civil disturbance	Low occurrence, low vulnerability
Coastal erosion	Geographic proximity
Hurricane/tropical storms	Geographic proximity
Karst topography	Low occurrence
Landslides	Low occurrence
Sinkholes	Low vulnerability
Tsunami	Geographic proximity
Volcano	Geographic proximity

The following information was included in each hazard profile:

- **Hazard Identification.** Definition of the hazard will include a description of the hazard and the general threats it poses. All hazards were identified using statistical data and records from a variety of sources, including presidential disaster declarations, National Weather Service data, maps, and hazardous materials (HAZMAT) response data. HAZMAT response data is identified from jurisdiction resources, including databases, historic incidents, and local news reports. The lists of hazards are based on frequency, severity, probability, potential loss, vulnerability, and large-scale effects on the City of McKinney.
- **Hazard Profile.** Each hazard will be profiled to explain how it will affect or has affected the City of McKinney. This will include areas prone to specific hazards and the effects they have had on City of McKinney infrastructure. It also includes previous incidents that have affected the City of McKinney.
- **Assets Exposed to Hazard.** The risk and vulnerability analysis compares identified hazards with the inventory of affected critical facilities and the effects on the population exposed to each hazard. This section will also include a vulnerability assessment for future development, such as schools, water, and waste treatment facilities and other critical infrastructure.
- **Vulnerability.** The city's vulnerability to each hazard will be summarized based on a common set of definitions and classifications used to estimate vulnerability and rank hazards. Table 4-3 identifies classifications of vulnerability. Each profile was analyzed by the following criteria: frequency of occurrence, amount of warning time prior to the hazard occurring, size of the area potentially affected by the hazard, and severity of impact should the hazard occur.

Table 4-3
Hazard Identifications/Classifications

Frequency of Occurrence Probability of occurrence		
Score	**Probability**	**Definitions**
1	Very Low	Events that occur less frequently than once in 1,000 years
2	Low	Events that occur from once in 100 years to once in 1,000 years
3	Moderate	Events occur from once in 10 years to once in 100 years
4	High	Events occur more frequently than once in 10 years
Warning Time Amount of time generally given to alert people to a hazard		
Score	**Warning Time**	
1	More than 12 hours	
2	6 to 12 hours	
3	3 to 6 hours	
4	None–Minimal	
Geographic Extent Area would likely be affected		
Score	**Area**	
1	Localized (Likely to affect a portion of the planning area)	
2	Community-wide (Likely to affect the entire planning area)	
3	County-wide (Likely to affect entire planning area and extend well beyond to include neighboring jurisdictions within Collin County)	
Potential Impact Severity and extent of damage and disruption		
Score	**Impact**	**Definitions**
1	Negligible	Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries
2	Minor	Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries
3	Moderate	Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities
4	Major	Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

- **Land Use and Development Trends.** This component of the risk and vulnerability analysis identifies land use trends and City of McKinney land use and development plans and references current plans and regulations that could prevent the impact of the disaster.
- **Hazard Summary.** A summary of the hazard profile will be provided.

4.1.1 Natural Hazards

Natural hazards such as floods, tornadoes, winter storms, and the like are enduring conditions. Natural hazards become disasters when they intersect with the human environment. In Texas, natural disasters have had devastating effects on human lives, property, the economy, and the community. While most incidents present little danger to human well-being, some develop into hazardous situations that place life, property, economy, and community at higher risk.

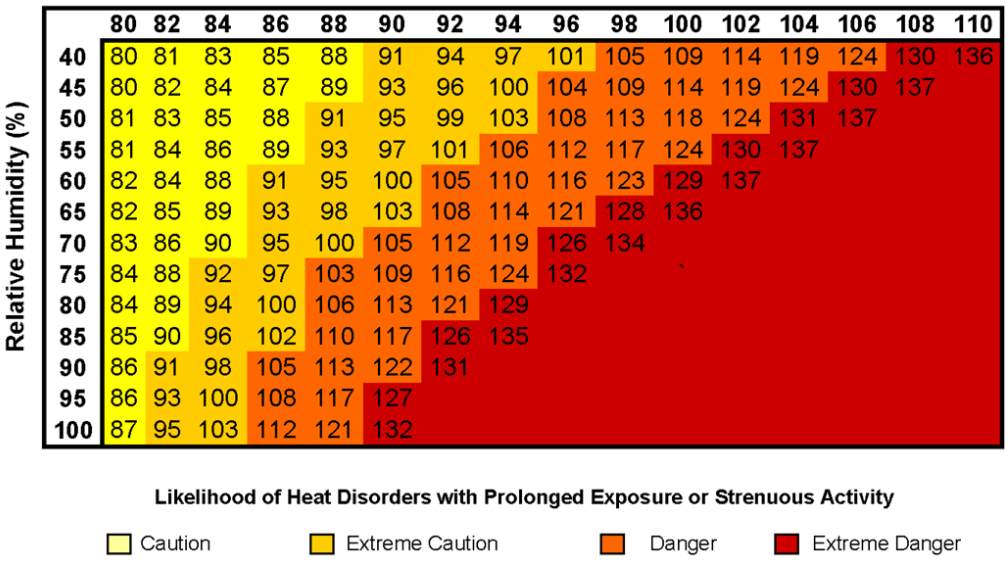
4.1.2 Extreme Heat

Hazard Identification

Extreme heat incidents can have a significant impact on human health, commercial/agricultural businesses, and primary and secondary effects on infrastructure (for example, burst pipes and power failure). What constitutes extreme heat can vary based on what the population is accustomed to in their respective climates.

Temperatures that hover 10 degrees or more above the normal high temperature for a region and last for several weeks are defined as extreme heat by the Centers for Disease Control and Prevention (CDC). Extreme heat is common in Texas. The National Weather Service (NWS) Heat Index (HI) is illustrated in figure 4-1. The HI combines air temperature and relative humidity to gauge the human perceived equivalent temperature. The City of McKinney hot season typically lasts about 4 months from May to September with normal high temperatures between 85° and 95° and normal relative humidity between 60% - 70%[22]. In the Dallas/Fort Worth area, the highest recorded temperature was 113°F[23].

Figure 4-1
Heat Index[24]



Hazard Profile

The City of McKinney has experienced 10 extreme heat events in the past 23 years, resulting in a 100 percent probability of an extreme heat event occurring every year.[25] The most severe extreme temperature event to impact the City of McKinney occurred in August 2011, when Collin County experienced triple-digit temperatures nearly every day during the month of August. An excessive heat warning was in effect for all of Texas, except the southwestern counties, for the first five days

[22] National Weather Service, https://www.weather.gov/fwd/dfw_normals
[23] National Weather Service, https://www.weather.gov/fwd/dgr8mxmn
[24] National Weather Service, http://www.nws.noaa.gov/os/heat/images/heatindex.png
[25] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

of the month. After the excessive heat warning ended on the morning of August 6, a heat advisory was in effect for several days during the month. A heat advisory was in effect for all or parts of North Texas for most of the remainder of the month, except for a few days in the middle of the month. The prolonged heat took its toll on North Texans, resulting in 27 heat-related deaths and many more heat-related illnesses. According to a Collin County medical examiner, one person died on August 12 as a result of the heat.[26]

Table 4-4
Extreme Heat 1988–2020[27][28]

County	Date	Injuries	Fatalities	Property Damage	Crop Damage
Collin	August 15, 1988	0	1	$0.00	$0.00
Collin	July 1, 1998	0	0	$0.00	$0.00
Collin	July 19, 1997	0	0	$0.00	$0.00
Collin	August 1, 1999	0	0	$0.00	$0.00
Collin	June 16, 1990	1	0	$0.00	$0.00
Collin	July 1, 2000	0	0	$0.00	$0.00
Collin	August 1, 2000	0	0	$0.00	$0.00
Collin	September 1, 2000	0	0	$0.00	$0.00
Collin	August 1, 2011	0	1	$0.00	$0.00
Collin	August 6, 2011	0	1	$0.00	$0.00
Collin	June 14, 2016	0	0	$0.00	$0.00
Collin	July 19, 2016	0	1	$0.00	$0.00
Collin	July 8, 2019	0	0	$0.00	$0.00
Collin	July 16, 2019	0	0	$0.00	$0.00
Collin	August 7, 2019	0	0	$0.00	$0.00
Collin	August 17, 2019	0	0	$0.00	$0.00
Collin	August 26, 2019	0	0	$0.00	$0.00
Collin	July 1, 2020	0	0	$0.00	$0.00
Collin	July 09, 2020	0	0	$0.00	$0.00
Collin	August 12, 2020	0	0	$0.00	$0.00

[26] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[27] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[28] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

County	Date	Injuries	Fatalities	Property Damage	Crop Damage
Collin	August 30, 2020	0	0	$0.00	$0.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities as well as all public, private, and commercial property were determined to be vulnerable to the effect of extreme heat; however, the risk is very low. Extreme heat may affect power supply to a facility.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of an extreme heat incident, and no way to predict where and when an above average temperature incident will occur. People are vulnerable to the effects of intense temperatures, including power outages, effects on transportation routes, establishment of shelters, etc. Those with existing medical conditions are also affected by extreme heat. Elderly people and young children may be at higher risk.
- **Environment Risk/Vulnerability.** The frequency of extreme heat in the City of McKinney is high. Consequently, there is an increased risk to the environment. Environmental concerns include interruption of water supply (such as water pipes freezing, frozen tree branches, etc.) and secondary events such as fires and HAZMAT accidents. Extreme heat may be a significant factor in causing droughts.

Vulnerability

Extreme Heat

Frequency of Occurrence	High
Warning Time	More than 12 hours
Geographic Extent	County-wide
Potential Impact	Moderate

Land Use and Development Trends

There are no future development trends in the City of McKinney that will be affected by extreme heat.

Hazard Summary

Extreme heat events have occurred across the City of McKinney and surrounding counties. Below average temperature effects are seen in different regions and vary depending on normal meteorological conditions such as extreme heat.

4.1.3 Drought

Hazard Identification

The City of McKinney HMSC reviewed historical data from the National Climatic Data Center (NCDC) and the Natural Resources Conservation Service (NRCS) while researching drought conditions in Collin County and the City of McKinney. By definition, a drought is a prolonged period of moisture deficiency. Drought conditions affect the cultivation of crops as well as water availability and water quality. Drought is also a key factor in wildfire development. Drought conditions make natural fuels (grass, brush, trees, dead vegetation, etc.) more fire prone.

The Palmer Drought Severity Index (PDSI) shown in table 4-5 is used to gauge long-term drought. The PDSI attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. A zero is considered normal conditions, and drought is indicated by negative numbers. Excessive moisture is indicated by positive numbers.

Table 4-5
Palmer Drought Severity Index[29]

Range	Description
-4.0 or less	Extreme drought
-3.0 to -3.9	Severe drought
-2.0 to -2.9	Moderate drought
-1.9 to +1.9	Near normal
+2.0 to +2.9	Unusual moist spell
+3.0 to +3.9	Very moist spell
+4.0 and above	Extremely moist

Hazard Profile

Collin County and the City of McKinney experienced drought conditions 56 times in the last 45 years. Agricultural losses are the most typical primary losses associated with drought. According to Spatial Hazard Events and Losses Database for the United States (SHELDUS) and the National Oceanic and Atmospheric Administration (NOAA), Collin County has incurred over $43 million dollars in crop damage and $7.5 million dollars in Property Damage over the course of 45 years. Collin County, including the City of McKinney, has experienced 33 drought incidents from 2010 to 2013.

One of the worst droughts in Collin County occurred in December 2012. Collin County experienced severe drought conditions over all but the far northern reaches of the County. As

[29] National Weather Service, http://www.nws.noaa.gov/

conditions remained dry, extreme drought severity affected all of Collin County by December 18 and persisted through the end of the month.[30] As severe and extreme droughts persist, it is unlikely for critical facilities to sustain any damage or functional downtime due to dry weather conditions.

According to available data, the City of McKinney is experiencing nearly normal conditions, or -1.9 to +1.9, according to the PDSI. However, it is important to note that drought conditions continually fluctuate throughout the year.

In terms of extent, the City of McKinney has the potential to experience the entire range of effects, from extreme drought to extremely moist conditions, as described in the PDSI. The impacts of a drought incident in the City of McKinney involve severe water restrictions, the impedance of crop production, and a heightened threat of wildfires and brush fires.

Table 4-6
Drought 1975-2020[31][32]

County	Date	Injuries	Fatalities	Property Damage	Crop Damage
Collin	October 1, 1975	0	0	$500.00	$431,034.48
Collin	August 1, 1996	0	0	$0.00	$0.00
Collin	July 1, 1998	0	0	$0.00	$0.00
Collin	May 1, 2005	0	0	$0.00	$8,571,428.57
Collin	June 1, 2005	0	0	$0.00	$3,750,000.00
Collin	July 1, 2005	0	0	$0.00	$1,578,947.37
Collin	August 1, 2005	0	0	$0.00	$3,000,000.00
Collin	September 1, 2005	0	0	$0.00	$2,400,000.00
Collin	October 1, 2005	0	0	$0.00	$2,307,692.31
Collin	November 1, 2005	0	0	$0.00	$2,608,695.65
Collin	December 1, 2005	0	0	$0.00	$2,666,666.67
Collin	January 1, 2006	0	0	$0.00	$2,739,130.43
Collin	March 1, 2006	0	0	$4,347,826.09	$0.00
Collin	April 1, 2006	0	0	$3,030,303.03	$0.00
Collin	May 1, 2006	0	0	$0.00	$3,030,303.03
Collin	June 6, 2006	0	0	$0.00	$2,631,578.95

[30] http://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=424097
[31] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[32] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

County	Date	Injuries	Fatalities	Property Damage	Crop Damage
Collin	July 1, 2006	0	0	$0.00	$2,173,913.04
Collin	August 1, 2006	0	0	$0.00	$2,222,222.22
Collin	September 1, 2006	0	0	$0.00	$1,739,130.43
Collin	October 1, 2006	0	0	$500,000.00	$500,000.00
Collin	November 1, 2006	0	0	$0.00	$800,000.00
Collin	August 1, 2000	0	0	$0.00	$0.00
Collin	September 1, 2000	0	0	$0.00	$0.00
Collin	March 21, 2011	0	0	$0.00	$8,000.00
Collin	April 1, 2011	0	0	$0.00	$10,000.00
Collin	August 1, 2011	0	0	$0.00	$10,000.00
Collin	September 1, 2011	0	0	$0.00	$25,000.00
Collin	October 1, 2011	0	0	$0.00	$5,000.00
Collin	September 25, 2012	0	0	$0.00	$2,000.00
Collin	November 1, 2012	0	0	$0.00	$3,000.00
Collin	December 1, 2012	0	0	$0.00	$2,000.00
Collin	January 1, 2013	0	0	$0.00	$3,000.00
Collin	February 1, 2013	0	0	$0.00	$2,000.00
Collin	March 1, 2013	0	0	$2,000.00	$0.00
Collin	July 9, 2013	0	0	$0.00	$1,000.00
Collin	August 1, 2013	0	0	$0.00	$3,000.00
Collin	September 1, 2013	0	0	$0.00	$3,000.00
Collin	March 1, 2014	0	0	$0.00	$4,000.00
Collin	April 1, 2014	0	0	$0.00	$3,000.00
Collin	Mary 1, 2014	0	0	$0.00	$3,000.00
Collin	June 1, 2014	0	0	$0.00	$3,000.00
Collin	July 1, 2014	0	0	$0.00	$3,000.00
Collin	August 1, 2014	0	0	$0.00	$2,000.00
Collin	September 1, 2014	0	0	$5,000.00	$0.00

County	Date	Injuries	Fatalities	Property Damage	Crop Damage
Collin	October 1, 2014	0	0	$0.00	$3,000.00
Collin	November 1, 2014	0	0	$0.00	$2,000.00
Collin	December 1, 2014	0	0	$0.00	$5,000.00
Collin	January 1, 2015	0	0	$0.00	$2,000.00
Collin	February 1, 2015	0	0	$0.00	$2,000.00
Collin	March 1, 2015	0	0	$0.00	$1,000.00
Collin	April 1, 2015	0	0	$0.00	$1,000.00
Collin	September 1, 2015	0	0	$0.00	$1,000.00
Collin	October 1, 2015	0	0	$2,000.00	$0.00
Collin	November 21, 2017	0	0	$0.00	$0.00
Collin	December 1, 2017	0	0	$0.00	$1,000.00
Collin	August 1, 2018	0	0	$0.00	$1,000.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** Drought conditions typically pose little to no threat to structures; however, wildfires are more likely to occur as a result of dry weather. The drought could result in the loss of the available municipal water supply. This threat has been addressed by mitigation actions.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a drought incident. People are vulnerable to the effects of drought, including reduced water supply availability (both public and private wells), wildfires, and limited ability to grow and water crops.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a drought incident. Environmental concerns include the risk of losing vegetation and risk of erosion in areas that are affected by drought and reduced water supply availability (both public and private wells).

Vulnerability

Drought

Frequency of Occurrence	Moderate
Warning Time	More than 12 hours
Geographic Extent	County-wide
Potential Impact	Minor

Land Use and Development Trends

The City of McKinney is a growing suburban area with many parcels of land not developed, and having an agricultural use. The crops on these lands will be impacted by drought. The City of McKinney City Council has passed a drought contingency plan ordinance. New developments are required to limit the amount of watering and use only certain types of vegetation to accommodate drought restrictions. A copy of the Drought Contingency Plan Ordinance is provided in appendix D.

Hazard Summary

Droughts do not have the immediate effects of other natural hazards, but sustained drought can cause severe economic stress to the agricultural interests in the City of McKinney, Collin County, and the entire state. The potential negative effects of sustained drought are numerous. In addition to an increased threat of wildfires, drought can affect municipal and industrial water supplies, stream water quality, water recreation facilities, hydropower generation, and agricultural resources. The HMSC discussed limitations associated with mitigation actions for drought and identified mitigation actions related to the potential threat of drought.

4.1.4 Expansive Soil

Hazard Identification

Expansive soils are defined as soils and soft rock that tend to swell or shrink due to changes in moisture content. Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets. In terms of extent, the City of McKinney may experience minor to moderate impacts such as problems with foundations, roadways, sidewalks and other structures and infrastructure, and a major expansive soil event is not likely.[33] The City of McKinney may be affected by the band of expansive soils stretching from Laredo northeast through San Antonio, Austin, and Dallas along an area also known as the I-35 corridor illustrated in figure 4-2. These areas receive the most moisture and are also vulnerable to droughts, which can cause the soils to expand and contract. The City of McKinney HMSC researched historical data from the United States Geological Survey (USGS), NCDC, and the NWS.

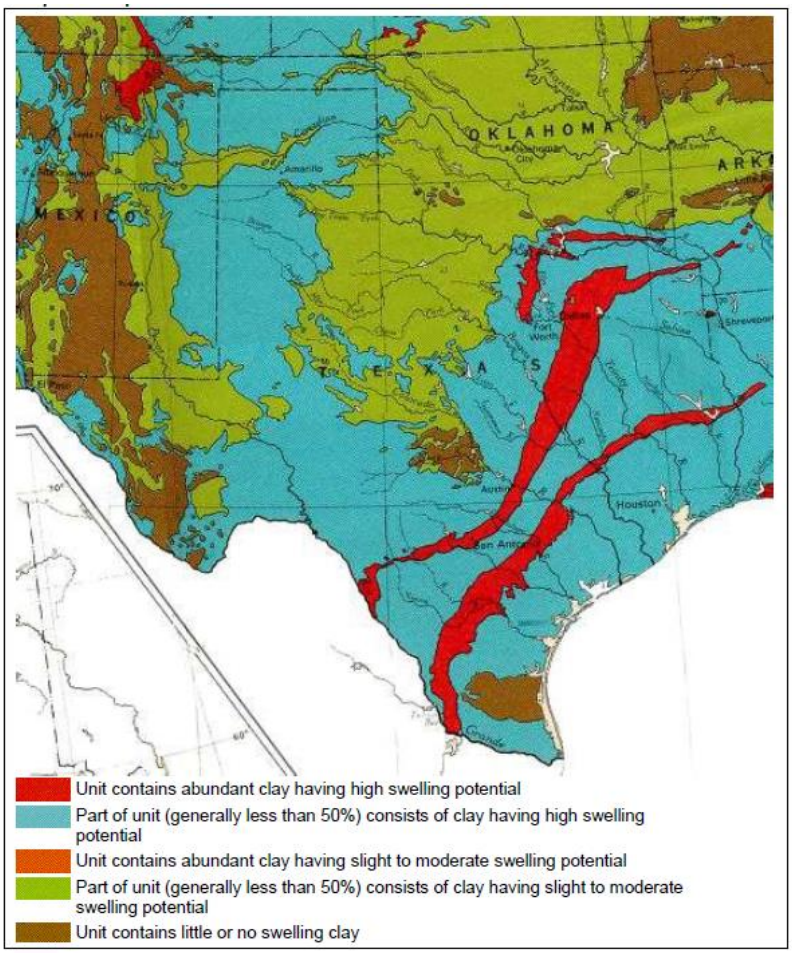


Figure 4-2
Swelling Clays of the Conterminous United States[34]

[33] State of Texas Hazard Mitigation Plan 2018, http://tdem.wpengine.com/wp-content/uploads/2019/08/txHazMitPlan.pdf
[34] United States Geological Survey, http://www.usgs.gov

Hazard Profile

Historically, the City of McKinney has experienced damage to its roadways, bridges, and retaining walls due to expansive soils. However, McKinney has not experienced any catastrophic damage from expansive soil, but the effects are seen throughout much of the DFW area. News reports dated February 2014 demonstrate the impacts, such as when the Heatherwood Subdivision located in McKinney felt the effects of expansive soil when a retaining wall supporting a homeowner's backyard began to crumble. The wall runs behind 30 other homes in the neighborhood and has shown signs of cracking.[35] Majority of the City of McKinney's soil series is Houston Black; however, parts of the City of McKinney do contain Trinity-Frio. This association consists of nearly level, deep soils on flood plains along the East Fork of the Trinity River and its tributaries. The soils consist mostly of alluvial clays and clay loams that have a moderately to slowly permeable subsoil.[36] According to the NRCS, Texas contains nearly two million acres of Houston Black soil series. NRCS is the primary federal agency that works with private landowners to help them conserve, maintain, and improve their natural resources. NRCS emphasizes voluntary, science-based conservation; technical assistance; partnerships; incentive-based programs; and cooperative problem solving at the community level.[37]

Houston Black soil has been nominated by the Professional Soil Scientists of Texas to be named the State Soil of Texas due to its unique and common influence on the lives of Texans.[38] Soil classification of the Houston Black series is fine, smectitic, thermic, Udic Haplusterts. These soils are classified in the Vertisol order, which is a group of soils that have very high shrink-swell characteristics, clayey texture, and large cracks when dry. The term "fine" refers to the subsoil containing 30 to 60 percent clay. The term "smectitic" refers to the dominant clay mineral in the soil, which is smectite. "Thermic" means the average soil temperature is between 15 and 22 degrees Celsius (59 to 72 degrees F).[39]

The three soil associations that make up the City of McKinney are indicated in figure 4-3.[40] The following provides additional details on these three soils.

Houston Black-Austin Association

Gently sloping to sloping, clayey soils that are deep over marl and chalk; on uplands.

This association consists of gently sloping to sloping soils on uplands. These soils are mostly in the western part of Collin County in a broad area that extends from the northern to the southern boundary. The association occupies 52 percent of Collin County.

The Houston Black soils make up 55 percent of the association; Austin soils, 23 percent; and minor soils, 22 percent.

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[35] The Dallas Morning News. http://www.dallasnews.com/news/community-news/mckinney/headlines/20140221-crumbling-walls-in-mckinney-subdivision-leave-hoa-residents-at-odds.ece

[36] USDA. http://soils.usda.gov/survey/online_surveys/texas/collinTX1969/CollinTX.pdf

[37] USDA, http://www.usda.gov/wps/portal/usda/usdahome

[38] USGS, http://tx.usgs.gov/

[39] USDA, Natural Resources Conservation Service. What on Earth is Houston Black Soil?

[40] Source: Soil Survey, Collin County, Texas; United States Department of Agriculture – Soil Conservation Service in cooperation with Texas Agricultural Experiment Station, July 1969.

The Houston Black soils are gently sloping and uneroded in most places. They have a very dark gray, calcareous clay surface layer that is generally underlain by marl at a depth of about 44 inches. These soils overlie chalk in some places in the western part of the association, but they are over gray and yellow marl in the eastern part.

The Austin soils are more sloping and more eroded than the Houston Black soils. They are mostly in the western part of the association. Austin soils have a dark grayish-brown, calcareous silty clay surface layer about 16 inches thick. Their subsoil is light brownish-gray to pale-brown silty clay and overlies beds of chalk at a depth of about 42 inches. In some places, the underlying beds consist of alternating layers of marl and chalk.

Houston Black-Burleson Association

Nearly level to gently sloping, deep, clayey soils on stream terraces.

This association mainly consists of nearly level to gently sloping soils along the major streams in Collin County. One large area extends along the western boundary and is parallel to a line between the communities of Celina and Frisco. This area occurs on nearly level uplands and is not adjacent to a major stream. The association covers about 8 percent of the Collin County. The Houston Black soils make up 50 percent of the association; Burleson soils, 25 percent; and minor soils, 25 percent.

Houston Black soils have a very dark gray clay surface layer. This layer is calcareous, and it overlies light-gray clay at a depth of about 44 inches. Deep cracks form in Houston Black soils when they are dry.

The Burleson soils have a dark gray, non-calcareous clay surface layer that overlies gray, extremely firm clay at a depth of about 33 inches. Crusts form on the surface of the Burleson soils when they dry.

Trinity-Frio Association

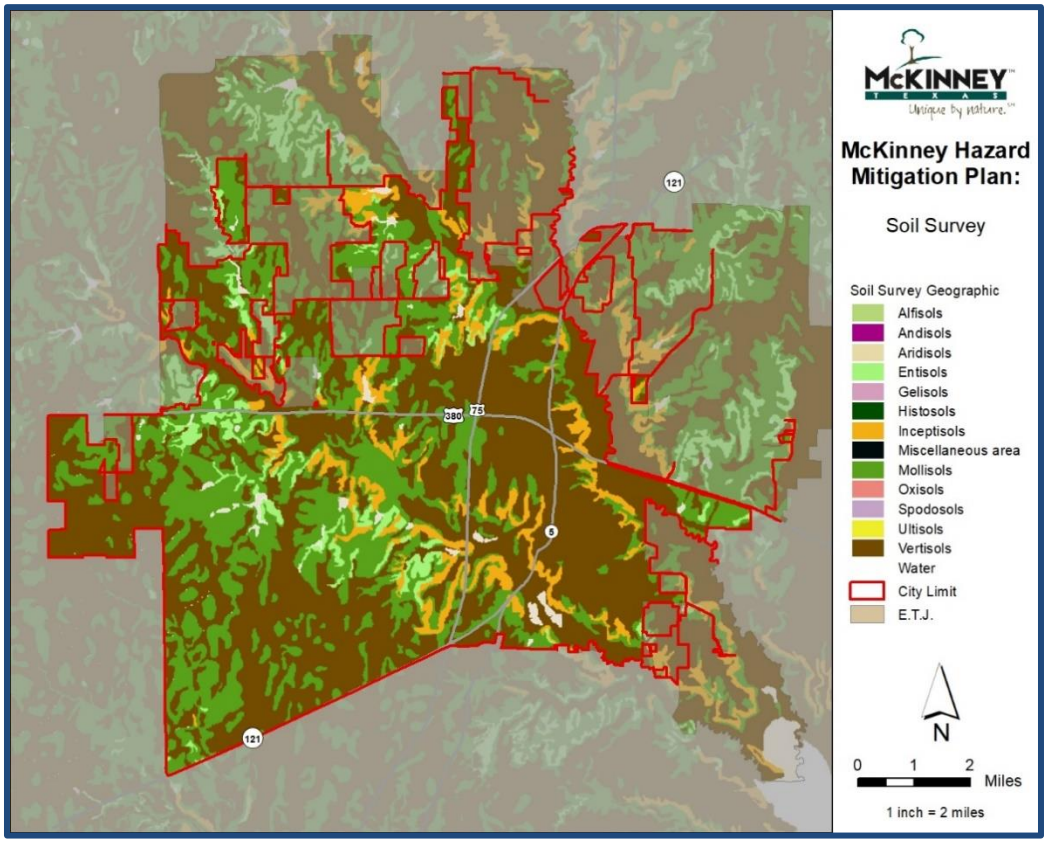
Deep, nearly level, clayey, and loamy soils on flood plains.

This association consists of the nearly level, deep soils on flood plains along the East Fork of the Trinity River and its tributaries. Most areas occur in the eastern part of Collin County. The soils consist mostly of alluvial clays and clay loams that have a moderately to slowly permeable subsoil. This association occupies about 10 percent of Collin County.

The Trinity soils make up 66 percent of the association; Frio soils, 14 percent; and minor soils, 20 percent.

The Trinity soils are in large areas, mostly on flood plains. They formed in alluvial material that washed mainly from areas of Houston Black and Houston soils. They have a very dark gray, calcareous clay surface layer. Below this layer is dark gray, very firm clay several feet thick. About half the acreage in the association is subject to frequent flooding. The rest is subject to occasional flooding.

Figure 4-3
General Soil Map
Collin County, Texas[41]



Damage from expansive clays can affect, to some extent, virtually every type of structure in Texas. Some structures, such as skyscrapers in downtown Dallas, generally have well engineered foundations that are too heavily loaded for swelling damage to occur. At the opposite extreme are public schools and single-family homes, which are generally constructed on a minimal budget and may have under-designed lightly loaded foundations that are particularly subject to damage from soil movment.[17]

Homeowners and public agencies that assume they cannot afford more costly foundations and floor systems, often incur the largest percentage of damage and costly repairs from expanding soil. No figures are available for the total damage to homes in Texas from expansive clays. However, several examples are known where the cost of repairs has exceeded the value of the house. Additionally, highways in some areas of Texas have required frequent and very expensive reconstruction or maintenance due to damage from expansive clay.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All structures within the City of McKinney are vulnerable to expansive soils, but those within the central and eastern portions of the region are most

[41] U.S. Department of Agriculture Natural Conservation Service

susceptible. Pipelines and pavements are vulnerable to expansive soils and are checked regularly for cracks and breaks.

- **People Risk/Vulnerability.** Risk/vulnerability includes populations of City of McKinney where expensive soils may occur. Figure 4-3 illustrates soil associations throughout Collin County and their possible impact on the City of McKinney population.
- **Environment Risk/Vulnerability.** Risks to the environment are high for expansive soils due to the Houston Black series of soil throughout the City of McKinney. Historically, this type of soil erosion can cause damage to trees, and falling trees are highly probable during droughts.

Vulnerability

Expansive Soils

Frequency of Occurrence	High
Warning Time	More than 12 hours
Geographic Extent	Localized
Potential Impact	Negligible

Land Use and Development Trends

There are no regulations in place regarding land use and development on expansive soils. Slab foundations, commonly found in single-family dwellings, are particularly vulnerable to expansive soil damage. Builders should understand that expansive soils may result in damaged foundations and pavements and pipelines.

Hazard Summary

Expansive soils pose a threat to City of McKinney property owners. The City's roadways, bridges, and retaining walls have been impacted from expansive soils over the years. In addition, the City of McKinney's infrastructure has experienced damage, including structure foundations and the stabilization of structures. Other minor damage to structures are sticking doors, uneven floors, and cracked foundations, floors, walls, ceilings, and windows. If damage is severe, the cost of repair may exceed the value of the structure.

Probably the greatest amount of small building damage has impacted those constructed when clays were dry, such as during a drought, followed by soaking rains that prompt swelling of clays. Other reported cases of damage involve volume increases due to moisture from broken or leaking water and sewer lines, watering lawns and shrubbery, and modifying surfaces that produce ponding.

4.1.5 Flooding

Hazard Identification

Overflow of rivers and streams due to severe storms or torrential rains may result in significant flooding. Different variables impact flooding, including topography, ground saturation, previous rainfall, soil types, drainage, basin size, drainage patterns of streams, and vegetative cover. Flooding may occur slowly or become a flash flood, such as in the case of a dam failure. All flood incidents potential for serious injuries and death. The City of McKinney HMSC researched historical data from NCDC, NWS, Federal Emergency Management Agency (FEMA), and the National Flood Insurance Program (NFIP). The NFIP is a federal program that enables property owners in participating communities to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. Data from the NFIP database of flood incidents occurring over the last 50 years was used to formulate the City of McKinney Hazard Profile. In addition to these resources, information from newspaper articles relating to flooding in the City of McKinney was also used.

The National Weather Service[42] characterizes flood severity as minor flooding (minimal or no property damage, but possibly some public threat or inconvenience), moderate flooding (some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations), and major flooding (extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations). In terms of extent, the City of McKinney has the potential to experience flood events ranging from minor flooding to major flooding.

Hazard Profile

Research indicates that there have been 56 flood occurrences recorded for the City of McKinney and the surrounding area since 1964.[43] Although flooding occurs infrequently, it has the potential to wreak havoc on the community. Statistically, McKinney can expect flooding every 2.5 years. This equates to a 38 percent chance of flooding occurring in any given year. City of McKinney floodplain and watershed are shown in figures 4-4 and 4-5. The City of McKinney has identified McNeill Elementary as the only critical facility, identified in Table 2-5, located within the floodplains. Appendix G identifies McNeil Elementary school along with critical facilities located near the floodplains.

In 2008, a slow-moving system caused flash flooding as multiple rounds of showers and thunderstorms dropped several inches of rain over the area. Numerous flooding reports were received from McKinney. Industrial Boulevard east of Highway 5 in McKinney was shut down due to flooding. Rain weakened the support beams of a bridge over Sloan Creek in Fairview, making it unsafe to use. The flash flood resulted in $20,000.00 worth of property damage throughout the City of McKinney and Collin County.[44]

On January 25, 2012, a flood affected multiple points of North Texas, including the City of McKinney. Heavy storms poured over 4.4 inches of rain on the City of McKinney, overwhelming water pumps at key intersections and underpasses throughout the City. The widespread storm

[42] National Weather Service, https://www.weather.gov/aprfc/terminology
[43] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[44] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

reportedly caused $50,000 in property damage throughout the Dallas-Fort Worth Region.[45] Table 4-7 identifies significant flood incidents from 1964–2020.

Table 4-7
Flood Incidents 1964-2020[4647]

County	Date	Type of Flood	Injuries	Fatalities	Property Damage	Crop Damage
Collin	September 21, 1964	Torrential rain; Flooding	0	1	$166,666.67	$0.00
Collin	April 22, 1966	Flooding	0	0.15	$90,909.09	$9,090.91
Collin	October 12,1969	Flash flooding	1.5	0	$250,000.00	$0.00
Collin	March 1, 1970	Flooding	0	0	$632.91	$0.00
Collin	December 9,1971	Flooding	0	0	$9,090.91	$0.00
Collin	April 17, 1973	Flooding, heavy rain	0	0	$185,185.19	$0.00
Collin	April 21, 1974	Rain, flooding	0	0	$925.93	$0.00
Collin	March 27, 1977	Wind, flash flooding	3	0	$500,000.00	$500,000.00
Collin	May 30, 1979	Flash flood	0	0	$5,000.00	$0.00
Collin	September 26, 1980	Flood	0	0	$68,493.15	$68,493.15
Collin	May 12, 1982	Flooding	0	0	$500,000.00	$500,000.00
Collin	October 20, 1983	Flood	0	0	$4,310.34	$0.00
Collin	December 17, 1984	Flood	0	0	$1,724.14	$0.00
Collin	June 4, 1985	Flooding	0	0.02	$0.00	$0.00
Collin	May 17, 1989	Flooding	0	2	$0.00	$0.00
Collin	May 1, 1990	Flooding	0	0	$4,310.34	$0.00
Collin	May 2, 1990	Flash flooding	0	1	$200,000.00	$0.00
Collin	May 4, 1990	Flooding	0	0	$43,103.45	$0.00
Collin	December 20, 1991	Flash flood	0	0	$50,000.00	$0.00
Collin	February 1, 1992	Flood	0	0	$4,310.34	$0.00
Collin	November 7, 1996	Floods	0	0	$10,000.00	$0.00
Collin	May 19, 1997	Floods	0	0	$10,000.00	$0.00

[45] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[46] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[47] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

County	Date	Type of Flood	Injuries	Fatalities	Property Damage	Crop Damage
Collin	February 19, 1997	Flood	0	0	$25,000.00	$0.00
Collin	October 19, 2002	Flood	0	0	$25,000.00	$0.00
Collin	May 2, 2007	Flash flood	0	0	$50,000.00	$0.00
McKinney	May 30, 2007	Flash flood	0	0	$10,000.00	$0.00
Collin	June 18, 2007	Flash flood	0	0	$10,000.00	$0.00
Collin	June 26, 2007	Flash flood	0	0	$20,000.00	$0.00
Collin	October 15, 2007	Flash flood	0	0	$80,000.00	$0.00
Collin	March 18, 2008	Flash flood	0	0	$4,000.00	$0.00
Collin	April 23, 2008	Flash flood	0	0	$2,000.00	$0.00
Collin	August 20, 2008	Flash flood	0	0	$20,000.00	$0.00
Collin	August 20, 2008	Flash flood	0	0	$4,000.00	$0.00
Collin	May 2, 2009	Flash flood	0	0	$20,000.00	$0.00
Collin	May 2, 2009	Flash flood	0	0	$2,000.00	$0.00
Collin	October 25, 2009	Flash flood	0	0	$3,000.00	$0.00
McKinney	October 25, 2009	Flash flood	0	0	$3,000.00	$0.00
Collin	November 20, 2009	Flood	0	0	$20,000.00	$0.00
Collin	January 25, 2012	Flood	0	0	$50,000.00	$0.00
Collin	March 20, 2012	Flood	0	0	$0.00	$0.00
Collin	July 31, 2014	Flash Flood	0	0	$0.00	$0.00
Collin	May 9, 2015	Flood	0	0	$0.00	$0.00
Collin	May 9, 2015	Flash Flood	0	0	$0.00	$0.00
Collin	May 17, 2015	Flood	0	0	$0.00	$0.00
Collin	May 29, 2015	Flash Flood	0	0	$0.00	$0.00
Collin	May 30, 2015	Flash Flood	0	0	$0.00	$0.00
Collin	November 27, 2015	Flood	0	0	$0.00	$0.00
Collin	June 21, 2015	Flash Flood	0	0	$1,000.00	$0.00
Collin	December 26, 2015	Flash Flood	0	0	$0.00	$0.00
Collin	June 12, 2016	Flash Flood	0	0	$0.00	$0.00

County	Date	Type of Flood	Injuries	Fatalities	Property Damage	Crop Damage
Collin	July 5, 2017	Flash Flood	0	0	$0.00	$0.00
Collin	August 17, 2017	Flood	0	0	$0.00	$0.00
Collin	September 21, 2018	Flash Flood	0	0	$10,000.00	$0.00
Collin	October 19, 2018	Flood	0	0	$0.00	$0.00
Collin	April 23, 2019	Flash Flood	0	0	$10,000.00	$0.00
Collin	March 18, 2020	Flash Flood	0	0	$0.00	$0.00

To provide a sense of the flood risk in a community, it is beneficial to summarize the policies in force and claim statistics from the NFIP. The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a federal program that enables property owners in participating communities to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. The City of McKinney engineering department is responsible for floodplain management and maintains floodplain records for the city. The City of McKinney has been a member of the NFIP since 1974. Table 4-8 provides the City of McKinney member details.

Table 4-8[48]
City of McKinney NFIP member detail

CID	Community Name	County	Initial Flood Hazard Boundary Map Identified	Initial Flood Insurance Rate Map Identified	Current Effective Map Date
485454#	McKinney, City of	Collin County	8/7/1970	12/31/1974	6/07/2017

FEMA NFIP statistics indicate that as of August 2013, federal flood insurance policies were in force on 193 buildings in the City of McKinney. This represents a dollar value of property and contents coverage totaling $53,561,100.49 Between 1978 and 2013, there have been a total of eight NFIP insurance claims in the City of McKinney with a total claims value of $113,406.50.

[48]Federal Emergency Management Agency Community Status Book Report, Texas, Communities Participating in the National Flood Program, http://www.fema.gov/cis/TX.pdf

[49] Federal Emergency Management Agency, http://bsa.nfipstat.fema.gov/reports/1011.htm

[50]Federal Emergency Management Agency, http://bsa.nfipstat.fema.gov/reports/1040.htm

Repetitive Loss Properties

Repetitive loss properties are a serious concern from a mitigation standpoint. A repetitive loss property is considered when there are two or more flood insurance claims that were paid more than $1,000 for each loss. The losses must be within 10 years of each other and must be at least 10 days apart. A property is considered a severe repetitive loss property when there are at least four losses (each exceeding $5,000), or when there are two or more losses where the building payments exceed the property value. Table 4-9 provides details on the City of McKinney repetitive loss property as defined above.

Tier 2 Facilities

Tier 2 data is a publicly available database from the Texas Department of State Health Services Tier 2 Chemical Reporting Program. Under the community right to know program laws upheld at the state and federal level, all facilities that store significant quantities of hazardous chemicals must share this information with state and local emergency responders and planners. Facilities in Texas share this information by filing annual hazardous chemical inventories with the state, Local Emergency Planning Committees (LEPCs), and local fire departments. The Texas Tier 2 Reports contain facility identification information and detailed chemical data about hazardous chemicals stored at the facility. None of the Tier 2 Facilities on Figure 4-4 are located within the 100-year flood zone. Facilities 4, 6, 14, 19 and 34 are close but do not actually fall within the flood zone.

A facility must report chemicals if it meets the following criteria:

- Any company using chemicals that could present a physical or health hazard must report them, according to Tier 2 requirements.
- If an industry has an Occupational Safety and Health Administration (OSHA) deemed hazardous chemical that exceeds the appropriate threshold at any point in time, then the chemical must be reported. These chemicals may be on the list of 356 Extremely Hazardous Substances (EHS) or one of the 650,000 reportable hazardous substances (not on the EHS list). This reporting format is for a "snapshot in time". EHS chemicals have to be reported if the quantity is either greater than 500 pounds, or if the Threshold Planning Quantity (TPQ) amount is less than 500 pounds.

Table 4-9[51]
City of McKinney Repetitive Loss Properties

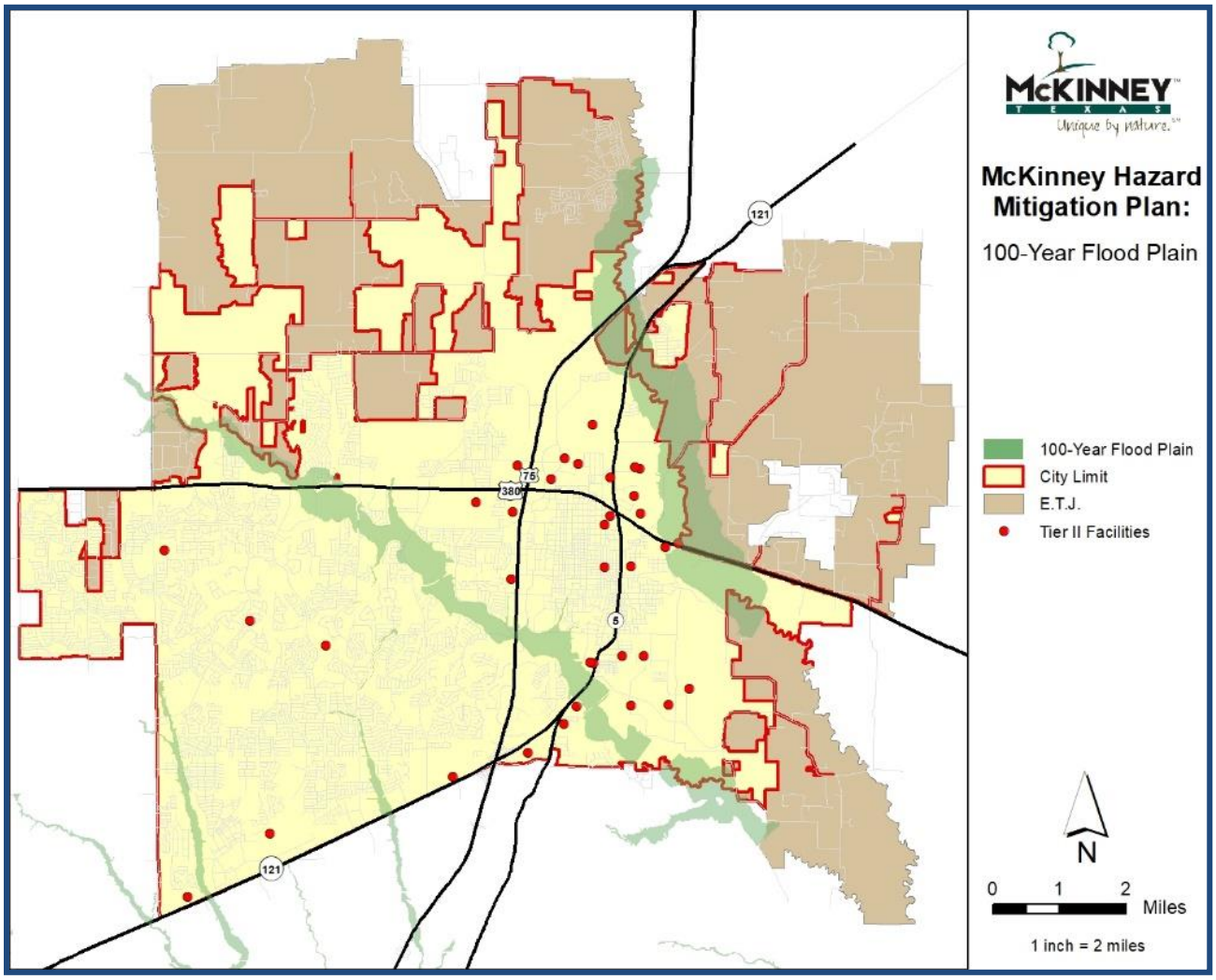
FEMA Requirement 44 CFR 201.6 (c)(2)(ii)
The risk assessment must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

Community Name	Mitigated?	Insured?	Zone	Firm	Type	Building Value

[51] FEMA representative

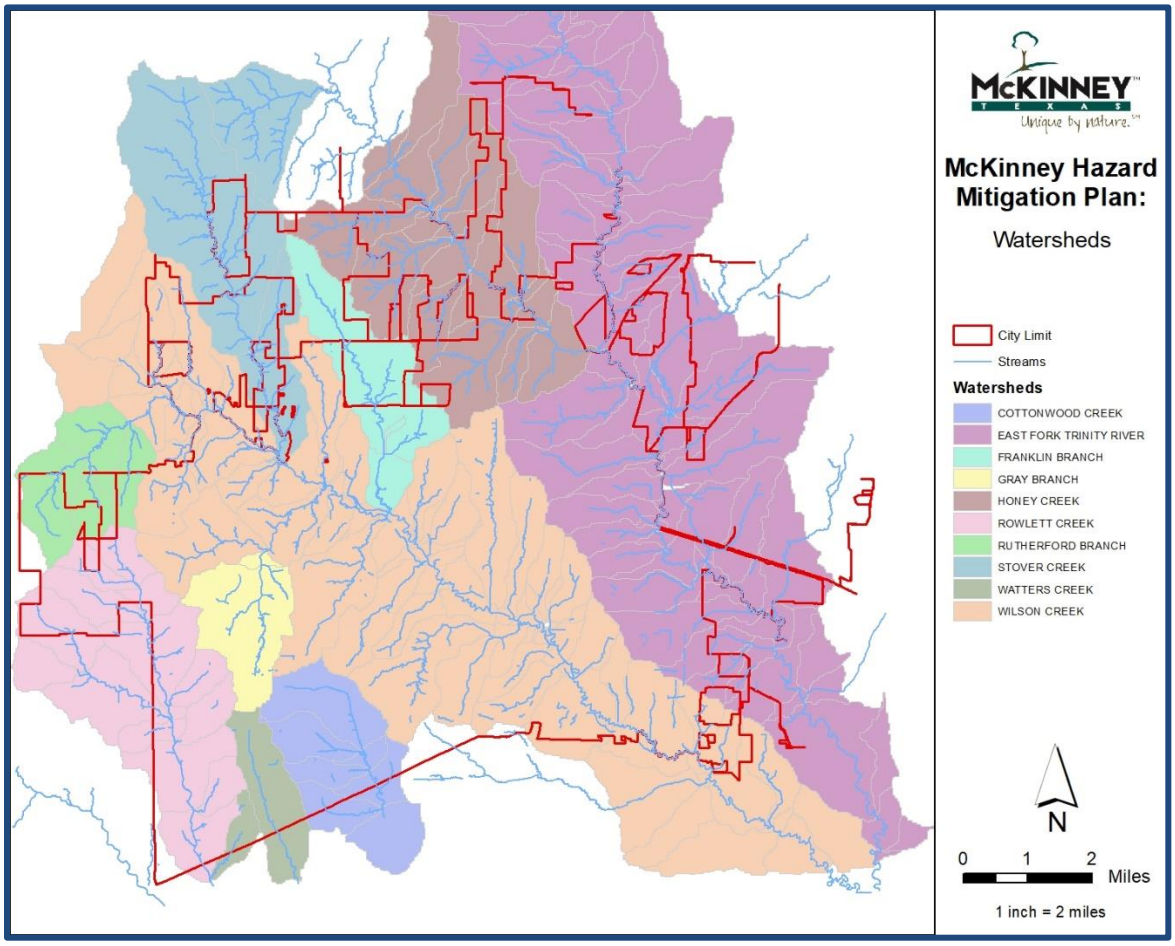
McKinney, City of	No	No	A	N	Residential	$90, 787.00

Figure 4-4



City of McKinney 100-Year FEMA Flood Zon

Figure 4-5
City of McKinney Watershed Map



Assets Exposed to Hazard

- **Property Risk/Vulnerability.** The City of McKinney has identified flood zones within the jurisdiction and all properties within a floodplain have an increased chance of flooding. The vulnerability of these structures is very high, depending on the probability of that area flooding within a 10-year or 100-year period. Many assets previously exposed to flooding have been mitigated through the FEMA Hazard Mitigation Grant Program buyouts or by implementing infrastructure changes such as widening culverts to better direct floodwaters.
- **People Risk/Vulnerability.** People living in and around identified floodplain areas are more vulnerable to a flooding incident than those who live/work out of floodplain areas, but these areas can still be affected depending on the severity of the flooding incident. There is a significant chance of a flooding incident occurring in any given year in the City of McKinney.
- **Environment Risk/Vulnerability.** Risks to the environment are high if a flooding incident occurs. Examples of common environmental risks include limited public access to water and the effects floodwater has on public water supply. Flooding can affect and contaminate potable water for public consumption.

Vulnerability

Flooding

Frequency of Occurrence	High
Warning Time	3-6 Hours
Geographic Extent	Community-wide
Potential Impact	Moderate

Land Use and Development Trends

The City of McKinney has a stormwater ordinance that regulates floodplain land use. In addition, the City of McKinney limits development in areas that are prone to erosion adjacent to natural streams with Erosion Hazard Setback Easements. These regulations not only direct how land in designated floodplain areas may be used or altered, but the location and types of structures that are permitted in those areas. Floodplain permits are required for any development in floodplains and if disobeyed, the City of McKinney takes legal action. The City of McKinney criteria for approval of floodplain alterations can be found in Municipal Code Section Sec. 130-383.

Hazard Summary

The risk for flooding in the City of McKinney is major, due largely in part to previous mitigation measures. The City of McKinney HMSC recognized the dangers posed by flooding and has identified specific mitigation actions that have been taken and would be considered in the future.

4.1.6 Hailstorms

Hazard Identification

Hail is a form of precipitation composed of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5-50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. The size of hailstones is a direct function of the severity and size of the storm. Hailstones are classified by size according to the Tornado and Storm Research Organization Hailstorm Intensity Scale shown in table 4-10. The scale extends from H0 to H10 with its increments of intensity or damage potential related to hail size (distribution and maximum), texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind. The City of McKinney may experience hail ranging from H0 (<5 mm or about 1/4" hail diameter) to H10 (>100 mm or about 4" hail diameter).

Table 4-10
Tornado and Storm Research Organization Hailstorm Intensity Scale[52]

Intensity Category		Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		Severe damage to aircraft bodywork (severest recorded in the British Isles)
H9	Super Hailstorms	75-100		Extensive structural damage; risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage; risk of severe or even fatal injuries to persons caught in the open

Hazard Profile

The City of McKinney has experienced 42 hail incidents over the past 24 years with over $300,000 dollars in damage. This correlates to about a 58% chance that the City of McKinney will be

[52] Tornado and Storm Research Organization, http://www.torro.org.uk/site/hscale.php

impacted by a hail incident each year. Neighboring jurisdictions within Collin County have been affected by over 123 hailstorms since 1996, causing over 2.5 billion dollars in damage.[53]

The greatest impact to the City of McKinney resulting from hail occurred on March 26, 2017, when hailstones reaching 2 inch in diameter caused $105,000 in property damage throughout the City of McKinney and $45,000 throughout neighboring jurisdictions within Collin County. The storm was reported in the far north Dallas Fort Worth metro, from near Denton to McKinney, with hail ranging from 1 to 4.25 inches. Numerous cars, houses, and businesses were severely damaged by the very large hail. A Walmart in McKinney was forced to close for a few hours after large hail broke a skylight outside of the store. Estimates suggest that the storm cost $2.17 million.[54]

Most of the United States, including Texas, experience hailstorms at least two days each year. Long-stemmed vegetation and structures are particularly vulnerable to damage by hail impacts and winds. The land area affected by individual hail incidents is not much smaller than that of a parent thunderstorm, an average of 15 miles in diameter around the center of a storm. The entire City of McKinney is vulnerable to a hail incident.

Table 4-11
Hailstorms 1996 -2013[55]

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
Collin	February 27, 1996	0.75 in.	0	0	$0.00	$0.00
Collin	March 18, 1996	0.75 in.	0	0	$0.00	$0.00
McKinney	March 24, 1996	0.75 in.	0	0	$0.00	$0.00
Collin	March 24, 1996	.075 in -1.25 in.	0	0	$0.00	$0.00
Collin	April 4, 1996	0.88 in.	0	0	$0.00	$0.00
McKinney	April 12, 1996	0.88 in.	0	0	$0.00	$0.00
Collin	April 12, 1996	0.88 - 0.75 in.	0	0-	$0.00	$0.00
McKinney	April 13, 1996	0.88 in.	0	0	$0.00	$0.00
Collin	April 13, 1996	0.75 -1.00 in.	0	0	$0.00	$0.00
Collin	May 27, 1996	1.00 in.	0	0	$0.00	$0.00
Collin	May 28, 1996	1.50 in.	0	0	$0.00	$0.00
Collin	June 12, 1996	1.00 in.	0	0	$0.00	$0.00
McKinney	June 17, 1996	0.75 in.	0	0	$0.00	$0.00

[53] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[54] NOAA, http://www.srh.noaa.gov/fwd/?n=june132012
[55] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
McKinney	June 17, 1996	0.88 in.	0	0	$0.00	$0.00
McKinney	July 23, 1996	0.75 in.	0	0	$0.00	$0.00
Collin	July 30, 1996	1.75 in.	0	0	$0.00	$0.00
Collin	October 21, 1996	0.75 - 2.00 in.	0	0	$0.00	$0.00
Collin	April 22, 1997	1.00 in.	0	0	$0.00	$0.00
Collin	May 25, 1997	1.00 in.	0	0	$0.00	$0.00
Collin	June 9, 1997	.75 -1.00 in.	0	0	$0.00	$0.00
Collin	June 16, 1997	0.75 - 0.88 in.	0	0	$0.00	$0.00
Collin	August 13, 1997	0.88 in.	0	0	$0.00	$0.00
Collin	January 4, 1998	1.00 in.	0	0	$0.00	$0.00
McKinney	January 4, 1998	0.75 in.	0	0	$0.00	$0.00
Collin	January 21, 1998	1.00 in.	0	0	$0.00	$0.00
Collin	February 25, 1998	0.75 in.	0	0	$0.00	$0.00
Collin	April 16, 1998	1.75 in.	0	0	$0.00	$0.00
Collin	May 8, 1998	0.75 – 1.00 in.	0	0	$0.00	$0.00
McKinney	May 8, 1998	1.00 in.	0	0	$0.00	$0.00
McKinney	May 8, 1998	0.75 in.	0	0	$0.00	$0.00
McKinney	May 8, 1998	1.75 in.	0	0	$0.00	$0.00
McKinney	May 8, 1998	1.75 in.	0	0	$0.00	$0.00
Collin	May 8, 1998	1.75 in.	0	0	$0.00	$0.00
Collin	October 2, 1998	1.00 in.	0	0	$0.00	$0.00
Collin	February 6, 1999	0.75 - 1.75 in.	0	0	$0.00	$0.00
Collin	April 3, 1999	1.00 in.	0	0	$0.00	$0.00
Collin	May 4, 1999	1.00 in.	0	0	$0.00	$0.00
Collin	May 25, 1999	1.00 in.	0	0	$0.00	$0.00
Collin	February 25, 2000	0.75 in.	0	0	$0.00	$0.00
Collin	March 2, 2000	1.00 in.	0	0	$0.00	$0.00

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
McKinney	March 2, 2000	1.00 in.	0	0	$0.00	$0.00
Collin	March 2, 2000	0.75 - 1.75 in.	0	0	$0.00	$0.00
Collin	March 10, 2000	0.75 in.	0	0	$0.00	$0.00
Collin	March 16, 2000	0.75 in.	0	0	$0.00	$0.00
Collin	May 12, 2000	0.75 in.	0	0	$0.00	$0.00
Collin	May 27, 2000	0.75 in.	0	0	$0.00	$0.00
Collin	March 11, 2001	0.88 in.	0	0	$0.00	$0.00
Collin	May 6, 2001	1.00 -3.00 in.	0	0	$0.00	$0.00
Collin	April 16, 2002	0.75 in.	0	0	$0.00	$0.00
McKinney	May 9, 2002	0.75 in.	0	0	$0.00	$0.00
Collin	December 30, 2002	1.00 -1.75 in.	0	0	$0.00	$0.00
Collin	April 5, 2003	2.00 -3.00 in.	0	0	$0.00	$0.00
Collin	April 6, 2003	1.00 in.	0	0	$0.00	$0.00
Collin	May 13, 2003	1.00 in.	0	0	$0.00	$0.00
McKinney	May 24, 2003	1.00 in.	0	0	$0.00	$0.00
Collin	May 24, 2003	0.75 in.	0	0	$0.00	$0.00
Collin	June 14, 2003	1.00 -1.50 in.	0	0	$0.00	$0.00
Collin	July 2, 2003	0.75 in.	0	0	$0.00	$0.00
McKinney	July 22, 2003	1.00 in.	0	0	$0.00	$0.00
Collin	July 22, 2003	0.75 in.	0	0	$0.00	$0.00
McKinney	June 5, 2004	1.75 in.	0	0	$0.00	$0.00
Collin	June 19, 2004	0.88 in.	0	0	$0.00	$0.00
Collin	January 12, 2005	1.25 in.	0	0	$0.00	$0.00
Collin	February 23, 2005	0.75 -1.75 in.	0	0	$0.00	$0.00
Collin	April 5, 2005	0.75 – 1.00 in.	0	0	$0.00	$0.00
Collin	May 25, 2005	0.75 in.	0	0	$0.00	$0.00
Collin	June 13, 2005	0.88 in.	0	0	$0.00	$0.00

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
Collin	May 9, 2006	1.75 in.	0	0	$5,000.00	$0.00
Collin	April 24, 2007	1.00 -1.75 in.	0	0	$5,000.00	$0.00
McKinney	May 30, 2007	0.75 in.	0	0	$0.00	$0.00
Collin	May 30, 2007	0.75 in.	0	0	$0.00	$0.00
Collin	June 4, 2007	0.88 in.	0	0	$0.00	$0.00
Collin	June 9, 2007	0.88 in.	0	0	$0.00	$0.00
Collin	June 20, 2007	1.00 in.	0	0	$0.00	$0.00
Collin	February 5, 2008	0.75 - 1.75 in.	0	0	$5,000.00	$0.00
Collin	February 16, 2008	1.00 -1.75 in.	0	0	$5,000.00	$0.00
McKinney	February 16, 2008	1.75 in.	0	0	$25,000.00	$0.00
Collin	April 4, 2008	1.00 in.	0	0	$0.00	$0.00
McKinney	April 4, 2008	1.75 in.	0	0	$10,000.00	$0.00
Collin	April 4, 2008	1.00 in.	0	0	$0.00	$0.00
Collin	April 8, 2008	0.75 – 1.00 in.	0	0	$0.00	$0.00
Collin	April 17, 2008	0.75 - 0.88 in.	0	0	$0.00	$0.00
Collin	May 7, 2008	1.75 in.	0	0	$5,000.00	$0.00
Collin	June 28, 2008	0.75 in.	0	0	$0.00	$0.00
Collin	February 10, 2009	1.00 in.	0	0	$0.00	$0.00
Collin	April 12, 2009	1.00 in.	0	0	$2,000.00	$0.00
McKinney	May 2, 2009	1.00 in.	0	0	$0.00	$0.00
Collin	May 2, 2009	1.25 in.	0	0	$0.00	$0.00
Collin	July 19, 2009	0.75 in.	0	0	$0.00	$0.00
Collin	October 24, 2010	2.00 in.	0	0	$50,000.00	$0.00
Collin	March 15, 2011	0.88 in.	0	0	$0.00	$0.00
Collin	April 4, 2011	0.75 in.	0	0	$0.00	$0.00
Collin	April 10, 2011	1.00 -2.75 in.	0	0	$2,010,000.00	$0.00
Collin	April 14, 2011	.88 -1.75 in.	0	0	$55,000.00	$0.00

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
Collin	April 19, 2011	1.25 in.	0	0	$0.00	$0.00
Collin	April 24, 2011	1.00 -1.75 in.	0	0	$150,000.00	$0.00
Collin	April 25, 2011	0.75 - 1.00 in.	0	0	$0.00	$0.00
Collin	April 26, 2011	1.00 in.	0	0	$0.00	$0.00
Collin	May 1, 2011	0.88 in.	0	0	$0.00	$0.00
Collin	May 2, 2011	1.25 in.	0	0	$0.00	$0.00
Collin	May 20, 2011	0.88 -1.50 in.	0	0	$0.00	$0.00
Collin	May 23, 2011	0.88 in.	0	0	$0.00	$0.00
Collin	May 24, 2011	0.88 -2.00 in.	0	0	$25,000.00	$0.00
McKinney	September 18, 2011	1.00 -1.25 in.	0	0	$0.00	$0.00
Collin	September 18, 2011	1.00 in.	0	0	$0.00	$0.00
Collin	October 17, 2011	0.75 in.	0	0	$0.00	$0.00
Collin	October 23, 2011	0.75 in.	0	0	$0.00	$0.00
Collin	April 3, 2012	1.00 -2.00 in.	0	0	$1,800,000,000.00	$0.00
Collin	May 14, 2012	0.88 in.	0	0	$0.00	$0.00
Collin	May 30, 2012	0.75 in.	0	0	$0.00	$0.00
Collin	June 6, 2012	075 -1.00 in.	0	0	$0.00	$0.00
McKinney	June 13, 2012	1.00 in.	0	0	$60,000.00	$0.00
Collin	June 13, 2012	2.00 - 3.25 in.	0	0	$1,675,000.00	$0.00
Collin	August 17, 2012	0.75 - 1.50 in.	0	0	$200,000.00	$0.00
Collin	March 23, 2013	0.88 in.	0	0	$0.00	$0.00
Collin	March 31, 2013	0.75- 1.00 in.	0	0	$0.00	$0.00
McKinney	March 27, 2014	1.50 in.	0	0	$5,000.00	$0.00
Collin	March 27, 2014	.75 – 1 in.	0	0	$0.00	$0.00
Collin	March 28, 2014	1.50 in.	0	0	$3,000.00	$0.00
Collin	April 3, 2014	0.75-2.00 in.	0	0	$560,000.00	$0.00
Collin	April 27, 2014	0.75-1.25 in.	0	0	$2,000.00	$0.00

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
Collin	April 24, 2015	.88 in.	0	0	$0.	$0.00
Collin	May 28, 2015	1.00-1.75 in.	0	0	$30,000.00	$0.00
Collin	August 24, 2015	.88 in.	0	0	$5,000.00	$0.00
Collin	March 17, 2016	.88 – 1.5 in.	0	0	$8,000.00	$0.00
Collin	March 23, 2016	.75 – 2 in.	0	0	$650,075,000.00	$.0.00
Collin	April 11, 2016	.75 – 5.25 in.	0	0	$226,150,000.00	$0.00
Collin	May 10, 2016	.88 in	0	0	$0.00	$0.00
Collin	May 29, 2016	.75- 1 in	0	0	$0.00	$0.00
Collin	February 27, 2017	.88 – 1 in.	0	0	$0.00	$0.00
McKinney	March 26, 2017	2 in.	0	0	$100,000.00	$0.00
McKinney	March 26, 2017	2 in.	0	0	$5,000.00	$0.00
Collin	March 26, 2017	.88 - 2 in.	0	0	$45,000.00	$0.00
Collin	March 29, 2017	1 in	0	0	$0.00	$0.00
Collin	April 4, 2017	1 in	0	0	$0.00	$0.00
McKinney	April 10, 2017	1 in.	0	0	$0.00	$0.00
Collin	April 10, 2017	1 – 2 in.	0	0	$22,000.00	$0.00
McKinney	April 21, 2017	1.75 in.	0	0	$10,000.00	$0.00
McKinney	April 21, 2017	2.75 in.	0	0	$20,000.00	$0.00
Collin	April 21, 2017	1 – 2.75 in.	0	0	$692,000.00	$0.00
Collin	January 21, 2018	.75 in.	0	0	$0.00	$0.00
McKinney	April 6, 2018	1.25 in.	0	0	$0.00	$0.00
McKinney	April 6, 2018	2 in.	0	0	$10,000.00	$0.00
Collin	April 6, 2018	1 – 3 in.	0	0	$195,000.00	$0.00
McKinney	April 13, 2018	1 in.	0	0	$0.00	$0.00
McKinney	April 13, 2018	1 in.	0	0	$0.00	$0.00
McKinney	April 13, 2018	1 in.	0	0	$0.00	$0.00
McKinney	April 13, 2018	1.25 in.	0	0	$0.00	$0.00

County	Date	Size of Hail	Injuries	Fatalities	Property Damage	Crop Damage
McKinney	April 13, 2018	1.75 in.	0	0	$0.00	$0.00
McKinney	April 13, 2018	1 in.	0	0	$0.00	$0.00
Collin	April 13, 2018	.75 – 1.75 in.	0	0	$0.00	$0.00
McKinney	June 5, 2018	1 in.	0	0	$0.00	$0.00
Collin	June 6, 2018	1 – 1.5 in.	0	0	$0.00	$0.00
Collin	November 30, 2018	1.25 in.	0	0	$0.00	$0.00
Collin	March 9, 2019	1 in.	0	0	$0.00	$0.00
McKinney	March 24, 2019	2 in.	0	0	$10,000.00	$0.00
McKinney	March 24, 2019	2.5 in.	0	0	$50,000.00	$0.00
Collin	March 24, 2019	1 – 3 in.	0	0	$1,040,000.00	$0.00
Collin	May 1, 2019	.75 in.	0	0	$0.00	$0.00
Collin	May 18, 2019	1 in.	0	0	$0.00	$0.00
McKinney	June 19, 2019	.88 in.	0	0	$0.00	$0.00
McKinney	June 19, 2019	1.25 in.	0	0	$0.00	$0.00
McKinney	June 19, 2019	1 in.	0	0	$0.00	$0.00
Collin	June 19, 2019	.75 – 2.5 in.	0	0	$10,000.00	$0.00
Collin	October 20, 2019	1 in.	0	0	$0.00	$0.00
Collin	August 16, 2020	.75 – 1.5 in.	0	0	$0.00	$0.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities as well as all public, private, and commercial properties are vulnerable to hailstorms. Outdoor facilities, such as public parks, are more vulnerable to hail damage than other facilities. Additionally, vehicles parked outdoors are particularly vulnerable to hail damage and could increase the economic impact of a storm.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a hailstorm incident, and no way to predict where and when a hailstorm will occur. People are vulnerable to the effects of hailstorms, including power outages, effects on transportation routes, damage to homes and cars, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are significant if a hailstorm occurs. Crops and vegetation may be destroyed.

Vulnerability

Hail

Frequency of Occurrence	High
Warning Time	None – minimal
Geographic Extent	Community-wide
Potential Impact	Moderate

Land Use and Development Trends

Future development throughout the City of McKinney will be vulnerable to potential damage of property from hailstorms because no property is immune to a hailstorm's effects.

Hazard Summary

The severity of hailstorms is measured by duration, size of the hail itself, and geographic extent. All of these factors are directly related to the weather phenomena that create hailstorms and thunderstorms. There is wide potential variation in these severity components. The size of the hail is a direct function of the severity and size of the storm. The duration of each storm varies but rarely lasts longer than a couple of hours.

Hailstorms rarely result in the loss of human life, but they cause nearly $1 billion in property, livestock, and crop damage in the United States each year. Once a hailstone reaches the size of about 1.5 inches in diameter, damage to cars, windows, and siding will occur. Although typically not life-threatening, severe hailstorms have the potential to cause significant property damage, particularly to automobiles and some building types.

4.1.7 Windstorms

Hazard Identification

The City of McKinney HMSC used data from NCDC and NWS in researching windstorms and their impact on the City of McKinney. Windstorms are defined as a storm marked by high winds with little or no precipitation. Extreme windstorm events are associated with tropical cyclones, severe thunderstorms, and downbursts. Winds can vary from zero mph at ground level to 200 mph in the upper atmospheric jet stream.

Windstorms are measured according to the Beaufort Wind Scale shown in table 4-12. The City of McKinney may experience wind events ranging from a 0 (0 to 1 MPH winds) up to a 12 (75+ MPH winds) on the Beaufort Wind Scale. Windstorms tend to affect areas of the City of McKinney with significant tree stands as well as areas with exposed property and infrastructure and aboveground utilities. Windstorms can cause power outages, transportation and economic disruptions, and significant property damage and pose a high risk for injuries and loss of life.

Table 4-12
Beaufort Wind Scale (Land)[56]

Beaufort	Avg miles per hour	Avg km per hour	Knots	Surroundings
0 (calm)	0	0	0–1	Smoke rises vertically
1 (light air)	1–3	2–5	1–3	Smoke drift indicates wind direction
2 (light breeze)	4–7	6–12	4–6	Wind felt on face; leaves rustle
3 (gentle breeze)	8–12	13–20	7–10	Leaves, small twigs in constant motion
4 (moderate breeze)	13–18	21–30	11–16	Dust and leaves raised up, branches move
5 (fresh breeze)	19–25	31–40	17–21	Small trees begin to sway
6 (strong breeze)	26–31	41–50	22–27	Large branches of trees in motion
7 (moderate gale)	32–38	51–61	28–33	Whole trees in motion; resistance felt walking against wind
8 (fresh gale)	39–46	62–74	34–40	Twigs and small branches break from trees
9 (strong gale)	47–55	75–89	41–47	Larger branches break from trees
10 (whole gale)	56–64	90–103	48–55	Trees broken and uprooted
11 (storm)	65–74	104–119	56–63	Widespread damage
12 (hurricane)	75+	120+	64+	Violence and destruction

[56] National Weather Service, http://www.nws.noaa.gov/

Hazard Profile

The City of McKinney has experienced 39 wind-related incidents since 1996. This equates to a 84% chance of a wind incident in the City of McKinney per year and an average of 1.625 incidents per year. The greatest impact to the City of McKinney resulting from thunderstorm winds occurred on May 8, 1998, causing over $100,000 in property damage. Thunderstorm winds damaged commercial and residential properties and transportation infrastructure. In addition, there were 39 reports of trees blown down and 51 reports of power lines blown down by thunderstorm winds.[57]

The 39 wind-related incidents recorded for the City of McKinney resulted in nearly $400,000 in property damage. In addition, neighboring jurisdictions in Collin County have been impacted by 130 wind-related incidents since 1996. As a result, Collin County has incurred over 3.5 million dollars in damage.[58] Table 4-13 reveals wind incidents in Collin County from 1996–2020.[59]

Table 4-13
Wind Incidents 1996–2020[60]

County	Date	Property Damage	Crop Damage
Collin	April 13, 1996	$2,000.00	$0.00
Collin	April 13, 1996	$40,000.00	$0.00
Collin	April 13, 1996	$0.00	$0.00
Collin	May 27, 1996	$1,000.00	$0.00
Collin	June 1, 1996	$2,000.00	$0.00
Collin	June 1, 1996	$2,000.00	$0.00
Collin	June 1, 1996	$2,000.00	$0.00
Collin	June 1, 1996	$50,000.00	$0.00
Collin	June 6, 1996	$0.00	$0.00
McKinney[61]	June 6, 1996	$3,000.00	$0.00
McKinney	June 6, 1996	$2,000.00	$0.00
Collin	June 6, 1996	$20,000.00	$0.00
Collin	June 12, 1996	$0.00	$0.00
Collin	June 15, 1996	$20,000.00	$0.00

[57] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents
[58] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[59] Highlighted cells indicates hailstorms directly impacting the City of McKinney
[60] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[61] Highlighted cells indicates hailstorms directly impacting the City of McKinney

County	Date	Property Damage	Crop Damage
McKinney	June 17, 1996	$10,000.00	$0.00
Collin	July 8, 1996	$5,000.00	$0.00
Collin	July 30, 1996	$14,000.00	$0.00
Collin	August 11, 1996	$6,000.00	$0.00
Collin	October 21, 1996	$3,000.00	$0.00
Collin	March 29, 1997	$4,000.00	$0.00
Collin	April 22, 1997	$9,000.00	$0.00
McKinney	April 22, 1997	$0.00	$0.00
Collin	April 22, 1997	$50,000.00	$0.00
Collin	May 19, 1997	$25,000.00	$0.00
Collin	June 9, 1997	$2,000.00	$0.00
Collin	June 16, 1997	$40,000.00	$0.00
Collin	June 22, 1997	$4,000.00	$0.00
McKinney	July 15, 1997	$0.00	$0.00
Collin	July 15, 1997	$4,000.00	$0.00
McKinney	August 13, 1997	$10,000.00	$0.00
Collin	August 20, 1997	$0.00	$0.00
Collin	September 15, 1997	$600,000.00	$0.00
Collin	May 8, 1998	$100,000.00	$0.00
McKinney	May 8, 1998	$0.00	$0.00
McKinney	May 8, 1998	$100,000.00	$0.00
McKinney	May 8, 1998	$0.00	$0.00
Collin	May 27, 1998	$0.00	$0.00
Collin	June 4, 1998	$0.00	$0.00
Collin	July 17, 1998	$1,000.00	$0.00
Collin	October 2, 1998	$12,000.00	$0.00
Collin	November 9, 1998	$0.00	$0.00

County	Date	Property Damage	Crop Damage
Collin	February 6, 1999	$500.00	$0.00
Collin	April 26, 1999	$1,000.00	$0.00
Collin	May 9, 1999	$400.00	$0.00
McKinney	May 9, 1999	$1,000.00	$0.00
Collin	May 9, 1999	$1,000.00	$0.00
Collin	February 25, 2000	$42,000.00	$0.00
Collin	March 2, 2000	$2,500.00	$0.00
Collin	May 12, 2000	$10,000.00	$0.00
Collin	May 27, 2000	$500.00	$0.00
Collin	February 24, 2001	$50,000.00	$0.00
McKinney	May 28, 2001	$0.00	$0.00
Collin	June 14, 2001	$0.00	$0.00
McKinney	June 14, 2001	$0.00	$0.00
Collin	September 18, 2001	$0.00	$0.00
Collin	October 10, 2001	$0.00	$0.00
Collin	October 12, 2001	$50,000.00	$0.00
McKinney	October 12, 2001	$0.00	$0.00
Collin	August 25, 2002	$4,000.00	$0.00
McKinney	August 27, 2002	$5,000.00	$0.00
Collin	May 24, 2003	$20,000.00	$0.00
McKinney	May 24, 2003	$0.00	$0.00
Collin	June 11, 2003	$5,000.00	$0.00
Collin	August 22, 2003	$2,000.00	$0.00
Collin	August 26, 2003	$5,000.00	$0.00
McKinney	August 26, 2003	$15,000.00	$0.00
Collin	March 4, 2004	$95,000.00	$0.00
McKinney	June 2, 2004	$2,000.00	$0.00
McKinney	April 5, 2005	$0.00	$0.00

County	Date	Property Damage	Crop Damage
Collin	May 25, 2005	$0.00	$0.00
Collin	July 15, 2005	$0.00	$0.00
Collin	August 4, 2005	$10,000.00	$0.00
Collin	September 28, 2005	$15,000.00	$0.00
Collin	March 13, 2006	$0.00	$0.00
McKinney	August 12, 2006	$0.00	$0.00
McKinney	August 22, 2006	$0.00	$0.00
Collin	August 22, 2006	$15,000.00	$0.00
McKinney	August 23, 2006	$0.00	$0.00
Collin	August 27, 2006	$5,000.00	$0.00
Collin	September 17, 2006	$5,000.00	$0.00
Collin	March 30, 2007	$25,000.00	$0.00
Collin	April 3, 2007	$0.00	$0.00
Collin	April 13, 2007	$0.00	$0.00
Collin	April 24, 2007	$500.00	$0.00
McKinney	April 24, 2007	$40,000.00	$0.00
McKinney	May 2, 2007	$40,000.00	$0.00
Collin	May 2, 2007	$5,000.00	$0.00
Collin	May 30, 2007	$15,000.00	$0.00
Collin	August 29, 2007	$0.00	$0.00
McKinney	April 10, 2008	$0.00	$0.00
McKinney	April 10, 2008	$0.00	$0.00
Collin	June 17, 2008	$1,000.00	$0.00
McKinney	June 17, 2008	$0.00	$0.00
Collin	June 28, 2008	$1,000.00	$0.00
Collin	February 9, 2009	$15,000.00	$0.00
Collin	February 10, 2009	$50,000.00	$0.00

County	Date	Property Damage	Crop Damage
Collin	April 30, 2009	$0.00	$0.00
Collin	May 2, 2009	$5,000.00	$0.00
Collin	May 6, 2009	$2,000.00	$0.00
Collin	May 6, 2009	$3,000.00	$0.00
Collin	June 10, 2009	$1,030,000.00	$0.00
McKinney	June 10, 2009	$5,000.00	$0.00
Collin	July 8, 2009	$6,000.00	$0.00
Collin	July 19, 2009	$8,000.00	$0.00
Collin	August 5, 2009	$5,000.00	$0.00
Collin	May 14, 2010	$5,000.00	$0.00
McKinney	August 17, 2010	$1,000.00	$0.00
Collin	April 10, 2011	$5,000.00	$0.00
Collin	April 14, 2011	$0.00	$0.00
Collin	April 23, 2011	$2,000.00	$0.00
Collin	April 25, 2011	$0.00	$0.00
Collin	May 24, 2011	$24,000.00	$0.00
Collin	June 21, 2011	$80,000.00	$0.00
Collin	July 2, 2011	$10,000.00	$0.00
Collin	September 18, 2011	$30,000.00	$0.00
Collin	October 23, 2011	$2,000.00	$0.00
Collin	May 4, 2012	$20,000.00	$0.00
Collin	May 4, 2012	$5,000.00	$0.00
Collin	May 30, 2012	$15,000.00	$0.00
Collin	June 6, 2012	$53,000.00	$0.00
McKinney	July 20, 2012	$2,000.00	$0.00
Collin	July 20, 2012	$160,000.00	$0.00
Collin	August 6, 2012	$2,000.00	$0.00
Collin	August 6, 2012	$6,000.00	$0.00

County	Date	Property Damage	Crop Damage
Collin	December 19, 2012	$150,000.00	$0.00
Collin	February 10, 2013	$1,000.00	$0.00
Collin	May 21, 2013	$140,000.00	$0.00
McKinney	May 21, 2013	$50,000.00	$0.00
McKinney	May 21, 2013	$50,000.00	$0.00
Collin	May 21, 2013	$50,000.00	$0.00
Collin	June 17, 2013	$2,000.00	$0.00
Collin	August 23, 2013	$10,000.00	$0.00
Collin	April 3, 2014	$90,000.00	$0.00
McKinney	April 7, 2014	$8,000.00	$0.00
Collin	May 12, 2014	$31,000.00	$0.00
Collin	July 14, 2014	$0.00	$0.00
Collin	October 2, 2014	$10,000.00	$0.00
Collin	October 10, 2014	$0.00	$5,000.00
Collin	October 13, 2014	$1,000.00	$0.00
Collin	April 18, 2015	$20,000.00	$0.00
Collin	November 17, 2015	$0.00	$0.00
Collin	December 26, 2015	$5,000.00	$0.00
Collin	March 8, 2016	$5,000.00	$0.00
Collin	March 23, 2016	$5,000.00	$0.00
Collin	April 11, 2016	$32,000.00	$0.00
Collin	April 29, 2016	$5,000.00	$0.00
Collin	May 29, 2016	$5,000.00	$0.00
Collin	July 15, 2016	$1,000.00	$0.00
Collin	January 15, 2017	$2,000.00	$0.00
McKinney	March 29, 2017	$5,000.00	$0.00
Collin	March 29, 2017	$10,000.00	$0.00

County	Date	Property Damage	Crop Damage
McKinney	July 8, 2017	$0.00	$0.00
Collin	July 8, 2017	$10,000.00	$0.00
Collin	July 23, 2017	$1,000.00	$0.00
McKinney	May 25, 2018	$1,000.00	$0.00
McKinney	June 7, 2018	$40,000.00	$0.00
Collin	August 18, 2018	$12,000.00	$0.00
McKinney	March 13, 2019	$0.00	$0.00
Collin	March 13, 2019	$0.00	$0.00
Collin	May 18, 2019	$0.00	$0.00
Collin	May 21, 2019	$0.00	$0.00
McKinney	June 9, 2019	$0.00	$0.00
Collin	June 9, 2019	$0.00	$0.00
Collin	June 29, 2019	$5,000.00	$0.00
Collin	October 20, 2019	$700,000.00	$0.00
Collin	October 21, 2019	$500.00	$0.00
Collin	April 28, 2020	$500.00	$0.00
McKinney	August 16, 2020	$0.00	$0.00
Collin	August 16, 2020	$23,000.00	$0.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** In evaluating assets that are vulnerable to severe windstorms, it was determined that all critical facilities as well as all public, private, and commercial properties are vulnerable to severe thunderstorms.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a windstorm, and no way to predict where a storm will occur. People are vulnerable to severe windstorms through power outages, effects on transportation routes, establishment of shelters, roofs blown off structures, etc. Windstorms occur frequently within the City of McKinney.
- **Environment Risk/Vulnerability.** Risks to the environment are high for severe windstorms. High winds can destroy trees and flooding from severe thunderstorms may destroy forestry and re-direct river flow.

Vulnerability

Windstorms

Frequency of Occurrence	High
Warning Time	3–6 hours
Geographic Extent	County – Wide
Potential Impact	Minor

Land Use and Development Trends

New technology allows for high wind-resistant windows, either by directly installing windows capable of withstanding high winds or applying a film that protects the window. This reduces property damage by reducing the number of broken windows and reduces injuries and deaths by reducing the amount of broken glass. Although the City of McKinney currently has no regulatory capabilities regarding this technology, it is advised that new developments include high wind-resistant windows.

Hazard Summary

Overall, severe thunderstorms and high winds pose one of the greatest threats to the City of McKinney in terms of property damage, injuries, and loss of life. Severe thunderstorms and high winds are the most frequently occurring natural hazard in the City of McKinney and have the greatest chance of affecting the City of McKinney each year. Based on the frequency of this hazard and its ability to negatively affect the City of McKinney, the mitigation measures identified in this plan should be aggressively pursued.

4.1.8 Infectious Disease Outbreak

Hazard Identification

A widespread infectious disease outbreak is a plausible incident(s) in the City of McKinney. The World Health Organization[62] defines a disease outbreak as "the occurrence of cases of disease in excess of what would normally be expected in a defined community." Infectious disease outbreaks are a danger to the emergency responders and the general public. This can include influenza (including H1N1), tuberculosis, Ebola, polio, smallpox, severe acute respiratory syndrome (SARS), coronavirus (COVID-19), and many other health-related incidents. Bioterrorism incidents can also be included in this identified hazard area.

Hazard Profile

Influenza comes to the City of McKinney area every winter, usually between October and March. Influenza is a specific viral infection that is responsible for a substantial number of hospitalizations and deaths each winter. The Centers for Disease Control and Prevention (CDC) estimates 36,000 deaths are caused by influenza each year in the United States.[63] Each year, approximately two deaths are attributed to influenza per Collin County Healthcare Services. Influenza is a seasonal disease that can cause severe illness as well as death of the ill people especially young and elders and those who have other health conditions and weak immune systems. The actual burden of the disease is not known in the community because it is not a modifiable condition. Schools and health care providers notify Collin County Health Care Services voluntarily. Ill persons lose work days and spend money on their treatments as well as hospitalization costs. The continuous genetic changes in the virus, called "antigenic drift," meaning that people can get sick from the same virus year after year; this year's flu shot does not prevent next year's illness.[64]

Historians estimate that over the last 3 centuries, there have been 10 influenza pandemics. A pandemic is an epidemic that affects the entire world. Influenza pandemics occur when the virus undergoes such dramatic changes that virtually no one has resistance to infection. When this occurs, the number of people infected is much higher than during ordinary flu seasons. In addition, during some pandemics, the severity of illness is higher. For example, in 1918–1919, not only was the number of ill people high, but also the death rate was 50 times higher than usual. Furthermore, there was a shift in the age group most severely affected from the elderly to those 20-40 years of age. In contrast, the more recent pandemics of 1957 and 1968 caused far less dramatic increases in the death rate (only about two times the norm of 36,000 per year from regular flu).[65] In 2014, evidence from multiple outbreak sites demonstrated that the H1N1 pandemic virus rapidly established itself as the dominant influenza strain in most parts of the world. The pandemic persisted as the virus continued to move through susceptible populations.[66]

The outbreak of the H5N1 influenza strain (bird flu) in wild and domestic birds, which began in Asia in late 2003, is being carefully watched as a potential precursor to a pandemic since several hundred humans have been infected. Although the number of human infections is quite small, about 60 percent of those infected have died, demonstrating the severity of this infection. The

[62] World Health Organization, http://www.emro.who.int/health-topics/disease-outbreaks/index.html
[63] Centers for Disease Control and Prevention, http://www.cdc.gov/nchs/fastats/infectis.htm
[64] Collin County Healthcare Services, http://www.co.collin.tx.us/healthcare_services/immunization.jsp
[65] Centers for Disease Control and Prevention, http://www.cdc.gov/nchs/fastats/infectis.htm
[66] World Health Organization, http://www.who.int/csr/disease/swineflu/en/

conditions to trigger a pandemic are not yet present since, at this point, the H5N1 virus is not transmitted efficiently from human to human.[67]

Ebola virus disease (EVD) is a severe, often fatal illness in humans. Ebola spreads through human-to-human transmission via direct contact (through broken skin or mucous membranes) with the blood, secretions, organs or other bodily fluids of infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids. The latest Ebola outbreak began in 2014 in West Africa. In September 2014, a case tested positive in Dallas County which was fatal. There were several contacts that remained under quarantine for further monitoring. Later, two nurses who cared for the first patient were diagnosed with Ebola. By November 7, 2014, all 177 contacts of the three patients completed 21 days of monitoring. None of those who were evaluated were found to have Ebola. [68]

In addition to the influence, Collin County, including the City of McKinney population, may be exposed to pertussis, also known as whooping cough, West Nile virus, and Zika virus. Pertussis is one of the vaccine preventable diseases, however can spread easily among the contacts of an ill person. Young children and un-vaccinated can die due to pertussis. The number of cases of pertussis is increasing in North Texas including Collin County as well as City of McKinney. In 2012, there were 54 cases of pertussis in whole Collin County while there were 41 cases reported to the Collin County Health Care Services from only City of McKinney during the year 2013. In 2012, there were 12 cases of pertussis reported from the City of McKinney. These numbers show large (>300%) increase in number of cases of pertussis in less than a year.

Economic impact of pertussis is lost work days for parents if their child is ill, cost of doctor visits, cost of hospitalization, and cost of medication and vaccination. During outbreaks of pertussis societal costs is estimated to be $ 2000 per case.[69]

West Nile virus spread by the bite of an infected mosquito and can infect humans, horses, many types of birds, and some other animals. Anybody can be infected, but people older than 50 have the highest risk of severe disease, and people with weakened immune systems are at an increased risk for West Nile virus. This infection can also kill the patient. Economic impact of West Nile virus infection is lost work days for patients and hospitalization cost. There is a rehabilitation cost for those who survive the West Nile virus disease. In 2012, the outbreak cost more than $47.6 million in Texas.[70]

Zika virus is another mosquito-borne illness with a growing number of cases in Texas. Zika is spread mostly by the bite of an infected Aedes species mosquito (Ae. aegypti and Ae. albopictus). These mosquitoes are aggressive daytime biters. They can also bite at night. Zika may cause serious side effects to the fetus of an infected woman. As of 2016, there have been no cases in McKinney and there is no vaccine for the Zika Virus. [71]

In 2020, the City of McKinney was affected by the Coronavirus disease (COVID-19) pandemic. COVID-19 was first detected in December 2019 in Wuhan, China and has since spread to over 200 countries. The COVID-19 pandemic has created an unprecedented challenge to public health,

[67] World Health Organization, http://www.who.int/csr/disease/swineflu/en/
[68] CDC
[69] Pediatrics, Texas Children's Hospital
[70] CIDRAP, Aug 2013
[71] http://www.cdc.gov/zika/about/index.html

food systems, and our local, national, and global economy.[72] As of December 17, 2020, there have been 74,724,989 global confirmed cases with 1,657,706 deaths[73] and has an estimated cost of over $4 billion to the State of Texas[74].

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities as well as all public, private, and commercial properties are vulnerable to being affected by an infectious disease incident due to employees being ill and possibly being unable to maintain the facilities.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of City of McKinney because there is no way to determine the impact/magnitude of an infectious disease incident and no way to predict which target group(s) will be the most vulnerable to a virus or bacteria. In addition to sickness (morbidity) and death (mortality), 40 percent of the workforce could become ill.
- **Environment Risk/Vulnerability.** Risks to the environment are low should an infectious disease incident occur.

Vulnerability

Infectious Disease Outbreak

Frequency of Occurrence	Moderate
Warning Time	More than 12 hours
Geographic Extent	County-wide
Potential Impact	Major

Land Use and Development Trends

There are no land use and development trends related to infectious disease outbreak.

Hazard Summary

Infectious disease outbreaks pose a threat to all of the City of McKinney. Many infectious diseases do not pose a great economic threat, but there are infectious diseases (COVID-19, West Nile virus, and influenza virus such as H1N1) that threaten to destabilize the economy by decreasing work production and increasing strain on the health system. Collin County has a robust public health system in place to quickly identify infectious disease and mitigate its existence. The County Collin Health Care Services offer numerous preventive programs for such infectious diseases as West Nile virus, influenza, perinatal hepatitis B, and many other infectious diseases.

[72] https://www.who.int/news/item/13-10-2020-impact-of-covid-19-on-people's-livelihoods-their-health-and-our-food-systems
[73] https://coronavirus.jhu.edu/
[74] https://tdem.texas.gov/disaster-summary-outline-2/

4.1.9 Lightning

Hazard Identification

The City of McKinney HMSC researched historical data from the NCDC and the NWS as well as information from past newspaper articles relating to lightning strikes in the City of McKinney. By definition, all thunderstorms are accompanied by lightning. The extent of lightning ranges and can include strikes to electrical equipment which may hamper communication and emergency response; strikes to buildings, critical facilities, and infrastructure which may cause significant damage largely due to igniting a fire; and strikes to people which may result in severe injury or death. The electrical charge from lightning can potentially be as much as 100 million volts. Lightning strikes proceed from cloud to cloud, cloud to ground, or where high structures are involved, from ground to cloud. Lightning strikes in the City of McKinney are most prevalent in May, with August being the next month of highest occurrence.

Hazard Profile

Lightning is a massive electrostatic discharge between the electrically charged regions within clouds or between a cloud and the Earth's surface. Lightning can occur during a thunderstorm; however, lightning can also be seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, and large hurricanes.[75] Data from NCDC reported five incidents of a lightning strike in the City of McKinney since 1996; however, local knowledge indicates many more instances. The most severe lightning incident in the City of McKinney occurred on August 26, 2003, when a two-story home was struck by lightning, which started a fire resulting in $300,000 in property damage. Another lightning strike occurred during a severe thunderstorm in May 2008. Lightning struck a home on Wind Row Drive and caused a fire, which damaged the attic and the second floor. Extensive water and smoke damage also occurred. The damage resulted in over $70,000 in property damage. Finally, on April 24, 2007, a lightning strike caused over $20,000 in damage when a home on Blue Sage Drive was hit by a lightning bolt, causing extensive damage to the home's electrical system.[76]

Local jurisdictions within Collin County have experienced 40 reported lightning strikes resulting in over 10.7 million dollars in damage and one injury between 1996–2020. Considering this trend and historical records, the City of McKinney may experience damage to critical infrastructure and facilities ranging from $5,000 to $500,000 as a result of lightning.

Table 4-14
Lightning Strikes[77]
from 1996-2020

Location	Date	Death	Injuries	Property Damage	Crop Damage
Collin	July 8, 1996	0	0	$100,000.00	$0.00

[75] NOAA, http://www.nssl.noaa.gov/education/svrwx101/lightning/faq/
[76] NOAA: http://www.ncdc.noaa.gov/stormevents/
[77] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents

Location	Date	Death	Injuries	Property Damage	Crop Damage
Collin	July 23, 1996	0	0	$80,000.00	$0.00
Collin	May 19, 1997	0	0	$50,000.00	$0.00
Collin	January 4, 1998	0	0	$20,000.00	$0.00
Collin	October 9, 1999	0	0	$5,000.00	$0.00
Collin	December 12, 1999	0	0	$30,000.00	$0.00
Collin	March 10, 2000	0	0	$25,000.00	$0.00
Collin	February 16, 2001	0	0	$750,000.00	$0.00
McKinney	April 29, 2002	0	1	$0.00	$0.00
McKinney	August 26, 2003	0	0	$300,000.00	$0.00
McKinney	April 24, 2007	0	0	$20,000.00	$0.00
Collin	May 3, 2007	0	0	$250,000.00	$0.00
Collin	May 30, 2007	0	0	$50,000.00	$0.00
McKinney	July 31, 2007	0	0	$7,000.00	$0.00
Collin	February 15, 2008	0	0	$500,000.00	$0.00
McKinney	May 27, 2008	0	0	$70,000.00	$0.00
Collin	July 19, 2009	0	0	$405,000.00	$0.00
Collin	August 21, 2009	0	0	$750,000.00	$0.00
Collin	September 11, 2009	0	0	$200,000.00	$0.00
Collin	September 1, 2010	0	0	$25,000.00	$0.00
Collin	June 21, 2011	0	0	$30,000.00	$0.00
Collin	May 30, 2012	0	0	$1,500,000.00	$0.00
Collin	October 2, 2014	0	0	$100,000.00	$0.00
Collin	June 21, 2015	0	0	$50,000.00	$0.00
Collin	June 26, 2015	0	0	$25,000.00	$0.00
Collin	April 29, 2016	0	0	$200,000.00	$0.00
Collin	May 23, 2016	0	0	$300,000.00	$0.00
Collin	May 29, 2016	0	0	$200,000.00	$0.00

Location	Date	Death	Injuries	Property Damage	Crop Damage
Collin	June 12, 2016	0	0	$4,000.00	$0.00
Collin	January 2, 2017	0	0	$500,000.00	$0.00
Collin	July 5, 2017	0	0	$1,000,000.00	$0.00
Collin	August 7, 2017	0	0	$100,000.00	$0.00
Collin	October 22, 2017	0	0	$225,000.00	$0.00
Collin	August 9, 2018	0	0	$400,000.00	$0.00
Collin	August 18, 2018	0	0	$2,000.00	$0.00
Collin	December 26, 2018	0	0	$100,000.00	$0.00
Collin	April 23, 2019	0	0	$350,500.00	$0.00
Collin	June 9, 2019	0	0	$1,000.00	$0.00
Collin	June 16, 2019	0	0	$6,000.00	$0.00
Collin	October 20, 2019	0	0	$150,000.00	$0.00
Collin	March 18, 2020	0	0	$800,000.00	$0.00
Collin	April 28, 2020	0	0	$624,000.00	$0.00
Collin	May 23, 2020	0	0	$200,000.00	$0.00
Collin	June 23, 2020	0	0	$250,000.00	$0.00
Collin	August 30, 2020	0	0	$350,000.00	$0.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** In evaluating assets that are vulnerable to lightning incidents, the HMSC determined that all critical facilities as well as all public, private, and commercial properties are vulnerable to lightning incidents.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of City of McKinney because there is no way to determine the impact or magnitude of a lightning incident and no way to predict where a lightning incident will occur. People are vulnerable to lightning incidents through power outages, effects on transportation routes, establishment of shelters, being struck by lightning, etc. A significant chance of a lightning incident exists in any given year in the City of McKinney.
- **Environment Risk/Vulnerability.** Risks to the environment are low for a lightning incident. However, lightening can cause damage to forest, grass, and crops. According to the National

Fire Protection Association, lightning causes an average of about 24,600 fires each year and costs about $407 million in environment damages.[78]

Vulnerability

Lightning

Frequency of Occurrence	High
Warning Time	None - Minimal
Geographic Extent	Localized
Potential Impact	Minor

Land Use and Development Trends

The City of McKinney does not currently have land use or development trends related to lightning.

Hazard Summary

Lightning strikes, although rare in occurrence, have a high danger potential associated with them. Lightning, as with some of the other natural hazards typical to the City of McKinney, can strike anywhere and at any time. Its unpredictability along with its deadly and destructive potential is even more reason to explore mitigation actions. The City of McKinney HMSC identified specific mitigation goals, objectives, and action items related to lightning strikes.

[78] National Fire Protection Association, http://www.nfpa.org/research/statistical-reports

4.1.10 Severe Winter Storm

Hazard Identification

The City of McKinney HMSC researched historical data from the NCDC and the NWS as well as information from past newspaper articles relating to severe winter storms in the City of McKinney. Severe winter storms bring the threat of snow, freezing rain, and ice storms to the City. The extent of winter weather in the City of McKinney ranges from less serious/limited impact conditions (may result in inconveniences and are rarely a direct threat to life and property) to severe/extreme impact conditions (may result in extreme disruptions to daily life, severe property damage, and require lifesaving actions). Generally, the winter storm season in Texas runs from late November to mid-March, although severe winter weather has occurred as early as October and as late as May in some locations.[79] A heavy accumulation of ice, especially when accompanied by high winds, devastates trees and power lines. Sidewalks, streets, and highways become extremely hazardous to pedestrians and motorists. Severe winter storms originate as mid-latitude depressions of cyclonic weather systems and can cause snowstorms and ice storms. Winter storms can paralyze a city by shutting down normal day-to-day operations and can produce an accumulation of snow and ice on trees and utility lines resulting in loss of electricity and blocked transportation routes.

Extreme Cold

The City of McKinney does not typically experience extreme cold, but history has shown the City of McKinney is not immune to extreme cold. Extreme cold temperature is caused by the passage of a cold front dramatically dropping temperatures, which heralds the arrival of a cold wave. A cold wave can last days, weeks, and in some cases months. Extreme cold can lead to frozen water pipes, which when erupted, can lead to extensive property damage and the depletion of a natural resource. When cities/communities have long-term loss of utilities, elderly and extremely young populations become more vulnerable to the effects of the extreme cold temperatures. In addition, in 8 out of the past 20 years, the City has been subjected to an extreme cold event, correlating to a 40 percent chance every year that an extreme cold event will occur.[80]

Hazard Profile

To determine the City of McKinney's vulnerability to severe winter storms, a time period from 1950 to 2013 was examined. Numerous sources were used in identifying the severe winter storm hazards that have occurred in the City of McKinney since 1950 (both primary and secondary). The City of McKinney Office of Emergency Management was used as a primary source. Secondary sources included the Cable News Network, NOAA, NCDC, NWS, SHELDUS, and The Weather Channel.

Research from the SHELDUS and NCDC indicates there have been 39 severe winter storm occurrences recorded for the Collin County in the past 63 years. Although severe winter storms occur infrequently, they have the potential to wreak havoc on the community when they strike. Statistically, the City of McKinney can expect a severe winter storm every three years; this equates to a 15 percent chance of a severe winter storm occurring in any given year.

[79] National Weather Service, http://www.nws.noaa.gov
[80] National Weather Service, http://www.weather.gov/

On December 5, 2013 a winter storm resulted from a strong upper level system and a cold front, which brought below freezing temperatures and significant ice and sleet accumulations up to four to six inches that lasted for several days. All of the Dallas-Fort Worth areas were impacted due to the ice accumulations, which caused significant amount of power outages and fallen and broken trees and debilitated all transportation in the area.

The City of McKinney had approximately 12,000 residents without power early Friday, December 6 2013. Oncor Electric quickly worked to restore power in the area. By Saturday, these numbers dramatically decreased as Oncor Electric worked through the night and brought in extra crews.

The Public Works Department worked to sand roadways and clear vegetative debris. Within a 4-day period, they responded to over 2,400 calls. The roadways remained dangerous due to the freezing temperatures through Monday, December 9. The dangerous conditions caused school districts to cancel all activities, McKinney ISD reopened on Tuesday, December 10 as temperatures reached above freezing and roadways were safe for travel. The preventive measures used and the recovery cost of the ice storm are estimated to be in excess of $1 million.

Another occurrence was on December 25, 2012. This winter storm was a result of a strong upper level system and cold front, which first brought hail-producing thunderstorms to the region followed by a winter weather event that included snow and sleet. The greatest concentration of heavy snow was in western Denton County and Collin County, where four to six inches of snow fell. The overall impacts from the sleet and snow were minimal, but transportation in the region was affected when the snow froze on area roads that night, especially on elevated roadways, bridges, and overpasses. According to historical records, the City of McKinney can anticipate the potential for up to three inches of snow and patches of black ice from a severe winter storm.

Extreme cold temperatures have impacted the State of Texas. According to NOAA, 1983 brought the coldest December on record to Texas, with severe citrus and vegetable crop losses in the Rio Grande Valley. The loss to the citrus and agricultural industry was $500 million. The farm workers and laborers in related industries suffered $30 million in income loss.[81] In December 1989, Collin County experienced a bitter and prolonged cold wave, which resulted in $43,000 in losses.

Table 4-15
Severe Winter Storms[82][83]
1962-2020

County	Date	Type of Severe Winter Weather	Injuries	Fatalities	Property Damage	Crop Damage
Collin County	January 9, 1962	Cold wave	0	0.01	$19,685.54	$19,685.54
Collin County	December 10, 1972	Ice storm	0	0	$196.85	$0.00
Collin County	January 8, 1973	Snow & ice storm	0	0	$1,968.50	$196,850.39
Collin County	January 9, 1974	Ice storm	0	0	$925.93	$0.00
Collin County	March 23, 1974	Ice storm	0	0	$909.09	$9,090.91

[81] State of Texas Hazard Mitigation Plan, http://www.txdps.state.tx.us/dem/documents/txhazmitplan.pdf
[82] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[83] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

County	Date	Type of Severe Winter Weather	Injuries	Fatalities	Property Damage	Crop Damage
Collin County	January 1, 1977	Ice, snow storm	0.17	0	$4,310.34	$431.03
Collin County	January 8, 1977	Ice, snow storm	0	0.04	$43,103.40	$431.03
Collin County	January 11, 1978	Freezing rain, ice storm, wind	0	0	$4,310.34	$431.03
Collin County	January 18, 1978	Ice, snow storm, wind	0	0	$4,310.34	$43.10
Collin County	January 21, 1978	Snowstorm	0	0	$44.25	$0.00
Collin County	February 7, 1978	Snow storm, ice storm	0	0.03	$43,103.45	$431.03
Collin County	February 15, 1978	Snow and ice storm	0	0	$46.73	$0.00
Collin County	February 17, 1978	Snow storm	0	0	$431.03	$0.00
Collin County	December 30, 1978	Ice storm	17.24	0	$43,103.45	$0.00
Collin County	January 5, 1979	Ice storm	0	0	$520.83	$0.00
Collin County	January 10, 1979	Snow and ice storm	0	0	$44.25	$0.00
Collin County	February 17, 1979	Ice and sleet	0	0	$5,208.33	$0.00
Collin County	January 28, 1980	Ice storm	0	0	$43.10	$0.00
Collin County	November 16, 1980	Snowstorm	0	0	$43.10	$0.00
Collin County	January 11, 1982	Cold/snow/ice storm	0	0	$16,667.00	$0.00
Collin County	December 15, 1983	Severe storm-snow	0.09	0.01	$431.03	$0.00
Collin County	December 18, 1983	Extreme cold, ice/sleet	0.86	0.04	$43,103.40	$0.00
Collin County	March 29, 1987	Freeze	0	0	$0.00	$4,347.83
Collin County	December 20, 1989	Bitter, prolonged cold	0.03	0	$43,103.45	$0.00
Collin County	February 9, 1994	Ice storm	0	0	$64,935.06	$0.00
Collin County	November 24, 1996	Winter Storm	0	0	$0.00	$0.00
Collin County	December 22, 1998	Ice Storm	0	0	$0.00	$0.00
Collin County	January 25, 2000	Winter Storm	0	1	$0.00	$0.00
Collin County	December 12, 2000	Winter Storm	0	0	$0.00	$0.00
Collin County	December 25, 2000	Winter Storm	0	0	$0.00	$0.00
Collin County	December 31, 2000	Winter Storm	0	0	$0.00	$0.00

County	Date	Type of Severe Winter Weather	Injuries	Fatalities	Property Damage	Crop Damage
Collin County	January 1, 2001	Heavy Snow	0	0	$0.00	$0.00
Collin County	November 29, 2001	Ice Storm	0	0	$0.00	$0.00
Collin County	February 5, 2002	Winter Storm	0	0	$0.00	$0.00
Collin County	March 2, 2002	Winter Storm	0	0	$0.00	$0.00
Collin County	February 24, 2003	Winter Storm	0	0	$326,086.95	$0.00
Collin County	February 14, 2004	Heavy Snow	0	0	$0.00	$0.00
Collin County	December 7, 2005	Winter Storm	0	0	$0.00	$0.00
Collin County	November 29, 2006	Winter storm	0	0	$3,636.36	$0.00
Collin County	January 13, 2007	Ice storm	0.16	0	$22,343.75	$0.00
Collin County	January 17, 2007	Winter weather	0	0	$6,562.50	$0.00
Collin County	February 1, 2007	Winter weather	0	0	$2,777.78	$0.00
Collin County	January 27, 2009	Ice storm	0	0.04	$43,346.15	$0.00
Collin County	December 24, 2009	Winter weather	0	0	$66,250.00	$0.00
Collin County	February 11, 2010	Heavy Snow	0	0	$1,000,000.00	$0.00
Collin County	March 20, 2010	Heavy Snow	0	0	$0.00	$0.00
Collin County	January 9, 2011	Heavy Snow	0	0	$150,000.00	$0.00
Collin County	February 1, 2011	Ice Storm	0	0	$150,000.00	$0.00
Collin County	February 3, 2011	Heavy Snow	0	0	$10,000.00	$0.00
Collin County	December 25, 2012	Heavy snow	0	0	$550,000.00	$0.00
Collin County	December 5, 2013	Ice Storm	0	0	$500,00.00	$0.00
Collin County	February 22, 2015	Winter Storm	0	0	$10,000.00	$0.00
Collin County	February 27, 2015	Heavy Snow	0	0	$200,000.00	$0.00
Collin County	March 5, 2015	Heavy Snow	0	0	$0.00	$0.00
Collin County	December 7, 2017	Winter Weather	0	0	$0.00	$0.00
Collin County	February 11, 2018	Winter Weather	0	0	$0.00	$0.00
Collin County	October 31, 2019	Cold/wind chill	0	0	$0.00	$0.00

Assets Exposed to Hazard

In evaluating assets that may potentially be impacted by the effects of severe winter storms, it was determined that all critical facilities as well as all public, private, and commercial properties are vulnerable.

- **Property Risk/Vulnerability.** In evaluating assets that may potentially be impacted by the effects of severe winter storms, all critical facilities as well as all public, private, and commercial properties are vulnerable to the effects of a winter storm. Roadways, sidewalks, and bridges may be damaged as well. Extreme cold may freeze water pipes, causing significant issues for a facility.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a winter storm and no way to predict where a storm will occur. People are vulnerable to winter storms through power outages, effects on transportation routes, establishment of shelters, water freezing, etc. The impact of a winter storm is larger in mild climates due to less familiarity and experience driving in and handling snow and ice, such as in the City of McKinney.
- **Environment Risk/Vulnerability.** Risks to the environment are low for a winter storm. Winter thaw can cause flooding, impacting the environment and possibly creating contamination of potable water for public consumption.

Vulnerability

Severe Winter Storms

Frequency of Occurrence	High
Warning Time	More than 12 hours
Geographic Extent	County-wide
Potential Impact	Minor

Land Use and Development Trends

The City of McKinney currently has no land use or development trends related to winter storms.

Hazard Summary

Severe winter storms, unlike other natural hazards, typically afford communities some advance warning. The NWS issues winter storm watches, warnings, and advisories as these storms make their way through the City of McKinney. Due to the frequency of winter storms in the City of McKinney, most buildings and infrastructure are typically designed to sustain severe winter conditions. However, aging facilities and particularly heavy snowfalls bring the possibility of building collapse and infrastructure damage. Additionally, winter weather always brings a possibility for dangerous driving conditions, particularly in a community such as the City of McKinney in which winter weather is not a regular occurrence. Extreme temperatures are possible throughout the planning area, with the northern portion of the state being vulnerable to intense cold temperatures during the winter months.

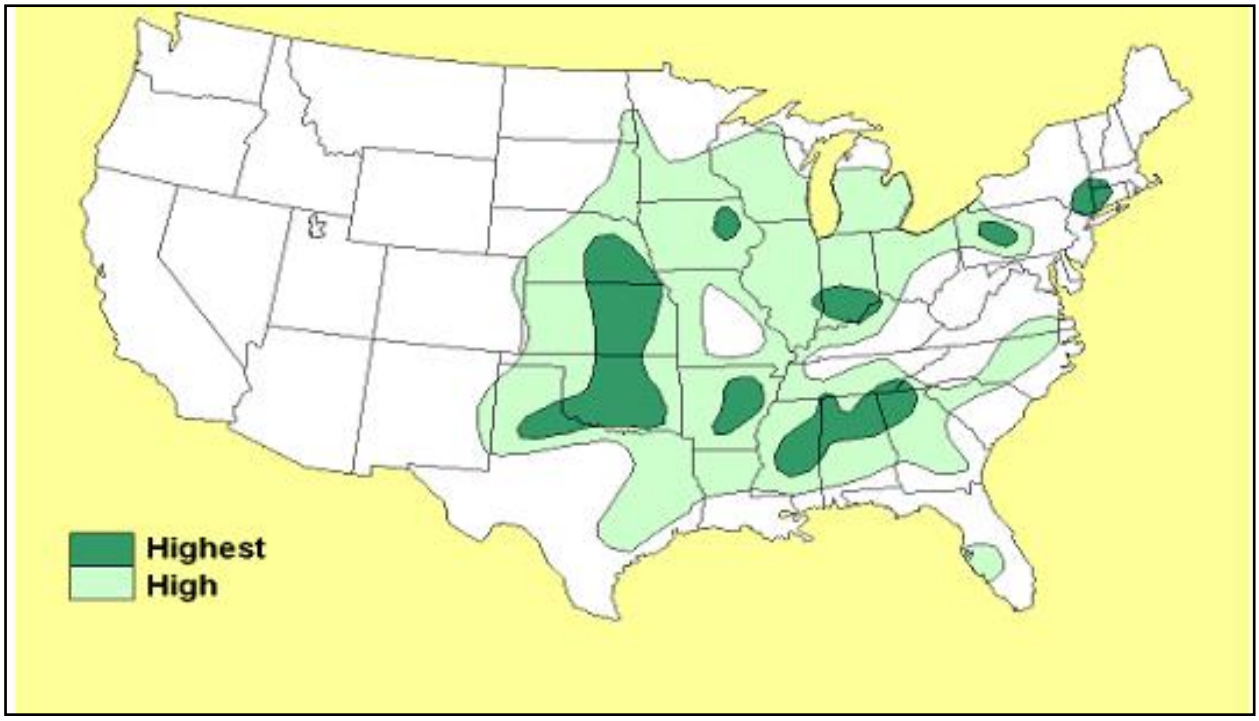
4.1.11 Tornadoes

Hazard Identification

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long. Tornado season in Texas runs ordinarily from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present.[84]

In terms of extent, the City may experience tornadoes ranging from EF0 (65-85 mph) to EF5 (200-234 mph). The levels of tornado risk nationwide are shown in figure 4-6. The Fujita Scale used to rate the severity of tornadoes and associated wind speed categories was updated in 2007 and is now the Enhanced Fujita (EF) Scale. The EF Scale is shown in table 4-16.

Figure 4-6
Tornado Risk Areas in the Conterminous United States[85]



[84] National Weather Service, http://www.nws.noaa.gov
[85] National Weather Service, http://www.nws.noaa.gov

Table 4-16
Enhanced Fujita Scale[86][87]

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼ Mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Hazard Profile

All of the City of McKinney is vulnerable to the threat of a tornado because it cannot be predicted exactly when or where a tornado might strike. Collin County has experienced 50 tornadoes, with at least four impacting the City of McKinney, within the last 72 years. In addition, countless tornado watches have been recorded during this period. Trend analysis indicates that a tornado will touch down in Collin County approximately every three years. This equates to a 30 percent chance of a tornado touching down in Collin County in any given year. Tornadoes tend to strike in somewhat random fashion, making the task of reliably calculating a recurrence interval extremely difficult. The damage potential associated with a tornado is extremely high.

In Collin County, tornadoes have been attributed to over $23 million in damage with at least 9 fatalities and over 300 injuries. The most devastating tornado touched down in the City of McKinney on May 3, 1948. It caused widespread destruction across the south and southeast section of town, killed 3 people, injured 43, left 700 homeless, and caused over $2 million worth of damage.[88] Property damage included 300 structures that were severely damaged or destroyed including the City of McKinney's Cotton Mill that was badly damaged.

On March 27, 1977, a F2 tornado touched down at the Aero Country Airport. The tornado destroyed several hangars, out-buildings, and airplanes. Debris was rolled up into twisted piles of steel which littered the entire area. Only two airplanes were salvageable after the tornado occurred.

On March 16, 1998, a small tornado moved through McKinney. The tornado reportedly damaged 35 homes as well as some cars that were damaged from flying debris.

[86] National Weather Service, http://www.nws.noaa.gov
[87] The Enhanced Fujita Scale still is a set of wind estimates (not measurements) based on damage. It uses 3-second gusts estimated at the point of damage based on a judgment of levels of damage to various indicators. These estimates vary with height and exposure. The 3-second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured "1-minute mile" speed.
[88] National Weather Service, http://www.nws.noaa.gov

On May 9, 2006, an EF-3 tornado touched down three miles northeast of the neighboring City of Anna, TX. A damage survey conducted by the NWS in Fort Worth found that a significant tornado developed approximately three miles east-northeast of Anna. A house was unroofed and another damaged just east of Collin County Road 477. Trees and power lines were also downed. A roof was damaged along FM 2862 west of Collin County Road 480. The tornado ranged from an F1 to an F2 on the Fujita Tornado Intensity Scale. The tornado then turned on a slightly more northerly track. The tornado reached its maximum intensity of F3 as it crossed FM 3133 just north of the Westminster community. Vegetation west of FM 3133 was scoured. Two homes were heavily damaged south of Collin County Road 531. A mobile home and several permanent structures suffered heavy damage or total destruction along Brangus and Black Roads, near the Collin-Grayson County line. Fatalities occurred in this location. Several other people suffered injuries and were transported to hospitals. Numerous livestock were killed. The affected parts of Collin County were declared disaster areas.

On April 10, 2008, a tornado rated on the Enhanced Fujita Scale as an EF1 with winds speeds between 90–96 miles per hour (MPH) touched down in southwest Allen and traveled northeast 7 miles to south of the City of McKinney. The City of McKinney reported numerous homes either lost part or all of their roofs or sustained roof damage due to impacts from flying debris. The McKinney National Airport sustained damage to several hangars and some aircraft. Throughout both cities, numerous power lines and poles were downed. Estimated insured losses for both cities were $10 million.

An upper level low and a cold front clashed with a very warm and very unstable air mass to produce numerous tornadoes and severe thunderstorms across much of North and Central Texas on April 3, 2012. There were a total of 17 confirmed tornadoes in the Dallas-Fort Worth Region. No lives were lost, but 30 people were injured.[89] In addition, during the late afternoon and evening of May 15, 2013, a handful of discrete supercells turned tornadic during an almost seven-hour period. One supercell turned particularly deadly and destructive southwest of the Dallas-Ft. Worth Metroplex.[90]

A significant tornado outbreak occurred on December 26, 2015, across portions of North and Central Texas. This significant tornado outbreak produced a total of 12 confirmed tornadoes. In all, 8 counties in North and Central Texas were impacted by tornadoes. 13 individuals were killed as a result of their injuries associated with tornadoes with numerous individuals injured. More than half of these individuals were killed at the Interstate 30 and Highway 190 (President George Bush Turnpike) junction in eastern Dallas County.[91]

These incidents as well as other confirmed tornadoes are listed in table 4-17.

[89] NOAA, http://www.srh.noaa.gov/fwd/?n=april32012sum
[90] NOAA, http://www.nws.noaa.gov/climate/
[91] NOAA, http://www.srh.noaa.gov/fwd/?n=dec26tor

Table 4-17
Tornadoes 1948–2020[92][93]

County	Date	Type	Magnitude	Injuries	Fatalities	Property Damage	Crop Damage
McKinney	May 3, 1948	Tornado	No Record	43	3	$2,000,000.00	$0.00
Collin	March 24, 1954	Tornado	F1[94]	4	0	$25,000.00	$0.00
Collin	May 25, 1954	Tornado	F0	0	0	$0.00	$0.00
Collin	April 2, 1957	Tornado	F3	2	0	$250,000.00	$0.00
Collin	April 27, 1958	Tornado	F2	0	0	$250,000.00	$0.00
Collin	October 4, 1959	Tornado	F3	5	0	$250,000.00	$0.00
Collin	April 22, 1963	Tornado	F2	0	0	$50,000.00	$50,000.00
Collin	April 28, 1963	Tornado	F1	0	0	$500.00	$0.00
Collin	May 19, 1963	Tornado	F0	0	0	$0.00	$0.00
Collin	March 25, 1967	Tornado	F0	0	0	$0.00	$0.00
Collin	April 22, 1968	Tornado	F1	0	0	$5,000.00	$0.00
Collin	May 13, 1968	Tornado	F2	1	0	$5,000.00	$0.00
Collin	April 27, 1969	Tornado	F2	45	0	$50,000.00	$500.00
Collin	October 12, 1969	Tornado	F3	0	0	$2,500.00	$0.00
Collin	April 18, 1970	Tornado	F1	0	0	$2,500.00	$0.00
Collin	April 18, 1970	Tornado	F1	2	0	$500.00	$0.00
Collin	September 1, 1970	Tornado	F1	0	0	$0.00	$0.00
Collin	July 19, 1971	Tornado	F1	0	0	$5,000.00	$0.00
Collin	December 14, 1971	Tornado	F0	0	0	$5,000.00	$0.00
Collin	August 10, 1972	Tornado	F0	0	0	$500.00	$0.00
Collin	November 20, 1973	Tornado	F1	3	0	$5,000.00	$0.00
Collin	June 9, 1975	Tornado	F0	0	0	$0.00	$0.00
McKinney	March 27, 1977	Tornado	F2	0	0	$50,000.00	$0.00

[92] SHELDUS, http://webra.cas.sc.edu/hvriapps/sheldus_web/sheldus_results.aspx
[93] NOAA Storm Events Database, http://www.ncdc.noaa.gov/stormevents/
[94] Fujita Tornado Damage Scale was used between 1950 – 2006, Source http://www.spc.noaa.gov/climo/online/sp3/plot.php

County	Date	Type	Magnitude	Injuries	Fatalities	Property Damage	Crop Damage
Collin	September 7, 1977	Tornado	F1	0	0	$500.00	$0.00
Collin	September 12, 1977	Tornado	F2	0	0	$5,000.00	$0.00
Collin	March 29, 1979	Tornado	F0	0	0	$0.00	$0.00
Collin	July 27, 1982	Tornado	F0	0	0	$500.00	$0.00
Collin	March 27, 1984	Tornado	F1	0	0	$2,500.00	$0.00
Collin	December 13, 1984	Tornado	F3	9.33	0	$1,666,666.67	$0.00
Collin	October 18, 1985	Tornado	F2	2	0	$50,000.00	$0.00
Collin	March 17, 1987	Tornado	F0	0	0	$0.00	$0.00
Collin	May 9, 1993	Tornado	F1	62	1	$500,000.00	$0.00
Collin	September 13, 1993	Tornado	F0	0	0	$0.00	$0.00
Collin	July 12, 1994	Tornado	F0	0	0	$50,000.00	$0.00
Collin	October 7, 1994	Tornado	F1	2	0	$50,000.00	$0.00
McKinney	March 16, 1998	Tornado	F1	0	0	$200,000.00	$0.00
Collin	September 5, 2001	Tornado	F0	0	0	$0.00	$0.00
Collin	September 5, 2001	Tornado	F1	0	0	$30,000.00	$0.00
Collin	July 1, 2003	Tornado	F0	0	0	$0.00	$0.00
Collin	March 4, 2004	Tornado	F1	2	0	$150,000.00	$0.00
Collin	May 9, 2006	Tornado	EF3	6	2	$1,000,000.00	$0.00
Collin	May 9, 2006	Tornado	EF0	0	0	$30,000.00	$0.00
Collin	March 30, 2007	Tornado	EF0	0	0	$500,000.00	$0.00
Collin / McKinney	April 10, 2008	Tornado	EF0	0	0	$12,000,000.00	$0.00
Collin	April 3, 2014	Tornado	EF0	1	0	$200,000.00	$0.00
Collin	December 26, 2015	Tornado	EF2	119	2	$1,400,000.00	$0.00
Collin	December 26, 2015	Tornado	EF1	0	0	$1,500,000.00	$0.00
Collin	December 26, 2015	Tornado	EF1	2	1	$600,000	$0.00
Collin	April 29, 2016	Tornado	EF0	0	0	$30,000.00	$0.00
Collin	October 20, 2019	Tornado	EF0	0	0	$200,000.00	$0.00

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It can be assumed that all structures and facilities within the City of McKinney could be damaged by a tornado because tornadoes are among the most unpredictable of weather phenomena and are indiscriminate as to when or where they strike.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a tornado, and no way to predict when or where a tornado will occur. People are vulnerable to the effects of tornadoes, including power outages, disruption to transportation routes, damage to shelter, flying debris, etc. There is a 50 percent chance of a tornado occurring in any given year in the City of McKinney.
- **Environment Risk/Vulnerability.** Risks to the environment can be significant. Environmental risks can include flying debris and destruction of critical infrastructure that damage and affect water supply and contaminate potable water for public consumption.

Vulnerability

Tornadoes

Frequency of Occurrence	Moderate
Warning Time	None–Minimal
Geographic Extent	Community-wide
Potential Impact	Major

Land Use and Development Trends

Continued development in the City of McKinney will result in an increase in the potential for damage from tornadoes. The City has a land use plan that clearly identifies future development. The City of McKinney enforces the Texas State Building Code, which requires structures to be designed and constructed for wind loads. Using and enforcing these codes will provide reasonable protection from most natural hazards, including tornadoes. Updating building codes and adopting these codes will reduce vulnerability and damage from tornadoes.

New technology allows for high wind-resistant windows, either by directly installing windows capable of withstanding high winds or applying a film that protects the window. This reduces property damage by reducing the number of broken windows and reduces injuries and deaths by reducing broken glass. Although the City of McKinney currently has no regulatory capabilities regarding this technology, it is advised that new developments include high wind-resistant windows.

Hazard Summary

Overall, the City of McKinney has high exposure to potential damage from tornadoes. Should a tornado hit certain portions of the City of McKinney that are highly concentrated with homes or any of the critical facilities identified, depending upon the strength and duration of the event, significant damage could occur. Due to the destructive nature of tornadoes, it is imperative that pre-disaster mitigation measures be identified.

4.1.12 Wildfire

Hazard Identification

A wildfire is defined as area-sweeping and destructive conflagration, especially in a wilderness or a rural area. Wildfires in Texas can be a wildland interface, or intermix fires. Wildfires can be a result of naturally occurring influences such as lightning, extreme drought and heat, or human influences such as a discarded cigarette butt, improperly extinguished campfire, or a stray spark from nearby railroad tracks. The potential for threat of wildfires is dependent upon topography and slope, surface fuel characteristics, recent climate conditions, current meteorological conditions, and fire behavior.

The Keetch-Byram Drought Index (KBDI) relates current weather conditions to potential or expected fire conditions. Fire behavior typically associated with these indices is provided in table 4-19. Throughout the development of this plan, the City of McKinney hovered around 300 on the Keetch-Byram Drought Index[95], correlating to slightly increased fire intensity and extended period of smoldering and smoke. The City of McKinney may experience conditions ranging from 0 KBDI (Low wildfire occurrence and intensity) to 800 KBDI (increased wildfire occurrence and intensity).

Hazard Profile

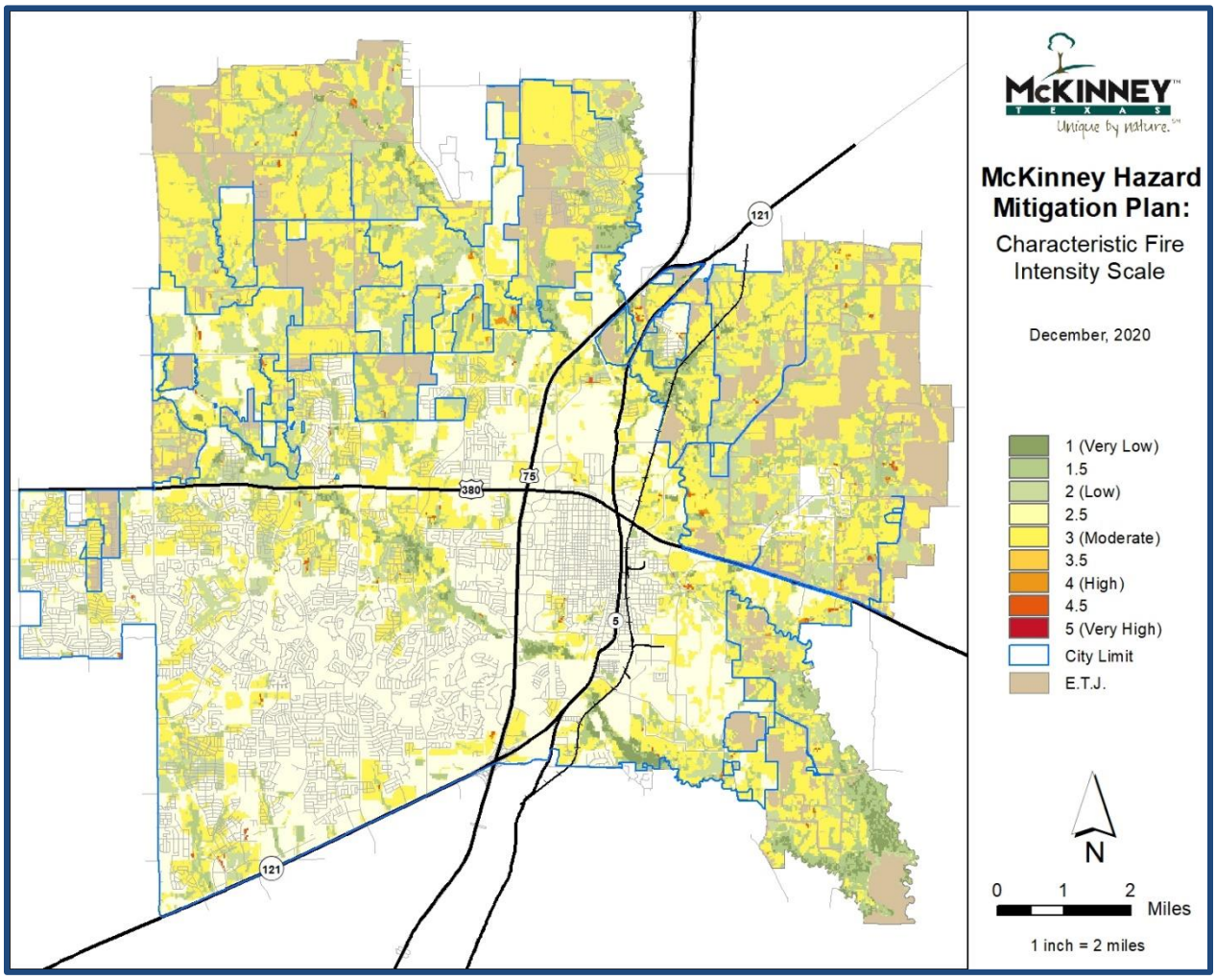
According to available records, there has been at least 4 wildfire incidents near the City of McKinney from 1996–2020 with nearly $70,000 in property and crop damage.[96] In addition, the City of McKinney has been impacted by smoke traveling to the City of McKinney from other areas of Texas. In June 2006, three miles east-southwest of the City of McKinney, a cigarette thrown from a car ignited a field, a barn, and twelve bales of hay. The property damage exceeded $18,000 and crop damage was estimated at approximately $2,400.[97] The most recent wildfire occurred on September 8, 2013, when a brushfire was set in the Extra Territorial Jurisdiction (ETJ).

The City of McKinney is located in northeast central Texas, also known as the Dallas-Fort Worth Metroplex, which has the potential for future damaging wildfires due to the combination of rapid population growth, topography, and densely covered, highly volatile, scrub cedars.[98] These conditions are most prominent in the southern part of the City of McKinney.

Table 4-18 illustrates where wildfire incidents may occur in City of McKinney using a characteristic fire intensity scale.

[95] National Weather Service, http://www.nws.noaa.gov
[96] NOAA, http://www.ncdc.noaa.gov/stormevents
[97] Source NOAA, http://www.ncdc.noaa.gov/stormevents
[98] State of Texas Hazard Mitigation Plan

Table 4-18
Characteristic Fire Intensity Scale



All unmaintained areas within the City of McKinney are susceptible to being affected by a wildfire. Unmaintained land areas of the City are more prone to wildfires than the urban areas. The smoke from the wildfires may also affect the urban areas as well as the travel on highways and roads throughout the City of McKinney.

Urban Fire Incidents

In addition, the City of McKinney has a sufficient amount of land space that can be considered a wildland urban interface. The wildland urban interface is most commonly described as a zone where human developments and improvements meet and intermix with wildland fuels. The close proximity of homes and wildland fuels is a volatile mix and, under the right conditions, can have catastrophic results. Table 4-18 illustrates the total number of urban fires recorded by the City of McKinney. McKinney's internal Fire Department data indicates that from 2013–2020 there have been an estimated 352 structure fires with no relation to vehicles or wildland with estimated damages exceeding $23 million. The most costly urban fire occurred on November 23, 1996, when McKinney Fire Department (MFD) initially responded to an automatic fire alarm with one engine.

Upon arrival, the fire was growing rapidly in the kitchen area of the Eldorado Country Club. MFD called for a full alarm. The icy road conditions slowed response times, as fire apparatus struggled to get up the steep driveway at the Eldorado Country Club. The club house was destroyed, and costs were estimated over $3 million. Once the investigation was conducted, the cause was not determined, and it was not classified as suspicious.

Table 4-18
McKinney Urban Fires 2001–2009[99]

Date	Type	Injuries	Fatalities	Asset or Structure Loss	Content Loss
November 23, 1996	Structure Fire	0	0	$3,000,000,000	UNK
April 2, 2010	Structure Fire	1	0	$313,000	$150,000
May 9, 2010	Apartment Fire	0	2	UNK[100]	UNK
January 3, 2013	Structure Fire/Assembly	0	1	$83,000.00	$75,000.00
May 19, 2008	Gas Explosion and Structure Fire	2	3	$133,000.00	UNK
2009-2013	Fires (non-vehicle nor wildland)	0	UNK	$14,237,380.00	UNK
October 7, 2013	Structure Fire	0	0	$350,764.00	$150,000.00
October 22, 2014	Structure Fire	0	1	$200,000.00	$150,000.00
April 23, 2015	Structure Fire	2	2	$40,000.00	$20,000.00
April 29, 2016	Lighting Strike	0	0	$755,842.00	$70,000.00
January 25, 2017	Structure Fire	0	1	$240,349.00	$50,000.00
August 18, 2018	Lightning Strike	0	0	$360,424.00	$180,000.00
2013 – 2020	Fires (non-vehicle / non-wildland)	49	6	$23,976,693.00	UNK

[99] City of McKinney Office of Emergency Management
[100] UNK - Unknown

Table 4-19[101]
Keetch-Byram Drought Index

Index	Potential or Expected Behavior
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
200-400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All assets throughout the City of McKinney are exposed to the threat of wildfires. Any of these assets could be lost during a wildfire. The amount of loss would vary from facility to facility.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of the City of McKinney, because there is no way to determine the impact/magnitude of a wildfire incident and no way to predict where a wildfire incident will occur.
- **Environment Risk/Vulnerability.** Risks to the environment are high for a wildfire incident, although there is a low frequency of occurrence. Environmental concerns include the risk of losing vegetation and risk of erosion in areas that are affected by wildfires.

Vulnerability

Wildfires

Frequency of Occurrence	Moderate
Warning Time	None – Minimal
Geographic Extent	Localized
Potential Impact	Major

Land Use and Development Trends

Future development throughout the City of McKinney will result in the potential for damage from wildfires. There are currently no building codes specified in the City of McKinney ordinance regarding wildfire.

[101] United States Department of Agriculture, http://www.usda.gov/wps/portal/usda/usdahome

Hazard Summary

According to available records, the City of McKinney has experienced numerous wildfire incidents. All of the City of McKinney is subject to wildfires and therefore should be included in any prospective mitigation projects. The focus should be on rural and unmaintained areas.

4.1.13 Earthquakes

Hazard Identification

Although earthquakes occur less frequently in the southwestern United States than on the west coast, historical records indicate that earthquakes and their associated seismic hazards exist in Texas. The City of McKinney HMSC reviewed historical data from the USGS in researching earthquakes in the City of McKinney and the State of Texas. By definition, an earthquake is the sudden release of stress along a fault and the resulting vibrations of the Earth. The vibrations propagate away from the epicenter.

The Modified Mercalli Intensity (MMI), depicted in table 4-20, is the method used for measuring earthquake intensity. This scale ranges from increasing levels of intensity from imperceptible shaking to catastrophic destruction. The magnitude of an earthquake is measured using the Richter Scale. Earthquake magnitudes are an absolute scale. A magnitude 8 earthquake is ten times stronger than a magnitude 7 earthquake and 100 times stronger than a magnitude 6 earthquake, etc. In terms of extent the City of McKinney may experience any level of MMI, however, the likelihood of a damaging earthquake (MMI level VI or higher) is extremely low[102].

Table 4-20
Modified Mercalli Intensity[103]

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

[102] USGS, https://www.usgs.gov/natural-hazards/earthquake-hazards/science/introduction-national-seismic-hazard-maps?qt-science_center_objects=0#qt-science_center_objects
[103] USGS, https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects

Hazard Profile

There has been nearly 30 documented occurrences of seismic activity above a magnitude of 3.0 in Northern Texas in the last 30 years. The latest seismic activity took place in Johnson County, Texas on October 1, 2019 and ranked a magnitude 3.2. Table 4-21 lists Northeast Texas earthquakes of a magnitude 3.0 and greater between 1811–2020. In addition, data collected from the USGS concludes Northern Texas has experienced 18 earthquakes from October 2008 through August 2011 ranging from 2.2 to 3.0 on the Richter Scale. Trend analysis indicates that an earthquake will affect North Texas approximately every 15 years. While there is a fault line in Collin County, there is no recorded or known historical data of activity. Therefore, it is unlikely that the City of McKinney will experience an earthquake ranging from Modified Mercalli Intensity I to V, equating to 4.8 and under on the Richter Scale.

Table 4-21
Northern Texas Earthquakes of Magnitude 3 and Greater 1811–2020[104]

Date	Magnitude	Modified Mercalli intensity	Location	County
December 16, 1811	9.0	VII	Missouri[105]	New Madrid
January, 23, 1812	7.8	VII	Missouri	New Madrid
February 7, 1812	8.0	VII	Missouri	New Madrid
October, 22, 1882	5.6	V	Oklahoma[106]	Ft. Gibson
January, 08, 1891	4.0	VI	Rusk	Cherokee
April 9, 1932	4.0	VI	Wortham-Mexia	Limestone
April 12, 1934	4.2	V	Trout Switch	Lamar
March 20, 1950	3.3	IV	Chico	Wise
April 9, 1952	5.5	V	Oklahoma	El Reno
March 19, 1957	4.7	V	Gladewater	Gregg
March 19, 1957	3.0	III	Gladewater	Gregg
March 20, 1957	3.0	III	Gladewater	Gregg
March 21, 1957	3.0	III	Gladewater	Gregg
April 24, 1964	3.7	V	Hemphill	Sabine
April 24, 1964	3.7	IV	Hemphill	Sabine

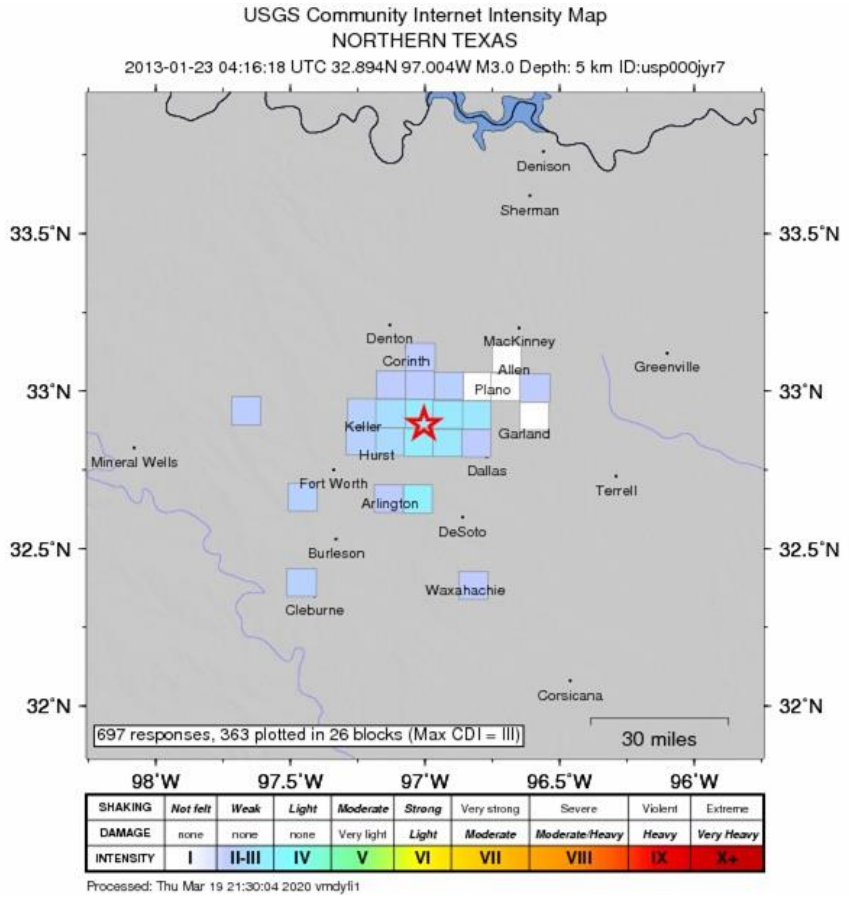
[104] USGS. http://earthquake.usgs.gov/earthquakes/map/
[105] USGS. Studies indicate the New Madrid, Missouri, earthquakes of 1811-1812 were responsible for the formation of Caddo Lake and that moderately high intensities of shock waves were experienced in Northeast Texas.
[106] USGS. The October 22, 1882 earthquake felt in North Texas was centered in Oklahoma.

Date	Magnitude	Modified Mercalli intensity	Location	County
April 24, 1964	3.2	IV	Hemphill	Sabine
April 27, 1964	3.2	IV	Hemphill	Sabine
April 28, 1964	4.4	VI	Hemphill	Sabine
April 30, 1964	3.0	III	Hemphill	Sabine
May 7, 1964	3.2	V	Hemphill	Sabine
June 2, 1964	4.2	V	Hemphill	Sabine
June 3, 1964	4.2	V	Hemphill	Sabine
June 3, 1964	3.1	III	Hamphill	Sabine
June 3, 1964	3.6	IV	Hemphill	Sabine
June 9, 1981	3.2	III	Center	Shelby
November 6, 1981	3.3	V	Jacksonville	Anderson
September 18, 1985	3.3	V	Valley View	Cooke
May 31, 1997	3.4	IV	Commerce	Hunt
October 31, 2008	3.0	IV	DFW	Tarrant
May 16, 2009	3.3	IV	DFW	Tarrant
May 16, 2009	3.0	-	DFW	Tarrant
July 17, 2011	3.0	IV	Cleburne	Johnson
January 18, 2012	3.3	IV	Cleburne	Johnson
January 15, 2012	3.3	IV	NW of Cleburne	Johnson
January 24, 2012	3.5	IV	NW of Cleburne	Johnson
September 30, 2012	3.4	IV	DFW	Tarrant
September 30, 2012	3.1	IV	DFW	Tarrant
January 22, 2013	3.0	IV	DFW	Dallas
November 29, 2013	3.1	IV	Pelican Bay	Tarrant
November 22, 2014	3.3	V	Irving	Dallas
January 6, 2015	3.5	V	Irving	Dallas

Date	Magnitude	Modified Mercalli intensity	Location	County
January 7, 2015	3.1	IV	Irving	Dallas
January 20, 2015	3.0	V	Irving	Dallas
February 27, 2015	3.1	III	Irving	Dallas
April 2, 2015	3.3	V	Irving	Dallas
May 3, 2015	3.2	IV	Irving	Dallas
May 7, 2015	4.0	V	Venus	Johnson
May 18, 2015	3.3	V	Irving	Dallas
December 17, 2015	3.0	IV	Haslet	Tarrant
August 25, 2017	3.0	V	Farmers Branch	Dallas
May 18, 2018	3.4	IV	Venus	Johnson
October 1, 2019	3.2	V	Mansfield	Johnson

DFW = Dallas-Fort Worth International Airport

Figure 4-7
Northern Texas Earthquake Intensity Map
March 19, 2020[107]



Assets Exposed to Hazard

- **Property Risk/Vulnerability:** The HMSC determined that all critical facilities as well as all public, private, and commercial properties are susceptible to being affected by an earthquake.
- **People Risk/Vulnerability:** In evaluating vulnerability of the population in the City of McKinney, it was determined that risk/vulnerability includes the entire population of the City because there is no way to determine the impact/magnitude of an earthquake and no way to predict where and when an earthquake will hit. People are vulnerable to earthquakes through power outages, effects on transportation routes, establishment of shelters, etc.
- **Environment Risk/Vulnerability:** Risks to the environment are high should an earthquake occur, but the frequency of earthquakes in the City of McKinney is low. Environmental concerns would be interruption of water supply and secondary events such as fires and hazardous materials (HAZMAT) accidents (such as gas pipelines rupturing, rupture of HAZMAT containers at facilities, etc.).

[107] United States Geological Survey (USGS), http://earthquake.usgs.gov/earthquakes/dyfi/events/us/b000et4i/us/index.html

Vulnerability

Earthquakes

Frequency of Occurrence	Very Low
Warning Time	None – Minimal
Geographic Extent	Localized
Potential Impact	Major

Land Use and Development Trends

The City of McKinney currently has no land use or development trends related to earthquakes.

Hazard Summary

Overall, the City of McKinney has the potential for damage from earthquakes. Should a earthquake hit certain portions of the City of McKinney that are highly concentrated with homes or any of the critical facilities identified, depending upon the magnitude and duration of the event, significant damage could occur.

4.1.14 Dam Failure

Hazard Identification

Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, which can affect life and property. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or terrorism cause dam failures. A dam failure could create fatalities, structural damage, and/or a cascading potential if a populated area is located below the dam structure. The hazard potential classification for a dam is intended to rank dams in terms of potential losses to downstream interests if the dam should fail for any reason. The classification is based on the incremental adverse consequences (after vs. before) of failure or mis-operation of the dam, and has no relationship to the current structural integrity, operational status, flood routing capability, or safety condition of the dam or its appurtenances. The hazard potential classification is based on potential adverse impacts/losses in four categories: environmental, lifeline, economic, and/or human life. Table 4-22 describes the classification of dams according to FEMA.

Table 4-22[108]
FEMA Dam Classifications

Hazard Potential Classification	Loss of Human Life	Economic Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Hazard Profile

There are several dams and reservoirs within Collin County that serve as flood protection structures. Most of these dams were built in the 1950s and 1960s by the Soil Conservation Service (SCS now the NRCS) for the purpose of flood control, while the secondary function is sedimentation trapping. The NRCS-assisted dams built in McKinney are located in the East Fork above Lavon watershed and protect the region's primary water source, Lake Lavon by capturing sediment upstream. Lake Lavon is maintained by the U.S. Army Corps of Engineers (USACE). Lake Lavon is located on the East Fork Trinity River in Wylie, Texas and has a total storage capacity of approximately 921,200 acre-feet. Appendix H identifies the breach inundation area for each dam of the eight dams the City of McKinney is responsible to maintain, as well as detailed maps and a list of properties located in the identified breach inundation area for each dam. Since East Fork above Lavon Site 53 is considered to be low hazard dam, Collin County has not performed a Breach Inundation Study. In addition, there is a data deficiency for the dams maintained by the Stonebridge community and privately owned dams.

According to the NRCS, 18 flood-retarding structures lie within the City of McKinney's ETJ. Figure 4-8 reveals the City of McKinney's national dam inventory and table 4-23 details pertinent

[108] FEMA, http://www.fema.gov/media-library-data/20130726-1502-20490-5785/fema-93.pdf

information on all of the dams maintained by the City of McKinney, including the surface area, flood storage, and top of dam elevation.

Figure 4-8
National Dam Inventory

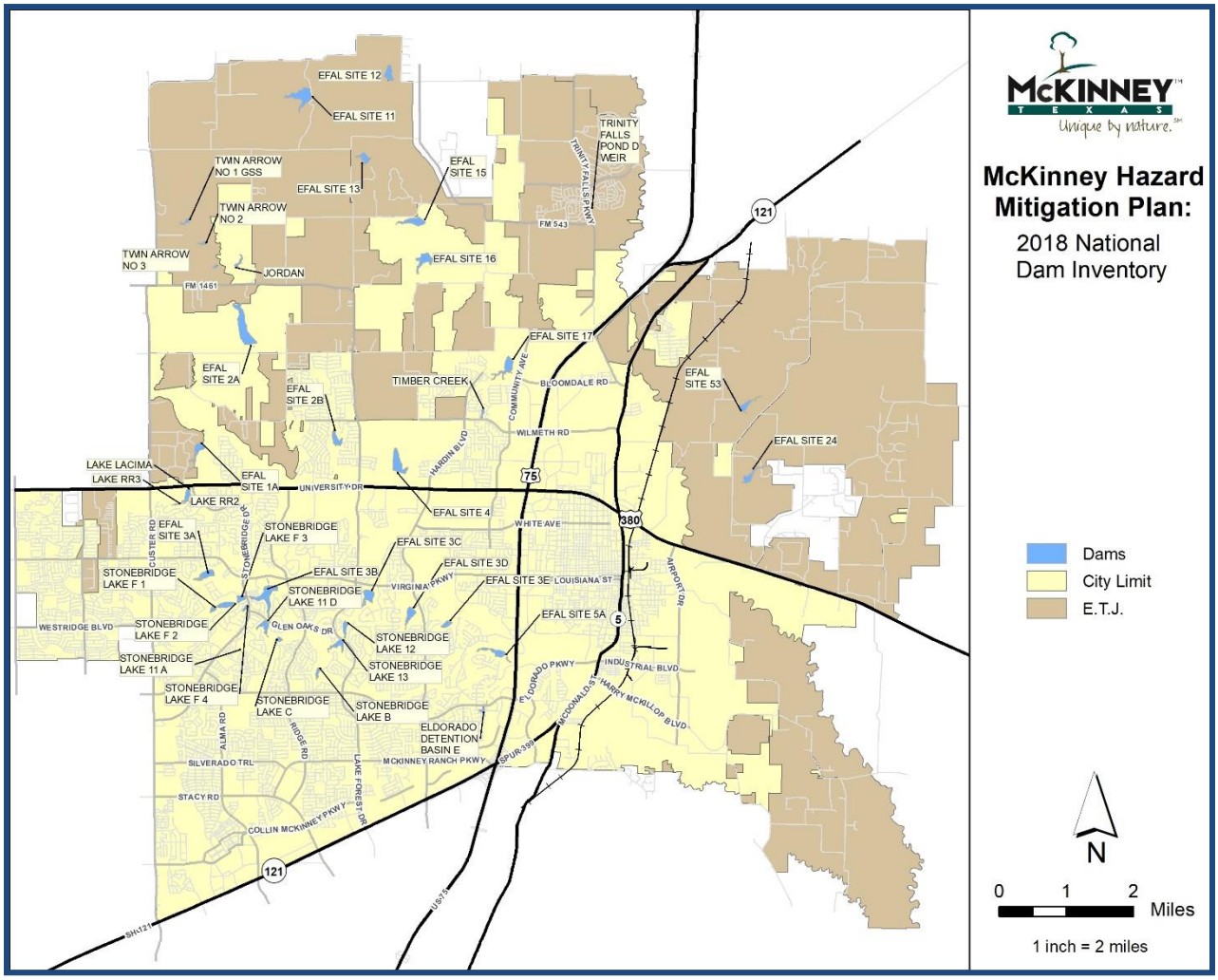


Table 4-23
City of McKinney Dams[109]

Dam Name	NIDID	Hazard Potential	Maintenance Responsibility	Primary Purpose	All Purposes	River
EAST FORK ABOVE LAVON WS SCS SITE 53 DAM	TX01120	Low	Collin County Commissioners Court	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-EAST FORK TRINITY RIVER
EAST FORK ABOVE LAVON WS SCS SITE 5A DAM	TX01108	High	McKinney	Flood Control	Flood Control, Recreation	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 3C DAM	TX01111	High	McKinney	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 2B DAM	TX01116	High	McKinney	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 1A DAM	TX01118	High	McKinney	Flood Control	Flood Control, Recreation	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 3E DAM	TX01110	High	McKinney	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 3D DAM	TX01112	High	McKinney	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	HERNDON BRANCH
EAST FORK ABOVE LAVON WS SCS SITE 17 DAM	TX01113	High	McKinney	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-HONEY CREEK
EAST FORK ABOVE LAVON WS SCS SITE 2A DAM	TX01117	High	McKinney	Flood Control	Irrigation, Flood Control, Recreation	STOVER CREEK
TIMBER CREEK DAM	TX09520	Low	Priority Development Lp	Irrigation	Irrigation, Recreation	TR-HONEY CREEK
EAST FORK ABOVE LAVON WS SCS SITE 4 DAM	TX01109	High	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	FRANKLIN BRANCH
EAST FORK ABOVE LAVON WS SCS SITE 13 DAM	TX01156	Low	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-HONEY CREEK

[109] National Inventory of Dams Database

Dam Name	NIDID	Hazard Potential	Maintenance Responsibility	Primary Purpose	All Purposes	River
EAST FORK ABOVE LAVON WS SCS SITE 16 DAM	TX01159	High	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-HONEY CREEK
EAST FORK ABOVE LAVON WS SCS SITE 12 DAM	TX01155	High	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-HONEY CREEK
EAST FORK ABOVE LAVON WS SCS SITE 24 DAM	TX01121	Low	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-EAST FORK TRINITY RIVER
EAST FORK ABOVE LAVON WS SCS SITE 15 DAM	TX01158	High	Private Owner	Flood Control	Flood Control, Recreation, Fire Protection, Stock, Or Small Fish Pond	TR-HONEY CREEK
EAST FORK ABOVE LAVON WS SCS SITE 3A DAM	TX01115	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE F 3 DAM	TX06537	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE F 2 DAM	TX06536	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE 13 DAM	TX06543	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE 11 D DAM	TX06541	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE 12 DAM	TX06542	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE 11 A DAM	TX06539	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE B DAM	TX06533	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE F 1 DAM	TX06535	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE A DAM	TX09209	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE C DAM	TX09210	High	Stonebridge Country Club	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK
EAST FORK ABOVE LAVON WS SCS SITE 3B DAM	TX01114	High	Stonebridge Ranch Community Assn. Inc	Flood Control	Irrigation, Flood Control	TR-WILSON CREEK
LAKE RR2 DAM	TX09472	Significant	Stonebridge Ranch Community Assn. Inc	Recreation	Recreation	TR-WILSON CREEK
LAKE LACIMA DAM	TX07112	High	Stonebridge Ranch Community Assn. Inc	Recreation	Recreation	TR-WILSON CREEK

Dam Name	NIDID	Hazard Potential	Maintenance Responsibility	Primary Purpose	All Purposes	River
LAKE RR3 DAM	TX09473	Significant	Stonebridge Ranch Community Assn. Inc	Recreation	Recreation	TR-WILSON CREEK
STONEBRIDGE LAKE F 4 DAM	TX06538	High	Stonebridge ranch owners association inc	Flood Control	Irrigation, Flood Control, Recreation	TR-WILSON CREEK

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** It was determined that critical facilities as well as public, private, and commercial properties are vulnerable to being affected by a dam failure if they are located in the inundation area. Currently, there are no critical facilities located in the City of McKinney's dam inundation areas. Appendix H includes a list of public, private and commercial properties located in the identified breach inundation area for each dam that would occur within the boundaries of the designated flood zones. A dam breach may potentially result in severe flooding to the private, public, and commercial properties identified within the inundation area causing inhabitable properties, excessive economic loss and extensive damage to roadways.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the majority of the population in the City of McKinney, given that there are several dams located throughout the City. People are vulnerable to the effects of dam failure through power outages, effects on transportation routes, establishment of shelters, flooding, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a dam failure occur, but the frequency of dam failures in the City of McKinney is low. Environmental concerns are interruption of water supply, water contamination, and loss of properties.

Vulnerability

Dam Failure

Frequency of Occurrence	Very Low
Warning Time	3–6 Hours
Geographic Extent	Localized
Potential Impact	Moderate

Land Use and Development Trends

When a dam is built, the surrounding area is vulnerable to a dam failure. The safety and permitting of dams is monitored by the Texas Department of Natural Resources. Whenever a dam is to be built, it must be approved by the State Dam Safety Engineer and comply with the Permit Guidelines for Dams. If a dam is considered high hazard, its owners are required by the State of Texas to develop an emergency action plan in response to possible failure. The City of McKinney has an emergency action plan in place for the dams that are high hazard, and the City is responsible for the operations and maintenance of.

The City of McKinney has collaborated with the NRCS to rehabilitate the high hazard dams located within the City's jurisdiction. The City of McKinney was the first city in Texas to take advantage of the nation's Small Watershed Rehabilitation Program. This program authorizes funding from the NRCS and technical assistance to rehabilitate small watershed dams. Through this program, McKinney has rehabilitated seven of the high hazard NRCS-assisted dams in McKinney. Rehabilitating these dams has brought the design up to current safety standards. The City's Storm water Ordinance regulates development in and around dams located in McKinney. A breach study of the dam is a requirement of development. Only limited development (parks, hike and bike trails, and parking areas) is allowed within that breach area. In addition, a developer is asked to contribute to the cost of rehabilitating aging NRCS dams if their development is in that watershed.

Hazard Summary

Based on available records, the City has not experienced any instances of dam failure. Susceptible areas surrounding the area located within the City will continue to be monitored by the HMSC for the identification of need for new mitigation actions.

Technological Hazards

Technological hazards are distinct from natural hazards primarily in that they originate from human activity. In contrast, while the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human-caused. The term "technological hazards" refers to the origins of incidents that can arise from human activities, such as the manufacturing, transportation, storage, and use of HAZMATs.

4.1.15 Terrorism

Hazard Identification

Terrorism is defined in the Code of Federal Regulations as the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.[110]

The primary objectives of most terrorist groups are to:

- Gain publicity
- Stimulate loss of confidence in the government
- Attract recruits
- Get public support
- Gain support from financial institutions
- Weaken and overthrow the government

Techniques used to gain an audience for their platform include hostage-taking, product-tampering, criminal extortion, arson, sabotage, threats against individual family members, assassinations, kidnapping, explosive bombings, and armed attacks. The most likely targets of these forms of terrorism are political leaders, key military personnel, foreign missions, military facilities, corporate executives and facilities, and celebrities. Unfortunately, the risk of terrorist acts exists in the Texas and cannot be ruled out for the City of McKinney. Terrorist attacks can take a wide variety of forms, ranging from a verbal threat to sabotage to biological weapons to bombs. The most frequently used terrorist methods include but are not limited to the following:

- **Bombs, guns, and explosives:** These are the traditional weapons used by terrorists worldwide. Typically, these weapons are less technically and resource demanding.
- **Biological weapons:** These weapons use infectious microbes or toxins to produce illness or death in people, animals, or plants. Potential biological weapons include anthrax, botulism, smallpox, viral hemorrhagic fevers, water safety threats (for example, cholera), and food safety threats (for example, salmonella). Biological weapons are relatively difficult to cultivate and disseminate.
- **Chemical weapons:** Chemical weapons cause severe health reactions designed to incapacitate or cause death. There is a wide array of potential chemical agents that could be used as weapons. These agents vary in how their effects on the body, required dose, exposure mechanism, length of exposure, toxicity, origination, and form (for example, liquid, gas). Examples of chemical agents include sarin, mustard agent, VX, and cyanide.
- **Radiological and nuclear weapons:** Although there has been much speculation by media and various governmental agencies regarding the potential for a terrorist to obtain fissionable material or a nuclear bomb, there are no known unclassified cases of any such organization or

[110] Grand Old Party (GOP) Code of Federal Regulations 28 C.F.R. Section 0.85). (2005, January 1). Retrieved October 1, 2013, from http://www.gpo.gov/fdsys/browse/collectionCfr.action?selectedYearFrom=2005&go=Go

group actually obtaining weapons grade material. Constructing a nuclear bomb would be relatively difficult and require special resources, training, and materials.

Hazard Profile

A major terrorism hazard incident has been determined to have a low likelihood of occurrence in the City of McKinney within the five-year planning cycle of this plan. Therefore, although some hazard characterization information is presented below, no further risk assessment has been performed for this hazard. Additional analyses to further characterize the risks of this hazard and the development of suitable mitigation action items will be conducted in the future based on periodic reviews of this hazard mitigation plan (HMP) and available resources.

Terrorist incidents in this country prior to the September 11, 2001 attacks included bombings of the World Trade Center in New York City, the United States Capitol Building in Washington, D.C., Mobil Oil corporate headquarters in New York City, the Murrah Federal Building in Oklahoma City, and the recent Boston Marathon terrorist attacks. In the United States, most terrorist incidents have involved small extremist groups using terrorism to further a designated objective or obtain publicity for a cause. Terrorist bombings have been the most frequent method of attack in the United States. Other possibilities include attacks against transportation facilities, utilities, or other public services or an incident involving chemical or biological materials.

Possible City of McKinney targets for terrorist organizations may include the McKinney National Airport, the City of McKinney major thoroughfares, the Dallas-Garland and Northeastern Railroad, and the Collin County Area Rural Transit bus route. Additionally, the future expansion of the Dallas Area Rapid Transit to McKinney and our physical location close to the DFW Metroplex may increase the City of McKinney to terrorist attack.

Active shooter incidents are becoming known more and more as terrorist events. Random civilian shootings in the United States occur in schools, office buildings, government functions, and even public venues. The City of McKinney experienced an active shooter incident on August 17, 2010. An individual drove a pickup towing a utility trailer containing an improvised explosive device and parked in front of the McKinney Public Safety Building (PSB). The active shooter then set the truck on fire and walked across the street to a field. Wearing a tactical vest loaded with ammunition and carrying an AR-15 type .223-caliber rifle equipped with a scope, a shotgun, and a.45-caliber semiautomatic pistol, the active shooter opened fire. After 163 rounds were fired by the active shooter and two officers fired 11 shots, the brief shootout ended with a self-inflicted shot by the active shooter.

More than 100 shots hit the PSB and 28 windows were shot. The rest of the shots hit bricks, exterior insulation finishing system areas, roof tiles, and man-made stone coverings of the building. The number of shots fired by the active shooter based on the shell casings found at his shooting positions exceeds the total number of bullet impact points on the PSB. Some rounds hit and were imbedded in the lawn in front of the PSB. [111]

Other notable active shooter events include the 1999 Columbine High School shootings, Virginia Tech shootings, the shooting in Arizona at a U.S. House of Representative Gabrielle Giffords event, and the movie theater shootings in Aurora, Colorado. These events are random, and the potential threats are difficult to profile. Therefore, everyone must be vigilant at all times.

[111] Fire Engineering, http://www.fireengineering.com/articles/print/volume-164/issue-8/features/lone-wolf-active-shooter-attack-on-texas-public-safety-building.html

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All assets within the City of McKinney are vulnerable to being affected by a terrorist incident; however, there are several pieces of infrastructure that pose a larger threat than others do. The McKinney National Airport poses a high risk of terrorism due to its proximity to the Dallas Metroplex area. The City of McKinney government facilities and schools are vulnerable to active shooter incidents.
- **People Risk/Vulnerability.** In evaluating vulnerability of the population in the City, it was determined that risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a terrorist incident and no way to predict where and when a terrorist incident will occur. People are vulnerable to terrorist events through physical injury or disease, power outages, effects on transportation routes, establishment of shelters, effect of incident on mental state of the public, confidence of public in law enforcement support, contamination of the food supply, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a terrorist incident occur but the frequency of terrorist events in the City of McKinney is low. Environmental concerns would be interruption or contamination of water or food supplies, secondary events such as fires and HAZMAT accidents (such as gas pipelines rupturing, rupture of HAZMAT containers at facilities, etc.).

Vulnerability

Terrorism

Frequency of Occurrence	Very Low
Warning Time	None–Minimal
Geographic Extent	Localized
Potential Impact	Major

Land Use and Development Trends

Future development throughout the City of McKinney will take into consideration possible terrorist incidents; particularly if new facilities are built that could be potential terrorist targets.

Hazard Summary

The incidents described above demonstrate the need to take terrorism seriously in City of McKinney. The City of McKinney officials work with state and federal officials on domestic preparedness efforts, the details of which go beyond the scope of this plan. The community should always remain vigilant to the threat of an attack, whether it is via explosives, agriculture, or a cyber-attack.

4.1.16 Hazardous Material Releases

Hazard Identification

Transportation

Hazardous Material (HAZMAT) Releases are substances or materials, which because of their chemical or biological nature, pose a potential risk to life, health, or property if they are released.[112] HAZMATs flow through the City of McKinney on a daily basis via the highway, the railroad, and the airway.

Facilities

Facilities that produce, process, or store HAZMATs are at risk, and facilities that treat or dispose of HAZMATs are also at risk. Equipment and machinery used to produce HAZMATs can be harmful to the City of McKinney if not properly maintained. Finally, the City of McKinney could be at risk if HAZMAT employees are not trained correctly on policies and procedures.

Pipeline

Several underground pipelines run east to west and north to south through the City of McKinney. The pipelines transport hydrocarbon (natural gas) at a constant flow and a liquid natural gas.

Hazard Profile

HAZMAT releases occur frequently within the City of McKinney. Transportation-related spills are typically the most prevalent. This is directly attributable U.S. Route 75 and 380 along with State Highways 5 and 121 running through portions of the City of McKinney. Another concern that the City of McKinney has regarding HAZMAT transportation is the Dallas, Garland, and Northeastern Railroad (DGNO) and its close proximity to the McKinney National Airport. The DGNO runs along the west side of the McKinney National Airport and crosses Farm-to-Market Road (FM) 546. The airport primarily serves corporate travelers but also serves as the main reliever for larger airports in the Dallas area. City emergency management officials have long been concerned about a plane accident that might impact the railway or cause a HAZMAT incident and have even exercised the scenario. Fortunately, an incident has never occurred

The City of McKinney has a history of incidents of pipelines containing HAZMAT. In 1996, a gas line break forced the evacuation of 15 businesses on the downtown square, and the El Dorado Country Club was destroyed by fire. In 1998, McKinney's industrial arena experienced an explosion at Delta Daily Foods. In 2008, three homes exploded after a natural gas pipeline burst. From June 1996 to August 2001, the City of McKinney recorded 18 toxic condition events and 3 chemical spills, for a total of 21 HAZMAT incidents.[113] Table 4-24 illustrates the City of McKinney's recorded HAZMAT incidents between 2001 and 2011.

On August 28, 2012, a contractor for Atmos Energy was boring a new six-inch high-pressure natural gas transmission line and the contractor struck an existing transmission line. The incident triggered a high-pressure gas release and subsequent explosion and gas fed fire. The fire was about 50-100 ft. in the air and resulted in surrounding area being shut down for several hours and the nearby hospital being placed on alert. The fire was allowed to burn out and the structures nearby

[112] FEMA, EPA, & DOT; Hazardous Materials Contingency Planning Course (SM 311), June 1990.
[113] McKinney Fire Department, Incident Summary Report, August 29, 2001.

were protected. Four pieces of construction equipment were a total loss. The most recent HAZMAT incident occurred on September 13, 2013 when an eight-inch gas line was punctured by work crews. MFD was on scene for six hours while crews accessed the break and made repairs. There were no reports of injuries or damages. The City of McKinney has recorded 1,290 HAZMAT incidents between 2001 and 2013. Between 2008–2013, 423 of the 1,290 incidents were natural gas or liquid petroleum gas ruptures or leaks with no reported explosions associated. Table 4-24 illustrates the most recent incidents while figure 4-9 depicts the City of McKinney's natural gas pipelines.

Figure 4-9
Gas Pipelines

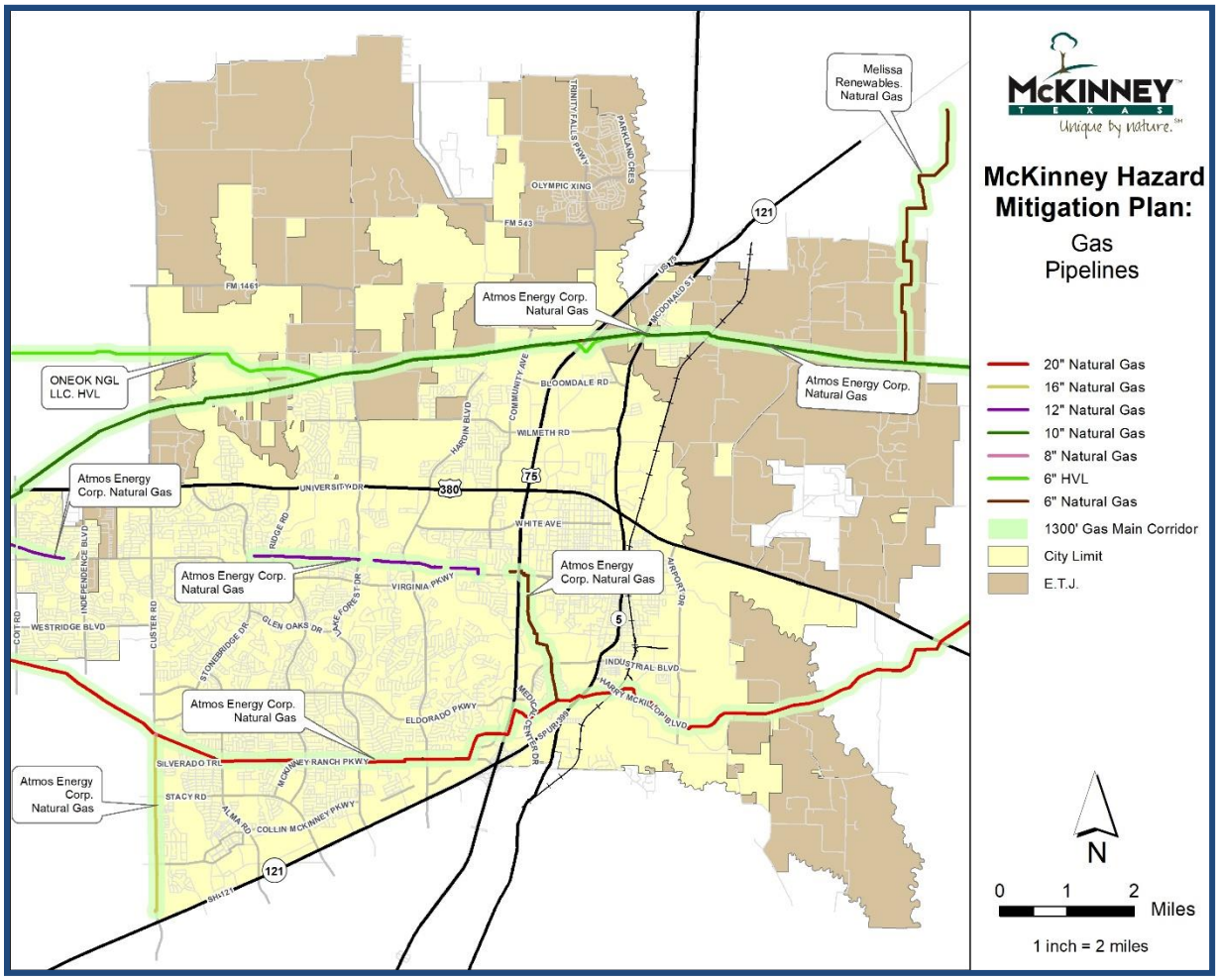


Table 4-24
HAZMAT Incidents 2012- 2013[114]

Hazard Date	Hazard Description	Death	Injuries	Content Loss
August 28, 2012	Explosion and gas line rupture	0	1	$425,000
January 7, 2013	Gas line break	0	0	UNK
September 6, 2013	8" gas line break	0	0	UNK

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** With multiple highway systems, all critical facilities can be affected by a HAZMAT incident.
- **People Risk/Vulnerability.** It was determined that risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a HAZMAT incident and no way to predict where and when a HAZMAT incident will occur. People are vulnerable to HAZMAT incidents through effects on transportation routes, establishment of shelters, etc.
- **Environment Risk/Vulnerability.** Risks to the environment are high should a HAZMAT accident occur. Environmental concerns are interruption of water supply and secondary incidents such as fires and HAZMAT accidents (such as gas pipelines rupturing, rupture of HAZMAT containers at facilities, etc.). When spills do occur, whether inside or outside facilities or along roadways, shutdowns, lost time, and expended man-hours are all factors mitigation planners must take into account.

Vulnerability

Hazard Materials Release

Frequency of Occurrence	High
Warning Time	None–Minimal
Geographic Extent	Localized
Potential Impact	Moderate

Land Use and Development Trends

The City of McKinney determines the land use and development trends of commercials districts and properties. The chemicals used in production of different resources is monitored and those companies are required to report chemicals used in their facilities to the State of Texas.

Hazard Summary

The types of HAZMAT at both fixed facilities and passing through on major transportation thoroughfares in the City of McKinney are many and varied. The presence of interstate highways

[114] City of McKinney Office of Emergency Management

and multilane highways with an unknown quantity of HAZMAT traveling through the City of McKinney on a daily basis poses a challenge in the development of adequate mitigation measures.

4.1.17 Energy/Fuel Shortage

Hazard Identification

Extreme temperatures could cause an energy/fuel shortage for the City of McKinney due to limited supplies coming into the area following an incident. This could cause fuel rations or the prioritization of fuel supply for both emergency services and residents of the City of McKinney. An energy/fuel shortage could also be due to damage to natural gas pipelines post-storm or the shutdown of the pipelines for repairs.

Hazard Profile

There have been energy/fuel shortages in the past directly in the City of McKinney. During the February 2011 winter storm, energy shortages forced rolling brown outs throughout Texas. The City of McKinney was affected by these brown outs for short periods of time. The summer heat of 2011 also brought rolling brown outs to Texas that affected parts of the state. Several disaster situations in recent years have affected the energy and fuel supply and demand over time. Hurricane Katrina affected the oil reservoirs in Louisiana in 2005 and the Deepwater Horizon oil spill in the Gulf of Mexico in the spring and summer of 2010 both caused issues with supply and demand.

The probability of energy/fuel shortage is minimal. The low probability of an incident suggests that the potential for impacts is minimal. Based on records from the past 10 years, the probability of future energy/fuel shortage occurring in the City of McKinney and the planning area is considered low.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities are considered as having the possibility of being affected by an energy or fuel shortage.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City of McKinney because there is no way to determine the impact/magnitude of a power outage incident or fuel shortage, and no way to predict where and when an incident will occur. Effects of power outages include the loss of heat, loss of ability to refrigerate food, accidents that occur due to reduced visibility in the dark, loss of ability to use medical devices that require electricity (such as respirators, etc.).
- **Environment Risk/Vulnerability.** Risks to the environment are low should a power outage occur.

Vulnerability

Energy or Fuel Shortage

Frequency of Occurrence	Very Low
Warning Time	More than 12 hours
Geographic Extent	Countywide
Potential Impact	Minor

Land Use and Development Trends

The City of McKinney requires certain facilities to store backup generators and fuel. There are requirements for placing transmission lines, transformers, and power lines to safeguard the community from long-term power outages.

Hazard Summary

Energy/fuel shortages are an uncommon occurrence in the City of McKinney. However, the potential for an energy/fuel shortage in the City of McKinney poses an interesting challenge in the development of adequate mitigation measures.

4.1.18 Aircraft Accident/Incident

Hazard Identification

The City of McKinney is located approximately 30 miles northeast of Dallas, Texas. The area has two major airports: Love Field and Dallas-Fort Worth International Airport (DFW). The City of McKinney is located in the flight pathway of both airports, making it vulnerable to the effects of aircraft accidents. The McKinney National Airport, which is owned by the City of McKinney, is within city limits.

Aircraft accident is an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death, or serious injury, or in which the aircraft receives substantial damage.[115] An aircraft incident is an occurrence other than an accident that affects or could affect the safety of operations.[116]

The McKinney National Airport is base to over 200 aircraft, services both corporate fleets and private craft consisting of jets and light aircraft. The airport serviced over 140,800 airport operations in Fiscal Year 2020 and expects steady increases in the future. McKinney National Airport serves as a base of operations for several corporations. Airport accidents and incidents are handled by the Airport Rescue Fire Fighting (ARFF) Company located within the MFD, Station 4. The City of McKinney completed the 7,002x150 foot complex in 2012.

Hazard Profile

Since 1999, 32 incidents and accidents have been documented and are listed in table 4-25. The most notable accident occurred on December 30, 2016 when two private airplanes collided in midair resulting in the deaths of both pilots and one passenger. The potential of a major aircraft accident and incident does exist due to the high volume of air traffic that goes in and out of McKinney National Airport, Dallas-Fort Worth International Airport, and Dallas Love Field.

Table 4-25
Airplane Accidents and Incidents 1999-2020

Date	Brief description	Cause	Accident/Incident
June 1999	A T6 ran off the runway upon landing and flipped over.	Pilot	Incident
October 1999	A Cessna 210 landed without the use of its landing gear.	Pilot	Incident
October 1999	A Cherokee PA 28 ran out of gas forcing it to land in a nearby field.	Pilot	Incident
November 1999	Cessna 152 missed the runway and landed in a nearby field.	Pilot	Incident
December 1999	Cessna 172 suffered a nose wheel collapse upon landing.	Mechanical	Incident
June 2000	Cherokee PA 28 experienced the collapse of the left main mount upon landing.	Mechanical	Incident

[115] National Transportation Safety Board, http://www.ntsb.gov/doclib/forms/6120_1web_nopwx.pdf
[116] U.S. Department of Transportation, Federal Aviation Administration, http://www.faa.gov/documentLibrar/

Date	Brief description	Cause	Accident/Incident
July 2000	Cherokee PA 28 ran off the runway upon landing.	Pilot	Incident
March 2005	Experimental plane's engine quit and made a forced landing ½ mile from the airport.	Mechanical	Incident
April 2005	Cessna 172 right wing tipped up by wind.	Weather	Incident
December 2005	Mooney M20E exited runway and struck sign and light.	Pilot	Incident
July 2006	C-172 pilot forgot to extend landing gear and landing on the belly of the plane.	Pilot	Incident
July 2007	C-172 pilot landed without extending landing gear.	Pilot	Accident
September 2007	C-172 student pilot first solo lost control upon landing and veering off runway.	Pilot	Accident
May 2008	Crosswind upon landing led to loss of control of the plane and tipped upside down when it stopped.	Weather	Accident
July 2008	C-172 pilot lost control of plane due to cross wind and veered from runway.	Weather	Incident
February 2009	Mooney landed with landing gear up.	Pilot	Incident
April 2009	Legend Club lost control of plane during touch and go landings.	Pilot	Accident
March 2010	The student pilot's loss of directional control while landing with a crosswind.	Pilot	Accident
December 2011	The passenger's inadvertent contact with a rotating propeller after exiting the parked airplane. Contributing to the accident were the dark night conditions and the deplaning of the passenger while the propeller was turning.	Pilot	Accident
January 2011	The pilot's loss of directional control during landing.	Pilot	Accident
January 2011	The student pilot's loss of directional control during takeoff, which resulted in a runway excursion and impact with terrain.	Pilot	Accident
March 2012	The pilot did not maintain control of the airplane during takeoff, which resulted in a ground collision with airport construction materials.	Pilot	Accident
November 2012	The student pilot's loss of directional control during landing.	Pilot	Accident
December 2012	The pilot's inadequate flare, which resulted in a hard nosewheel landing.	Pilot	Accident

Date	Brief description	Cause	Accident/Incident
January 2013	Collapse of the landing gear for reasons that could not be determined because visual examination did not reveal any mechanical malfunction or failure that would have prevented the gear from locking in the extended position and post-accident damage precluded functional testing.	Pilot	Accident
October 2015	The pilot's use of excessive brake input during the recovery from the ground loop, which resulted in a nose over.	Pilot	Accident
May 2016	Plane left the runway to the left and could not get the plane stopped before colliding with a tree line	Pilot	Accident
December 2016	On December 31 , 2016, about 1725 central standard time, a Piper PA-28R-200 airplane, N4407T, and a Luscombe 8A light sport airplane, N2889K, were destroyed when they collided in mid-air, about .5 mile east of Aero Country Airport (T31), McKinney, Texas.	Pilot	Accident
July 2017	The student pilot's improper landing flare, which resulted in bounced landing and the collapse of the nose landing gear.	Pilot	Accident
September 2017	A failure failure of the bell crank pivot bolt resulted in the left main landing gear collapse. Contributing to the accident was the lack of landing gear inspections in accordance with the airplane Manufacturer's maintenance manuals.	Mechanical	Accident
January 2018	The student pilot's improper approach and landing flare, which resulted in a porpoised landing.	Pilot	Accident
May 2019	Pilot lost control during an attempted go-around in gusting crosswind conditions.	Weather	Accident

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities have the possibility of being affected by an aircraft accident.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of the City because there is no way to determine the impact/magnitude of an aircraft accident/incident, and no way to predict where and when an aircraft accident/incident will occur. People are vulnerable to aircraft accident/incidents due to the county being near many airports.
- **Environment Risk/Vulnerability.** Risks to the environment are low should an aircraft accident occur. Environmental concerns are the impact of the aircraft on or near a natural gas line and secondary incidents such as fires and HAZMAT accidents (rupture of gas pipelines, rupture of HAZMAT containers at facilities, etc.).

Vulnerability

Aircraft Accidents

Frequency of Occurrence	High
Warning Time	None-minimal
Geographic Extent	Localized
Potential Impact	Minor

Land Use and Development Trends

The City of McKinney regulates development for the McKinney National Airport.

Hazard Summary

Aircraft accidents are an uncommon occurrence in the City of McKinney. However, the potential for an aircraft accident in the City of McKinney poses a challenge in the development of adequate mitigation measures.

4.1.18 Water Transmission Failure

Hazard Identification

Water transmission failure incidents can have an impact on safety and health as well as affect infrastructure and business. What constitutes a water transmission failure can include immediate and sudden loss of water to the City or a part of the City and the slow loss of water due to loss of water storage at the regional level. Sudden loss of water will affect the community or portions of the community immediately with little or no warning. Slow loss of water will typically allow the City to communicate with residents to help mitigate the effects of water loss prior to it becoming an emergency with major impacts.

Hazard Profile

The City of McKinney experienced a citywide transmission failure in 2005 as a result of a major transmission line failure not located in McKinney. The failure lasted multiple hours, and water service was restored the same evening. It took a few days to completely fill all storage capacity in the City.

The City of Anna, located within Collin County, experienced a water transmission failure that affected a major portion of the City in 2013, lasting multiple days. The failure was the result of a construction crew hitting the main transmission line into the City. In addition, after the initial repair was made, other failure occurred resulting in continued outages.

In addition to main line failures, the City of McKinney could also have the failure of other lines in the City. During the summer months, the North Texas Region experiences multiple water transmission failures due to ground shifting. These failures typically do not impact a whole city but can affect neighborhoods. Losing water in specific areas can be a nuisance to homeowners for a short period; however, with the loss of water, firefighting capabilities may be reduced as well.

Assets Exposed to Hazard

- **Property Risk/Vulnerability.** All critical facilities as well as all public, private, and commercial property were determined to be vulnerable to be affected by water transmission failure; however, the risk is low due to multiple water lines feeding the City of McKinney and expanded, and continued expansion, of water storage capabilities.
- **People Risk/Vulnerability.** Risk/vulnerability includes the entire population of McKinney, along with travelers and guests to McKinney or those traveling through McKinney. People are vulnerable to lack of water and require water for both consumption/hydration and basic hygiene. People living with certain medical conditions may also be adversely affected more than those without medical conditions due to needing need for water in greater frequency and/or quantity.
- **Environment Risk/Vulnerability.** The frequency of water transmission failures in McKinney is not high; however, it has occurred in McKinney and has occurred more frequently region-wide. Not having water potentially has a high risk to the environment. For example, some type of equipment and machinery requires water for cooling purposes and without water can result in catastrophic failures.

Vulnerability

Water Transmission Failure

Frequency of Occurrence	Moderate
Warning Time	None–Minimal
Geographic Extent	Community-wide
Potential Impact	Minor

Land Use and Development Trends

As more neighborhoods and areas are developed, the vulnerability increases due to the fact more residents would be affected by a water transmission failure.

Hazard Summary

Water transmission failures have occurred in McKinney in the past and occurred in other portions of our region in higher frequency. Lack of water may be an inconvenience in the beginning and initial hours of the impact; however, major impacts can occur during prolonged events and in events in which firefighting capabilities are reduced resulting in greater loss. Water transmission failures are possible throughout the planning area, with older pipelines having the greater vulnerability.

Section 5
MITIGATION STRATEGIES

The foundation of the City of McKinney Hazard Mitigation Plan (HMP) is the identification of strategies through which the City of McKinney will implement hazard mitigation goals, objectives, and actions. For each identified hazard, goals and objectives are provided as part of the mitigation strategy. Mitigation actions for all City of McKinney departments are incorporated into the City's goals, objectives, and actions.

The HMSC reviewed all mitigation actions from the previous FEMA approved HMP. The HMSC determined that the current goals and priorities continue to reflect current conditions and no changes in priorities are necessary. Table 5-1 shows mitigation actions from the previous plan that were completed or were determined to be no longer relevant actions items.

Each project cost estimation was based on agency expertise by those submitting mitigation actions as well as previous project costs. Estimated costs were those calculated to apply for grant funding. However, many projects provided have not yet undergone the official benefit-cost analysis provided by the Federal Emergency Management Agency (FEMA). In these cases, the City derived the benefit-cost per project based on a study conducted by the Multi-hazard Mitigation Council (MMC)117. The key findings of the

FEMA Requirement 44 CFR §201.6(c)(3) The plan shall include the following: 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.

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

FEMA Requirement 44 CFR §201.6(c)(3)(ii) 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. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate.

FEMA Requirement 44 CFR §201.6(c)(3)(iii) The hazard mitigation strategy shall include an action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the 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.

FEMA Requirement 44 CFR §201.6(c)(4)(ii) 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.

[117] Multi-hazard Mitigation Council. (2005, December) Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities. Retrieved August 28, 2013, from http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/MMC/hms_vol2_ch1-7.pdf

report indicated that $1.00 spent on mitigation saves society an average of $4.00, with positive benefit-cost ratios for all hazard types studied. Mitigation strategies benefit-cost were derived by each City of McKinney Department using an independent approach. However, projects that could not determine a benefit-cost were multiplied by four to represent the benefit of each mitigation strategy. HMSC ranked the mitigation strategies from highest to lowest benefit cost to the City of McKinney.

All mitigation strategies were applied to multiple hazards to increase the overall preparedness of the emergency response system. All actions are associated to the identified hazards located in Section 4 of the HMP and the City of McKinney's mitigation actions are listed in Table 5-2. The status of all mitigation actions from the previous approved plan were reviewed and revised as necessary.

The City of McKinney Hazard Mitigation Steering Committee (HMSC) determined that the strategies should be ranked according to the hazards that present the largest threat to the City. As such, the mitigation strategies were ranked in accordance with the hazard rankings in the executive summary of this plan, with the exception of the all-hazards mitigation strategies. Because the all-hazards mitigation strategies refer to those action items that will prepare the City for all emergencies or disasters, the HMSC determined they should be ranked first, with the hazard-specific mitigation strategies following. Therefore, the mitigation goals are ranked as follows:

- **Goal 1**: Reduce City of McKinney risk of and vulnerability to flood events.
- **Goal 2:** Promote and protect agriculture health in the City of McKinney.
- **Goal 3:** Ensure first responder capabilities to prepare for, respond to, and recover from all-hazard incidents.
- **Goal 4:** Regulate development in hazard areas.
- **Goal 5:** Reduce City of McKinney risk of and vulnerability to domestic and international terrorism incidents.
- **Goal 6**: Ensure that the City's critical infrastructure can withstand an all-hazard incident.
- **Goal 7**: Provide a more secure environment for Independent School District (ISD) facilities in the City of McKinney.
- **Goal 8**: Minimize loss of life and property at City of McKinney parks, recreation, and open areas during an all-hazard event.
- **Goal 9:** Protect City of McKinney historic landmarks from all-hazard events.
- **Goal 10:** Develop programs with McKinney communities on communication techniques during a gas utility failure due to an all-hazard event.
- **Goal 11:** Mitigate the effects of expansive soils and/or erosion hazards.
- **Goal 12:** Implement and maintain database to capture fire service response and recovery during all-hazard incidents.
- **Goal 13:** Increase capabilities at McKinney National Airport.
- **Goal 14:** Identify critical facilities at McKinney National Airport that would need auxiliary power in the event of a power outage.

- **Goal 15:** Minimize the burden of pertussis, influenza, and West Nile virus infection on the citizens of City of McKinney.
- **Goal 16**: Ensure the citizens of the City of McKinney are aware of how to prepare, respond, and recover from all-hazard event to minimize losses of life and property.

Table 5-1
City of McKinney Removed Mitigation Strategies

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources	Status
Goal 3: Ensure first responder capabilities to prepare for, respond to, and recover from identified hazards.								
Objective 3: Reduce the risk and impact of urban fires.								
3.3.1	W, E	Eliminate the use of Corrugated Stainless Steel Tubing (CSST) in structures.	MFD	FY 2014-2024	$100,000	$400,000	City of McKinney Funds	No longer relevant
3.3.2	W, E	Ensure lots are large enough for adequate spacing between structures.	MFD, Building Inspections	FY 2014-2019	$50,000	$200,000	City of McKinney Funds	No longer relevant
Objective 4: Ensure first responders have a safe haven during an identified hazard.								
3.4.1	T, HM, H, TR	Ensure all fire stations have re-enforced rooms for shelter in place locations for all first responders working in the field, including Police, Public Works, and Fire.	MFD	FY 2014-2024	$200,000	$80,000	City of McKinney Funds	Complete
Goal 7: Provide a more secure environment for Independent School District (ISD) facilities in the City of McKinney.								
Objective 2: Provide training to campus and building administration.								
7.2.3	T, WF, TR	Conduct lockdown, fire, and tornado drills.	Frisco ISD	Fire – Monthly Lockdown/Tornado every semester	$1,000	$4,000	Frisco ISD Funds	Complete
Objective 3: Improve communication for all hazard events.								
7.3.1	T, W, F, WF, H, L, TR, E, AA, DF, EFS, ES	Implement Emergency Lockdown Duress Activation via Radio.	Frisco ISD	2015	$60,000	$240,000	Frisco ISD Funds	Complete
Objective 4: Provide police first responders with access to locked doors.								
7.4.1	T, F, WF, HM, H, WS, L, D, TR	Issue proximity access cards to all officers.	Frisco ISD MISD	2014-2015	$1,000	$4,000	Frisco ISD Funds	Complete

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources	Status
Objective 5: Increase student, faculty, and staff awareness of preparedness for severe weather events.								
7.5.1	T, W, F, H, WS, L, WTF	Enhance current web site for student, faculty, and staff information such as shelter locations, shelter-in-place and emergency preparedness.	McKinney ISD	2015	$5,000	$50,000	McKinney ISD and City of McKinney Funds	No longer relevant
Objective 6: Improve tornado preparedness.								
7.6.1	T	Connect emergency radios at every campus to City of McKinney Police/Fire towers to ensure tornado warnings are properly communicated.	McKinney ISD, MPD, MFD, OEM	2015	$70,000	$280,000	McKinney ISD Funds	No longer relevant
7.6.2	T	Implement tornado readiness and response procedures in curriculum.	McKinney ISD, OEM	2014	$2,000	$8,000	McKinney ISD Funds	Complete
Goal 8: Minimize loss of life and property at City of McKinney parks, recreation, and open areas during an all-hazard event.								
Objective 1: Purchase and install warning and detection equipment at McKinney parks.								
8.1.1	T, H, L	Identification of applicable parks that need lightning detectors.	PARD	FY 2014	$500	$1,000	City of McKinney Funds	Complete
8.1.2	T, H, L	Installation of lightning detectors at City parks that have been identified to receive the detectors.	PARD	FY 2015	$10,000	$25,000	City of McKinney Funds	Complete
8.1.3	T, W, F, WF, HM, H, WS, L, TR, E, AA, DF	Install NOAA weather radios in all City parks with concession buildings.	PARD, OEM	FY 2014-2016	$500	$5,000	City of McKinney Funds	No longer relevant
Goal 9: Protect City of McKinney historic landmarks from identified hazards.								
Objective 2: Reduce risk of fire hazards in Historic Downtown McKinney.								
9.2.2	WF, HM, WS, L, D, TR, E, AA, EFS	Purchase and place fire hose boxes in Downtown during events resulting in limited access.	MFD	2015	$2,000	$8,000	City of McKinney Funds	Complete

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources	Status
Goal 13: Increase capabilities at McKinney National Airport.								
Objective 2: Purchase additional equipment for response and recovery operations at McKinney National Airport.								
13.2.1	AA	Provide mass fatality capability and associated equipment for responding to an aircraft accident.	MFD, OEM, McKinney National Airport	2015	$150,000	$300,000	City of McKinney Funds, FEMA, DSHS	Complete
Goal 14: Ensure McKinney National Airport can fully operate during a severe winter event.								
Objective 1: Purchase and implement Anti-icing equipment.								
14.1.1	WS	Spray Rig	McKinney National Airport	2014	$4,000	$8,000	State funds and grants	Complete
14.1.2	WS	Chemical Spray (E36)	McKinney National Airport	2014	$2,500	$100,000	State funds and grants	Complete
14.1.3	WS	Plastic Storage Container	McKinney National Airport	2014	$750	$2,250	State funds and grants	No longer relevant
Goal 16: Minimize the spread of infectious diseases on the residents of City of McKinney.								
Objective 1: Immunize the population of McKinney.								
16.1.2	ID	Monitor health status of community through surveillance and providing the data to City of McKinney.	Collin County Health Care Services	Annual	$390,000	$75,000	Tx DSHS, CCHCS budget and City of McKinney Funds	No longer relevant/ revised
Objective 3: Fix mosquito traps and spray insecticides.								
16.3.3	ID	Compile West Nile virus surveillance data and provide to City of McKinney	City of McKinney and Collin County Health Care Services	2015	$5,000	$20,000	CCHCS	No longer relevant/ revised

HAZARD KEY:				
T	TORNADO		EH	EXTREME HEAT
W	WINDSTORM		WTF	WATER TRANSMISSION FAILURE
F	FLOODING		TR	TERRORISM
WF	WILDFIRE		ID	INFECTIOUS DISEASE OUTBREAK
HM	HAZARDOUS MATERIALS RELEASE		E	EARTHQUAKES
H	HAILSTORM		AA	AIRCRAFT ACCIDENT/INCIDENT
WS	SEVERE WINTER STORM		DF	DAM AND LEVEE FAILURE
L	LIGHTNING		EFS	ENERGY/FUEL SHORTAGE
D	DROUGHT		ES	EXPANSIVE SOILS

Table 5-2
City of McKinney Mitigation Strategies

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Goal 1: Reduce City of McKinney risk of and vulnerability to flood events.							
Objective 1: Improve City of McKinney's capability to prepare for, respond to, and recover from flood events.							
1.1.1	F	Continue to rehabilitate the High Hazard Natural Resource Conservation Service Dams located within McKinney's jurisdiction.	Development Services	FY 2021-2030	$10,000,000	$12,000,000	Bond Program funds, NRCS & TSSWCB grant funds
1.1.2	F	Complete a master plan of two creeks in McKinney.	Development Services	FY 2025	$1,000,000	$2,000,000	City of McKinney Funds, Storm water Fund, Bond Program
1.1.3	F	Assess City bridges and develop a plan to address infrastructure deficiencies.	Development Services	Annual	$200,000	$600,000	City of McKinney Funds, Bond Program
1.1.4	F	Assess structures located within the City's floodplain.	Development Services	FY 2021-2029	$200,000	$500,000	City of McKinney Funds
1.1.5	F	Evaluate the City's storm water/floodplain facilities (e.g., dry and wet ponds) to address deficiencies.	Development Services, Building Inspection	FY 2021-2029	$200,000	$500,000	City of McKinney Funds
1.1.6	F	Increase staff training and personnel for the City's Healthy Creeks and Lakes Initiative Program.	Development Services	Annual	$50,000	$100,000	City of McKinney Funds, Storm water fund
1.1.7	F	Design, construct, and maintain drainage improvements to minimize the risk of loss of life and future flood damages.	Development Services	Annual	$500,000	$500,000	City of McKinney Funds, Bond program funds
Objective 2: Enforce Floodplain Ordinance by citing structures that are prohibited in the floodplain.							
1.2.1	F	Assess unpermitted structures	Code Compliance, Engineering	FY 2021-2029	$50,000	$200,000	FEMA, City of McKinney Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Goal 2: Promote and protect agriculture health in the City of McKinney.							
Objective 1: Mitigate the spread of invasive species diseases.							
2.1.1	ID	Inform, educate, and empower community members about specific health issues pertaining to invasive species incidents in agriculture.	AgriLife Extension Service for Collin County	Annual	$2,500	$25,000	City of McKinney Funds, State and Federal Sources
Objective 2: Promote the use of Best Management Practices on agriculture lands.							
2.2.1	ID	Inform, educate, and empower community members about specific health issues pertaining to invasive species incidents in agriculture.	USDA-NRCS AgriLife Extension	Annual	$10,000	$100,000	City of McKinney Funds, State and Federal Sources
2.2.2	HM	Inform, educate, and empower agriculture producers to correctly use fertilizers and pesticides around environmentally sensitive areas.	AgriLife Extension USDA-NRCS	Annual	$10,000	$40,000	City of McKinney Funds, State and Federal Sources
Goal 3: Ensure first responder capabilities to prepare for, respond to, and recover from identified hazards.							
Objective 1: Purchase equipment to better prepare the City of McKinney to recover from identified hazards.							
3.1.1	T, W, F, WF, H, WS, L, TR, E, AA, DF, ES	Conduct tree debris removal.	Public Works	Annual	$200,000	$800,000	City of McKinney Funds, Storm Water Fund
3.1.2	T, W, H, WS, L, EH, E, AA	Create covered areas for City of McKinney equipment/vehicles.	Public Works	FY 2021-2030	$150,000	$450,000	City of McKinney Funds
3.1.3	T, W, F, WF, H, WS, L, TR, E, AA, DF, ES	Acquire a large dump truck with a grapple arm for debris removal.	Public Works	FY 2021-2030	$125,000	$500,000	Storm Water Fund
3.1.4	WS	Provide additional ice control capability for public works equipment.	Public Works	FY 2021-2030	$25,000	$100,000	City of McKinney Funds, FEMA
3.1.5	T, W, F, WF, HM, H, L, TR, E, AA, DF	Provide additional outdoor warning sirens to current notification system to provide 100 percent coverage.	OEM, MFD, MPD	FY 2021-2030	$150,000	$600,000	City of McKinney Funds, FEMA
3.1.6	T, W, F, WF, H, WS, L, TR, E, AA, DF, ES	Procure mobile command equipment to respond to areas severely impacted during identified hazards.	OEM, MFD, MPD	FY 2021-2030	$750,000	$1,500,000	City of McKinney Funds, HSGP
3.1.7	T, W, F, WF, H, WS, L, D	Provide National Oceanic and Atmospheric Administration (NOAA) weather radios to identified special needs citizens (for example, elderly, rural, low income).	OEM	FY 2021-2030	$5,000	$20,000	City of McKinney Funds, FEMA

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
3.1.8	T, W, F, WF, HM, H, L, TR, E, AA, DF	Implement alert, warning, and notification options for visually impaired and hearing impaired citizens.	CMO	FY 2021-2030	$5,000	$20,000	City of McKinney Funds, FEMA
3.1.9	T, F, WS, EH, TR	Acquire additional mass care sheltering supplies (for example, cots and blankets).	OEM	FY 2021-2030	$10,000	$40,000	City of McKinney Funds, FEMA
3.1.10	TR	Provide CBRNE equipment for first responders responding to a CBRNE incident.	MFD, MPD	FY 2021-2030	$75,000	$300,000	City of McKinney Funds, Commercial Equipment Direct Assistance Program
Objective 2: Conduct HAZMAT training and exercises on an annual basis.							
3.2.1	HM, TR	Provide training to First Responders to ensure proper response to all HAZMAT incidents.	MFD	Annual	$2,000	$8,000	City of McKinney Funds
3.2.2	HM, TR, ID	Develop exercises for HAZMAT response.	MFD	Annual	$10,000	$40,000	City of McKinney Funds
Objective 3: Ensure current emergency response plans coordinate with North Texas Municipal Water District (NTMWD) emergency protocols.							
3.3.1	WTF, TR	Update OEM emergency response plans to coordinate with NTMWD emergency protocols during a water contamination incident.	OEM, NTMWD	FY 2021 - 2025	$20,000	$80,000	City of McKinney Funds, NTMWD Funding
Goal 4: Regulate development in hazard areas.							
Objective 1: Require conditional/special use permits for developments in known hazard areas.							
4.1.1	T, W, F, H, WS, L, WTF, E, DF, ES	Evaluate internal permit process, including expenditures, personnel, etc.	Building Inspections	Annual	$10,000	$40,000	City of McKinney Funds
Objective 2: Evaluate permitting process in the area affected by the event.							
4.2.1	T, W, F, WF, WS, L, E, DF	Review process for augmenting the need for building inspectors after a disaster/incident.	Building Inspection	Annual	$50,000	$200,000	City of McKinney Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
4.2.2	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA, DF, EFS, ES	Issue permits within 24 hours of an incident.	Building Inspections	As needed	$25,000	$30,000	City of McKinney Funds
4.2.3	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA, DF, EFS, ES	Review policies and procedures on suspending post-disaster reconstruction permits.	Building Inspections	Annual	$500	$5,000	City of McKinney Funds
Goal 5: Reduce City of McKinney risk of and vulnerability to domestic and international terrorism incidents.							
Objective 1: Improve first responder capability to prepare for and respond to terrorism incidents.							
5.1.1	TR	Decrease the potential impact of terrorism incidents by continuing to train first responders on terrorism response.	MPD, MFD	Annual	$100,000	$200,000	City of McKinney Funds
5.1.2	TR	Identify hardening measures for critical infrastructure.	MPD	FY 2022	$500	$5,000	City of McKinney Funds
5.1.3	TR	Implement identified hardening measures for critical infrastructure.	MPD, Development Services	FY 2025	$25,000	$100,000	City of McKinney Funds
Goal 6: Ensure that the City's critical infrastructure can withstand an all-hazard incident							
Objective 1: Assess and develop plans to improve critical infrastructure.							
6.1.1	F	Integrate into the Master Water and Sewer Plan the rehabilitation/replacement of mains that meet at least one of the following criteria: (1) is over 30 years old, (2) needs frequent repairs, (3) constructed with vitrified clay pipe.	Engineering, Public Works	FY 2021-2030	$20,000,000	$80,000,000	City of McKinney Funds
6.1.2	T, WF, H, WS, L, EH, E, ES	Assess condition of major roadways in McKinney and implement repairs.	Public Works	Annual	$100,000	$200,000	City of McKinney Funds
6.1.3	WS	Assess sidewalk and barrier free ramps for current ADA compliance.	Public Works	FY 2022	$100,000	$500,00	City of McKinney Funds
6.1.4	F, DF, H	Assess water and sewer mains for condition and materials.	Engineering	FY 2025	$50,000	$200,000	City of McKinney Funds
6.1.5	T, W, F, WF, H, WS, L, D, EH, WTF, T, ID, E, AA, DF, EFS, ES	Develop policies and procedures on suspending post-disaster reconstruction permits.	Building Inspections	FY 2022	$500	$5,000	City of McKinney Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
6.1.6	W	Identify critical facilities in wildfire hazard areas and identify protective actions.	OEM, MFD, GIS	FY 2023	$2,500	$10,000	City of McKinney Funds
Objective 2: Plan for future growth.							
6.2.1	WTF, F, D	Maintain water storage volume of 360 gallons/person for future and existing McKinney residents.	Public Works and Engineering	FY 2021-2040	$3,000,000	$3,100,000	City of McKinney Funds
Goal 7: Provide a more secure environment for Independent School District (ISD) facilities in the City of McKinney.							
Objective 1: Update security technology at schools throughout the City of McKinney.							
7.1.1	HM, WTF, TR, ID, AA, DF, EFS, ES	Install security vestibules	McKinney ISD	2025	$1,000,000	$4,000,000	McKinney ISD Bond
Objective 2: Provide training to campus and building administration.							
7.2.1	HM, WTF, TR, ID, AA, DF, EFS, ES	Train campus and building administrators to use the emergency communications systems.	Frisco ISD	2022	$1,000	$4,000	Frisco ISD Funds
7.2.2	T, W, F, WF, WS, L, DF	Implement severe weather readiness and response training.	Frisco ISD	2022	$1,000	$4,000	Frisco ISD Funds
7.2.3	T, W, F, WF, HM, H, WS, L, WTF, TR, ID, E, AA, DF, EFS	Develop campus CERT teams.	Collin College, OEM	FY 2025	$2,000	$8,000	TDEM, Collin College Funds
7.2.4	T, F, WF, HM, H, WS, L, D, TR, ID, E	Increase student training on campus for identified hazards	Collin College	Annual	$1,000	$4,000	Collin College Funds
7.2.5	T, F, WF, HM, H, WS, L, D, TR, ID, E	Maintain crisis/action plans annually.	McKinney ISD	Annual	$1,000	$4,000	McKinney ISD General Fund
7.2.6	T, F, WF, HM, H, WS, L, D, TR, ID, E	Conduct safety audit at all facilities.	McKinney ISD	Every three years	$50,000	$200,000	McKinney ISD General Fund
7.2.7	WS	Conduct a comprehensive public education campaign on winter storm preparations on campus	Collin College, OEM	FY 2025	$2,500	$25,000	Collin College Funds
7.2.8	T, WS, L	Obtain “Storm Ready Campus” designation from the National Weather Service	Collin College, OEM	FY 2025	$1,000	$4,000	Collin College Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Objective 3: Improve communication for all hazard events.							
7.3.1	T, WF, HM, WS, EH, WTF, TR, ID, E, AA, DF, EFS	Identify interoperability solutions for communication between first responders and school staff.	Frisco ISD MISD Collin College	2022	$50,000	$200,000	Frisco ISD Funds McKinney ISD Funds Collin College Funds
Goal 8: Minimize loss of life and property at City of McKinney parks, recreation, and open areas during an all-hazard event.							
Objective 1: Increase public awareness of natural hazards at City of McKinney parks, recreation, and open areas (PROS).							
8.1.1	T, W, F, WF, H, L	Implement a Know What 2 Do public awareness campaign at all City of McKinney parks, recreation, and open areas.	PARD, Comms & Marketing	FY 2022	$500	$2,500	City of McKinney Funds
Goal 9: Protect City of McKinney historic landmarks from identified hazards.							
Objective 1: Implement security and protection measures at existing historic landmarks owned by the City of McKinney.							
9.1.1	WF	Upgrade mechanical and fire protection systems while maintaining historical integrity.	Historic Preservation, MFD	FY 2021-2026	$100,000	$400,000	Grant Funds - FEMA, Texas Historic Commission, Main Street
9.1.2	ES	Brace parapets and anchor City of McKinney non-structural historic landmarks.	Historic Preservation, Public Works	FY 2021-2023	$10,000	$40,000	Grant Funds - FEMA, Texas Historic Commission, Main Street
9.1.3	TR, EFS	Improve historic structure lighting to enhance security for buildings and people.	Historic Preservation, Public Works	FY 2022	$10,000	$40,000	Grant Funds - FEMA, Texas Historic Commission, Main Street
9.1.4	T, W, F, WF, H, WS, L, TR, E, AA, DLF, ES	Integrate historic preservation trained personnel as part of the Disaster Assessment Team.	Historic Preservation, OEM	FY 2022	$2,000	$6,000	Grant Funds - FEMA, Texas Historic Commission, Main Street

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Objective 2: Reduce risk of fire hazards in Historic Downtown McKinney.							
9.2.1	WF, HM, WS, L, WTF, TR, E, AA, DF, EFS	Encourage the installation of fire sprinklers in Downtown McKinney Buildings.	MFD	FY 2021-2025	$7,000	$14,000	Partnership between City of McKinney and Owners
Goal 10: Develop programs with McKinney communities on communication techniques during a utility failure due to an identified hazard.							
Objective 1: Conduct a public education campaign on communication techniques during a utility failure.							
10.1.1	T, W, F, WF, H, WS, L, E, AA, EFS	Increase public awareness on communication techniques during utility failure.	City of McKinney Communications, Atmos Energy, CoServ, OEM, Public Works	FY 2022-2023	$2,000	$8,000	Public Utilities and City Funds
10.1.2	T, F, WF, WS, L, TR, E, AA, EFS, ES	Increase public awareness of the "call before you dig" and 811 program after an all-hazard event has occurred.	City of McKinney Communications, Atmos Energy, CoSerM, OEM, Public Works	FY 2022-2023	$2,000	$8,000	Public Utilities and City Funds
Objective 2: Develop an emergency public awareness plan to increase efficiency and effectiveness during a large-scale interruption of energy service.							
10.2.1	T, F, WF, WS, L, TR, E, AA, EFS, ES	Implement and maintain public awareness plan for energy customers.	Atmos Energy, CoServ, Communications and Marketing, Public Works	FY 2022-2024	$10,000	$40,000	Atmos Energy Corporation Funds
Goal 11: Mitigate the effects of expansive soils and/or erosion hazards.							
Objective 1: Assess expansive soil and/erosion throughout the City.							
11.1.1	ES	Assess all the major creeks in McKinney to evaluate damage from erosion and expansive soils, and develop a plan of action to correct erosive conditions.	Development Services	FY 2021-2030	$2,000,000	$4,000,000	City of McKinney Funds
11.1.2	ES	Assess all retaining walls belonging to the City of McKinney.	Development Services	FY 2021-2029	$100,000	$200,000	City of McKinney Funds
11.1.3	ES	Assess impervious surfaces and structures located within the City's Erosion Hazard Setback.	Development Services	Annual	$20,000	$50,000	City of McKinney Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Goal 12: Implement and maintain database to capture fire service response and recovery for the identified hazards.							
Objective 1: Ensure adequate staffing to capture, analyze, and implement data usage.							
12.1.1	WF, WS, L, TR, E, AA	Hire database analyst to ensure proper data is captured and accurately maintained.	MFD	FY 2021-2022	$90,000	$270,000	City of McKinney Funds
Objective 2: Use data, including reports and GIS for preplanning activities.							
12.2.1	T, W, F, WF, HM, H, WS, L, D, EH, WTF, E, AA, DF, EFS, ES	Use data in GIS and other databases for preplanning activities.	MFD, GIS	Annual	$5,000	$20,000	City of McKinney Funds
12.2.2	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AAA, DF, EFS, ES	Use GIS data to ensure all neighborhoods have proper access points for first responders.	MFD, GIS	Annual	$10,000	$40,000	City of McKinney Funds
Goal 13: Increase capabilities at McKinney National Airport.							
Objective 1: Implement and maintain the training center at McKinney National Airport for first responders.							
13.1.1	AA	Increase ARFF training capabilities to better prepare personnel assigned to Airport Fire Station.	MFD	FY 2014-2019	$1,000,000	4,000,000	City of McKinney Funds
Goal 14: Identify critical facilities at the airport that would need auxiliary power in the event of a power outage.							
Objective 1: Implement and maintain emergency power generators for critical facilities at the airport.							
14.1.1	T, W, F, H, WS, L, EH, WTF, E, EFS	Identify appropriate size and type of generators for critical facilities at the airport.	McKinney National Airport	2022	$5,000	$100,000	McKinney National Airport, FEMA, City of McKinney Funds, private donations
14.1.2	T, W, F, H, WS, L, EH, WTF, E, EFS	Purchase generators	McKinney National Airport	2023	$50,000	$200,000	McKinney National Airport, FEMA, City of McKinney Funds, private donations

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
Goal 15: Minimize the spread of infectious diseases on the residents of City of McKinney.							
Objective 1: Immunize the population of McKinney.							
15.1.1	ID	Supply and administer immunizations for the residents of McKinney.	Collin County Health Care Services	Annual	$500,000	$2,000,000	Texas Department of Health grant funding, Collin County Health Care Service (CCHCS) budget and City of McKinney Funds
Objective 2: Increase public health monitoring techniques.							
15.2.1	ID	Monitor health status of community through surveillance and providing the data to City of McKinney.	Collin County Health Care Services	Annual	$103,000	$412,000	CCHCS and City of McKinney Funds
Objective 3: Fix mosquito traps and spray insecticides.							
15.3.1	ID	Fixed mosquito traps	City of McKinney	Annual	$2,000	$8,000	City of McKinney Funds
15.3.2	ID	Insecticide sprays	City of McKinney	Annual	$1,000,000	$4,000,000	City of McKinney Funds and Collin County Funds
Goal 16: Ensure the citizens of the City of McKinney are aware of how to prepare, respond, and recover from an identified hazard incident to minimize losses of life and property.							
Objective 1: Increase citizen awareness of preparing for identified hazards.							
16.1.1	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA, DF, EFS, ES	Distribute preparedness literature at appropriate/identified community events for all hazards.	OEM, Communications and Marketing	Annual	$8,000	$32,000	City of McKinney Funds
16.1.2	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA	Educate citizens through the McKinney Newsletter about all hazards and the potential negative effects.	City of McKinney Communications and Marketing Department	Annual	$10,000	$40,000	City of McKinney Funds
16.1.3	T, W, F, WF, H, WS, L, D, EH, ID, E, AA, DF, EFS, ES	Institute a public education campaign and associated signage for walking trails.	OEM, PARD	Annual	$2,000	$8,000	City of McKinney Funds

Action	Hazard	Action/Project Description	Department or Agency Responsible	Time Line	Estimated Cost	Estimated Benefit	Funding Sources
16.1.4	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA, DF, EFS, ES	Educate homeowners during Fire Prevention Month (October).	Communications and Marketing, MFD	Annual	$2,000	$8,000	City of McKinney Funds
16.1.5	T, W, F, WF, HM, H, WS, L, D, EH, WTF, TR, ID, E, AA, DF, EFS, ES	Provide public education on Tier II hazardous material sites.	OEM, MFD, LEPC	Annual	$3,000	$12,000	City of McKinney Funds

HAZARD KEY:				
T	TORNADO		EH	EXTREME HEAT
W	WINDSTORM		WTF	WATER TRANSMISSION FAILURE
F	FLOODING		TR	TERRORISM
WF	WILDFIRE		ID	INFECTIOUS DISEASE OUTBREAK
HM	HAZARDOUS MATERIALS RELEASE		E	EARTHQUAKES
H	HAILSTORM		AA	AIRCRAFT ACCIDENT/INCIDENT
WS	SEVERE WINTER STORM		DF	DAM AND LEVEE FAILURE
L	LIGHTNING		EFS	ENERGY/FUEL SHORTAGE
D	DROUGHT		ES	EXPANSIVE SOILS

Section 6
EXECUTING THE PLAN

6.1 Plan Implementation

The City of McKinney hazard mitigation planning process was overseen by the City of McKinney Office of Emergency Management. The City of McKinney Hazard Mitigation Plan (HMP) was submitted to the Texas Division of Emergency Management and the Federal Emergency Management Agency (FEMA) for approval.

The City of McKinney plan is responsible for implementing specific mitigation actions as prescribed in the mitigation strategies. In each mitigation strategy, every proposed action is assigned to a specific department or agency in order to assign responsibility and accountability and increase the likelihood of subsequent implementation. This approach ensures accountability to the department level, while providing the Office of Emergency Management with oversight responsibilities.

FEMA Requirement 44 CFR 201.6 (c) (4) (i)
The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

In addition to the assignment of a lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. As necessary, the City of McKinney seeks outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in the mitigation strategies.

6.2 Evaluation

All members of the City of McKinney Hazard Mitigation Steering Committee (HMSC) and the Office of Emergency Management coordinator will be responsible for ensuring that the City of McKinney HMP is evaluated as required. The evaluation will include analyzing current mitigation projects, evaluating success, and reevaluating future mitigation needs and prioritization based upon changes in needs and/or capabilities of City of McKinney.

The HMSC will reconvene annually to ensure that projects are on track and to reevaluate the mitigation goals, objectives, and action steps. Additionally, the HMSC will meet as needed following any disaster that may have an impact on the City of McKinney mitigation goals or available funding opportunities. The mitigation plan shall be viewed as an evolving, dynamic document.

6.3 Plan Update

The Disaster Mitigation Act of 2000 requires that the City of McKinney HMP be updated at least once every five years. The City of McKinney Office of Emergency Management will be responsible for ensuring that this requirement is met. The City of McKinney Office of Emergency Management and the HMSC will annually review the plan for needed updates. The HMSC will be involved in this process to ensure all departments and private sector partners provide input into the planning process. The public will be invited to participate in this process through public input surveys and public meetings.

6.4 Plan Maintenance

It is the intention of the City of McKinney to formally adopt the HMP after each maintenance revision. Once all participants adopt the changes, the revised plan will be submitted to the Texas Division of Emergency Management and FEMA. The plan will be revised and maintained as required under the guidance of the HMSC and formally adopted by the City Council after each revision.

Public participation will be sought throughout the implementation, evaluation, and maintenance of the HMP. This participation will be sought in a multitude of ways, including but not limited to periodic presentations on the plan's progress to elected officials, schools, or other community groups; questionnaires or surveys; public meetings; and postings on social media and interactive websites.

6.5 Incorporation into Existing Planning Mechanisms

It will be the responsibility of the Office of Emergency Management to determine additional implementation procedures when appropriate. This includes integrating the requirements of the City of McKinney HMP into other local planning documents, processes, or mechanisms such as the following:

- Comprehensive plans
- Capital improvement plans
- Ordinances
- Subdivision regulations
- Building codes

FEMA Requirement 44 CFR Requirement 201.6(c)(5) The plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council). For multijurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Opportunities to integrate the requirements of this plan into other local planning mechanisms will continue to be identified through future meetings of the HMSC and through the five-year review process as required by FEMA.

The primary means for integrating mitigation strategies into other planning mechanisms will be through the revision, update, and implementation of plans that require specific planning and administrative tasks (for example, plan amendments, ordinance revisions, capital improvement projects, etc.).

FEMA Requirement 44 CFR Requirement 201.6(c)(4)(iii) The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

The members of the HMSC will remain charged with ensuring that the goals and strategies of new and updated planning documents are consistent with the goals and actions of the City of McKinney HMP and will not contribute to increased hazard vulnerability in City of McKinney.

During the planning process for new and updated local planning documents, such as a comprehensive plan, capital improvements plan, or emergency management plan, the City of McKinney will provide a copy of the City of McKinney HMP to the appropriate parties and recommend that all goals and strategies of new and updated planning documents are consistent with and support the goals of the City of McKinney HMP and will not contribute to increased hazards in the City.

Although it is recognized that there are many possible benefits to integrating components of this plan into other planning mechanisms, the development and maintenance of this stand-alone HMP is deemed by the HMSC to be the most effective and appropriate method to ensure implementation of local hazard mitigation actions at this time.

All organizations will incorporate the City of McKinney HMP into existing plans in an effort to mitigate the impact of future disasters. A list of the existing plans, regulations and ordinances in which mitigation activities will be integrated are listed in Table 6-1.

Table 6-1
Incorporation into Planning Mechanisms

Type of Plan	Responsible Department	Review Timeline	New or Existing	Actions to be Integrated	Approval
Comprehensive Plan	Planning	Every 5 years	Existing	Identify and implement hardening measures for critical infrastructure.	Comprehensive Plan Steering Committee
Capital Improvement Plan	Planning Department	Every 5 years	Existing	Continue to strengthen at-risk critical facilities.	City Council
Building Codes	Development Services	Every 3 years	Existing	Utilize the Hazard Mitigation Plan when assessing building codes and potential hazards.	City Council

Type of Plan	Responsible Department	Review Timeline	New or Existing	Actions to be Integrated	Approval
Historic Ordinance	Historic Preservation Office	Annual review	Existing	Implement security and protective measures to historic landmarks.	Historic Preservation Advisory Board
Subdivision Regulations	Development Services	Annual review	Existing	Engage subdivisions in public education activities about disaster preparedness and mitigation strategies.	City Council
Fire Prevention Code	Fire Department	Every 3 years	Existing	Use the Hazard Mitigation Plan as a resource when updating the code.	City Council
Storm Water Management Ordinance	Development Services	Annual review	Existing	Continue to implement long-term mitigation efforts to limit flooding and drainage issues as new development increases.	City Council
Zoning Ordinance	Development Services	Annual review	Existing	Continue to ensure proper zoning to mitigate flooding and other hazards as development in the City increases.	City Council
Community Development Block Grant	Housing & Community Development	Annual review	Existing	Address hazards in McKinney when discussing housing and economic opportunities.	Community Grants Advisory Commission
Urban Areas Security Initiative	Office of Emergency Management	Annual review	Existing	Use the Hazard Mitigation Plan to develop projects to mitigate against terrorism.	Regional Urban Area Working Group

Section 7
SUMMARY

7.1 Conclusion

Through the development of this plan, the City of McKinney has developed a thorough hazard history, an inventory of critical facilities, and an updated contact list for emergency contacts at critical facilities. This data, when used in conjunction with the updated information about hazard threats and vulnerabilities, will prove to be invaluable to the City of McKinney and its citizens.

Natural and technological hazards have been identified citywide. Possible mitigation projects that would reduce the risk to lives and property due to the identified threats have been compiled and prioritized.

The creation of the City of McKinney Hazard Mitigation Steering Committee has brought together stakeholders from the government and community organizations into one planning team. This group has been able to work together effectively and efficiently to produce this document and establish a greater awareness of our risks and our mitigation strategies.

This plan will continue to evolve as necessary to properly represent the threats and vulnerabilities affecting the City of McKinney.

Continued public participation is encouraged and will be continued through the ongoing hazard mitigation process.

7.2 References

- Publications
  - Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation How-to-Guides #1, 2, 3, 7
  - One McKinney 2040 Comprehensive Plan
- Websites
  - FEMA (www.fema.gov)
  - Texas Division of Emergency Management (www.TDEM.state.mn.us)
  - City of McKinney (www.co.sherburne.mn.us)
  - National Climatic Data Center (www.ncdc.noaa.gov)
  - National Weather Service (www.srh.noaa.gov/ffc/default.html)
- Other Sources
  - Spatial Hazard Events and Losses Database for the United States
  - Texas Department of Natural Resources

- National Weather Service
- U.S. Geological Survey

- Cover Photos
  - Chapel Snow – Laura Smetak
  - MPAC Storm – City of McKinney
  - McKinney 2674 – City of McKinney

Appendix A
ACRONYMS AND ABBREVIATIONS

ARFF	Aircraft Rescue and Fire Fighting
CCISD	Collin County Independent School District
CDC	Centers for Disease Control and Prevention
CSST	Corrugated Stainless Steel Tubing
DEM	Digital Elevation Model
DFW	Dallas-Fort Worth
DGNR	Dallas-Garland and Northeastern Railroad
EF	Enhanced Fujita
ETJ	Extra Territorial Jurisdiction
FBO	Fixed Base Operator
FEMA	Federal Emergency Management Agency
HAZMAT	Hazardous Materials
HI	Heat Index
HMP	Hazard Mitigation Plan
HMSC	Hazard Mitigation Steering Committee
ISD	Independent School District
MFD	McKinney Fire Department
MPH	Miles per Hour
MUD	Municipal Utility District
NCDC	National Climatic Data Center
NCTCOG	North Central Texas Council of Governments
NFIP	National Flood Insurance Program

NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NTMWD	North Texas Municipal Water District
NWS	National Weather Service
OEM	Office of Emergency Management
PDSI	Palmer Drought Severity Index
PROS	Parks, Recreation, and Open
PSB	Public Safety Building
REC	Regional Employment Center
RVA	Risk and Vulnerability Assessment
SARS	Severe Acute Respiratory Syndrome
SCS	Soil Conservation Service
SHELDUS	Spatial Hazard Events and Losses Database for the United States
TDEM	Texas Department of Emergency Management
TI	Texas Instruments Incorporated
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey

Appendix B
PUBLIC INPUT AND MEETING MINUTES

City of McKinney, Texas
Hazard Mitigation Plan Project
Hazard Mitigation Steering Committee Meeting #1 Minutes

October 30, 2020

Purpose

The purpose of the meeting was to introduce City of McKinney stakeholders to the hazard mitigation planning process. Due to COVID-19 in person meeting restrictions, the meeting was held virtually via zoom on October 30, 2020 from 2 – 3 pm. The meeting gave stakeholders an opportunity to discuss their involvement in the project, the phases of the project, and the time line for each phase.

Meeting Attendees

Name	Organization	E-mail	Phone
Jeremy Cuddeback	Office of Emergency Management	jcuddeba@mckinneytexas.org	972-547-2863
Karen Adkins	Office of Emergency Management	kadkins@mckinneytexas.org	972-547-2868
Rick Herzberger	Building Inspections	rherzber@mckinneytexas.org	972-547-7453
Ryan Mullins	Parks & Recreation	rmullins@mckinneytexas.org	972-547-7482
Jeff Harris	Building Inspections	jharris@mckinneytexas.org	972-547-7452
Gary West	Water Distribution	gwest@mckinneytexas.org	972-547-2186
Randy Roland	Police Department	rroland@mckinneytexas.org	972-547-2713
Haripriya Madabushi	Information Technology	hmadabushi@mckinneytexas.org	972-547-7429
Sid Hudson	Information Technology	shudson@mckinneytexas.org	972-547-7604
Stephen Bonner	Drainage	sbonner@mckinneytexas.org	
Lisa Littrell	Purchasing	llittrell@mckinneytexas.org	972-547-7583
Rosanne Lemus	Purchasing	rlemus@mckinneytexas.org	972-547-7582

Name	Organization	E-mail	Phone
Camille Smith	Housing & Community Services	Csmith2@mckinneytexas.org	972-547-7517
Michael Hebert	Engineering	mhebert@mckinneytexas.org	972-547-7424
Nick Ataie	Engineering	nataie@mckinneytexas.org	972-547-7637
Denise Lessard	Communications & Marketing	Dlessard@mckinneytexas.org	972-547-7556
Trevor Minyard	City Manager Office	tminyard@mckinneytexas.org	972-547-7616
Craig Sherwood	Water Distribution	csherwood@mckinneytexas.org	
Julia Hunt	Public Works	jhunt@mckinneytexas.org	
Frances La Rue	Communications & Marketing	flarue@mckinneytexas.org	972-547-7525
Gary Graham	Engineering	ggraham@mckinneytexas.org	972-547-7383
Paul Sparkman	Public Works	psparkman@mckinneytexas.org	972-547-7351
Daniel Still	Engineering	dstill@mckinneytexas.org	972-547-7631
Mike Smith	Fire Department	Msmith5@mckinneytexas.org	972-547-2855

Overview of Meeting

- Jeremy Cuddeback welcomed the Hazard Mitigation Steering Committee (HMSC) and invited the Committee to identify others to join the team, as needed.
- Discussed the make up of the Steering Committee
- Jeremy presented a PowerPoint with the following Agenda:
    - Planning process
    - What is Mitigation?
    - Mitigation planning
    - Mitigation assistance
    - Mitigation Strategies
    - Next Steps
- Planning Process Overview
    - HMSC will update and provide input into the HMP update

    - Surveys will be utilized as well as a feedback process
    - Grant funding – an approved plan allows the City of McKinney to apply for federal Hazard Mitigation funding
    - Submit updated plan to TDEM Mitigation for initial approval
    - Submit to FEMA for final approval
- Schedule
    - October 2020 - Hazard Mitigation Kick-off
    - February 2021 – Submit to TDEM and then FEMA
    - April/May 2021 – Receive preliminary approval from FEMA pending City Council adoption
    - June 2021 – HMP adoption by City Council
    - July 2021 – City of McKinney receives final approval from FEMA
    - 2021-2023: Annual updates
    - 2024: Kick-off 5-year HMP review, update, and approval
    - 2025: HMP approval and adoption
- Hazard Mitigation Goals
    - Maximize the use of all resources by promoting intergovernmental coordination and partnerships in the public and private sectors.
    - Harden our communities against the effects of disasters through the development of new mitigation strategies and strict enforcement of current regulations that have proved effective.
    - Reduce and, where possible, eliminate repetitive damage, loss of life, and property from disasters.
    - Bring greater awareness throughout the community about potential hazards and the need for community preparedness.
    - Continue city training for City of McKinney departments.
- What is Hazard Mitigation?
    - All efforts to help prevent or lessen the impact of disasters
- Mitigation Examples
    - Building codes
    - CIP
    - Education and outreach
    - Hardening of structures
    - Home elevation
    - Land use planning and zoning
    - Open space preservation
    - Planning
- Mitigation is an Investment
    - Prevents injury and loss of life
    - Prevents damage to the community assets

    - Reduces cost of disaster response/recovery
    - Benefit-Cost Ratio
        - For every dollar spent, it saves about $6 post-disaster
- Disaster Resilience
    - *"Instead of repeated damage and continual demands for federal disaster assistance, resilient communities proactively protect themselves against hazards, build self-sufficiency, and become more sustainable."*
    - Aligns with HPO.
- Hazard Mitigation Planning
    - Assess vulnerabilities and risks
    - Identify policies and actions to reduce risk
- Hazard Mitigation Assistance
    - HMGP
    - FMA
    - BRIC
    - HMGP Post Fire Grant
- Communities Plan
    - Strengthen community disaster resilience
- Mitigation Strategies
    - Review of Goal 1: Reduce COM risk of and vulnerability to flood events as an example
- Review of deliverables and target completion dates
- Next Steps
    - Review plan and related documents
    - Develop outreach strategy
    - Conduct surveys to gather feedback from stakeholders
    - Conduct and document meetings for HMP
    - Implement changes and additions to HMP
- ACTION ITEMS
    1. Develop meeting minutes for HMP Kick-off Meeting
    2. Create Microsoft TEAMS collaboration site for Steering Committee
    3. Develop outreach strategy
    4. Develop and distribute Data Collection Surveys
    5. Review current plans and documents

City of McKinney, Texas
Hazard Mitigation Plan Project
Public Input Survey

November 19 – December 10, 2020

Purpose

The purpose of the public input survey was to gather public input and comments to incorporate into the plan. The survey was an online survey that was available from November 19, 2020 through December 10, 2020.

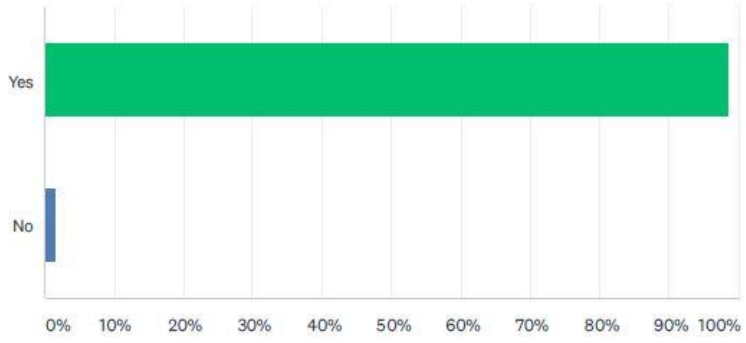
A total of 73 participants responded to the survey. 72 respondents live or work within the City of McKinney with one (1) participant choosing not to respond. Survey results were distributed to all HMSC members and made available on the shared Teams site. Additionally, physical copies of the results was made available at the final HMSC planning meeting to help refresh and inform HMSC members.

Results

McKinney Mitigation Survey

Q1 Do you work or live within the City of McKinney?

Answered: 73 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	98.63%	72
No	1.37%	1
TOTAL		73

Q2 Please provide your zip code

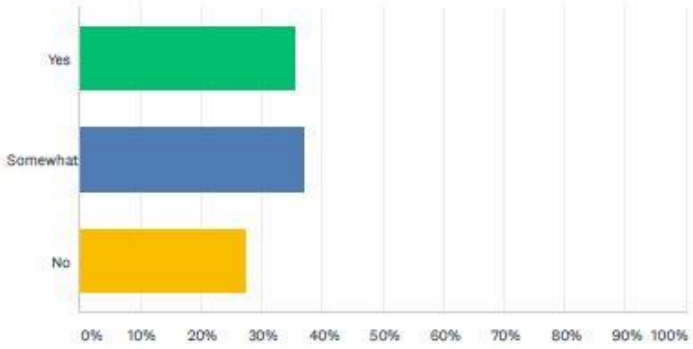
Answered: 65 Skipped: 9

#	RESPONSES	DATE
1	75072	12/11/2020 9:57 AM
2	75071	12/11/2020 7:57 AM
3	75070	12/10/2020 8:44 PM
4	75072	12/10/2020 6:48 PM
5	75072	12/10/2020 5:48 PM
6	75070	12/10/2020 4:43 PM
7	75070	12/10/2020 4:21 PM
8	75069	12/10/2020 3:15 PM
9	75702	12/10/2020 2:57 PM
10	75069	12/10/2020 2:46 PM
11	75071	12/10/2020 2:45 PM
12	75071	12/10/2020 2:29 PM
13	75070	12/10/2020 2:27 PM
14	75072	12/10/2020 2:18 PM
15	75070	12/10/2020 2:17 PM
16	75071	12/10/2020 2:08 PM
17	75070	12/10/2020 2:01 PM
18	75071	12/10/2020 1:56 PM
19	75070	12/10/2020 1:53 PM
20	75071	12/8/2020 4:19 PM
21	75071	12/7/2020 11:54 AM
22	75071	12/4/2020 5:19 PM
23	75071	12/4/2020 6:48 AM
24	75071	12/3/2020 7:49 PM
25	75070	12/3/2020 6:45 PM
26	75071	12/3/2020 5:50 PM
27	75071	12/2/2020 10:05 PM
28	75069	12/1/2020 5:11 PM
29	75069	12/1/2020 12:37 PM
30	75071	12/1/2020 8:18 AM
31	75071	11/30/2020 11:45 PM
32	75070	11/30/2020 11:06 PM
33	75072	11/30/2020 10:08 PM
34	75070	11/30/2020 9:23 PM
35	75071	11/30/2020 9:22 PM
36	75071	11/30/2020 8:51 PM
37	75071	11/30/2020 8:43 PM

38	75071	11/30/2020 7:47 PM
39	75071	11/30/2020 6:43 PM
40	75072	11/30/2020 6:33 PM
41	75071	11/30/2020 6:24 PM
42	75701	11/30/2020 5:46 PM
43	75072	11/30/2020 5:33 PM
44	75072	11/30/2020 4:26 PM
45	75072	11/30/2020 3:46 PM
46	75069	11/30/2020 10:06 AM
47	75071	11/28/2020 5:48 AM
48	75072	11/26/2020 10:59 AM
49	75072	11/25/2020 5:59 PM
50	75072	11/25/2020 1:11 PM
51	75070	11/24/2020 9:20 PM
52	75071-5966	11/24/2020 10:56 AM
53	75072	11/20/2020 7:58 PM
54	75071	11/19/2020 9:17 PM
55	75072	11/19/2020 7:53 PM
56	75072	11/19/2020 3:57 PM
57	75072	11/19/2020 3:46 PM
58	75071	11/19/2020 3:40 PM
59	75071	11/19/2020 2:47 PM
60	75071	11/19/2020 12:58 PM
61	75070	11/19/2020 12:56 PM
62	75072	11/19/2020 12:23 PM
63	75070	11/19/2020 12:17 PM
64	75071	11/19/2020 12:15 PM
65	75072	11/19/2020 11:58 AM

Q3 When you moved into your home, did you consider the impact a natural or non-natural disaster could have on your residence?

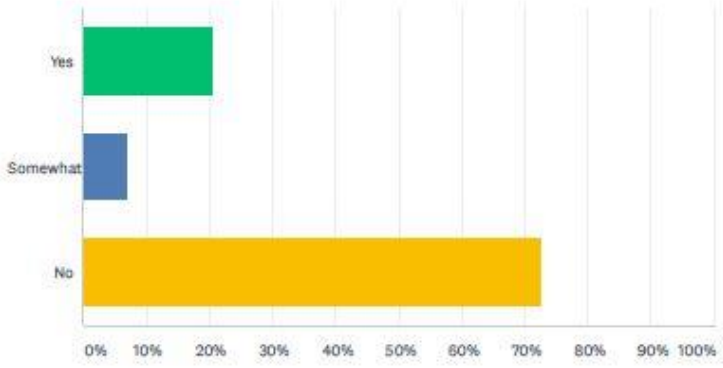
Answered: 73 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	35.62%	26
Somewhat	36.99%	27
No	27.40%	20
TOTAL		73

Q4 Was the presence of a natural hazard risk zone (e.g., dam failure zone, flood zone, high fire risk area) disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your residence?

Answered: 73 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	20.55%	15
Somewhat	6.85%	5
No	72.60%	53
TOTAL		73

Q5 If your residence has experienced damage from a hazard event, please describe type of damage.

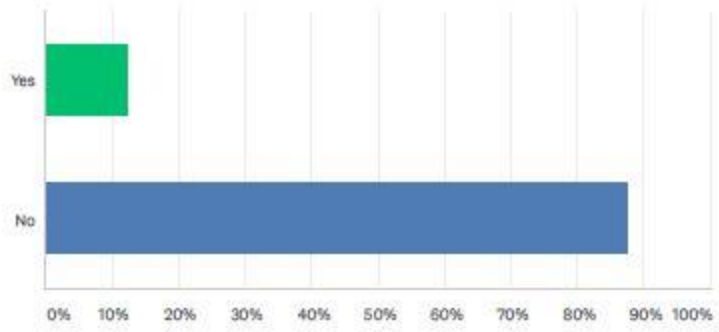
Answered: 49 Skipped: 25

#	RESPONSES	DATE
1	none	12/11/2020 7:57 AM
2	None	12/10/2020 6:48 PM
3	Hail	12/10/2020 4:43 PM
4	na	12/10/2020 4:21 PM
5	None	12/10/2020 3:15 PM
6	Hail	12/10/2020 2:57 PM
7	Na	12/10/2020 2:46 PM
8	None yet	12/10/2020 2:45 PM
9	Hail on windows and cars	12/10/2020 2:27 PM
10	no	12/10/2020 2:18 PM
11	none	12/10/2020 2:17 PM
12	none	12/10/2020 2:08 PM
13	hail damage	12/10/2020 1:56 PM
14	It has been damaged	12/8/2020 4:19 PM
15	Hail storm	12/7/2020 11:54 AM
16	Hail damage	12/3/2020 7:49 PM
17	None	12/3/2020 5:50 PM
18	Roof damage from hail storm	12/2/2020 10:05 PM
19	Wind ,water	12/1/2020 5:11 PM
20	Hail damage in 2017 resulting in the replacement of roof and gutters	12/1/2020 8:18 AM
21	None	11/30/2020 11:45 PM
22	Hail	11/30/2020 11:06 PM
23	Hail damage	11/30/2020 10:08 PM
24	Hail damage	11/30/2020 9:23 PM
25	Hail damage	11/30/2020 9:22 PM
26	None	11/30/2020 8:51 PM
27	hail storm roof damage	11/30/2020 7:47 PM
28	Hail	11/30/2020 6:43 PM
29	Hail	11/30/2020 6:33 PM
30	Hail damage to roof	11/30/2020 6:24 PM
31	Some flooding in yard due to closeness to flood plane and improperly installed drains.	11/30/2020 5:46 PM
32	Na	11/30/2020 3:46 PM
33	Roof damage from high winds during a storm. Fallen fence from high winds.	11/30/2020 10:06 AM
34	Hail & wind only	11/28/2020 5:48 AM
35	no	11/26/2020 10:59 AM
36	Toilet backed up led into flooding and destroy two bedrooms, garage, half bath and laundry	11/26/2020 6:19 AM
37	.	11/25/2020 5:59 PM

38	2 Hailstorms: significant roof damange during both storms, totaling of 1 car, damage to fence twice, damage to a back yard shed, damage to windows, window screens and garage doors	11/25/2020 1:11 PM
39	None	11/24/2020 10:56 AM
40	Hail damage	11/20/2020 7:58 PM
41	Hail	11/19/2020 9:17 PM
42	We lost shingles and needed a roof replacement during the tornados of a couple of years ago. Also, lost branches on our trees and a few bushes.	11/19/2020 7:53 PM
43	hail	11/19/2020 3:57 PM
44	Non	11/19/2020 3:40 PM
45	N/A	11/19/2020 2:47 PM
46	wind and hail damage	11/19/2020 12:58 PM
47	Hail and wind	11/19/2020 12:17 PM
48	Roof damage from hail	11/19/2020 12:15 PM
49	Hail damage	11/19/2020 11:58 AM

Q6 Is your residence located in or near a FEMA designated floodplain? If you do not know, please go to the following link at: HTTP://msc.fema.gov/portal/home

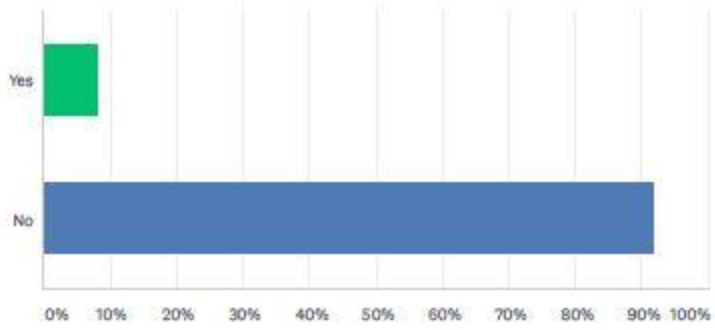
Answered: 73 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	12.33%	9
No	87.67%	64
TOTAL		73

Q7 Do you have flood insurance?

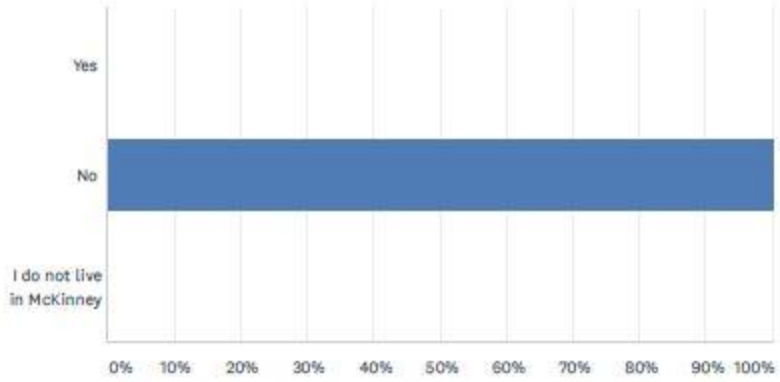
Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	8.11%	6
No	91.89%	68
TOTAL		74

Q8 Have you ever had problems securing homeowners or renters insurance on your residence in McKinney due to risks from hazards?

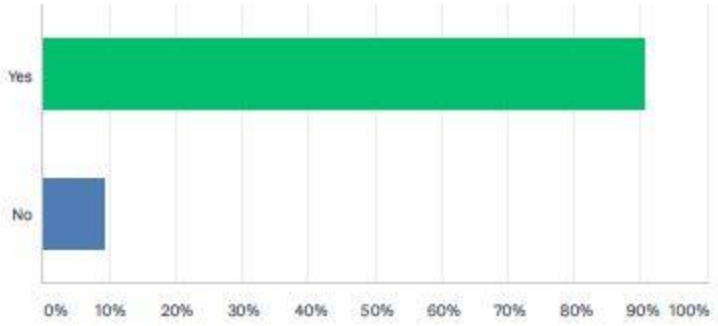
Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	0.00%	0
No	100.00%	74
I do not live in McKinney	0.00%	0
TOTAL		74

Q9 Do you support policies to limit development in designated hazard zones?

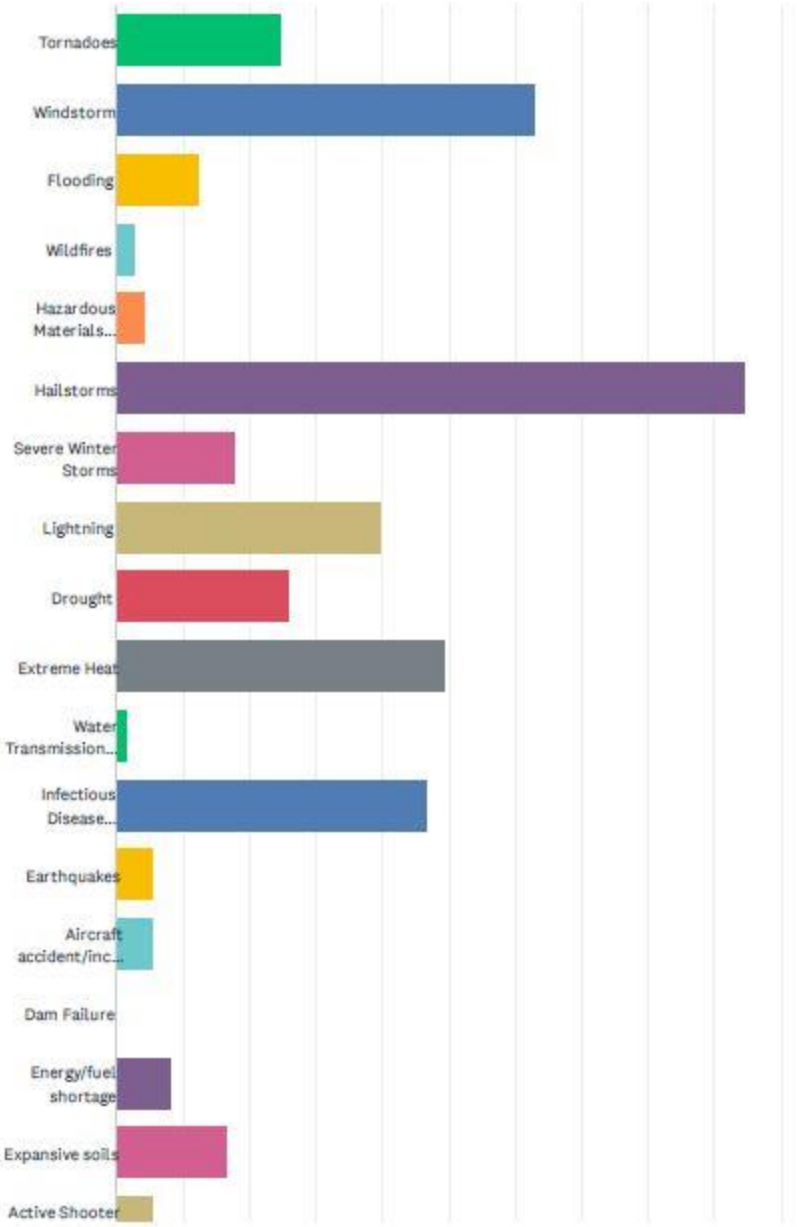
Answered: 74 Skipped: 0

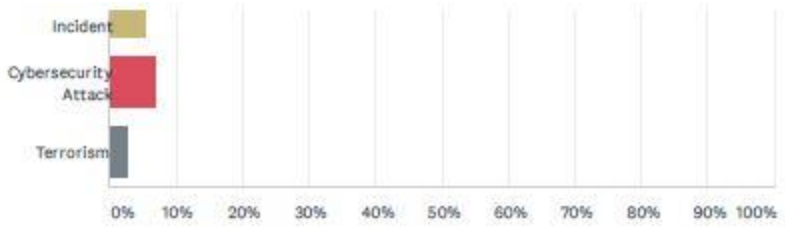


ANSWER CHOICES	RESPONSES	
Yes	90.54%	67
No	9.46%	7
TOTAL		74

Q10 Which of the following natural or non-natural hazard events have you or has anyone in your household experienced within the past 5 years? Select all that apply:

Answered: 73 Skipped: 1

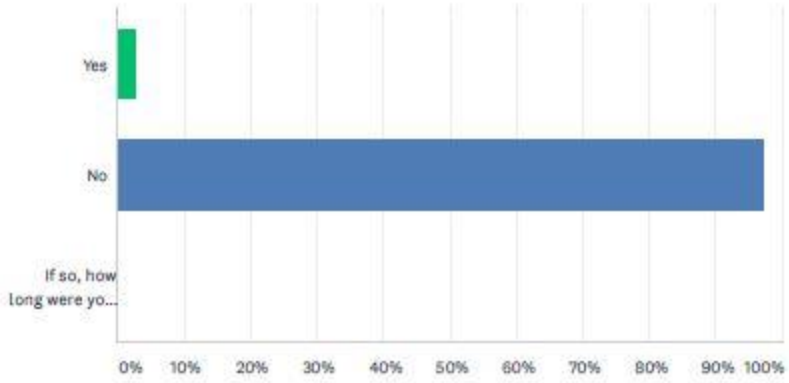




ANSWER CHOICES	RESPONSES	
Tornadoes	24.66%	18
Windstorm	63.01%	46
Flooding	12.33%	9
Wildfires	2.74%	2
Hazardous Materials Release/spill	4.11%	3
Hailstorms	94.52%	69
Severe Winter Storms	17.81%	13
Lightning	39.73%	29
Drought	26.03%	19
Extreme Heat	49.32%	36
Water Transmission Failure	1.37%	1
Infectious Disease Outbreak	46.58%	34
Earthquakes	5.48%	4
Aircraft accident/incident	5.48%	4
Dam Failure	0.00%	0
Energy/fuel shortage	8.22%	6
Expansive soils	16.44%	12
Active Shooter Incident	5.48%	4
Cybersecurity Attack	6.85%	5
Terrorism	2.74%	2
Total Respondents: 73		

Q11 In the last 5 years, were you evacuated from your home as a result of a disaster (e.g. flooding)?

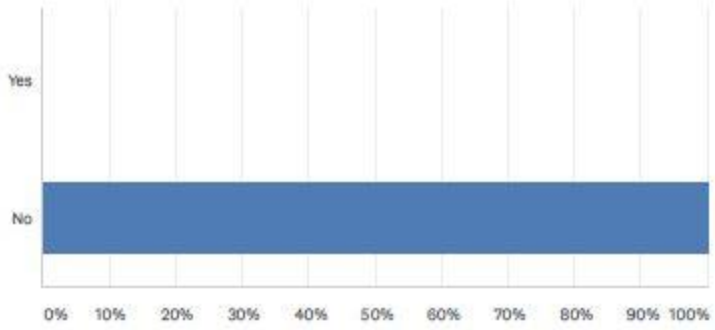
Answered: 74 Skipped: 0



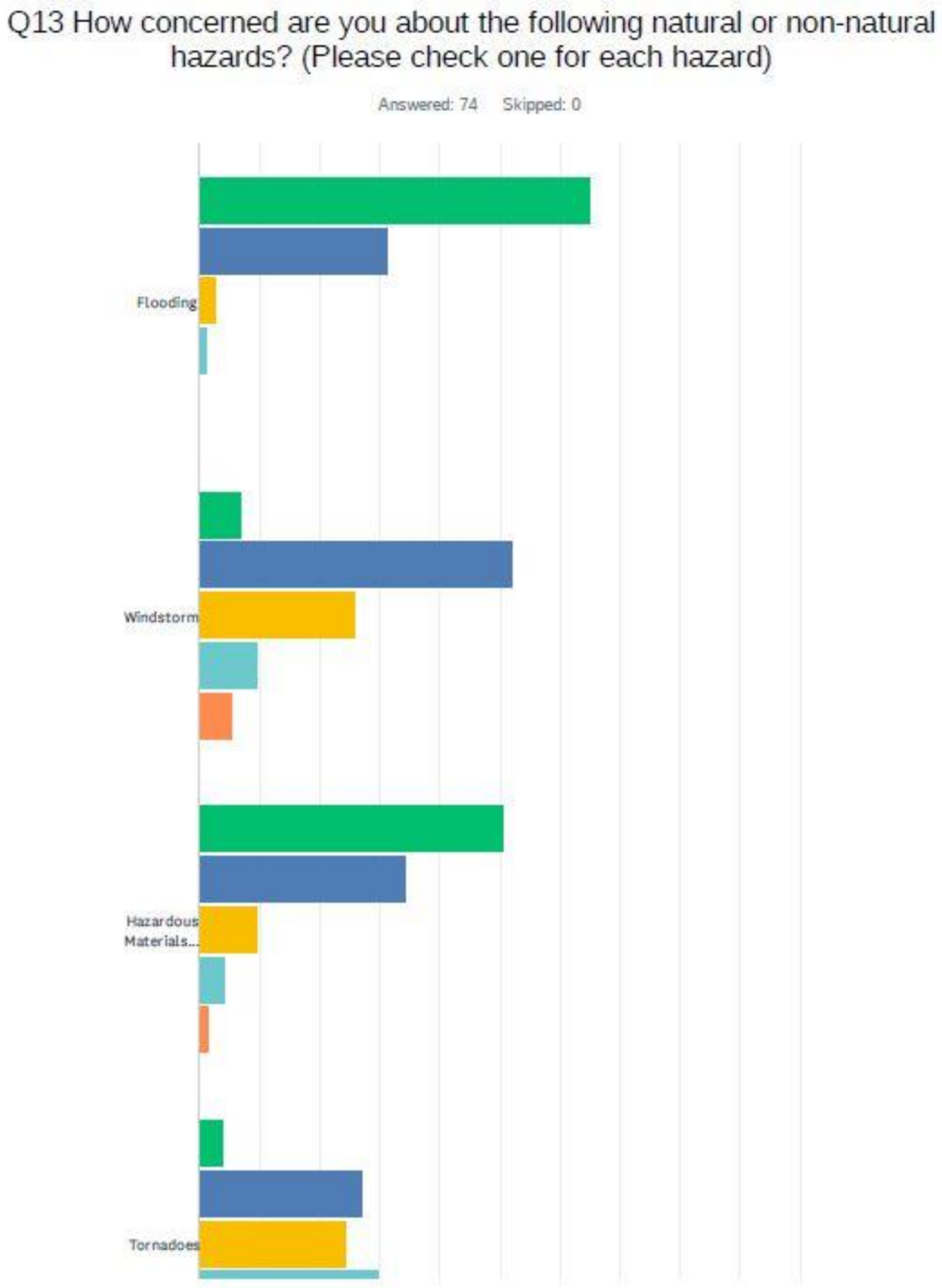
ANSWER CHOICES	RESPONSES	
Yes	2.70%	2
No	97.30%	72
If so, how long were you displaced?	0.00%	0
TOTAL		74

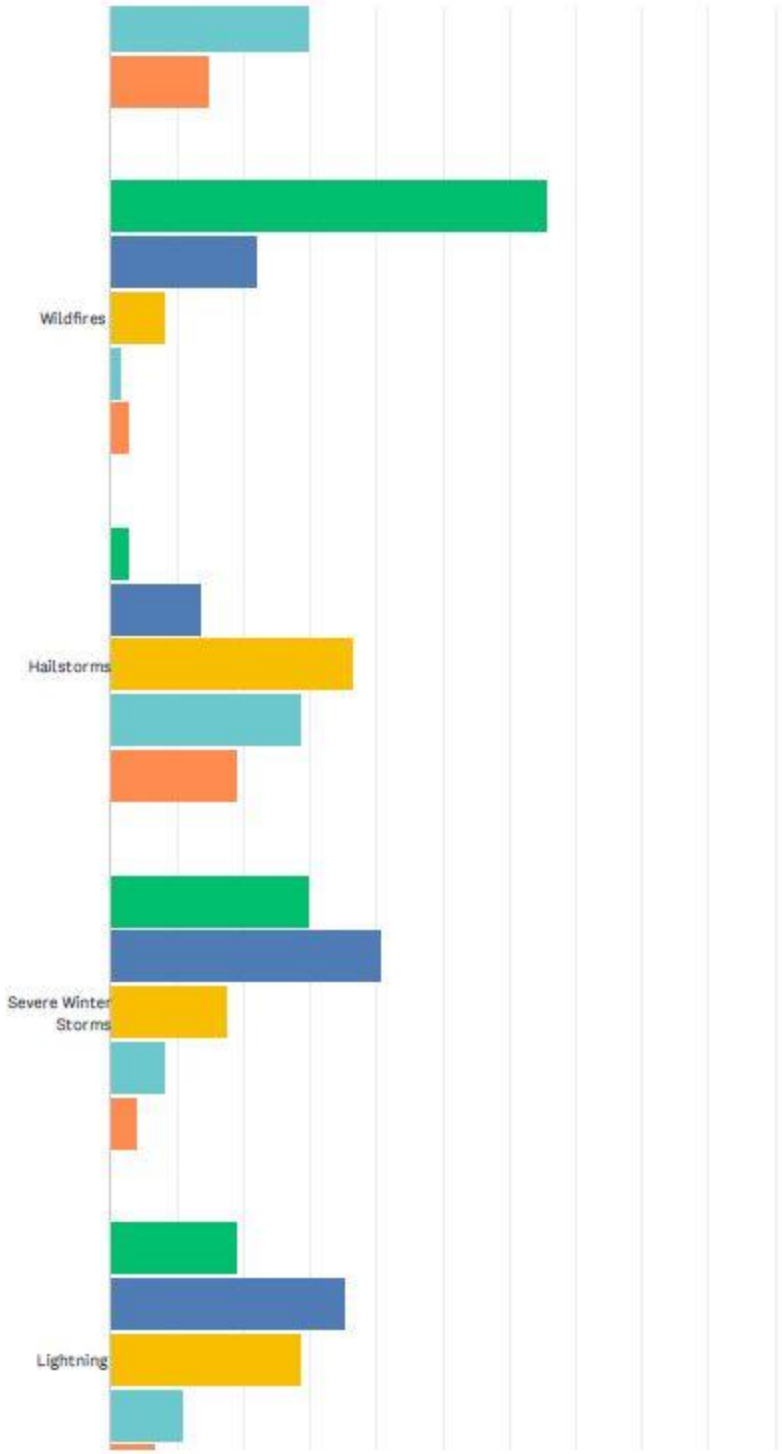
Q12 In the last 5 years, if you were evacuated from your home as a result of a disaster, did you go to a shelter?

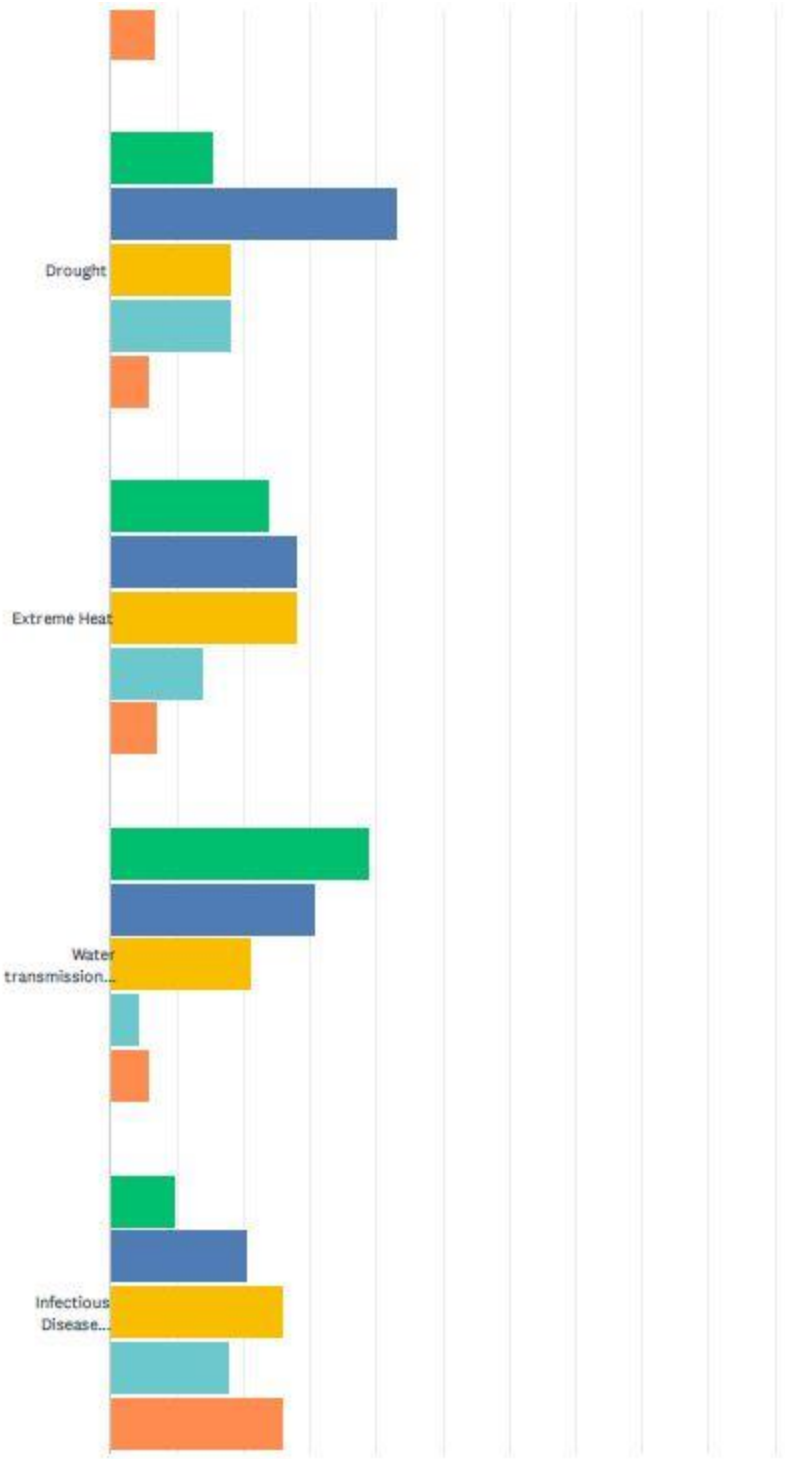
Answered: 65 Skipped: 9

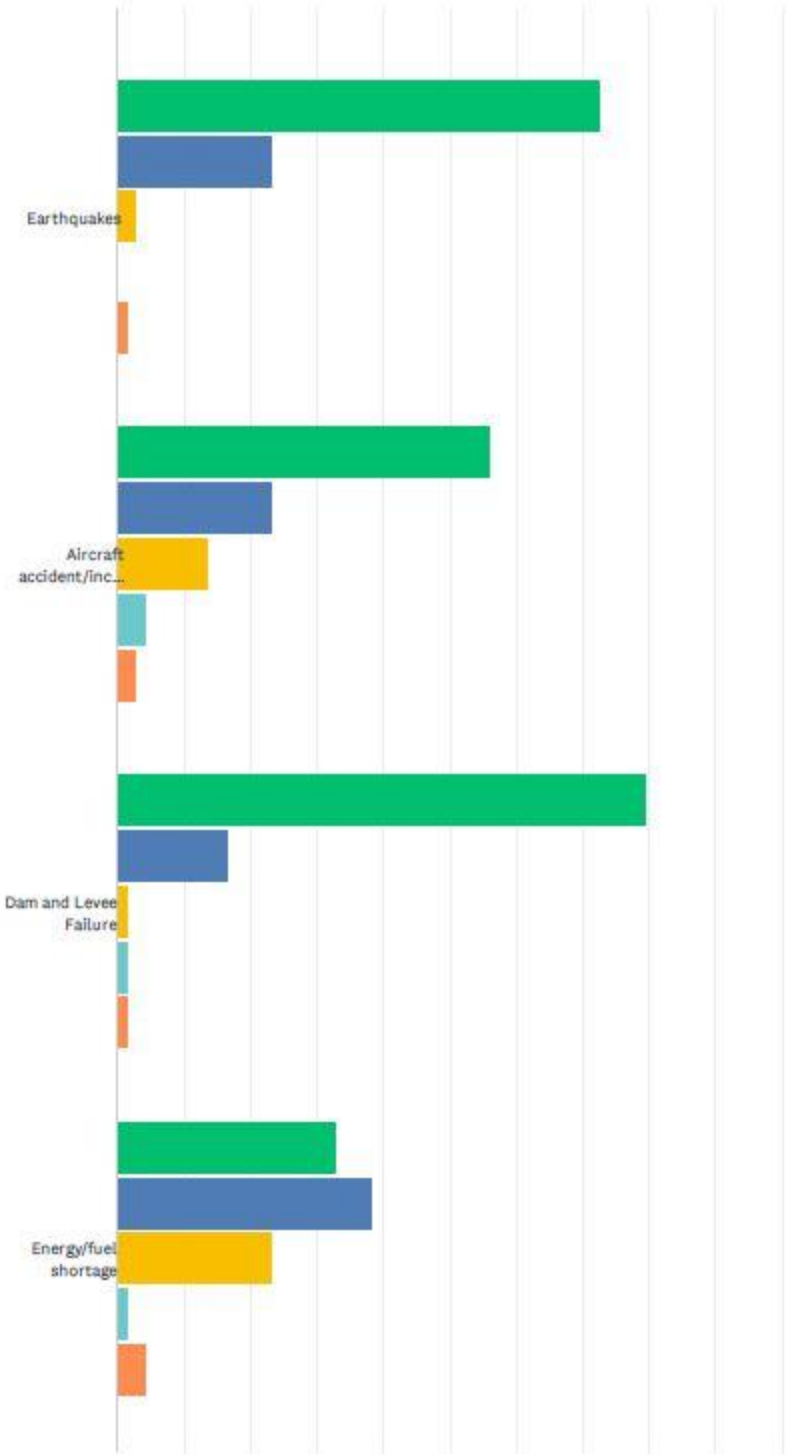


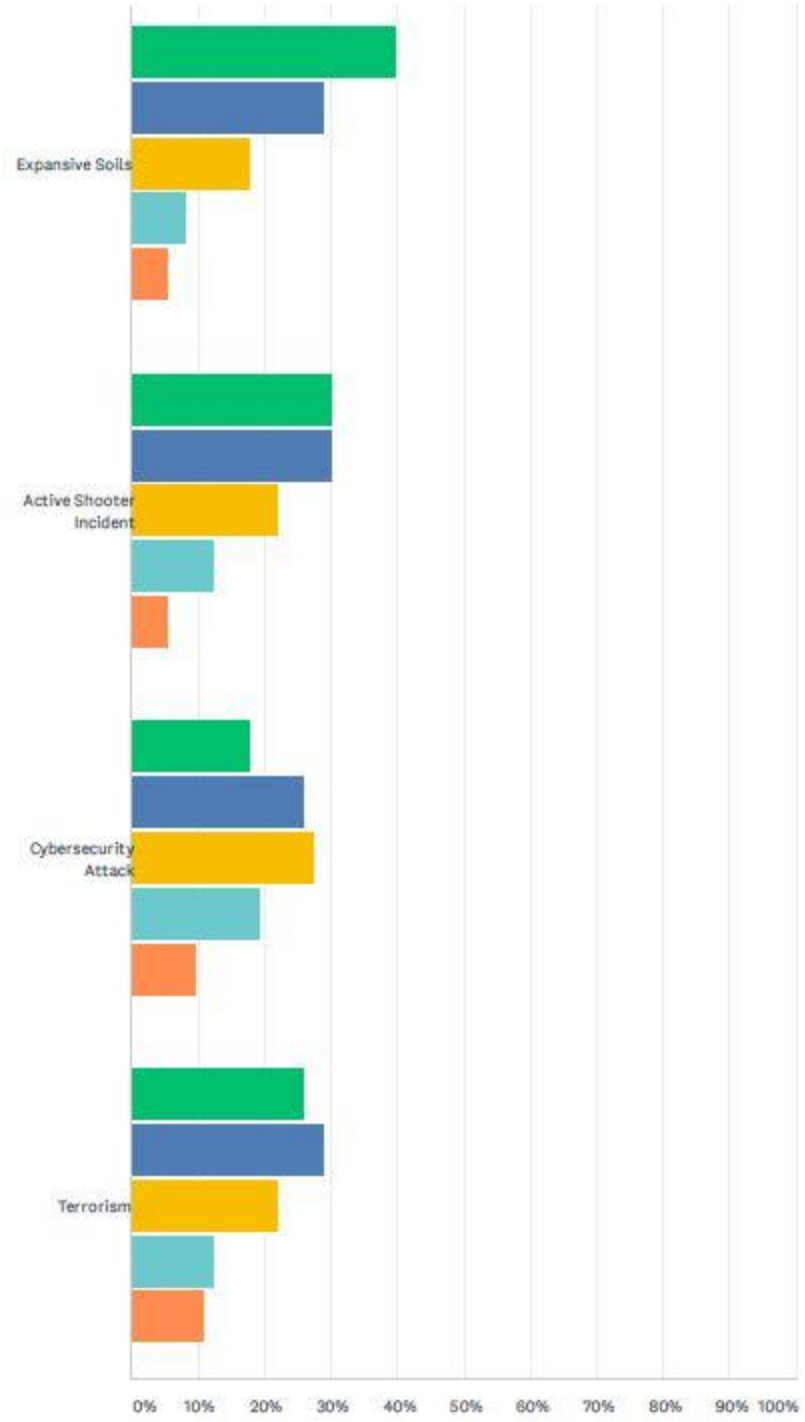
ANSWER CHOICES	RESPONSES	
Yes	0.00%	0
No	100.00%	65
TOTAL		65

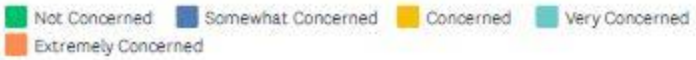

Q13 How concerned are you about the following natural or non-natural hazards? (Please check one for each hazard)
Answered: 74 Skipped: 0
Flooding
Windstorm
Hazardous Materials...
Tornadoes


Wildfires
Hailstorms
Severe Winter Storms
Lightning


Drought
Extreme Heat
Water transmission...
Infectious Disease...


Earthquakes
Aircraft accident/inc...
Dam and Levee Failure
Energy/fuel shortage


Expansive Soils
Active Shooter Incident
Cybersecurity Attack
Terrorism
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

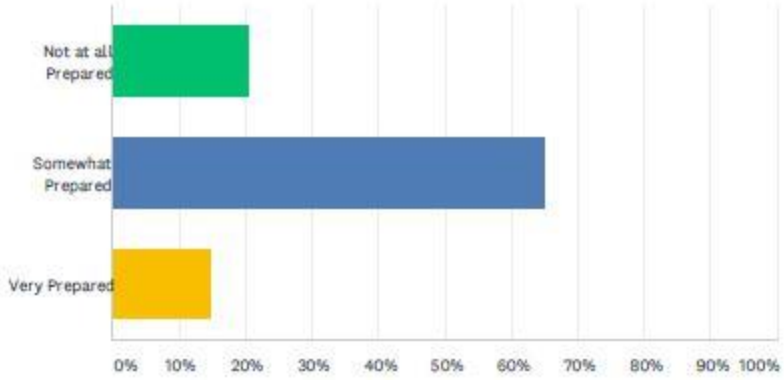


	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
Flooding	64.86% 48	31.08% 23	2.70% 2	1.35% 1	0.00% 0	74	1.41
Windstorm	6.85% 5	52.05% 38	26.03% 19	9.59% 7	5.48% 4	73	2.55
Hazardous Materials Release	50.68% 37	34.25% 25	9.59% 7	4.11% 3	1.37% 1	73	1.71
Tornadoes	4.05% 3	27.03% 20	24.32% 18	29.73% 22	14.86% 11	74	3.24
Wildfires	65.75% 48	21.92% 16	8.22% 6	1.37% 1	2.74% 2	73	1.53
Hailstorms	2.70% 2	13.51% 10	36.49% 27	28.38% 21	18.92% 14	74	3.47
Severe Winter Storms	29.73% 22	40.54% 30	17.57% 13	8.11% 6	4.05% 3	74	2.16
Lightning	18.92% 14	35.14% 26	28.38% 21	10.81% 8	6.76% 5	74	2.51
Drought	15.28% 11	43.06% 31	18.06% 13	18.06% 13	5.56% 4	72	2.56
Extreme Heat	23.61% 17	27.78% 20	27.78% 20	13.89% 10	6.94% 5	72	2.53
Water transmission failure	38.89% 28	30.56% 22	20.83% 15	4.17% 3	5.56% 4	72	2.07
Infectious Disease Outbreak	9.59% 7	20.55% 15	26.03% 19	17.81% 13	26.03% 19	73	3.30
Earthquakes	72.60% 53	23.29% 17	2.74% 2	0.00% 0	1.37% 1	73	1.34
Aircraft accident/incident	56.16% 41	23.29% 17	13.70% 10	4.11% 3	2.74% 2	73	1.74
Dam and Levee Failure	79.45% 58	16.44% 12	1.37% 1	1.37% 1	1.37% 1	73	1.29
Energy/fuel shortage	32.88% 24	38.36% 28	23.29% 17	1.37% 1	4.11% 3	73	2.05
Expansive Soils	39.73% 29	28.77% 21	17.81% 13	8.22% 6	5.48% 4	73	2.11
Active Shooter Incident	30.14% 22	30.14% 22	21.92% 16	12.33% 9	5.48% 4	73	2.33
Cybersecurity Attack	17.81% 13	26.03% 19	27.40% 20	19.18% 14	9.59% 7	73	2.77
Terrorism	26.03% 19	28.77% 21	21.92% 16	12.33% 9	10.96% 8	73	2.53

#	OTHER (PLEASE SPECIFY)	DATE
1	the newly elected president & socilaism extremely concerned	12/10/2020 2:27 PM
2	traffic safety	12/10/2020 2:17 PM
3	Erosion; Sewer line breaks	12/1/2020 12:37 PM
4	Nuclear accident at Glen Rose	12/1/2020 9:31 AM
5	Hazards from industrial production	11/19/2020 3:46 PM
6	Government over reach EXTREMELY CONCERNED	11/19/2020 3:40 PM
7	Police do not respond when called.	11/19/2020 12:17 PM

Q14 The City of McKinney Office of Emergency Management website, www.mckinneyoem.org, provides important information on how to prepare you and your family for a disaster. How prepared is your household for a natural or human-caused hazard event?

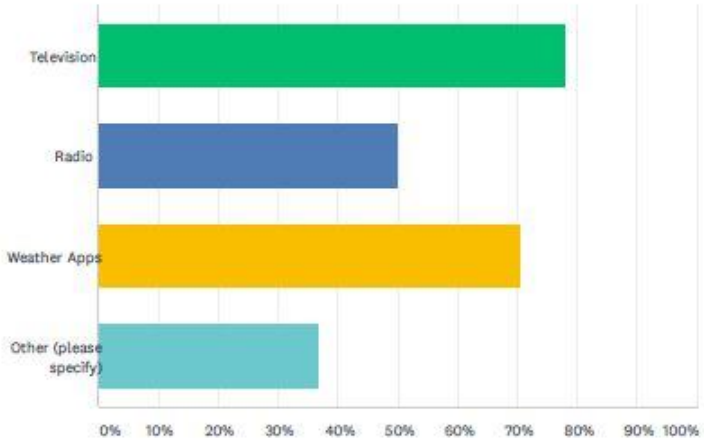
Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Not at all Prepared	20.27%	15
Somewhat Prepared	64.86%	48
Very Prepared	14.86%	11
TOTAL		74

Q15 How would you expect to learn about an immediate threat caused by a natural or non-natural hazard? Select all that apply:

Answered: 68 Skipped: 6

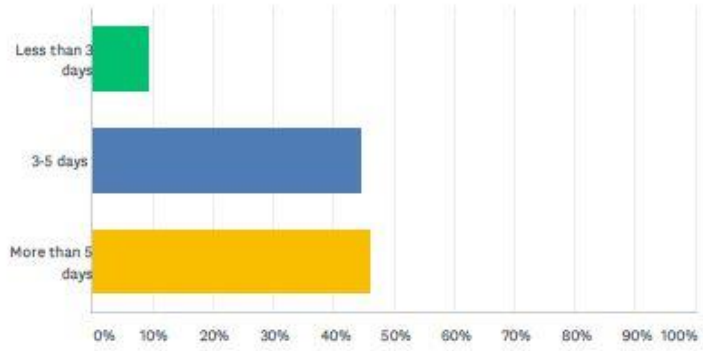


ANSWER CHOICES	RESPONSES	
Television	77.94%	53
Radio	50.00%	34
Weather Apps	70.59%	48
Other (please specify)	36.76%	25
Total Respondents: 68		

#	OTHER (PLEASE SPECIFY)	DATE
1	amateur radio	12/10/2020 8:44 PM
2	Texts sent to everyone on cell phones + sirens	12/10/2020 2:45 PM
3	Online news orgs	12/10/2020 2:29 PM
4	cell phone	12/10/2020 2:27 PM
5	Looking out the window or from internet news sources	12/7/2020 11:54 AM
6	Emergency broadcast via cellular	12/4/2020 6:48 AM
7	Cell phone blast, sirens	12/3/2020 7:49 PM
8	Social media	12/2/2020 10:05 PM
9	All of the above	12/1/2020 5:11 PM
10	Social Media; text	12/1/2020 12:37 PM
11	Social media	12/1/2020 10:50 AM
12	Facebook alert would be great	12/1/2020 9:31 AM
13	WEA message, social media, OWS, weather radio	12/1/2020 8:18 AM
14	News apps	12/1/2020 6:23 AM
15	Social media	12/1/2020 4:37 AM
16	Text	11/30/2020 9:23 PM
17	local emergency siren system	11/30/2020 8:43 PM
18	ham radio & social media	11/30/2020 7:47 PM
19	Facebook	11/30/2020 6:52 PM
20	Emergency Alert System	11/30/2020 5:46 PM
21	Emergency text systems that come through the phone.	11/30/2020 10:06 AM
22	social media	11/25/2020 1:11 PM
23	Social media	11/24/2020 9:20 PM
24	City message alert	11/19/2020 3:46 PM
25	City email	11/19/2020 2:47 PM

Q16 FEMA suggests that households have at least 3 days of food, water, and vital supplies (e.g. medications) on hand in the event of a disaster. How many days of food, water, and vital supplies does your family have on hand in the event of a disaster?

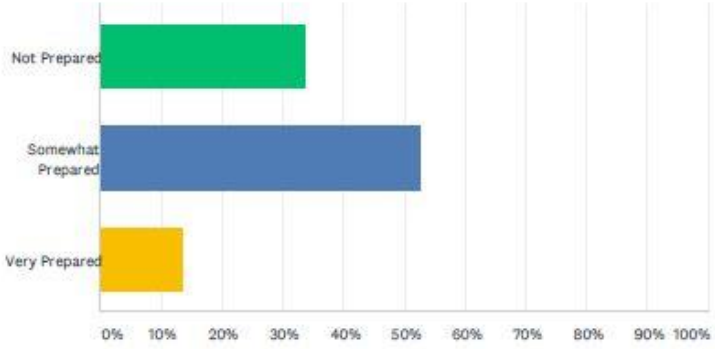
Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than 3 days	9.46%	7
3-5 days	44.59%	33
More than 5 days	45.95%	34
TOTAL		74

Q17 How prepared are you to get along without electricity or natural gas for 3 or more days? (Check one)

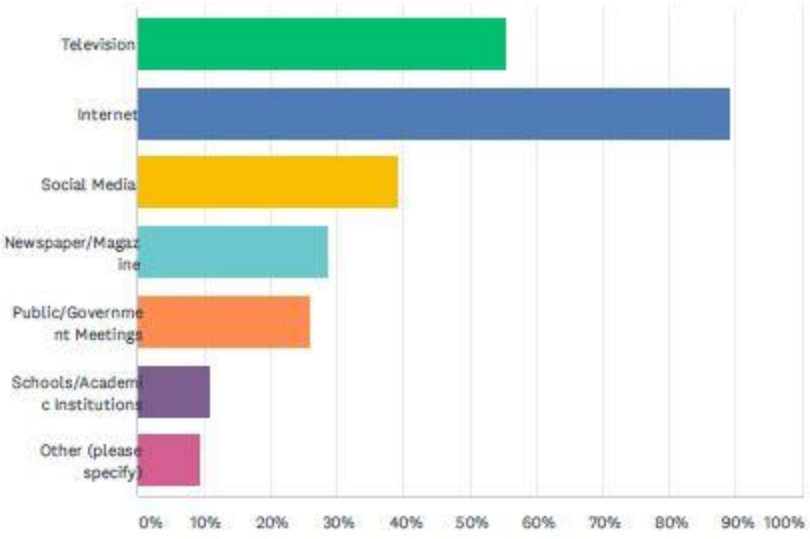
Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Not Prepared	33.78%	25
Somewhat Prepared	52.70%	39
Very Prepared	13.51%	10
TOTAL		74

Q18 Where would you expect to find useful information to help you be prepared? Select all that apply:

Answered: 74 Skipped: 0

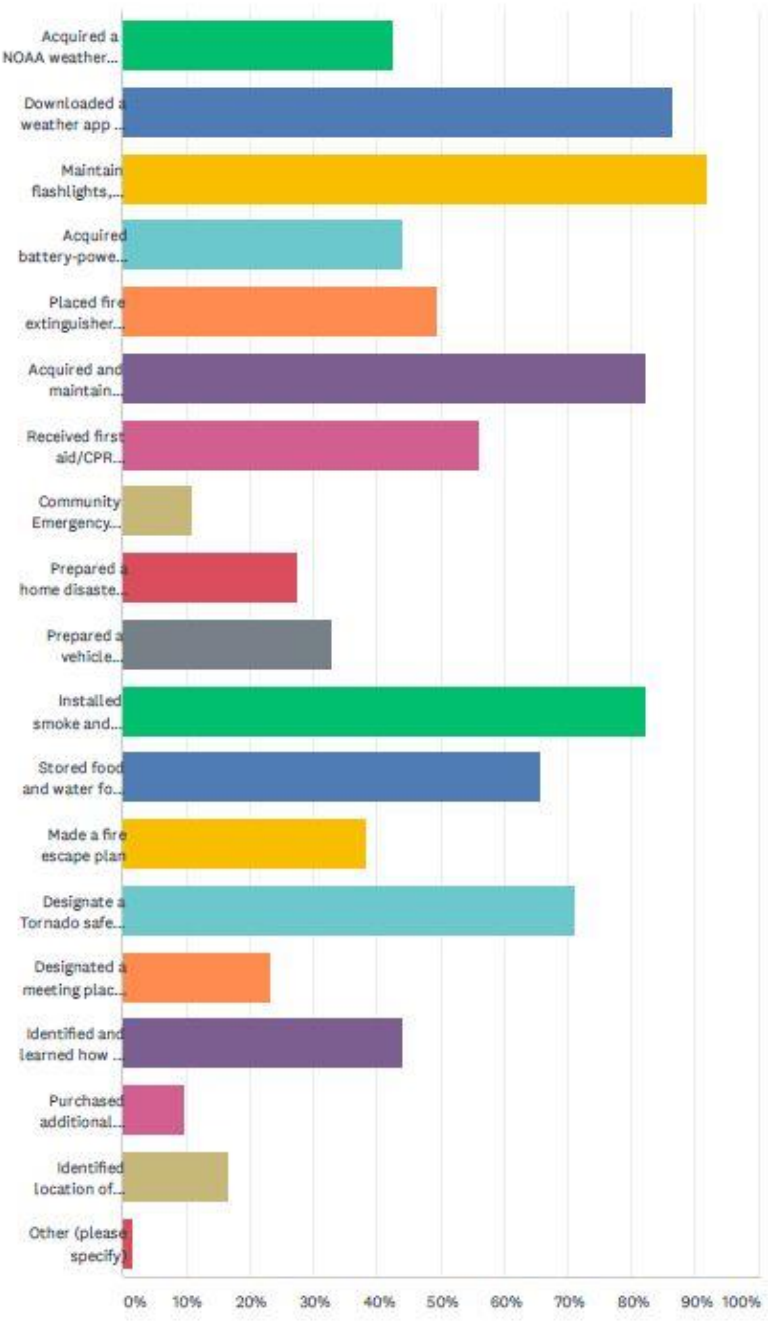


ANSWER CHOICES	RESPONSES	
Television	55.41%	41
Internet	89.19%	66
Social Media	39.19%	29
Newspaper/Magazine	28.38%	21
Public/Government Meetings	25.68%	19
Schools/Academic Institutions	10.81%	8
Other (please specify)	9.46%	7
Total Respondents: 74		

#	OTHER (PLEASE SPECIFY)	DATE
1	government publications	12/10/2020 8:44 PM
2	Prep orgs	12/10/2020 2:29 PM
3	cell phone	12/10/2020 2:27 PM
4	Local officials	11/30/2020 10:08 PM
5	Personal & professional knowledge	11/19/2020 9:17 PM
6	City website	11/19/2020 3:46 PM
7	Books	11/19/2020 12:17 PM

Q19 Which of the following steps has your household already undertaken to prepare for a natural or non-natural disaster? Select all that apply:

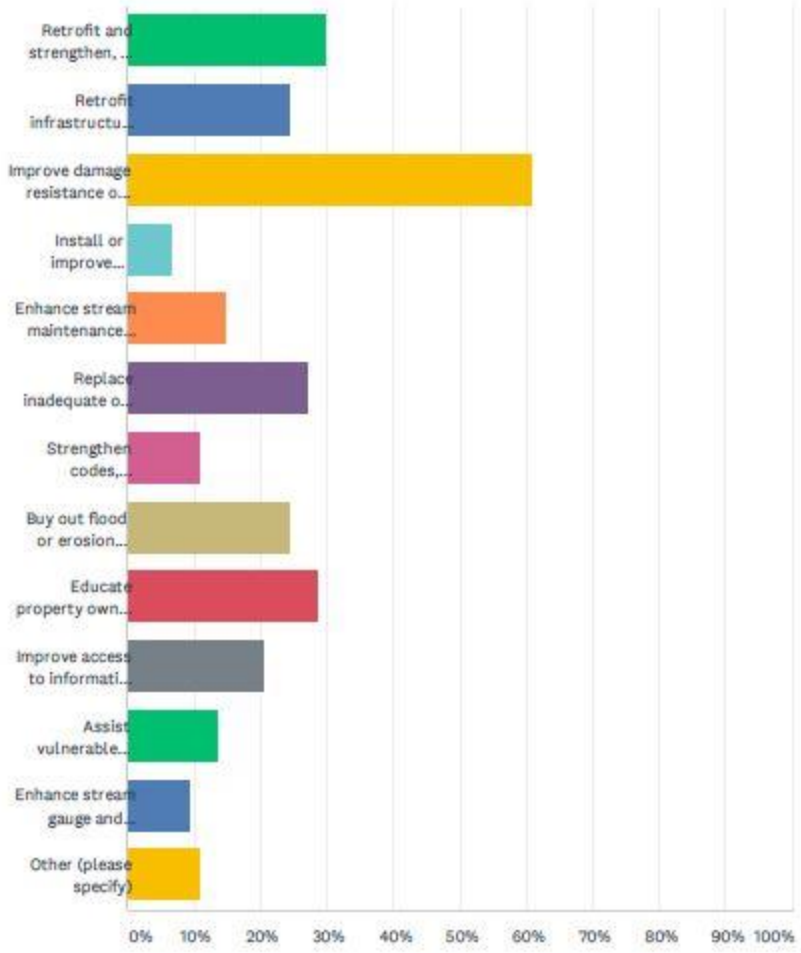
Answered: 73 Skipped: 1


Acquired a NOAA weather...
Downloaded a weather app ...
Maintain flashlights,...
Acquired battery-powe...
Placed fire extinguisher...
Acquired and maintain...
Received first aid/CPR...
Community Emergency...
Prepared a home disaste...
Prepared a vehicle...
Installed smoke and...
Stored food and water fo...
Made a fire escape plan
Designate a Tornado safe...
Designated a meeting plac...
Identified and learned how ...
Purchased additional...
Identified location of...
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Acquired a NOAA weather radio (personal indoor alerting device)	42.47%	31
Downloaded a weather app to receive hazard watches and warnings	86.30%	63
Maintain flashlights, batteries, spare cell phone chargers	91.78%	67
Acquired battery-powered or hand-cranked radio	43.84%	32
Placed fire extinguishers in the kitchen and on every floor in home	49.32%	36
Acquired and maintain medical supplies (first aid kit, medications)	82.19%	60
Received first aid/CPR training	56.16%	41
Community Emergency Response Team (CERT)	10.96%	8
Prepared a home disaster supply kit/Go Bag	27.40%	20
Prepared a vehicle emergency supply kit	32.88%	24
Installed smoke and carbon monoxide detectors on each level of the house	82.19%	60
Stored food and water for at least 3 days per person	65.75%	48
Made a fire escape plan	38.36%	28
Designate a Tornado safe room	71.23%	52
Designated a meeting place outside the home	23.29%	17
Identified and learned how to operate utility shutoffs	43.84%	32
Purchased additional hazard insurance	9.59%	7
Identified location of nearest emergency shelter (may be a neighbors house, public building, or facility open 24/7)	16.44%	12
Other (please specify)	1.37%	1
Total Respondents: 73		

Q20 What types of projects do you believe local, county, state, or federal government agencies could be doing to reduce the damage and disruption of disasters in the City of McKinney? Select your top three choices.

Answered: 74 Skipped: 0



ANSWER CHOICES	RESPONSES	
Retrofit and strengthen, as necessary, essential facilities such as public safety, schools, and hospitals	29.73%	22
Retrofit infrastructure, where possible, such as elevating roadways and improving drainage systems	24.32%	18
Improve damage resistance of utilities (electricity, communications, water/wastewater facilities etc.)	60.81%	45
Install or improve protective measures, such as hardening public facilities, floodwalls, and wildland urban interface	6.76%	5
Enhance stream maintenance programs/projects	14.86%	11
Replace inadequate or vulnerable bridges	27.03%	20
Strengthen codes, ordinances and plans to require higher hazard risk management standards	10.81%	8
Buy out flood or erosion prone properties and maintain as open space	24.32%	18
Educate property owners of ways they can mitigate damage to their properties	28.38%	21
Improve access to information about hazard risks and high-hazard areas	20.27%	15
Assist vulnerable property owners with securing funding to mitigate their properties	13.51%	10
Enhance stream gauge and weather monitoring program to provide more accurate data and warnings	9.46%	7
Other (please specify)	10.81%	8
Total Respondents: 74		

#	OTHER (PLEASE SPECIFY)	DATE
1	Evaluate means to mitigate attack on infrastructure/utilities	12/10/2020 8:44 PM
2	More emergency loud systems in older neighborhoods	12/10/2020 2:46 PM
3	educate and inform then stay out of our lives	12/10/2020 2:27 PM
4	Severe weather announcements are difficult to understand	12/2/2020 10:05 PM
5	Send new HO info on dam location, shelters, tornado sirens et	12/1/2020 9:31 AM
6	Strengthen codes within reason, at times the codes go to far and too expensive, however, having codes for metal fence posts is cheap and protects people's property versus requiring a safe room in homes.	12/1/2020 8:18 AM
7	More natural and deep root plantings near waterways to prevent erosion along our creekways	11/30/2020 10:06 AM
8	There is no excuse for having no storm shelters in schools. HOWEVER, school tax should pay for that.	11/19/2020 12:17 PM

Notices

McKinney, Texas - Unique by Nature
November 30, 2020 ·

The city's Hazard Mitigation Plans help us to better understand the natural hazards that pose a threat to the area and to develop actions that reduce the risk associated with these hazards. Part of the update process includes review and approval from the Texas Department of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA). Their approval allows the city to be eligible for Hazard Mitigation Assistance (HMA) grant funding.

As part of the update process we need to hear from you. We've developed a survey to help gauge local household and business preparedness for disasters. Information you provide will help us identify actions that would reduce risk and loss from natural hazards. All responses are anonymous. Take the survey: mckinneytexas.org/mitigation

Hazard Mitigation

Hazard Mitigation is a critical function of emergency management. Mitigation efforts include activities that prevent or reduce disaster impacts and eliminate potential risks. These actions are in place before an event occurs. According to FEMA, each dollar spent on mitigation saves our community an average of four dollars after an event.

Hazard Mitigation Plan Update

Hazard Mitigation Plans help us to better understand the natural hazards that pose a threat to the area and to develop actions that reduce the risk associated with these hazards.

Part of the update process includes review and approval from the Texas Department of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA).

This approval allows the city to be eligible for Hazard Mitigation Assistance (HMA) grant funding, including the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and the Flood Mitigation Assistance program.

Public Input

As part of the update process we need to hear from you. We've developed a survey to help gauge local household and business preparedness for disasters. Information you provide will help us identify actions that would reduce risk and loss from natural hazards. All responses are anonymous.

They survey will be available Nov 19 - Dec 10 | Take the Survey

Hazard Mitigation Plan Project
Hazard Mitigation Steering Committee Meeting #2 Minutes

January 6, 2021

Purpose

The purpose of the meeting was to discuss the draft risk and vulnerability assessment (RVA) and obtain input on potential hazard mitigation strategies. Due to COVID-19 in person meeting restrictions, the meeting was held virtually via zoom on January 6, 2021 from 3 - 4 pm. The meeting gave stakeholders an opportunity to discuss and provide input on the draft RVA and hazard mitigation strategies.

Meeting Attendees

Name	Organization	E-mail	Phone
Jeremy Cuddeback	Office of Emergency Management	jcuddeba@mckinneytexas.org	972-547-2863
Stephen Bonner	Drainage	sbonner@mckinneytexas.org	
Frances La Rue	Communications & Marketing	flarue@mckinneytexas.org	972-547-7525
Trish Jackson	Public Works	pjackson@mckinneytexas.org	972-547-7439
Jeff Harris	Building Inspections	jharris@mckinneytexas.org	972-547-7452
Paul Sparkman	Public Works	psparkman@mckinneytexas.org	972-547-7351
Jason Smith	Construction Inspections	Jsmith5@mckinneytexas.org	972-547-2664
Lisa Littrell	Purchasing	llittrell@mckinneytexas.org	972-547-7583
Haripriya Madabushi	Information Technology	hmadabushi@mckinneytexas.org	972-547-7429
Camille Smith	Housing & Community Services	Csmith2@mckinneytexas.org	972-547-7517
Rick Herzberger	Building Inspections	rherzber@mckinneytexas.org	972-547-7453
Denise Lessard	Communications & Marketing	dlessard@mckinneytexas.org	972-547-7556
Sid Hudson	Information Technology	shudson@mckinneytexas.org	972-547-7604
Michael Hebert	Engineering	mhebert@mckinneytexas.org	972-547-7424
Eddie Garza	Streets – Maintenance	egarza@mckinneytexas.org	
Rosanne Lemus	Purchasing	rlemus@mckinneytexas.org	972-547-7582
Danny Still	Engineering	dstill@mckinneytexas.org	972-547-7631

Overview of Meeting

- Jeremy Cuddeback welcomed the Hazard Mitigation Steering Committee.
- The committee discussed current planning and coordination efforts and outlined the next steps.
    - Discussed delaying the next planning steps due to COVID-19 vaccination hub and planning.
    - Submit date to be pushed back to a later determined date.
- The use of Teams to review and provide input into the draft plan was encouraged.
- Hazard profiles and maps have been updated with most current available data.
- Critical facilities list is being updated.
    - Any additional facilities or data that needs to be included can be added using Teams or submitted via email to Jeremy.
- A review of the public input survey was conducted.
- Discussed the most current risk assessment. The HMSC agreed that the most current Hazard Vulnerability Analysis accurately reflects the current conditions.
- The Hazard Mitigation Strategy was discussed. It was decided that the current goals and objectives accurately reflect the current conditions and will remain in the plan.
- The following Action Items were discussed:
    - A review of the current identified actions will be conducted.
    - All identified responsible agencies and departments for mitigation actions will be contacted to obtain the current status of the mitigation actions, objectives, and goals.

City of McKinney, Texas
Hazard Mitigation Plan Project
Hazard Mitigation Steering Committee Meeting #3

June 8, 2021

Purpose

The purpose of the meeting was to review the draft hazard mitigation plan (HMP), discuss hazard mitigation strategy revisions, and collect information needed to complete the plan from the Hazard Mitigation Steering Committee (HMSC) members. The meeting was held at the City of McKinney Public Safety Building, located at 2200 Taylor-Burk Drive, McKinney, Texas on June 8, 2021 from 2:00 p.m.– 4:00 p.m.

Meeting Attendees

Name	Department	E-mail	Phone
Karen E. Adkins	Office of Emergency Management	kadkins@mckinneytexas.org	972-547-2868
Jeremy Cuddeback	Office of Emergency Management	jcuddeba@mckinneytexas.org	972-547-2863
Gary West	Water Distribution	gwest@mckinneytexas.org	972-547-2186
Paul Sparkman	Public Works	psparkman@mckinneytexas.org	972-547-7351
Eddie Garza	Streets – Maintenance	egarza@mckinneytexas.org	
Michael Hebert	Engineering	mhebert@mckinneytexas.org	972-547-7424
Michael R. Smith	Fire Department	Msmith5@mckinneytexas.org	972-547-2855
Jeff Harris	Building Inspections	jharris@mckinneytexas.org	972-547-7452
Gabriel Bowden	Public Works	Gbowden@mckinneytexas.org	972-547-7361
Jeff Patterson	Airport	jpatterson@flyTKI.com	972-562-4096
Haripriya Madabushi	Information Technology	hmadabushi@mckinneytexas.org	972-547-7429
Rosanne Lemus	Purchasing	rlemus@mckinneytexas.org	972-547-7582
Jody Morse	Police Department	jmorse@mckinneytexas.org	972-547-2777
Stevee Franks	Office of Emergency Management	sfranks@mckinneytexas.org	972-547-2866
Camille Smith	Housing & Community Services	Csmith2@mckinneytexas.org	972-547-7517

Overview of Meeting

- Jeremy Cuddeback welcomed the Hazard Mitigation Steering Committee (HMSC) and introduced himself. Introductions continued around the room.
- Jeremy Cuddeback briefly reviewed and discussed the mitigation planning process to date.
    - The planning process was delayed due to unforeseen circumstances including Covid-19 vaccine operations and Winter Storm Uri.
    - The current schedule is as follows:
        - June 2021 – Conduct Final Planning Meeting and Final Public Input Meeting.
        - July 2021 – Submit plan to TDEM and then FEMA
        - September/October 2021 – Receive preliminary approval from FEMA pending City Council adoption
        - November 2021 – Plan adoption by City Council
        - December 2021 – City of McKinney receives final approval from FEMA.
- Individuals were broken out into four small planning groups.
    - Mitigation goals, objectives, and actions were reviewed.
    - Break out teams discussed any needed editing, removal of any actions and objectives that are no longer relevant or necessary, and the addition of any actions and objectives that may be needed to meet mitigation goals.
    - Groups reported out on recommendations to the entire steering committee. An open discussion was held to ensure all recommendations were clarified and discussed as needed and consensus was reached.
- Needed plan maintenance improvements were discussed.
    - Additional opportunities for mitigation training would be useful.
    - Meetings and trainings should be conducted at least two times per year.
    - Additional meetings should be held as needed following emergency events and funding opportunities to discuss potential mitigation projects.
- The next mitigation meeting will be held on June 24 at 6 pm at the John and Judy Gay Library. This meeting will be an opportunity for the public to learn about the McKinney Hazard Mitigation Plan and give an additional opportunity to provide input on the plan.

City of McKinney Hazard Mitigation Plan
Sign-In Sheet

Meeting Date: 06/08/2021

Name	Title	Agency or Department	Phone	Email
Cody West	WW Superintendent	PW - Water Wastewater	972-547-2186	cwest@mckinneytexas.org
Paul Sparkman	Asst Director PW	PW	972 547 7351	psparkman@mckinneytexas.org
Eddie Garza	Superintendent	PW	972-547-21[illegible]	egarza@mckinneytexas.org
Michael Hebert	Asst Dir Eng	Engineering	972-547-7424	mhebert@
Michael Smith	Asst Fire Chief/Fire Marshal	MFD	547 2870	MSmith@
Karen Adkins	Emergency Manager	MFD-OEM	972-547-2648	kadkins@mckinneytexas.org

City of McKinney Hazard Mitigation Plan
Sign-In Sheet

Meeting Date: 06/08/2021

Name	Title	Agency or Department	Phone	Email
Jeff Harris	chief Plans Examiner	Building Inspections	7452	jharris@mckinneyTexas.org
Gabriel Bardo	AD PW	PW	618-363-9802	gbardo@ic
Jeff Patterson	Ops Manager	Airport	972-562-4096	jpatterson@flytki.com
Haripriya Madabushi	GIS Manager	IT/GIS	972-547-7429	hmadabushi@mckinneytexas.org
Lisa Littrell	Procurement Ser. Manager	Procurement	x 7583	llittrell@mckinneytexas.org
Rosanne Lemus	Contract Administrator	Procurement	972-547-7582	rlemus@mckinneytexas.org
JEDY MOISE	DEPUTY CHIEF	POLICE	9 547 2777	JMOISE@MCKINNEYTEXAS.ORG
Steven Franks	Asst. EMC	OEM / Fire	214-316-0809	sfranks@mckinneyTexas.org
CAMILLE SMITH	COMMUNITY SOC COORD	HCD	972-547-7517	CSMITH20@MCKINNEYTEXAS.ORG

City of McKinney, Texas
Hazard Mitigation Plan Project
Public Input Meeting

June 24, 2021

Purpose

The purpose of the meeting was to review the draft hazard mitigation plan (HMP), discuss hazard rankings and mitigation strategy revisions, and collect information needed to complete the plan from the stakeholders of the City of McKinney. The third and final public meeting was held on June 24, 2021 between 6:00 p.m. and 9:00 p.m. at the John and Judy Gay Library, located at 6861 W. Eldorado Parkway, McKinney, Texas. The meeting gave stakeholders an opportunity to discuss and provide input on the draft HMP.

Meeting Attendees

Name	Organization	E-mail	Phone
Jim Eades	Citizen of McKinney		
Karen E. Adkins	Office of Emergency Management	kadkins@mckinneytexas.org	972-547-2868
Jeremy Cuddeback	Office of Emergency Management	jcuddeba@mckinneytexas.org	972-547-2863

Overview of Meeting

- Jeremy Cuddeback welcomed everyone and introduced himself. Introductions continued around the room.
- Jeremy Cuddeback gave a PowerPoint presentation with the following being discussed:
    - Planning Process
        - Mitigation Plan Update key dates
    - Mitigation Goals
        - Maximize resources
        - Harden our community
        - Reduce and eliminate loss of life and property
        - Bring awareness to potential hazards and need for preparedness
        - Continue city training

- What is Hazard Mitigation?
  - Examples:
    - Building codes
    - CIP
    - Education and Outreach
    - Hardening of structures
    - Home elevation
    - Land Use and Zoning
    - Open Space Preservation
    - Planning
- Investment in Mitigation
  - Prevents injury and loss of life
  - Prevents damage to community assets
  - Reduces costs
    - Mitigation efforts save $4-$7 for every $1 spent
  - Advances community objectives
- Mitigation Planning
- Federal regulations
- Available Assistance
  - HMGP
  - FMA
  - BRIC
  - HMGP Post Fire
- Mitigation Strategy

- OEM was available the remainder of the time to answer any questions.

McKinney, Texas - Unique by Nature
June 15 at 9:52 AM ·

Make plans to join the Hazard Mitigation Public Input Meeting on Thursday, June 24 from 6-9 p.m. at the John & Judy Gay Library. The Office of Emergency Management will be available for questions.

1

Like Comment Share

Hazard Mitigation

Hazard Mitigation is a critical function of emergency management. Mitigation efforts include activities that prevent or reduce disaster impacts and eliminate potential risks. These actions are in place before an event occurs. According to FEMA, each dollar spent on mitigation saves our community an average of four dollars after an event.

Hazard Mitigation Plan Update

Hazard Mitigation Plans help us to better understand the natural hazards that pose a threat to the area and to develop actions that reduce the risk associated with these hazards.

Part of the update process includes review and approval from the Texas Department of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA).

This approval allows the city to be eligible for Hazard Mitigation Assistance (HMA) grant funding, including the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and the Flood Mitigation Assistance program.

Public Input

A public meeting will be held on Thursday, June 24 from 6 - 9 p.m. at the John & Judy Gay Library. This will be an opportunity to learn about the hazard mitigation planning process and contribute ideas. The Office of Emergency Management will be available for questions.

Meeting Date:	06/24/2021
Meeting Time:	6:00 PM – 9:00 PM
Meeting Location:	John & Judy Gay Library 6861 Eldorado Pkwy McKinney, TX 75070

Public Input Meeting Sign-in Sheet

Print Name	Signature
Jim Eades	
Karen Adkins	Karen Adkins

Appendix C
CITY OF MCKINNEY DROUGHT CONTINGENCY PLAN

1. ARTICLE VI. DROUGHT CONTINGENCY PLAN[118]

Sec. 110-364. Declaration of policy, purpose, and intent.

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard to domestic water use, sanitation, and fire protection, to protect and preserve public health, welfare, and safety, and to minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the city hereby adopts the following regulations and restrictions on the delivery and consumption of water.

(Code 1982, § 31-181; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-365. Public involvement.

The city, by means of public notice in the newspaper and direct mail to wholesale customers, has provided opportunity for customers and other members of the public to provide input into the preparation of this plan.

(Code 1982, § 31-182; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-366. Public education.

The city will periodically provide the public with information about the plan, including information about the conditions under which stage of this plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of press releases, water bill inserts, and the city's web page.

(Code 1982, § 31-183; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-367. Coordination with regional water planning groups.

The service area of the city is located within regional water planning area C. The city has provided a copy of this plan to region C water planning group.

(Code 1982, § 31-184; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-368. Application.

The provisions of this plan shall apply to all persons, customers and property utilizing water provided by the city. The terms "person" and "customer," as used in the plan, include individuals, corporations, partnerships, associations, and all other legal entities.

(Code 1982, § 31-185; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

[118]State law reference(s)—Public water suppliers required by rule to develop drought contingency plans, V.T.C.A., Water Code § 11.1272; drought contingency plans for municipal uses by public water suppliers, 30 Tex. Admin. Code § 288.20.

Sec. 110-369. Definitions.

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Aesthetic water use means water used for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use means water use that is integral to the operations of commercial and nonprofit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation means those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative use.

Customer means any person, company, or organization using water supplied by the city.

Domestic water use means water used for personal needs or for household or sanitary purposes such as drinking, bathing, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even-numbered address means street addresses, box numbers, or rural postal route numbers ending in zero, two, four, six, or eight and locations without addresses.

Industrial water use means the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use means water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Nonessential water use means water uses that are not essential or required for the protection of public, health, safety, and welfare.

NTMWD means the North Texas Municipal Water District, water supplier for the city.

Odd-numbered address means street addresses, box numbers, or rural postal route numbers ending in one, three, five, seven, or nine.

TCEQ means the Texas Commission on Environmental Quality.

Wholesale customers means customers purchasing water from the city and redistributing it for a fee to their own customers.

(Code 1982, § 31-186; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-370. Implementation of drought contingency plan.

(a) When conditions defined by the drought contingency plan are present, the water utilities and infrastructure director, or his designee, in consultation with the city manager, may authorize drought condition operations in the entire city water service area or for a limited area affected by equipment failure or limited capacity.

(b) Once the authorization has been given, operations shall continue under the drought contingency plan, with progression from one stage to another as determined by the appropriate trigger conditions executed by the water utilities and infrastructure director.

(c) Public notification of the initiation or termination of drought response stages shall be by means of direct mail, newspaper or other media available.

(Code 1982, § 31-187; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005; Ord. No. 2014-04-027, § 2, 4-15-2014)

Sec. 110-371. Drought condition operations.

(a) *Stage 1 drought conditions.*

(1) *Requirement for initiation.* Customers shall be requested to conserve water and adhere to the prescribed restrictions on certain water uses for stage 1 of this plan when, notification is received from NTMWD that stage 1 drought conditions exist and requests that the city initiate the appropriate stage of their drought contingency plan.

(2) *Drought responses.*

a. *Goal.* Stage 1, is intended to raise public awareness of potential drought problems. The goal for reduction of water use is 5%.

b. *Water use restrictions.* The city manager may implement any action required by NTMWD. In addition, the city manager may order the implementation of any of the actions set forth in the stage 1 policy, as adopted by the city council by resolution. The adoption of the stage 1 policy shall not replace the requirements set forth in the ordinance from which this section is derived.

(3) *Requirements for termination.* Stage 1 of this plan may be rescinded when notification is received from NTMWD, that triggering conditions for stage 1 have ceased.

(b) *Stage 2 drought conditions.*

(1) *Requirement for initiation.* Customers shall be required to comply with the requirements and restrictions on certain nonessential water uses for stage 2 of this plan when, notification is received from NTMWD that stage 2 drought conditions exist and requests that the city initiate the appropriate stage of their drought contingency plan.

(2) *Drought responses.*

a. *Goal.* The goal for water use reduction under stage 2, moderate, is a ten percent reduction in the use that would have occurred in the absence of drought contingency measures.

b. *Water use restrictions.* The city manager may implement any action required by NTMWD. In addition, the city manager may order the implementation of any of the actions set forth in the stage 2 policy, as adopted by the city council by resolution. The adoption of the stage 2 policy shall not replace the requirements set forth in the ordinance from which this section is derived.

(3) *Requirements for termination.* Stage 2 of this plan may be rescinded when notification is received from NTMWD, that triggering conditions for stage 2 have ceased. Upon termination of stage 2, stage 1 becomes operative.

(c) *Stage 3 drought conditions.*

(1) *Requirement for initiation.* Customers shall be required to comply with the requirements and restrictions on certain nonessential water uses for stage 3 of this plan when, notification is received from NTMWD that stage 3 severe drought conditions exist and requests that the city initiate the appropriate stage of their drought contingency plan.

(2) *Drought responses.*

a. The goal for water use reduction under Stage 3 is a reduction of whatever amount is necessary in the amount of water obtained from NTMWD from the previous annual payment period prior to drought restrictions. If circumstances warrant or if required by NTMWD, the City Manager, General Manager, Mayor, Chief Executive, or official designee can set a goal for greater or lesser water use reduction.

b. Water use restrictions. The city manager may implement any action required by NTMWD. In addition, the city manager may order the implementation of any of the actions set forth in the stage 3 policy, as adopted by the city council by resolution. The adoption of the stage 3 policy shall not replace the requirements set forth in the ordinance from which this section is derived.

(3) *Requirements for termination.* Stage 3 of this plan may be rescinded when notification is received from NTMWD, that triggering conditions for stage 3 have ceased. Upon termination of stage 3, stage 2 becomes operative.

(Code § 31-188; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005; Ord. No. 2006-05-064, § 2, 5-22-2006; Ord. No. 2006-09-097, 9-5-2006; Ord. No. 2014-04-027, § 3, 4-15-2014)

Sec. 110-372. System limitation operations.

(a) *Stage 1—Mild limitations.*

(1) *Requirement for initiation.* Mild limitation operations are initiated when total daily water demand equals or exceeds 90 percent of the city's firm pumping capacity or of any delivery system of the city to specific water users for three consecutive days or 95 percent of capacity on a single day or if notification is received from NTMWD that mild limitations exist in their system.

(2) *Limitation responses.* The same steps will be taken for the water users affected as outlined in section 110-371(a)(2).

(b) *Stage 2—Moderate limitations.*

(1) *Requirement for initiation.* Moderate limitation operations are initiated when total daily water demand equals or exceeds 95 percent of the city's firm pumping capacity or of any delivery system of the city to specific water users for three consecutive days or 100 percent of capacity on a single day or if notification is received from NTMWD that moderate limitations exist in their system.

(2) *Limitation responses.* The same steps will be taken for the water users affected as outlined in section 110-371(b)(2).

(c) *Stage 3—Severe limitations.*

(1) *Requirement for initiation.* Severe limitation operations are initiated when total daily water demand equals or exceeds 100 percent of the city's firm pumping capacity or of any delivery system of the city to specific water users for three consecutive days or if notification is received from NTMWD that severe limitations exist in their system.

(2) *Limitation responses.* The same steps will be taken for the water users affected as outlined in section 110-371(c)(2).

(Code 1982, § 31-189; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005; Ord. No. 2014-04-027, §§ 2, 4, 4-15-2014)

Sec. 110-373. Enforcement.

(a) No person, corporation, firm, association, or other entity shall use or allow the use of water supplied by or in the city in a manner contrary to any provision of this article, or any policy adopted pursuant to this article, for residential, commercial, industrial, agricultural, governmental, or any other purpose.

(b) Any person, corporation, firm, association, or other entity violating this article may be assessed a civil penalty as set forth herein. Each day that one or more of the provisions of this article are not complied with shall constitute a separate violation. The water utilities and infrastructure director shall assess the person, corporation, firm, association, or other entity an administrative fee for each violation. The administrative fee for each violation of this article shall be as follows:

First violation - warning

Second violation - $50.00

Third violation - $100.00

Fourth and each subsequent violation - $150.00

In addition, suitable assurances, in a manner to be determined and set by the water utilities and infrastructure director, must be given that no further violations shall occur while the restrictions contained in this article are in effect. Further violations may result in further action by the city, up to and including the discontinuation or reduction of service. Compliance with this article may also be sought through injunctive relief in the district court.

(c) A person, corporation, firm, association, or other entity shall be presumed to be the violator if the person, corporation, firm, association, or other entity is the owner or occupant of the subject property, exercises actual or apparent control over the subject property, or is listed as the water customer of the city for the subject property. Proof that the violation occurred on or originated from the subject property shall constitute a rebuttable presumption that the person, corporation, firm, association, or other entity who owns, occupies, exercises actual or apparent control of, or is listed as the water customer for the subject property committed the violation. Parents shall be responsible for violations of their children, for purposes of this article a child is a person under 17 years old and proof that a violation, committed by a child, occurred on property where the parent is listed as the water customer or the parent is the owner or occupant of the property shall constitute a conclusive presumption that the parent committed the violation.

(d) Any city police officer, code enforcement officer, irrigation inspection officer or the water utilities and infrastructure director, or his/her designee, may issue the administrative penalty notice to a person he/she reasonably believes to be in violation of this article. The notice of administrative penalty shall be posted on the property where the violation occurs and shall include the following information:

(1) The date and time of the violation.

(2) The amount of the administrative penalty to be imposed for the violation.

(3) The date by which the administrative penalty must be paid or the request for an administrative appeal hearing must be made.

(4) A reference to this Code, article and section number.

(5) The address where the person, corporation, firm, association, or other may pay the administrative penalty in person or by mail.

(6) A notification that the person, corporation, firm, association, or other entity has the right to contest the imposition of the administrative penalty in an administrative appeal hearing by submitting a written request for an administrative appeal hearing within 15 calendar days after the date the administrative penalty notice is issued.

(7) A notification that failure to pay the administrative penalty or to timely request an administrative appeal hearing is considered an admission of liability for the violation, is a waiver of the person, corporation, firm, association, or other entity's right to appeal the imposition of the administrative penalty, and will result in the assessment of appropriate civil fines, penalties, and costs.

(8) A statement that the person, corporation, firm, association, or other entity will incur a late payment penalty if the person fails to pay the administrative penalty or request an administrative appeal hearing within 15 calendar days after the date of issuance of the administrative penalty.

(9) A notification that an arrest warrant may not be issued for failure to timely pay the administrative penalty, penalties, and costs.

(10) A notification that the city may take appropriate action under chapter 54 of the Texas Local Government Code, to enforce any administrative penalty assessed under this article.

(e) In the event that a person, corporation, firm association, or other entity responsible for a property where an administrative penalty notice is posted fails to respond to such notice, the city shall mail to the address of the person, corporation, firm, association, or other entity listed as the owner of the property where the violation occurred, via regular and certified mail, return receipt requested, a second notice with the following information:

(1) The name and address of the person, corporation, firm, association, or other entity who owns the property where the violation occurred.

(2) The address and description of the violation alleged.

(3) The date and time of the violation.

(4) The issuance date of the administrative penalty notice.

(5) The amount of the administrative penalty to be imposed for the violation and the amount of penalties, if any, to be assessed due to the failure to pay the administrative penalty in a timely manner.

(6) A notification that the person, corporation, firm, association, or other entity has waived the right to contest the imposition of the administrative penalty through an administrative appeal hearing.

(7) A notification that an arrest warrant may not be issued for failure to timely pay the administrative penalty, penalties, and costs.

(8) A notification that the city may take appropriate action under chapter 54 of the Texas Local Government Code, to enforce any administrative penalty assessed under this article.

Failure of the alleged violator to accept delivery, pick up or receive a copy of the administrative penalty notice sent via certified mail shall not constitute lack of service.

(f) A violation of this article is not subject to the provisions of section 1-18 and 1-19 of this Code. No criminal enforcement shall be taken for a violation of this article.

(Code 1982, § 31-190; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005; Ord. No. 2006-05-064, § 3, 5-22-2006; Ord. No. 2006-09-097, 9-5-2006; Ord. No. 2011-10-063, § 2, 10-18-2011; Ord. No. 2014-04-027, § 2, 4-15-2014)

Sec. 110-374. Exceptions from the application of this article.

(a) The city manager may, in writing, grant a temporary exception from the application of this article ("exception") for water uses otherwise prohibited under this plan if it is determined that failure to grant such exception would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such exception and if one or more of the following conditions are met:

(1) Compliance with this plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the plan is in effect; or

(2) Alternative methods can be implemented which will achieve the same level of reduction in water use.

(b) Persons requesting an exception shall file a petition for the exception with the city within five days after this plan or a particular drought or limitation response stage has been invoked. All petitions for exceptions shall be reviewed by the city manager and shall include the following:

(1) The name and address of the petitioner;

(2) The purpose of water use;

(3) The specific provisions of this plan from which the petitioner is requesting relief;

(4) A detailed statement as to how the specific provision of this plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this article;

(5) A description of the relief requested;

(6) The period of time for which exception is sought;

(7) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this plan and the compliance date; and

(8) Other pertinent information.

(c) Exceptions granted by the city shall be subject to the following conditions, unless waived or modified by the city manager or his designee:

(1) Exceptions granted shall include a timetable for compliance; and

(2) Exceptions granted shall expire when this plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

(Code 1982, § 31-191; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005; Ord. No. 2006-05-064, § 4, 5-22-2006)

Sec. 110-375. Contractual provisions.

Every wholesale water contract entered into or renewed after the effective date of this plan shall contain a provision that in case of a shortage of water resulting from drought, the water distributed shall be divided in accordance with V.T.C.A., Water Code § 11.039.

(Code 1982, § 31-192; Ord. No. 2002-02-005, § 1, 2-5-2002; Ord. No. 2005-05-52, § 1, 5-17-2005)

Sec. 110-376. Appeal of administrative penalty.

(a) *Appeal.* Upon receipt of a written notice of appeal of an administrative penalty, all papers, audio and video tapes, and any other items constituting the record of the action from which the appeal is taken shall be transmitted to the water utilities and infrastructure director. In the event that an appeal is taken from the decision of the water utilities and infrastructure director, all papers, audio and video, and any other items constituting the records of the action from which the appeal is taken shall be transmitted to the city manager, or his designee.

(b) *Initial appeal process.*

(1) The water utilities and infrastructure director shall hear an appeal of an administrative penalty under this article. The water utilities and infrastructure director shall give the appealing party an opportunity to present evidence and make argument on his/her behalf. The formal rules of evidence do not apply to an appeal hearing under this section and the water utilities and infrastructure director shall make his ruling on a basis of a preponderance of the evidence presented at the hearing.

(2) Upon receipt of the request for an appeal, a hearing before the water utilities and infrastructure director shall be scheduled to take place within ten calendar days from the date of receipt unless both parties agree to a certain date beyond the ten calendar days.

(3) The water utilities and infrastructure director may affirm, modify, or reverse all or part of the administrative penalty being appealed.

(4) After such hearing, the water utilities and infrastructure director shall notify the person, corporation, firm, association, or other entity of his decision by certified mail or by personal delivery.

(c) *Final appeal process.*

(1) The city manager, or his designee, shall hear any appeal of the water utilities and infrastructure director's decision under this section. The city manager, or his designee, shall give the appealing party an opportunity to present evidence and make argument on his/her behalf. The formal rules of evidence do not apply to a final appeal hearing under this section and the city manager, or his designee, shall make his ruling on a basis of a preponderance of the evidence presented at the hearing.

(2) Upon receipt of the request for an appeal from the decision of the water utilities and infrastructure director, a hearing before the city manager, or his designee, shall be scheduled to take place within ten calendar days from the date of receipt unless both parties agree to a certain date beyond the ten calendar days.

(3) The city manager, or his designee, may affirm, modify, or reverse all or part of the water utilities and infrastructure director's decision being appealed.

(4) After such hearing, the city manager shall notify the person, corporation, firm, association, or other entity of his decision by certified mail or by personal delivery. The decision of the city manager, or his designee, shall be final.

(Ord. No. 2011-10-063, § 3, 10-18-2011; Ord. No. 2014-04-027, § 2, 4-15-2014)

Secs. 110-377—110-393. Reserved.

Appendix D
AMERICAN COMMUNITY SURVEY

	McKinney city, Texas			
Label	**Estimate**	**Margin of Error**	**Percent**	**Percent Margin of Error**
SEX AND AGE				
Total population	199,174	±40	199,174	(X)
Male	98,468	±3,394	49.4%	±1.7
Female	100,706	±3,396	50.6%	±1.7
Sex ratio (males per 100 females)	97.8	±6.7	(X)	(X)
Under 5 years	14,334	±1,808	7.2%	±0.9
5 to 9 years	17,772	±2,533	8.9%	±1.3
10 to 14 years	15,326	±1,948	7.7%	±1.0
15 to 19 years	13,426	±2,080	6.7%	±1.0
20 to 24 years	10,320	±2,000	5.2%	±1.0
25 to 34 years	22,140	±3,433	11.1%	±1.7
35 to 44 years	34,422	±3,249	17.3%	±1.6
45 to 54 years	30,138	±2,762	15.1%	±1.4
55 to 59 years	9,841	±1,692	4.9%	±0.8
60 to 64 years	8,809	±1,942	4.4%	±1.0
65 to 74 years	13,411	±2,420	6.7%	±1.2
75 to 84 years	6,850	±1,515	3.4%	±0.8
85 years and over	2,385	±969	1.2%	±0.5
Median age (years)	37.2	±1.2	(X)	(X)
Under 18 years	57,321	±3,573	28.8%	±1.8
16 years and over	148,541	±3,347	74.6%	±1.7
18 years and over	141,853	±3,571	71.2%	±1.8
21 years and over	136,632	±3,544	68.6%	±1.8
62 years and over	26,276	±2,835	13.2%	±1.4
65 years and over	22,646	±2,870	11.4%	±1.4
18 years and over	141,853	±3,571	141,853	(X)
Male	68,228	±3,476	48.1%	±1.8
Female	73,625	±2,688	51.9%	±1.8
Sex ratio (males per 100 females)	92.7	±6.7	(X)	(X)
65 years and over	22,646	±2,870	22,646	(X)
Male	9,527	±1,488	42.1%	±3.2
Female	13,119	±1,722	57.9%	±3.2
Sex ratio (males per 100 females)	72.6	±9.5	(X)	(X)

RACE				
Total population	199,174	±40	199,174	(X)
One race	192,521	±2,211	96.7%	±1.1
Two or more races	6,653	±2,214	3.3%	±1.1
One race	192,521	±2,211	96.7%	±1.1
White	146,574	±6,656	73.6%	±3.3
Black or African American	23,214	±5,057	11.7%	±2.5
American Indian and Alaska Native	1,028	±636	0.5%	±0.3
Cherokee tribal grouping	N	N	N	N
Chippewa tribal grouping	N	N	N	N
Navajo tribal grouping	N	N	N	N
Sioux tribal grouping	N	N	N	N
Asian	20,130	±3,814	10.1%	±1.9
Asian Indian	9,179	±3,192	4.6%	±1.6
Chinese	4,127	±1,601	2.1%	±0.8
Filipino	786	±780	0.4%	±0.4
Japanese	424	±603	0.2%	±0.3
Korean	1,312	±1,305	0.7%	±0.7
Vietnamese	1,321	±1,127	0.7%	±0.6
Other Asian	2,981	±1,524	1.5%	±0.8
Native Hawaiian and Other Pacific Islander	48	±76	0.0%	±0.1
Native Hawaiian	N	N	N	N
Guamanian or Chamorro	N	N	N	N
Samoan	N	N	N	N
Other Pacific Islander	N	N	N	N
Some other race	1,527	±632	0.8%	±0.3
Two or more races	6,653	±2,214	3.3%	±1.1
White and Black or African American	1,932	±1,130	1.0%	±0.6
White and American Indian and Alaska Native	984	±480	0.5%	±0.2
White and Asian	2,274	±1,040	1.1%	±0.5
Black or African American and American Indian and Alaska Native	0	±234	0.0%	±0.1
Race alone or in combination with one or more other races				
Total population	199,174	±40	199,174	(X)
White	152,720	±6,436	76.7%	±3.2
Black or African American	25,396	±5,140	12.8%	±2.6
American Indian and Alaska Native	2,099	±801	1.1%	±0.4
Asian	23,098	±4,120	11.6%	±2.1
Native Hawaiian and Other Pacific Islander	N	N	N	N
Some other race	2,242	±859	1.1%	±0.4

HISPANIC OR LATINO AND RACE				
Total population	199,174	±40	199,174	(X)
Hispanic or Latino (of any race)	35,404	±5,574	17.8%	±2.8
Mexican	30,563	±5,780	15.3%	±2.9
Puerto Rican	1,155	±769	0.6%	±0.4
Cuban	643	±480	0.3%	±0.2
Other Hispanic or Latino	3,043	±1,074	1.5%	±0.5
Not Hispanic or Latino	163,770	±5,578	82.2%	±2.8
White alone	113,953	±6,827	57.2%	±3.4
Black or African American alone	23,143	±5,060	11.6%	±2.5
American Indian and Alaska Native alone	1,028	±636	0.5%	±0.3
Asian alone	19,952	±3,817	10.0%	±1.9
Native Hawaiian and Other Pacific Islander alone	48	±76	0.0%	±0.1
Some other race alone	0	±234	0.0%	±0.1
Two or more races	5,646	±2,002	2.8%	±1.0
Two races including Some other race	306	±399	0.2%	±0.2
Two races excluding Some other race, and Three or more races	5,340	±1,973	2.7%	±1.0
Total housing units	73,411	±2,740	(X)	(X)
CITIZEN, VOTING AGE POPULATION				
Citizen, 18 and over population	126,697	±4,658	126,697	(X)
Male	59,890	±3,500	47.3%	±1.8
Female	66,807	±3,013	52.7%	±1.8

Appendix E
CITY OF MCKINNEY LAND USE ASSUMPTIONS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CONTENTS

01 / Purpose and Overview

02 / Study Process

03 / Service Area Maps

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05 / Ultimate Projections

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PURPOSE AND OVERVIEW

To accurately determine the costs associated with providing infrastructure services to new and existing development, a study must be conducted to determine the type, amount, and location of existing development and expected growth. This study is called the Land Use Assumptions (LUA), and is the first step in the impact fee update process. Impact fees are levied against new development to pay for the off-site construction or expansion of infrastructure that is necessitated by the additional impact caused by the new development.

As defined by Chapter 395 of the Texas Local Government Code, impact fees are "a charge or assessment imposed by a political subdivision against new development in order to generate revenue for funding or recouping the costs of capital improvements or facility expansions necessitated by and attributable to the new development", and that "a political subdivision imposing an impact fee shall update the land use assumptions and capital improvements plan at least every five years".

STUDY PROCESS

This report documents the practical approach that was taken to determine Land Use Assumptions. The residential and non-residential growth projections formulated in this report were performed using reasonable and generally accepted forecasting and planning principles. The following data and procedures were used in developing this report:

Study Data

- Existing land uses and non-residential square footages (source: Collin Central Appraisal District).
- Existing zoning map and development regulations (source: City of McKinney).
- ONE McKinney 2040 Comprehensive Plan - Future Land Use Plan (source: City of McKinney).
- Historical population information (source: City of McKinney, U.S. Census Bureau).
- Texas Population Projections 2010 to 2050 (source: Texas Demographic Center)
- Proposals for residential and non-residential developments that have been approved by the City but not yet constructed (source: City of McKinney).

Primary Steps

1. Update service area boundaries in accordance with State Law requirements.
2. Determine baseline conditions for 2019 population and non-residential square footage
3. Project the ultimate buildout population and non-residential square footage.
4. Project population and non-residential square footage growth for the next ten years.

SERVICE AREA MAPS

What is a Service Area?

As defined by Local Government Code Chapter 395, a "service area" may include all or part of the land within the political subdivision or its ETJ to be served by the capital improvements or facilities expansions specified in the Capital Improvements Plan, except roadway facilities and storm water, drainage, and flood control facilities.

For roadway facilities, a service area is limited to an area within the corporate boundaries of the political subdivision and shall not exceed 6 miles. Roadway service area boundaries generally follow existing and future major thoroughfares. Also, roadway service areas represent areas of similar traffic generation characteristics and help to maintain efficiencies in accounting and administration of roadway impact fees.

Exhibit "A" shows the 2019 Roadway Service Area Map. The 2019 Roadway Service Area Map includes the same 13 Service Areas that the City of McKinney recognized during the 2012-2013 Impact Fee Update. Slight changes have been made to align service area boundaries with newly constructed roadways and the Master Thoroughfare Plan that was adopted in 2018 as part of the ONE McKinney 2040 Comprehensive Plan.

Exhibit "B" shows the 2019 Utility Service Area Map. Minor changes have been made to reflect changes in the ETJ boundary that have taken effect since the last impact fee update that was completed in 2012-2013.

For the purpose of further analysis and geographic specificity, sub-service areas were created to assist with the classification of existing population and non-residential square footages, and distribution of future projections. The sub-service areas are smaller boundary entities that nest within their larger service area counterparts.

"Roadway service areas represent areas of similar traffic generation characteristics"

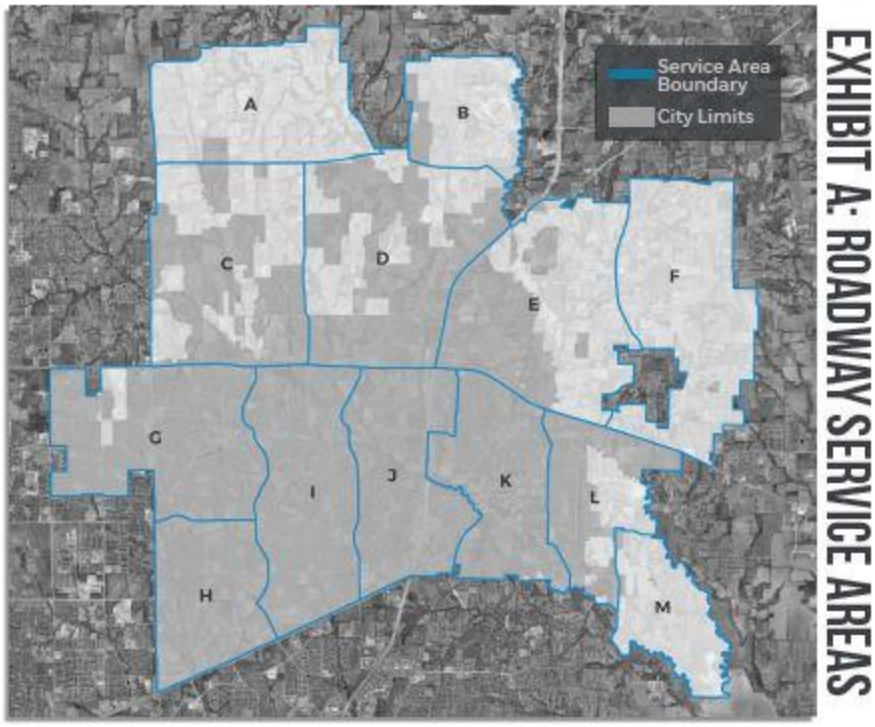

EXHIBIT A: ROADWAY SERVICE AREAS

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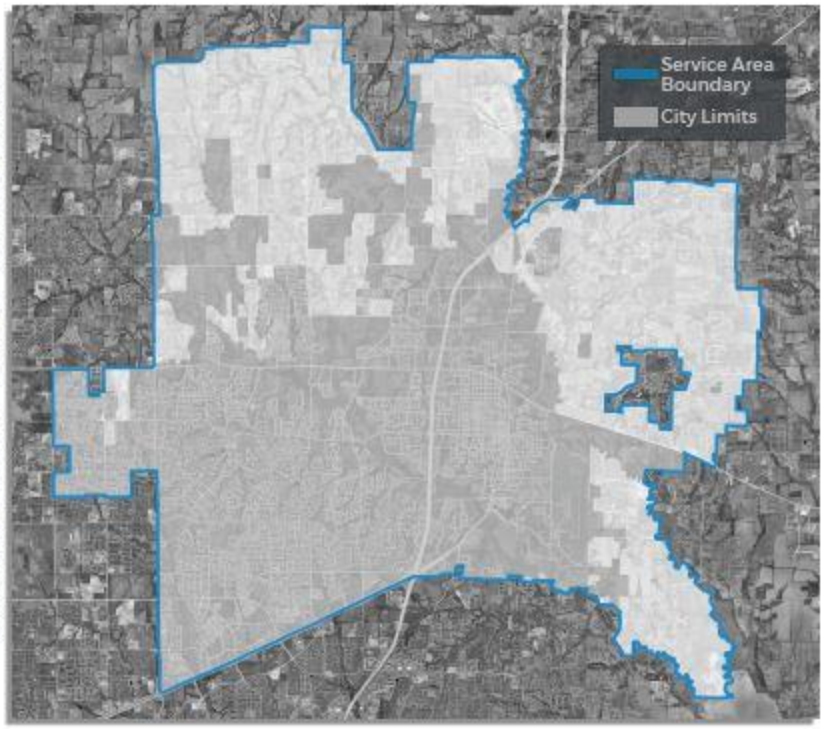

EXHIBIT B: UTILITY SERVICE AREA

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BASELINE DATA

Population

The baseline population in McKinney (including ETJ) as of January 1, 2019 has been estimated at 193,012.

Table 1 shows the population history for McKinney and its ETJ from the 2010 U.S. Census through the estimate for January 1, 2019. Using the official 2010 U.S. Census population as starting point, City Planning Staff estimated a population figure each year based on an analysis of building permit data for the previous years as well as on commonly accepted assumptions for occupancy rates and household sizes.

Table 1 illustrates that McKinney has been experiencing continual residential growth over the last nine years. This general trend of population growth is expected to continue throughout the ten year forecast of this study.

McKinney's population estimate was spatially distributed among the thirteen roadway service areas. To do this, City building permit data was used in conjunction with data from the 2010 Census to determine the location of McKinney's population. This permit data was subsequently converted into population using a "persons per dwelling unit figure" for single-family and multi-family housing types that is annually updated. For single-family, the average household size used is 3.08*. For multi-family, the average household size used is 2.17*.

YEAR	POPULATION	% GROWTH
2010	135,038	-
2011	137,406	1.8%
2012	141,330	2.9%
2013	145,511	3.0%
2014	153,807	5.7%
2015	159,100	3.4%
2016	166,569	4.7%
2017	174,141	4.5%
2018	184,420	5.9%
2019	193,012	4.7%

TABLE 1: POPULATION HISTORY

"McKinney has been experiencing continual residential growth over the last nine years"

6 *Estimated Persons per Dwelling Unit based on information obtained from the North Central Texas Council of Governments.

Non-Residential Square Footages

It is also necessary to establish a baseline figure for the square footage of non-residential uses currently in McKinney. For roadway impact fees, building square footage is the most common independent variable for the estimation of non-residential vehicle trips generated in the Institute of Transportation Engineers (ITE) Trip Generation Manual. Building square footage is closely tied to trip generation and is known at the time of assessment for an impact fee for a proposed development.

The building square footages were categorized into three commonly used land use classifications. Each classification has unique trip making characteristics.

Basic: Higher impact land uses that generate goods and services that are typically used and sold outside of McKinney, such as manufacturing, construction, transportation, warehousing, and other industrial uses.

Service: Land uses that provide personal and professional services, such as government facilities, schools, medical offices, and other professional offices.

Retail: Land uses where the retail sale of goods primarily serves households, and whose location choice is oriented towards a local market. Examples include restaurants, grocery, and clothing stores.

Baseline square footage of Basic, Service, and Retail uses are determined using data from Collin County Appraisal District (CAD). Collin CAD provides land use and square footage data for all existing non-residential uses within McKinney and its ETJ. Using this data, a summary table of all non-residential use categories within each service area was created. These figures act as the baseline conditions for non-residential square footages.

SERVICE AREA	RESIDENTIAL		NON-RESIDENTIAL SQUARE FEET		
	Population	*Dwelling Units*	*Basic*	*Service*	*Retail*
A	306	115	23,500	0	81,515
B	2,834	973	0	0	16,699
C	8,429	2,959	227,746	632,125	278,982
D	11,213	3,343	0	3,104,234	1,255,451
E	3,905	1,204	3,624,114	478,284	1,754,956
F	1,485	556	212,216	27,295	263,232
G	50,272	17,987	899,720	1,889,230	2,428,620
H	29,944	12,197	581,141	1,933,505	2,627,061
I	39,502	13,959	352,879	2,397,595	1,433,682
J	24,011	10,072	1,649,518	2,754,401	3,513,500
K	20,558	7,651	5,125,000	2,871,086	2,325,009
L	182	75	561,885	499,422	82,826
M	370	164	66,320	14,572	0
TOTAL	**193,012**	**71,255**	**13,324,039**	**16,601,750**	**16,061,533**

TABLE 2: BASELINE CONDITIONS

ULTIMATE BUILDOUT PROJECTIONS

Overview

An ultimate buildout projection is needed to determine the potential for additional growth that is available in the undeveloped areas of the city and ETJ. The ultimate buildout projection is broken into the same sub-categories as the baseline data (population, dwelling units, basic, service, and retail). The baseline data was used as the developed areas, and the undeveloped areas were broken into the two following categories:

Zoning Applications

Staff analyzed the zoning districts for all parcels within city limits that were considered undeveloped*. Base zoning districts were given an associated land use category (single-family, multi-family, basic, service, or retail). The Planned Development (PD) districts were reviewed and assigned one or more land use categories. In instances where multiple land uses existed in one zoning, the anticipated acreage of the different uses were applied. The land use acreages for each of these zonings were then multiplied by standard metrics from nearby existing conditions to determine the extent of additional growth that is possible. The standard metrics includes an average persons per acre for single-family and multi-family developments, as well as a typical floor-area-ratio (FAR) for non-residential uses. The districts from the ONE McKinney 2040 Comprehensive Plan's Preferred Scenario were utilized to derive a geographic and market specific approach in determining the existing condition metrics.

Future Land Use Plan Applications

Undeveloped areas located within the ETJ but outside the city limits are not subject to the City's zoning regulations. The Future Land Use Plan (FLUP) will be used to consider an appropriate land use at the time of development in the future. The ultimate buildout projection for the area within the ETJ but outside of the current city limits is calculated based on an analysis of the FLUP. Additionally, areas within city limits that are zoned "AG - Agricultural District" are anticipated to rezone and develop in the future and therefore will also adhere to FLUP designated land uses. The areas where the FLUP is applied were categorized by the Placetypes outlined in the ONE McKinney 2040 Comprehensive Plan. The Placetype acreages were multiplied using a calculator that determines anticipated population and square footages for non-residential uses. Since Placetypes are not land-use-specific, the calculator applies anticipated percentages to determine the associated acreage of a Placetype that will fall into one of the land use categories (residential, basic, service, retail).

8 *With the exception of Agricultural District zoned areas which are included in the Future Land Use Plan applications.

SERVICE AREA	RESIDENTIAL		NON-RESIDENTIAL SQUARE FEET		
	Population	*Dwelling Units*	*Basic*	*Service*	*Retail*
A	46,188	17,743	9,419,802	12,772,114	4,609,915
B	25,032	8,233	51,707	245,645	369,503
C	57,987	19,538	227,746	2,158,784	4,397,073
D	66,423	23,628	917,483	8,690,336	8,077,829
E	32,533	11,449	11,542,472	3,242,892	6,352,282
F	13,811	4,668	998,038	908,095	1,841,789
G	52,046	18,687	1,157,424	2,184,560	4,653,668
H	39,582	16,242	641,152	7,115,049	4,131,473
I	46,593	16,581	808,120	3,663,775	4,102,982
J	28,292	11,771	2,180,080	6,881,683	5,658,617
K	24,126	9,048	7,823,668	4,434,426	2,966,485
L	300	114	9,239,373	3,235,736	420,080
M	957	362	4,152,840	1,076,720	229,602
TOTAL	**433,869**	**158,064**	**49,159,907**	**56,609,815**	**47,811,298**

TABLE 3: BUILDOUT CONDITIONS

[Existing Population] + [Zoning Applications] + [FLUP Applications] = [Ultimate Buildout]

"An ultimate buildout projection is needed to determine the potential for additional growth"

9

10-YEAR GROWTH ASSUMPTIONS

This study considers the years 2019-2029. Acknowledging that the parameters of the study (city limits, Master Thoroughfare Plan, Comprehensive Plan, zoning maps, existing development, etc.) are changing constantly, this study is based on conditions as they were on January 1, 2019.

Population Projections

The following methods were used in projecting the population of McKinney in 2029. An explanation of why these methods were chosen follows their description.

Gompertz Method
The Gompertz growth curve is an extrapolation method that generally fits the growth pattern of McKinney over the last few years. It assumes that, during the total growth period of a geographic area, the growth is slow in the beginning, then increases exponentially for a period of time, and then tapers off as the population approaches an upper growth limit. Using the ultimate population (433,869) from the ultimate buildout projections as the upper growth limit, a Gompertz curve has been plotted and used in part to project the population in 2029.

Ratio Method
Projections for larger geographic areas (i.e. counties or regions) are more reliable than projections for smaller areas (i.e. cities) since a larger population base is less likely to exhibit short term variations. For this reason, the ratio method has also been utilized. This method operates under the assumptions that if a relationship between a city's population and its larger geographic area has a generally fixed ratio, the population of the city can be related and projected based on the population projection of the larger area. Eight variations of the ratio method were tested for their ability to project McKinney's population over the next ten years. From these methods, the two best performing were chosen, McKinney's share of Collin County's growth, and Collin County's population rate of change.

The Texas Demographic Center's Population Projections Program produces projections for the state, and all counties in the state by age, sex and race/ethnicity. These projections contain the anticipated population for Collin County for every year from 2010 to 2050. Using the ratio methods described above, and for the purposes of the Land Use Assumptions, McKinney's population was projected out to 2029.

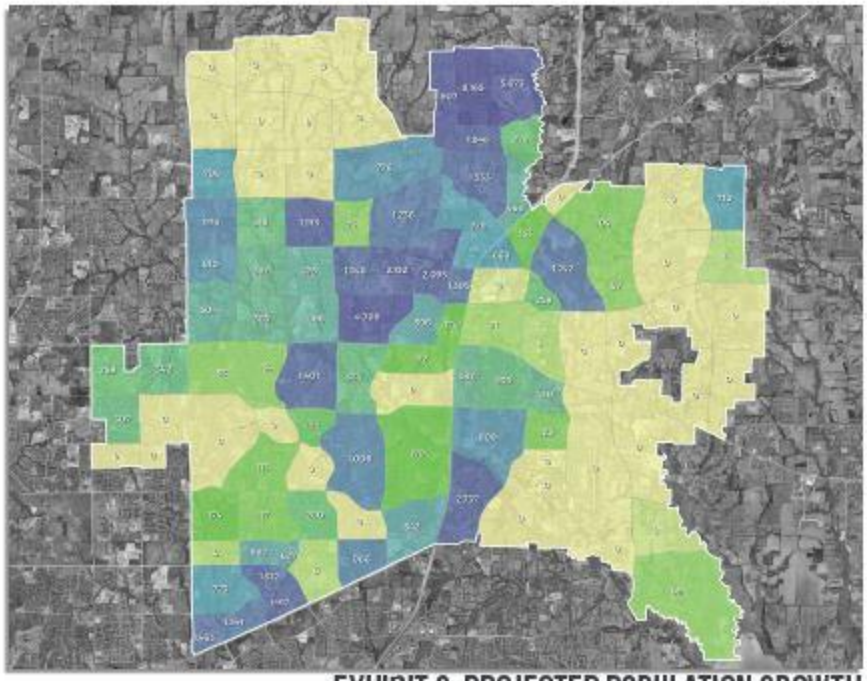

EXHIBIT C: PROJECTED POPULATION GROWTH

Similar to previous iterations of Land Use Assumptions, in projecting the population for McKinney it is assumed that using a combination of the Ratio and Gompertz method will perform best. The Ratio projection methods are a simplified extension of existing or predicted population trends. Gompertz is a logarithmic curve that recalculates new projections as new data points (updated yearly populations) are added. The combination of these methods help to provide a balanced approach for population projections.

In deriving the 2029 population, a weighted average was used between the three population projections (Collin County's Growth Share, Collin County's Population Rate of Change, and Gompertz) for the two methods. The average divides the weight of the projections by method, allotting 50% of the weight to the Ratio Method, and 50% to Gompertz. From this average, a population of 262,084 was calculated for McKinney in 2029; a growth of 69,073 from the 2019 population of 193,012.*

Once the population was projected for the ten year window, distribution was completed using the spatial data generated during the buildout potential calculation. The existing level of developed area in a sub-service area was calculated as well as the sub-service area's remaining growth potential. Then, using common Planning practices the sub-service area's buildout percent was structured to reflect conditions that area likely to exist in 2029. These incremental percentage increases generate additional population, and are influenced by the sub-service areas buildout potential and location.

*2019 and 2029 population distribution maps can be found in the Appendix.

10-YEAR GROWTH ASSUMPTIONS

Non-Residential Projections

To forecast the amount of growth in Basic, Service, and Retail land use categories over the ten year period of the study, a combination of methods were utilized. The previous ten years of non-residential square footages were analyzed on a service area basis to identify existing trends. The most consistent and noticeable trend were the land use categories relationship's with population. By analyzing the amount of Basic, Service, and Retail square feet per person for the last ten years, the following trends were identified:

Basic: It is assumed that as McKinney's population increases, the amount of Basic square footage per person will decrease. While total square feet of Basic has increased, the general trend for the past ten years showed a decrease in square feet per person. An average of the ten year median, and a ten year trend were used to determine a square foot per person growth over the next ten years. An additional 4,230,559 square feet of Basic is expected by 2029.

Service: It is assumed that as McKinney's population increases, the amount of Service square footage per person will remain the same. The general trend for the past five years showed a slight decrease in square feet per person. A five year median was used to determine a square foot per person growth over the next ten years. An additional 6,160,065 square feet of Service is expected by 2029.

Retail: It is assumed that as McKinney's population increases, the amount of Retail square footage per person will slightly increase. The general trend for the past ten years showed a general increase in square feet per person. An average of the ten year median, and a ten year trend were used to determine a square foot per person growth over the next ten years. An additional 6,136,024 square feet of Retail is expected by 2029.

Once the square footages were projected for the ten year window, distribution was completed using the spatial data generated during the buildout determination process. The existing level of developed area in a sub-service area was calculated as well as the sub-service area's remaining non-residential growth potential. Then, using common Planning practices the sub-service area's buildout percent was structured to reflect conditions that area likely to exist in 2029. These changes in percent generate additional square footages for the three land uses, and are influenced by the sub-service areas buildout potential.

SERVICE AREA	RESIDENTIAL		NON-RESIDENTIAL SQUARE FEET		
	Population	Dwelling Units	Basic	Service	Retail
A	0	0	0	0	0
B	21,871	6,959	10,071	207,903	86,236
C	6,945	2,312	0	726,068	438,993
D	17,370	6,277	59,635	700,061	830,401
E	2,506	873	2,482,408	199,736	725,194
F	713	118	19,891	71,783	212,738
G	1,130	435	30,630	69,408	719,260
H	8,439	3,495	14,932	1,806,746	787,669
I	4,218	1,608	112,104	252,841	1,199,668
J	4,112	1,390	227,006	1,733,118	774,630
K	1,700	639	504,952	247,260	331,012
L	0	0	597,354	113,513	16,437
M	69	23	171,577	31,628	13,786
TOTAL	69,073	24,128	4,230,559	6,160,065	6,136,024

TABLE 4: PROJECTED GROWTH

SERVICE AREA	RESIDENTIAL		NON-RESIDENTIAL SQUARE FEET		
	Population	Dwelling Units	Basic	Service	Retail
A	306	115	23,500	0	81,515
B	24,705	7,932	10,071	207,903	102,935
C	15,374	5,271	227,746	1,358,193	717,975
D	28,583	9,620	59,635	3,804,295	2,085,852
E	6,411	2,077	6,106,522	678,020	2,480,149
F	2,198	674	232,107	99,078	475,970
G	51,402	18,422	930,350	1,958,638	3,147,880
H	38,383	15,692	596,073	3,740,251	3,414,730
I	43,720	15,567	464,983	2,650,436	2,633,350
J	28,123	11,462	1,876,524	4,487,519	4,288,131
K	22,258	8,290	5,629,951	3,118,347	2,656,021
L	182	75	1,159,239	612,935	99,263
M	439	187	237,897	46,200	13,786
TOTAL	262,084	95,383	17,554,598	22,761,815	22,197,558

TABLE 5: 2029 BASELINE CONDITIONS

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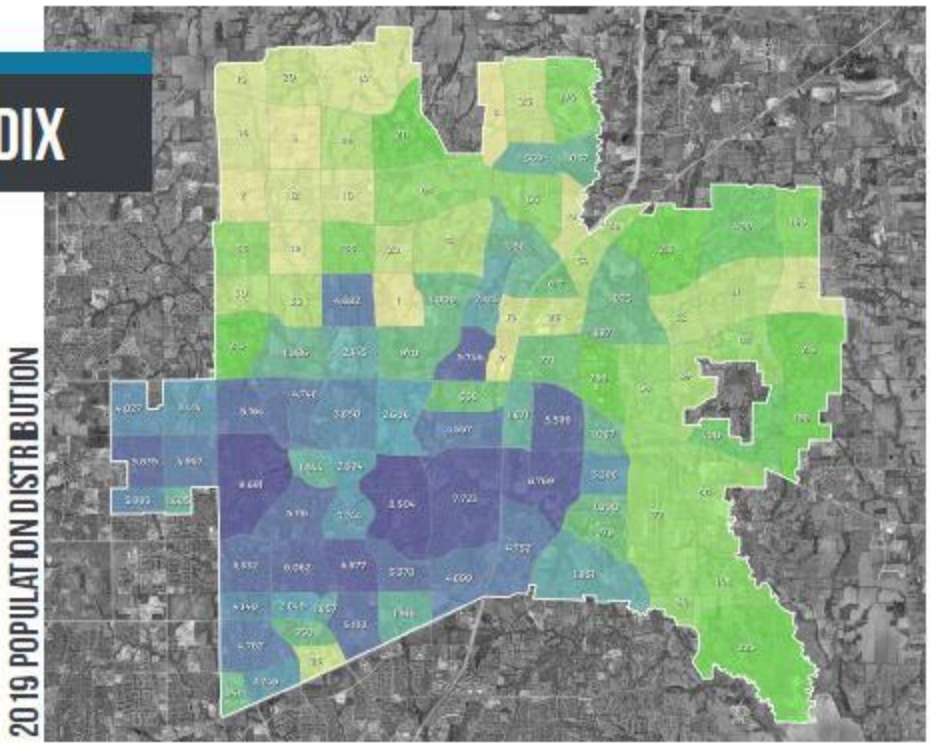
APPENDIX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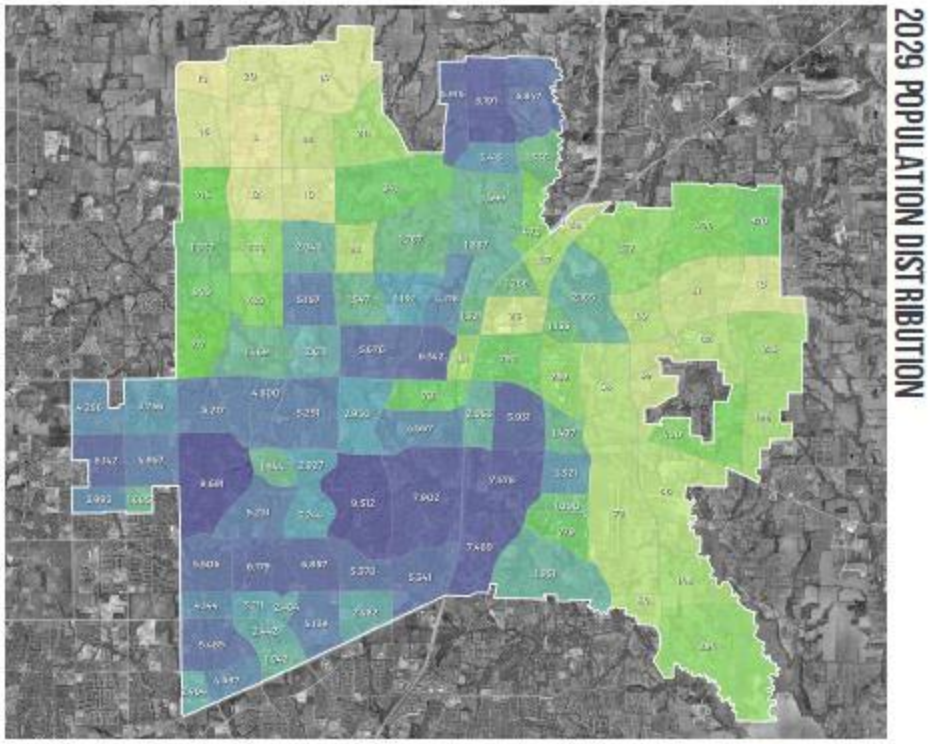
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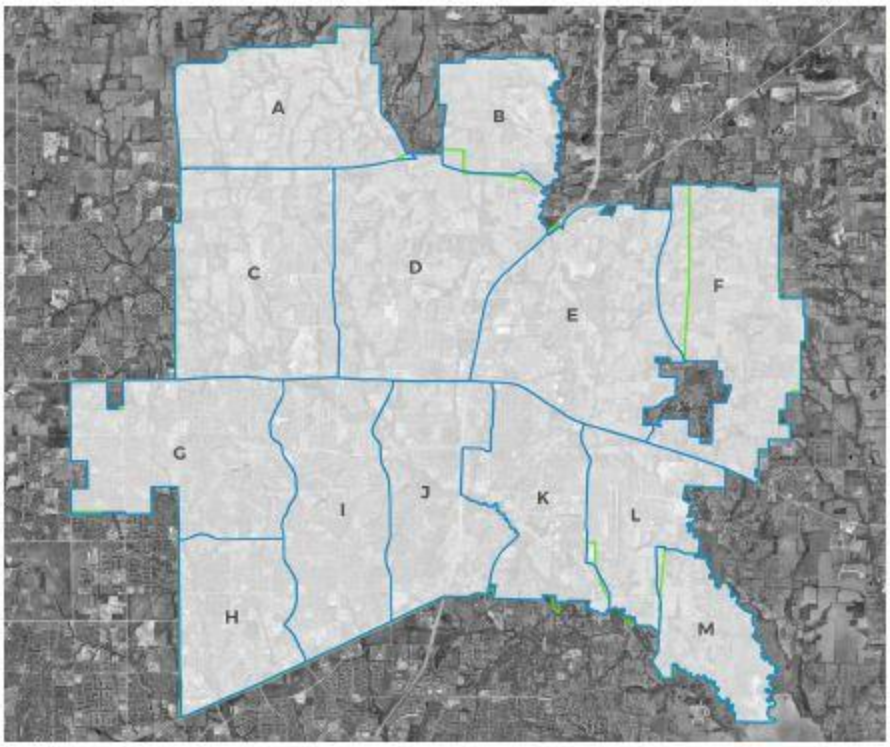
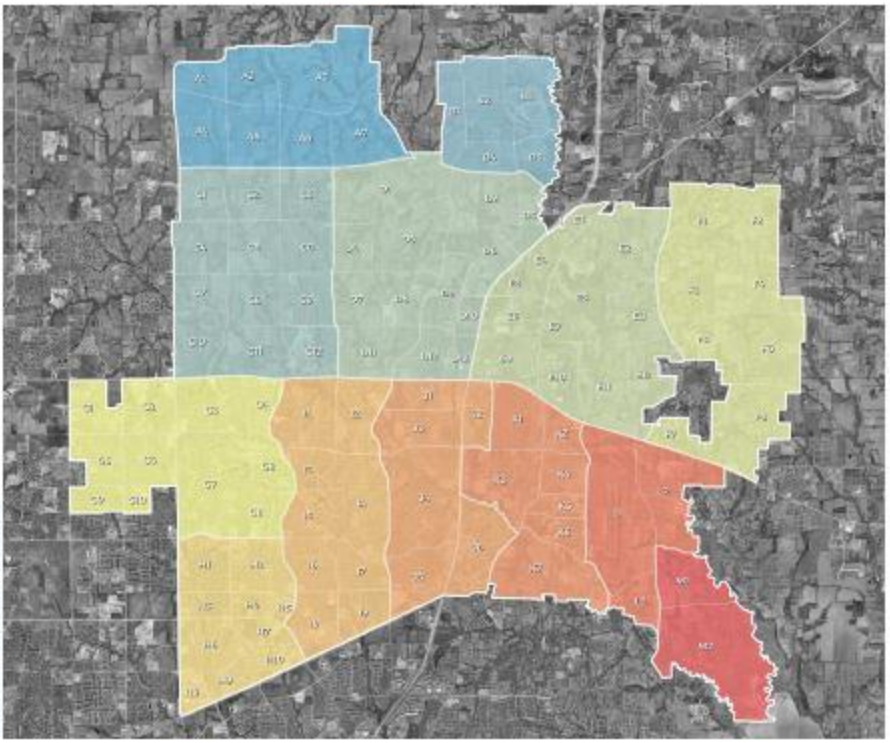
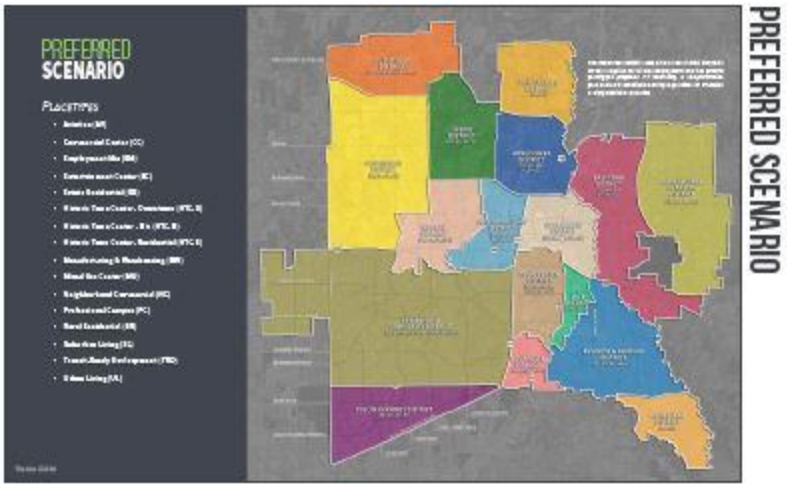


SERVICE AREA CHANGES



SUBSERVICE AREAS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PLACETYPES
PREFERRED SCENARIO


LAND USE
DIAGRAM
LEGEND
FUTURE LAND USE DIAGRAM

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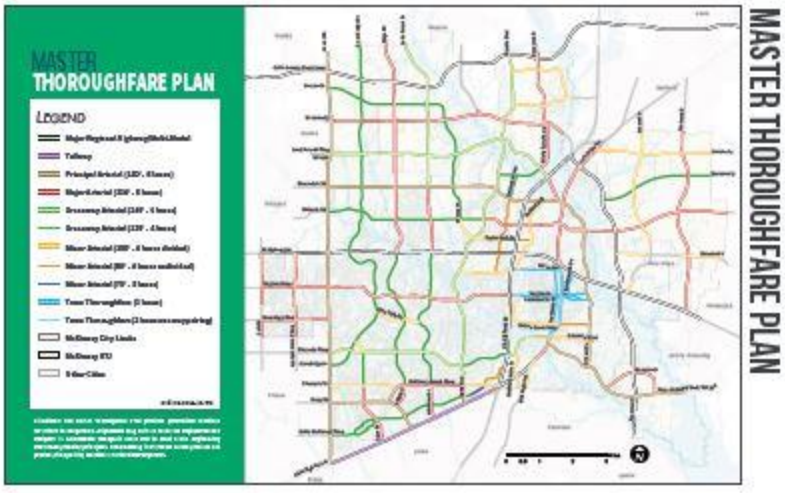
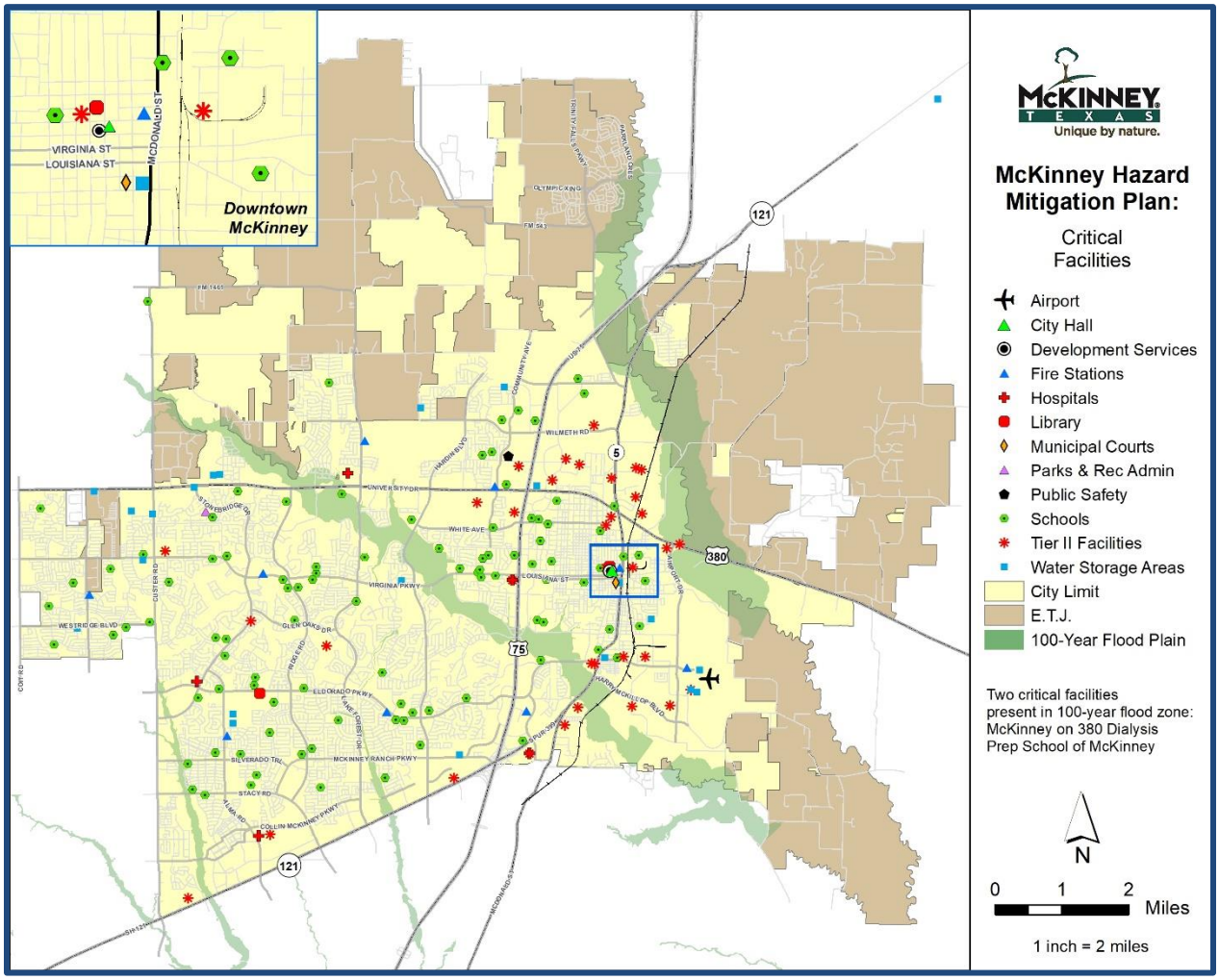

MASTER
THOROUGHFARE PLAN
LEGEND
MASTER THOROUGHFARE PLAN

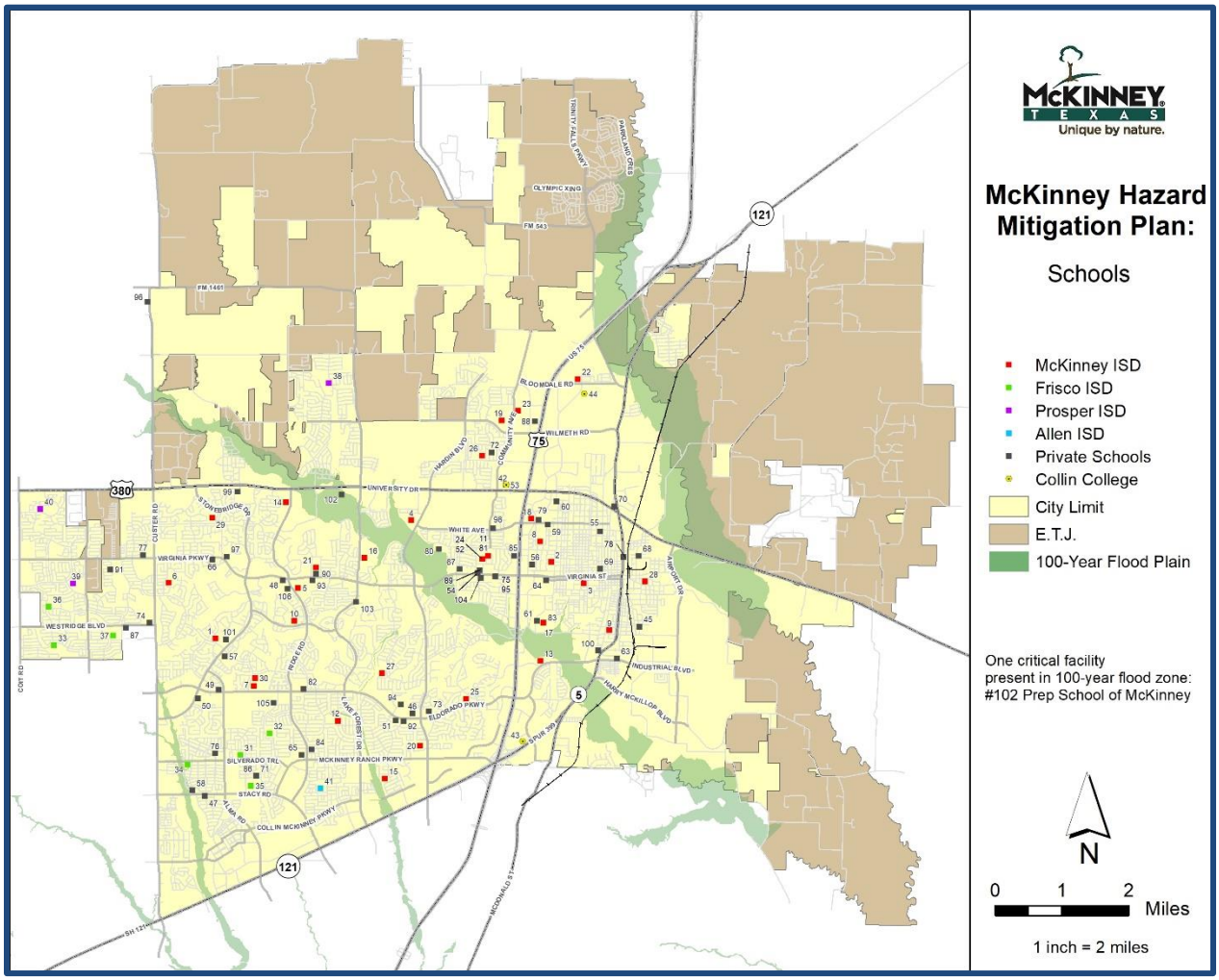
Appendix F
CRITICAL FACILITIES WITHIN AND NEAR THE FLOOD PLAINS

Appendix G
CRITICAL FACILITIES WITHIN AND NEAR THE FLOOD PLAINS

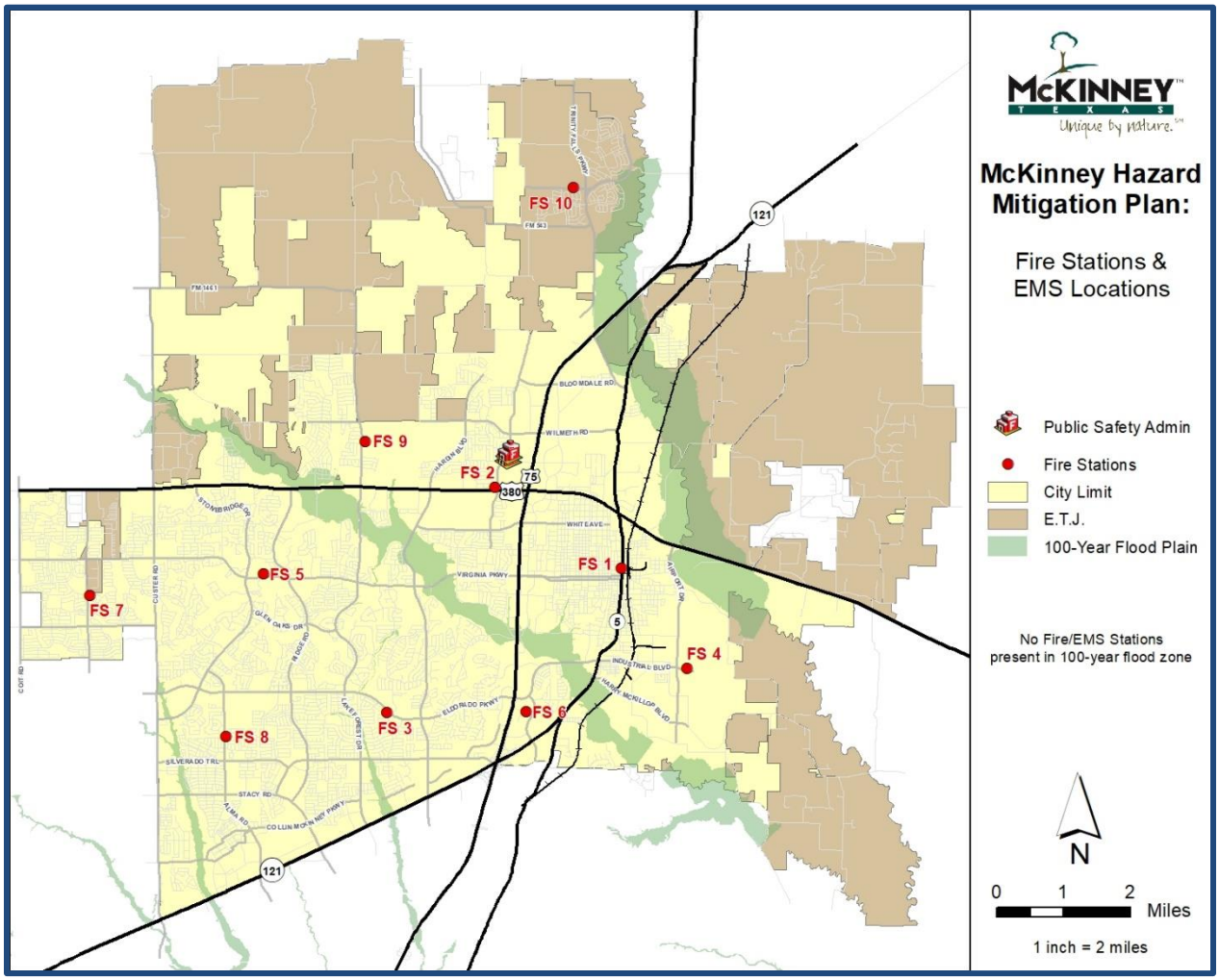
Critical Facilities



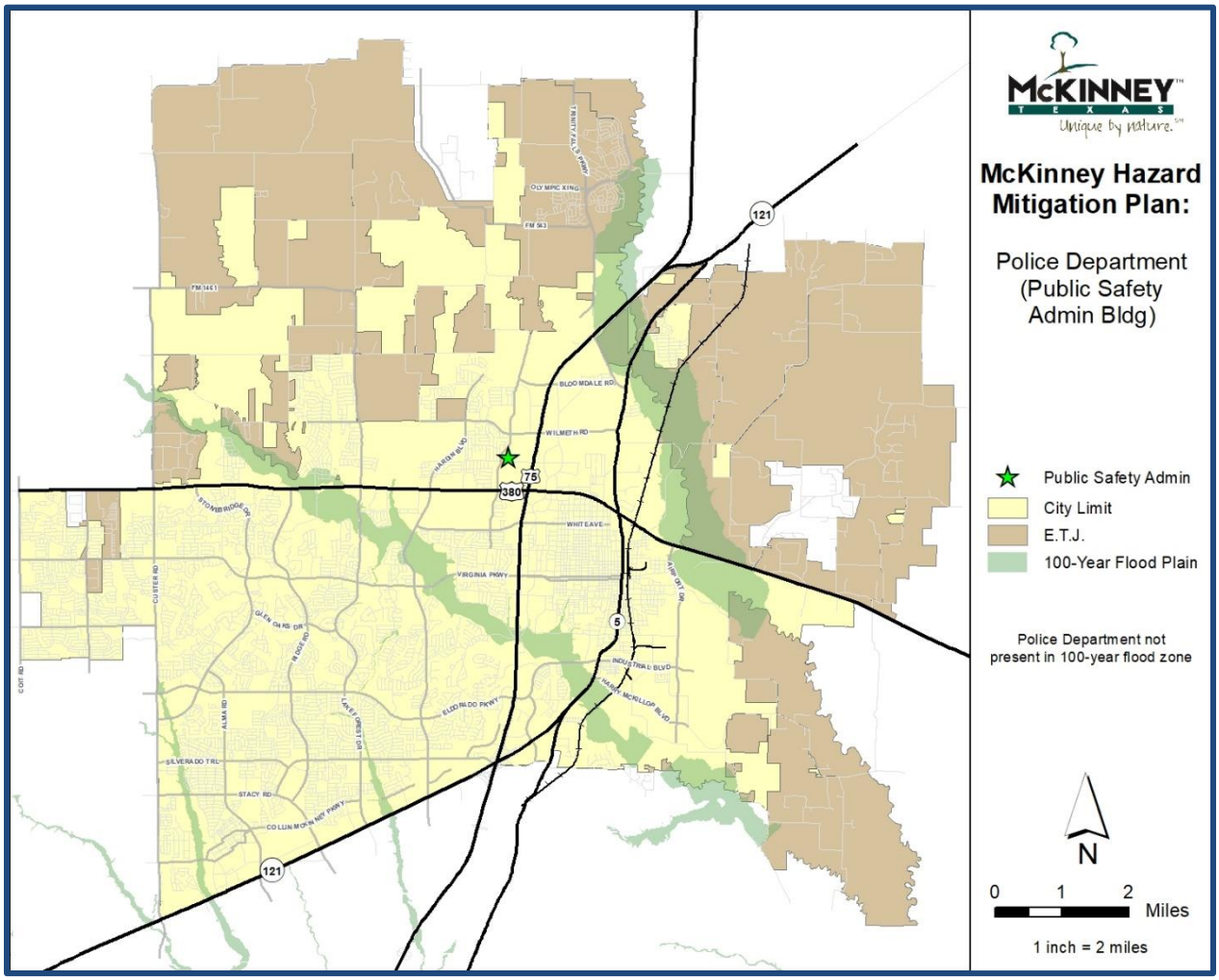
Public Education Facilities



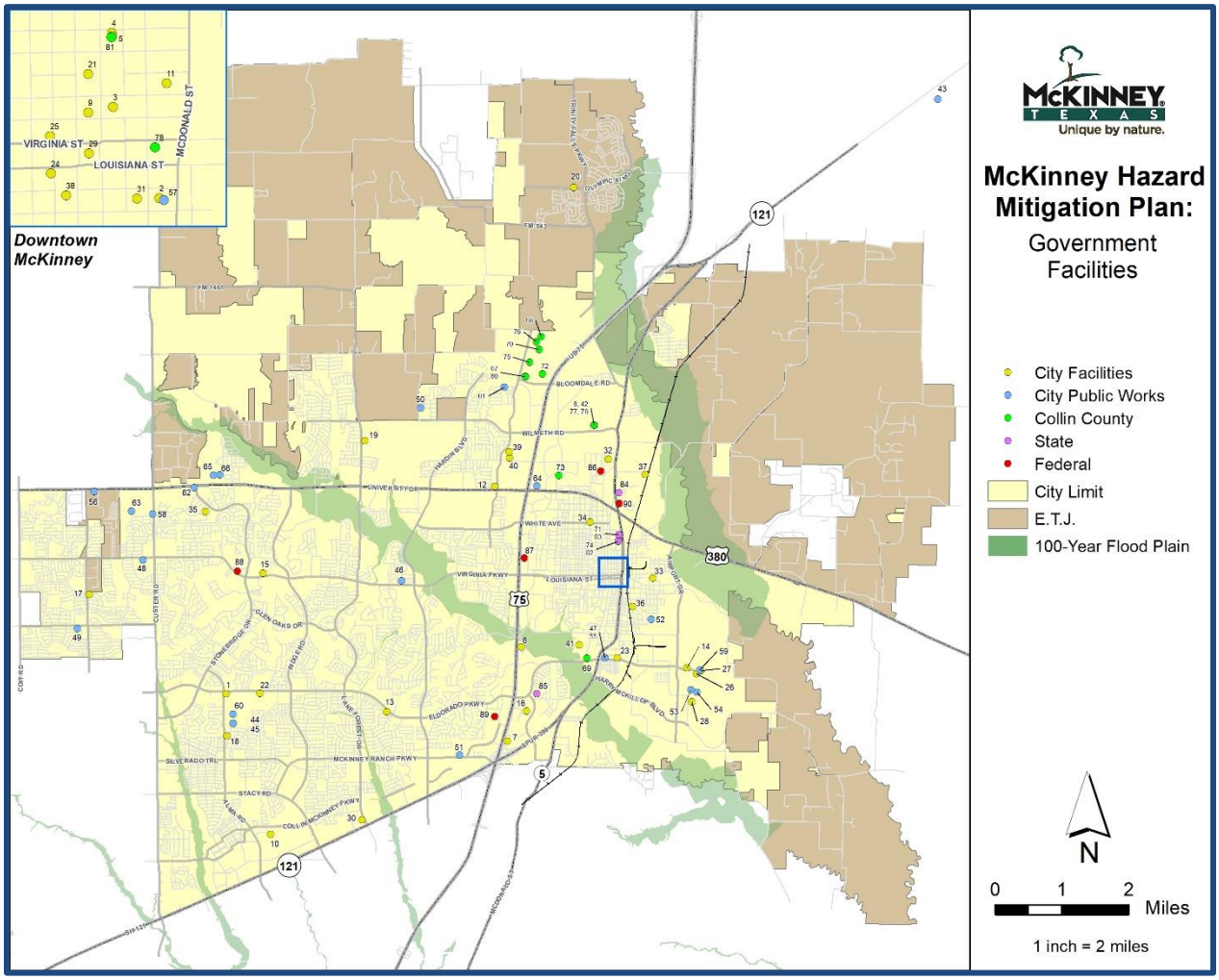
Fire Station/EMS Facilities



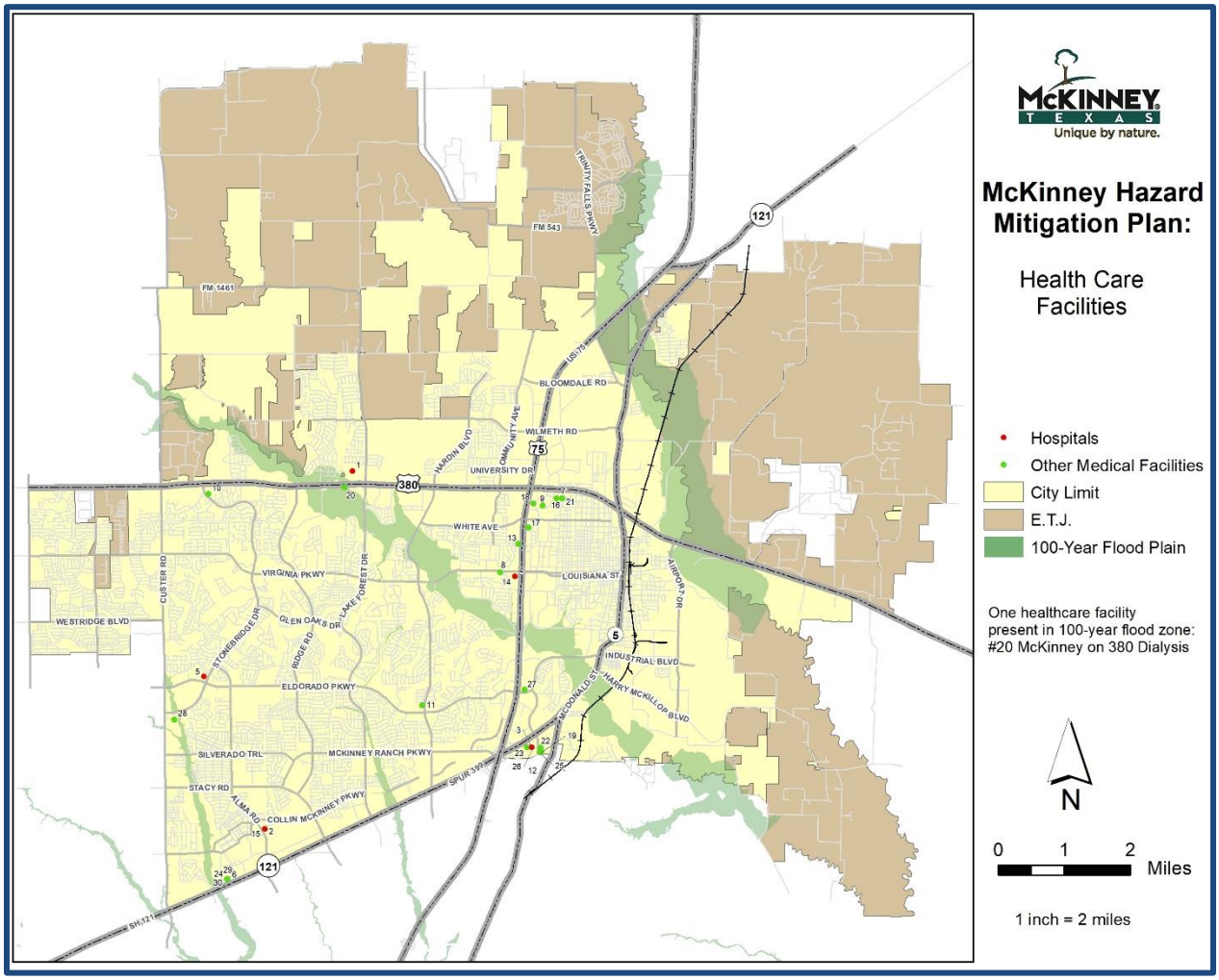
Police Department Facilities



Government Facilities



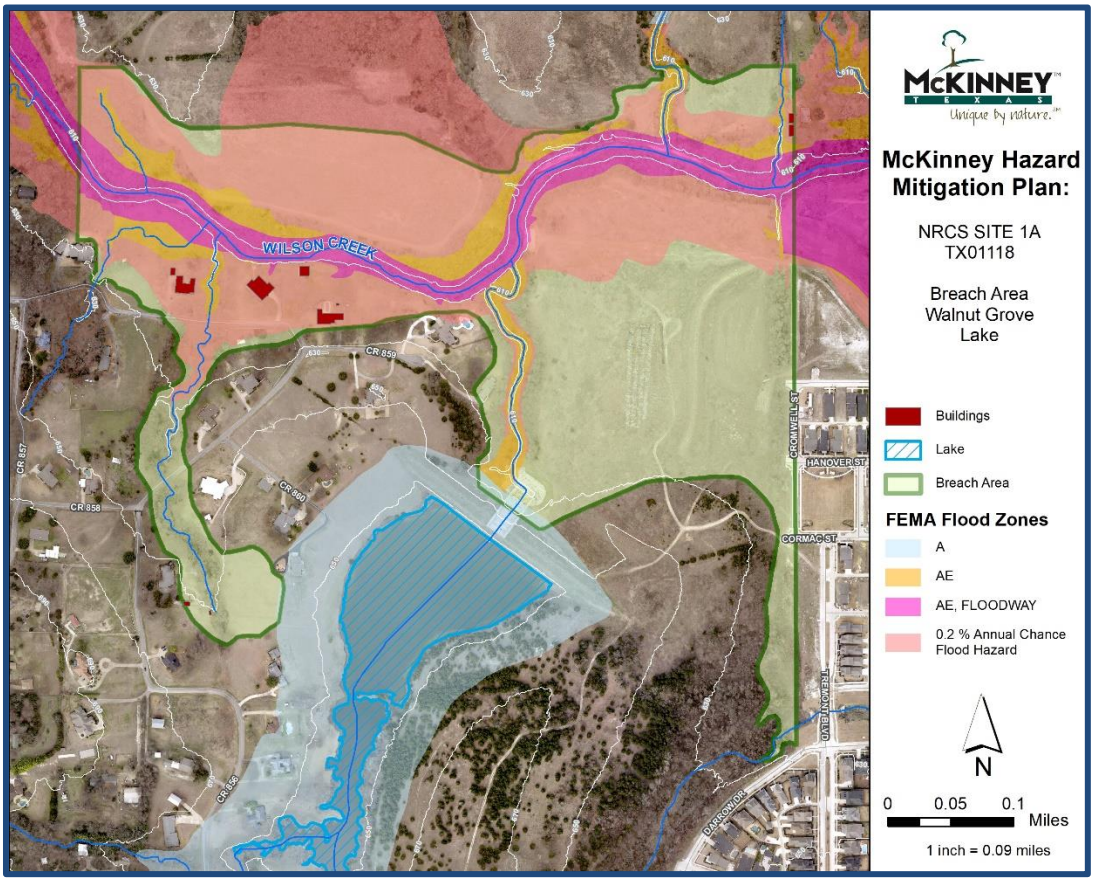
Healthcare Facilities



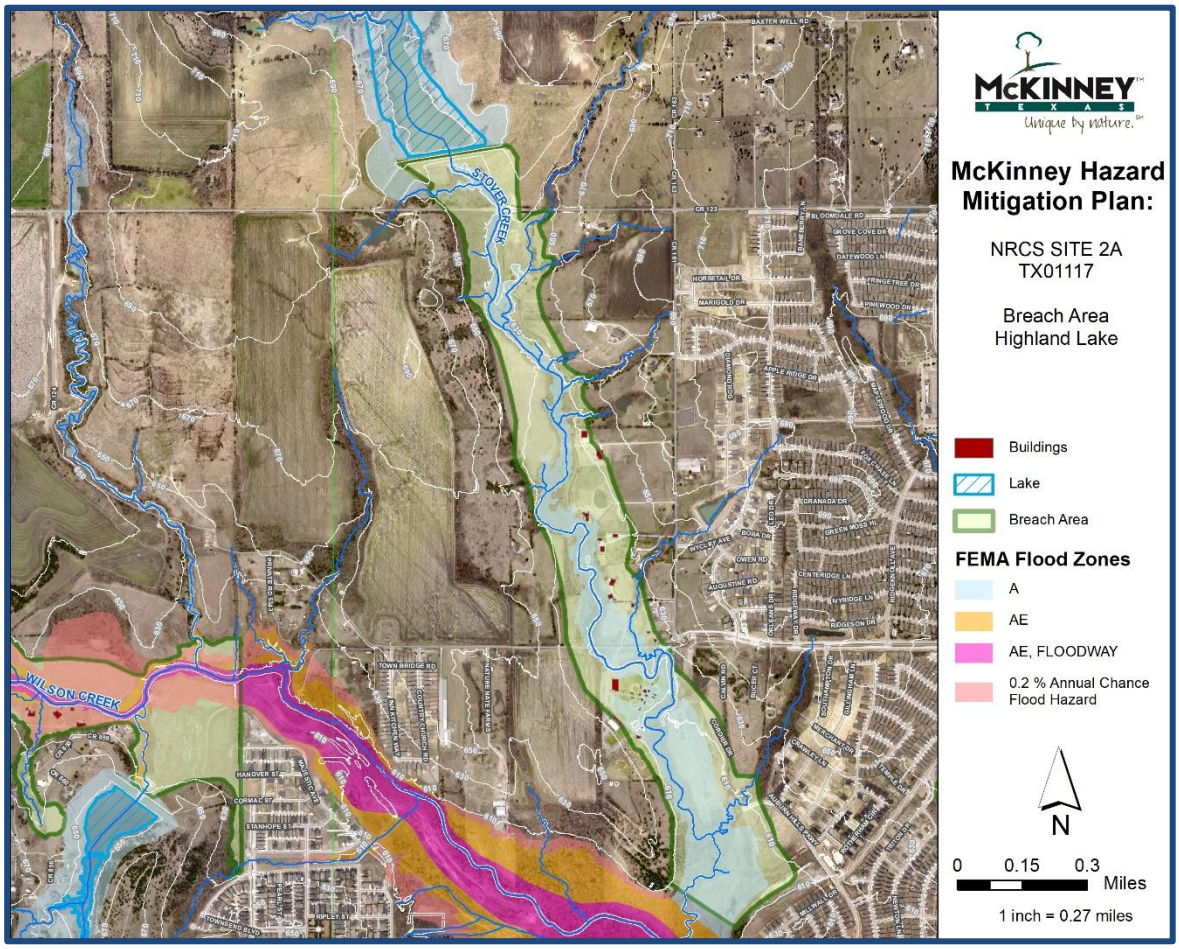
Appendix G
CITY OF MCKINNEY DROUGHT CONTINGENCY PLAN

Appendix H
BREACH INUNDATION MAPS AND STRUCTURES IN INUNDATION AREA

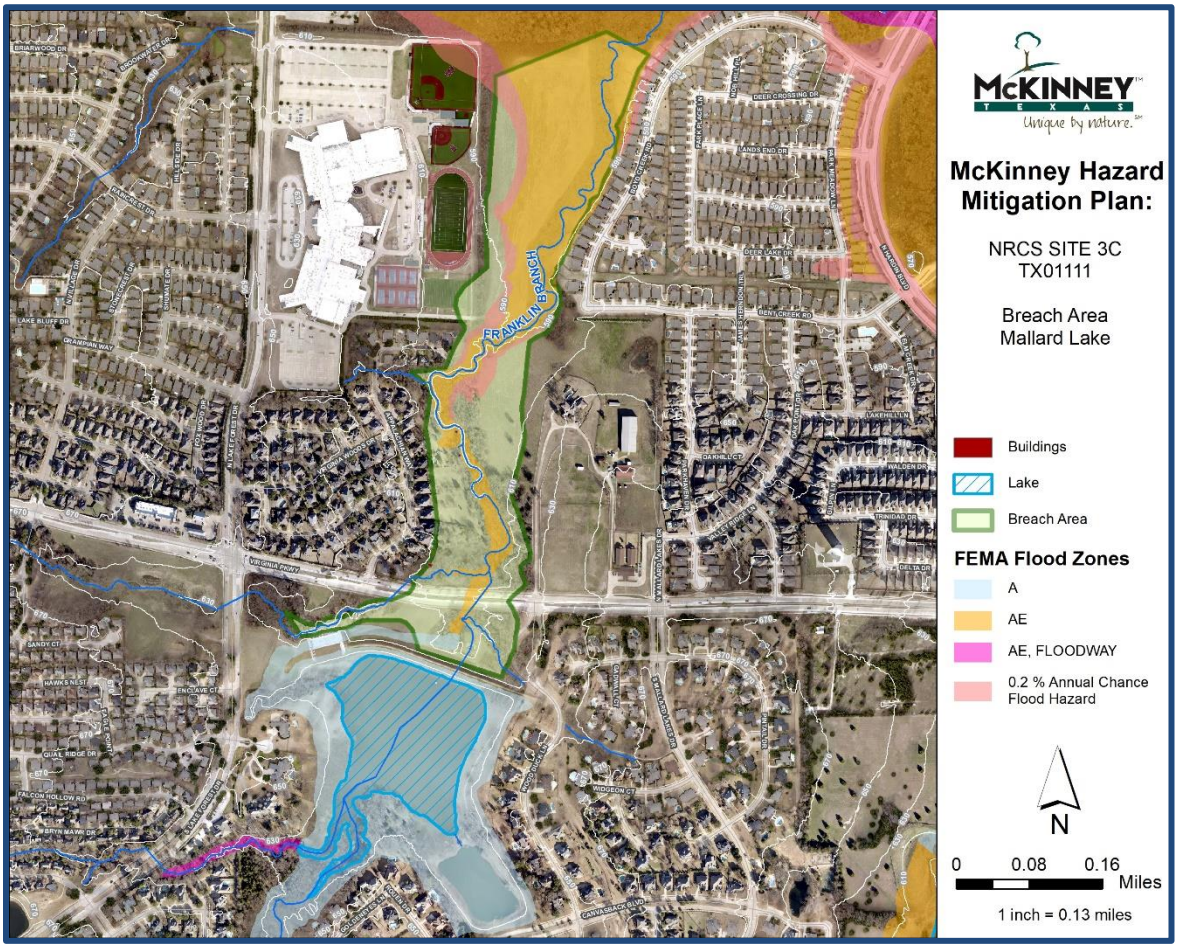
Site 1A - TX01118 - Walnut Grove Lake



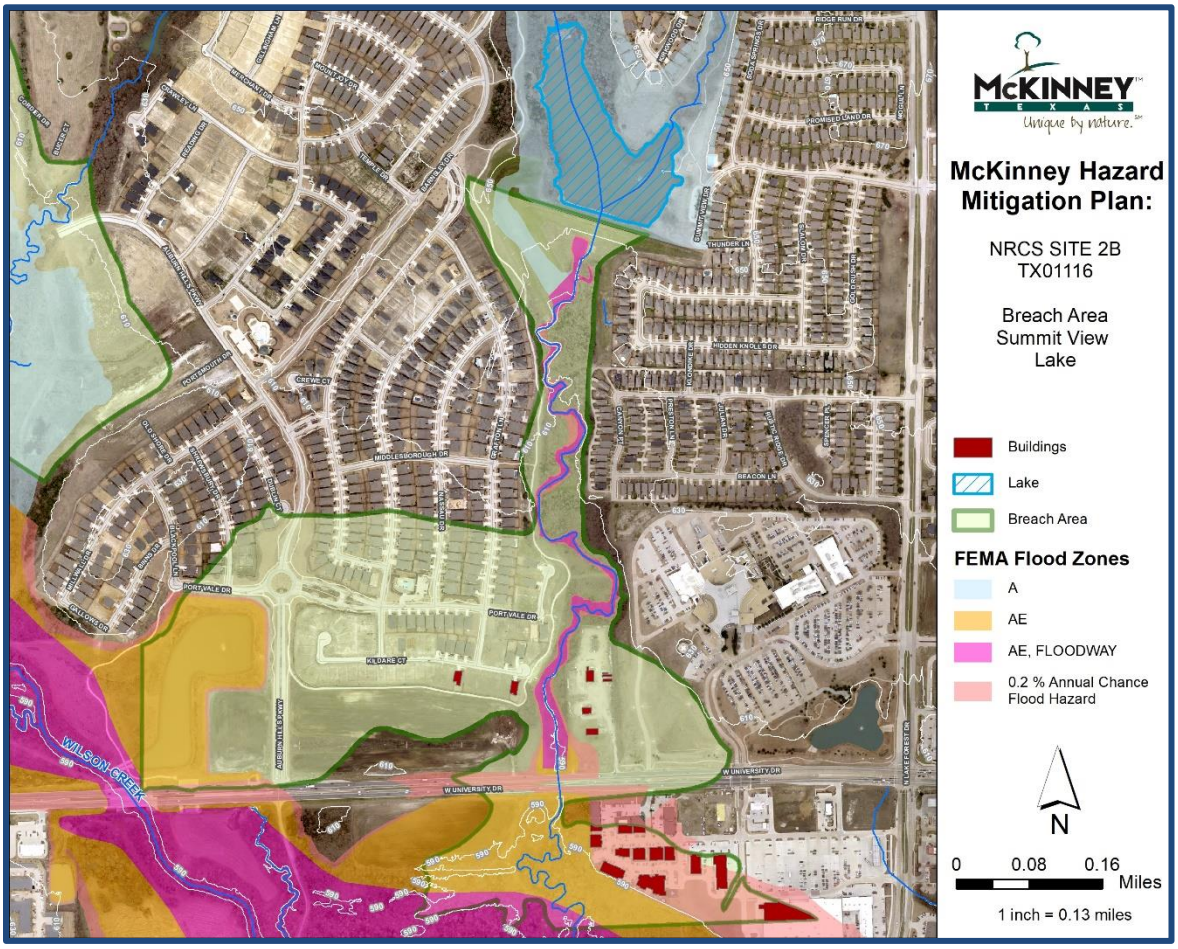
Site 2A – TX01117 - Highland Lake



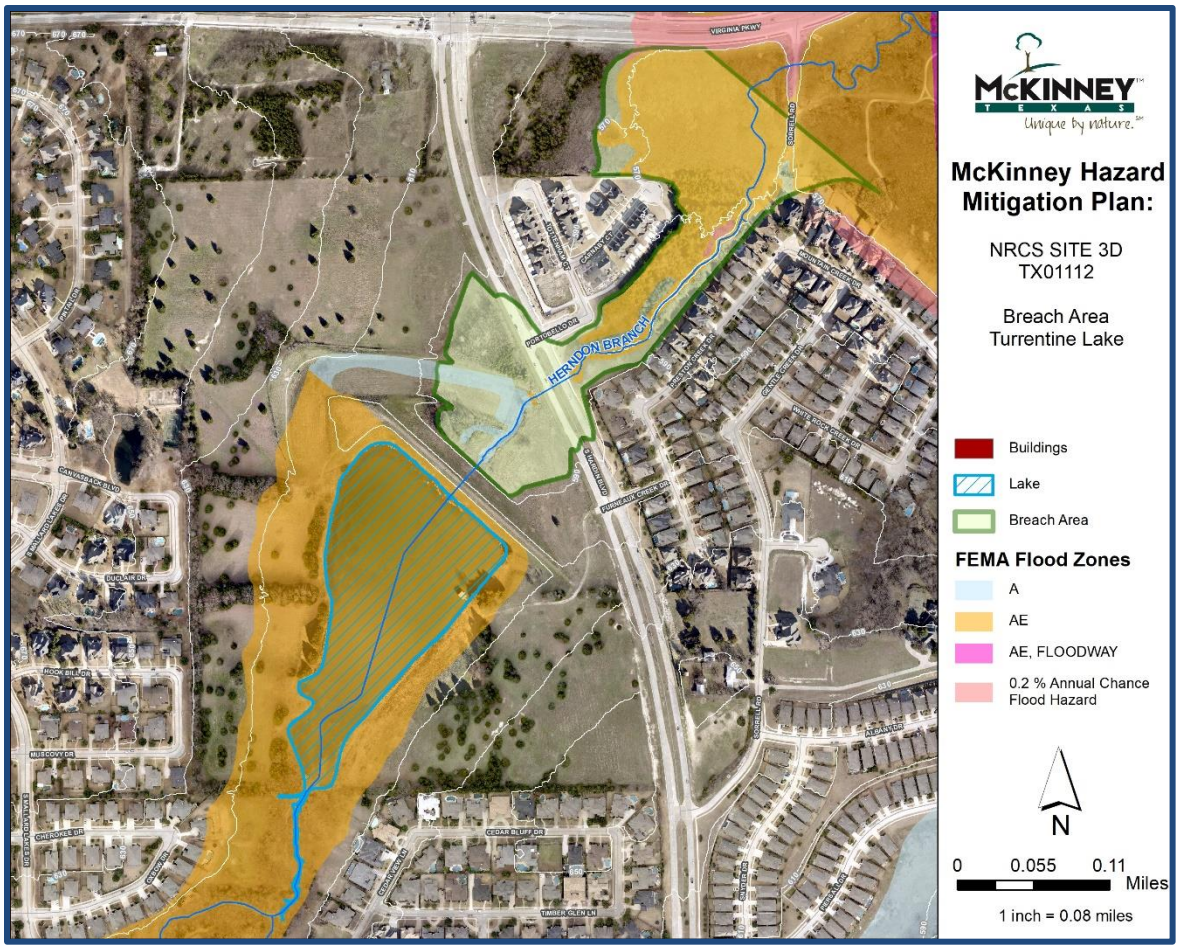
Site 3C – TX01111 - Mallard Lake



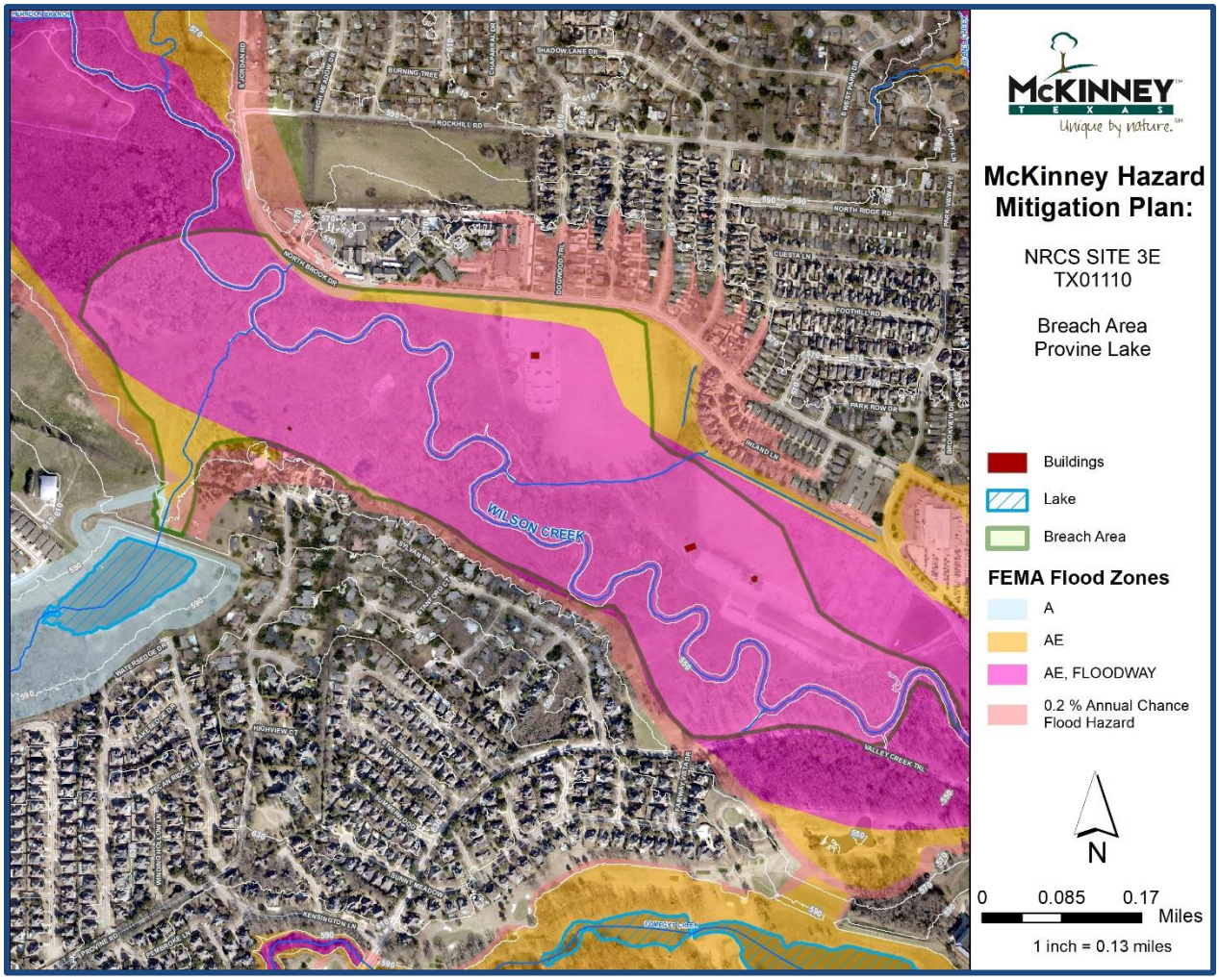
Site 2B – TX01116 - Summit View Lake



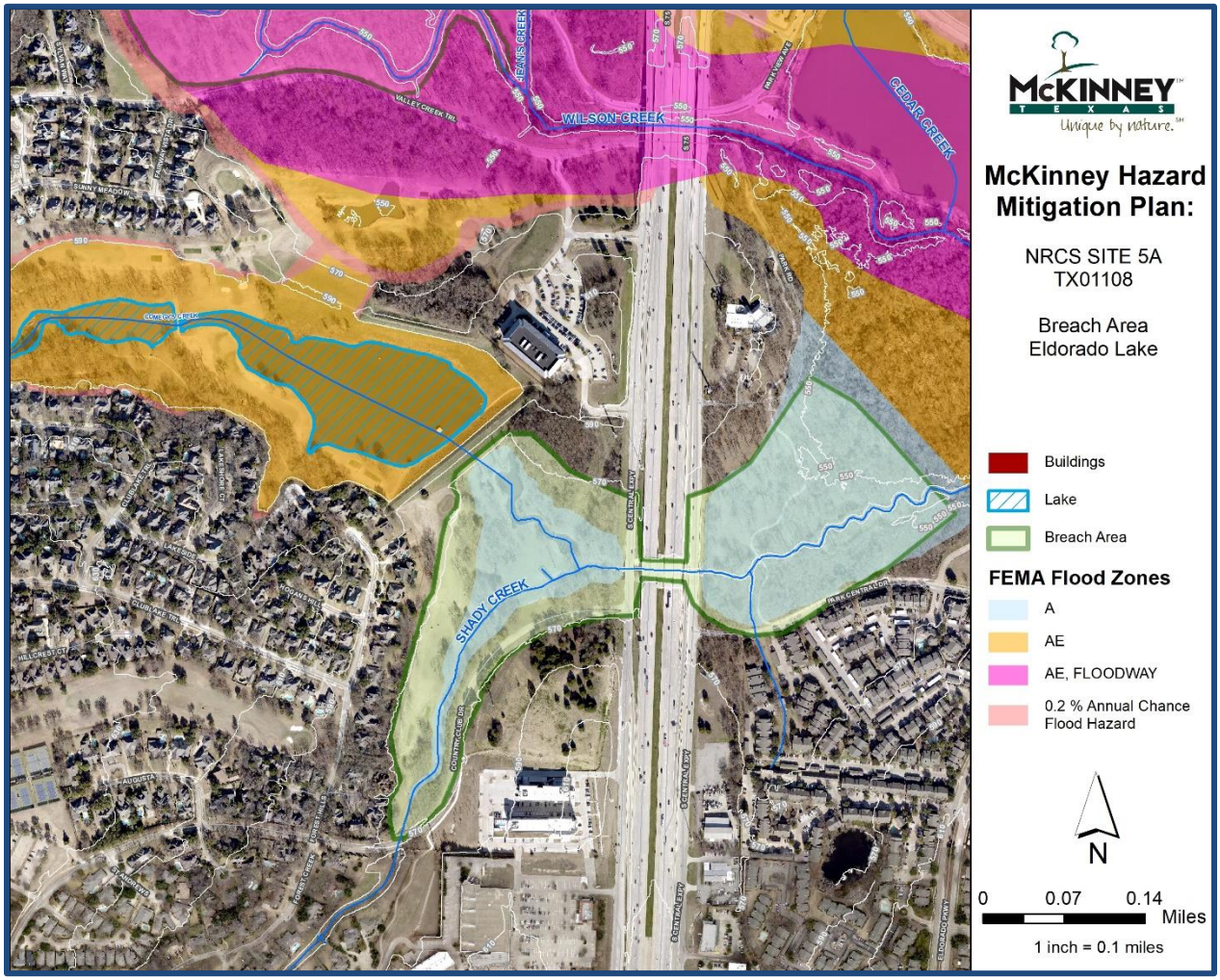
Site 3D – TX01110 - Turrentine Lake



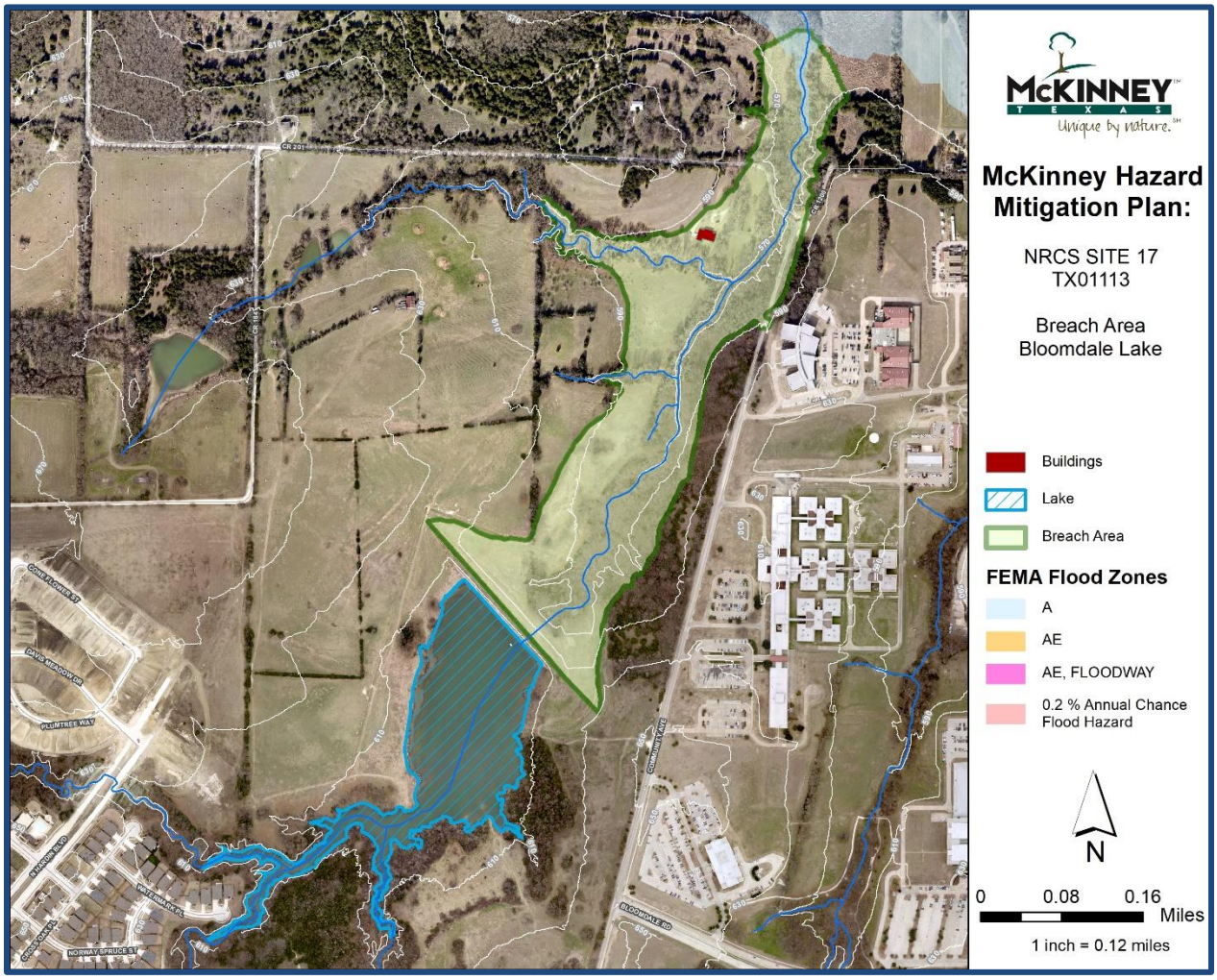
Site 3E – TX01110 - "Provine Lake"



Site 5A – TX01108 - Eldorado Lake



SITE 17 – TX01113 - Bloomdale Lake



Structures in Inundation Area

Site	Name	Structure Type	Total # of Structures in Inundation Area	Structure Values
1 A	Walnut Grove Lake	Private	4	Private structure 1: $287,840
				Private structure 2: $343,129
				Private structure 3: $219,080
				Private structure 4: $188,684
2 A	Highland Lake	Private	7	Private structure 1:$135,527
				Private structure 2: $362,310
				Private structure 3: $206,504
				Private structure 4: $506,008
		Commercial		Private structure 4: $506,008
				Commercial structure 1: $760,446
				Commercial structure 2: Unknown
2 B	Summit View Lake	Private	2	Private structure 1: Unknown
				Private structure 2: Unknown
3 C	Mallard Lake	0	0	No structures in inundation area
3 D	Turrentine Lake	0	0	No structures in inundation area
3 E	Provine Lake	Public	1	Private structure 1: Unknown
5 A	Eldorado Lake	0	0	No structures in inundation area
17	Bloomdale Lake	Private	1	Private structure 1: $146,214