City of Kyle
Hays County Hazard Mitigation Plan Update
2017

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City of Kyle Annex
Section 1: Organize and Review

This section contains a brief description of the City of Kyle and its jurisdictional features. In addition, Section 1 contains the following details regarding Kyle's:

- participation in the Hays County HMP Update process,
- stakeholder engagement,
- public outreach strategy,
- incorporation efforts, and
- plan maintenance procedures.

*Population :	28,840
Size of Community:	30.66 sq. miles
*Population over 65 years old	1,261
*Population under 16 years old	9,644
*Economically Disadvantaged Population ($0-$20k)	635

Kyle is serviced by the following responders:

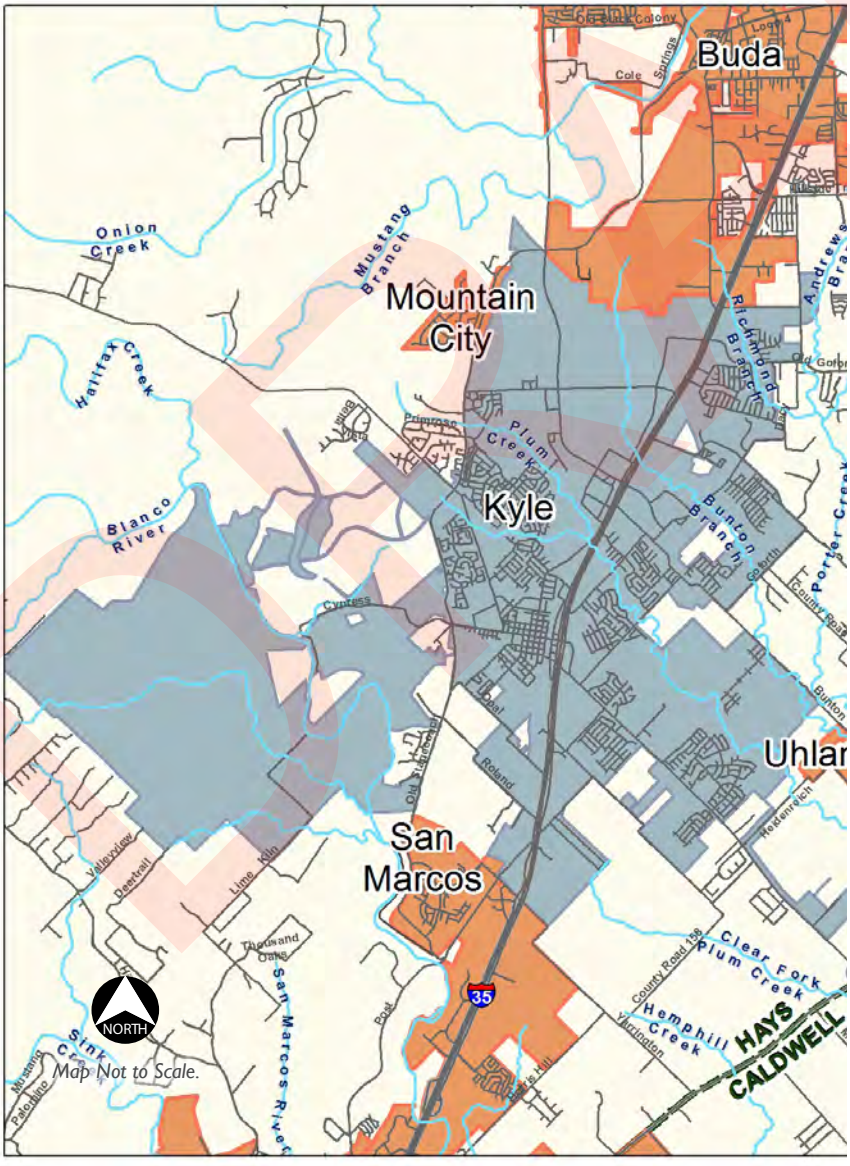
Fire – ESD #5

EMS - ESD # 5

Law Enforcement- Kyle Police Department

HAZUS-MH 3.2 Updated Census 2010 Population Estimates

Figure KY.1, City of Kyle



Community Description

When planning, it is important to take into account the characteristics that make a community unique. Consideration of unique needs when it comes to mitigating or recovering from natural hazards ensures that all members of the community and their needs are addressed.

The City was incorporated in 1928 and is located in Hays County, in close proximity to the City of Austin. This convenience is attractive to residents seeking alternatives from the densely populated Austin area. With an annexation in 2016, the City now covers 30.39 square miles consisting of 19,450 acres of land, 188 acres of waters or waterways, and contains approximately 139 miles of public streets. According to the 2010 census, Kyle's population was 28,016 and 30,875 in 2012. Kyle's population as of 2016 is estimated to be 36,800 with approximately 11,000 residential homes and 320 commercial businesses in the City.

According to data from the *Master Parks and Recreation Plan*, 77% of existing dwelling units in Kyle were built since 2000. The City is continuing to grow at a rapid rate.

The City is operated under a Council-Manager form of government and governed by an elected mayor and 6 City Council members. The City Council and planning and zoning commission regulate development within the City. The City has a public works department, planning department, engineering department, and a sophisticated building department, all of which play a role in development in Kyle. The community is served by the Hays Consolidated Independent School District.

Kyle's major employers are shown in Table KY.1. The main utility providers for Kyle are shown in KY.2.

Table KY.1, Major Employers

Business Type	Name of Employer
Education	Hays CISD
Medical	Seton Medical Center Hays
Retail	Home Depot
Government	City of Kyle
Retail	Lowes
Education	Austin Community College- Kyle Campus
Retail	HEB Plus
Medical	Legend Oaks Healthcare & Rehabilitation
Retail	Target
Education	Austin Community College Hays Campus
Retail	Kohl's
Small Industry	Construction Metal Products
Small Industry	Southwestern Pneumatic
Small Industry	Miscellaneous Steel Industries

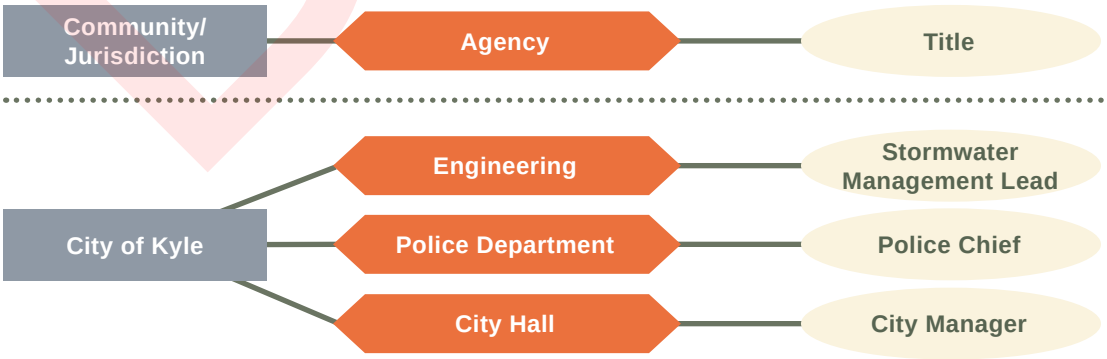
Table KY.2, Utility Providers

Type	Provider
Electric	Pedernales Electric Cooperative (PEC)
Natural Gas	Center Point Energy, Texas Gas
Water	City of Kyle, Monarch, County Line, and Goforth
Cable	Spectrum

Planning Committee

Planners who represented Kyle in the update process are collectively known as the Kyle Mitigation Planning Committee (MPC) and are shown in KY.2.

Figure KY.2, Planning Committee Membership



Community Planning Involvement

MPC planning activities for the Hays County Hazard Mitigation Plan (HMP) Update are captured in Figure KY.3, which utilizes check-marks to indicate each of the activities that were completed by the Kyle MPC.

Figure KY.3, City of Kyle Plan Participation

Meetings

- ✓ Kick-Off
- ✓ Risk Assessment
- ✓ Mitigation Strategy

Data Submission

- ✓ Planner's Survey
- ✓ Data Collection Spreadsheet/ GIS Data
- ✓ Planning Worksheets
- ✓ Phone Interview

Public Involvement

- ✓ City Council/Commissioner's Court Agenda Items
- ✓ Public Survey Posting/ Collection

Stakeholders

During the Phase 1 Kick-Off Meeting, planners were provided with a Planner/Stakeholder Worksheet, referred to in Chapter 1, the Plan Process portion of the Hays County HMP Update. This document allowed planners to identify stakeholders for inclusion in the Risk Assessment and Mitigation Strategy Meetings. Table KY.3 identifies the stakeholders that were invited to participate by the following email:

Good Morning,

You or your organization has been identified by a local community planner as a stakeholder (interested/affected party) for the Hays County Hazard Mitigation Plan Update process. The planning team, made up of community officials from throughout Hays County, is working to update this plan that identifies actions for reducing and mitigating the risk from natural hazards (flood, tornado, severe winter, etc...) affecting Hays County and the communities within it. If your schedule allows, your insight would be valuable at a meeting being held on Thursday, January 12, 2017, from 1 p.m. to 4 p.m. at

Wimberley Community Center
14068 Ranch Road 12
Wimberley, TX 78676

Please register for the Hazard Mitigation Plan Update- Risk Assessment Meeting. https://www.eventbrite.com/e/hays-county-hazard-mitigation-plan-update-risk-assessment-meeting-registration-30892049953

If unable to complete registration on the Eventbrite site, please reply to this email and indicate who will attend from your organization so that the meeting facility can be prepared for the proper number of attendees.

JWSA and Halff Associates are providing coordination and facilitation support for this process for Hays County and participating communities utilizing FEMA mitigation grant funding. Any questions regarding this meeting can be directed to Paloma Alaniz at palaniz@halff.com.

Thank you.

Table KY.3, Plan Stakeholders

Jurisdiction	Agency	Title
City of Kyle	Engineering	City Engineer/Floodplain Administration/Emergency Management/Stormwater
City of Kyle	Economic Development	Director
City of Kyle	GIS	GIS Analyst
City of Kyle	Engineering	Project Manager/Floodplain
City of Kyle	Engineering	Floodplain Administrator
City of Kyle	Communications	Director
City of Kyle	Planning	Director of Planning
City of Kyle	Finance	Director
City of Kyle	Building	Chief Building Official
City of Kyle	Government	City Manager
City of Kyle	Police Department	Police Chief
City of Kyle	Parks and Recreation	Director
City of Kyle	Government	Mayor
City of Kyle	Public Works	Director
City of Kyle	Government	Assistant City Manager
Pedernales Electric Cooperative	Electric Co-operative	Chief Executive Officer
Hays County	Sheriff's Office	Lieutenant
Spectrum (Charter)	Cable	Public Relations
Travis County	Neighboring Community	Emergency Management Coordinator
Hays CISD	School District	Superintendent
ESD #5	Fire Department/Emergency Services District	Fire Chief
Austin Community College	Higher Education	Director of Safety

Outreach Strategy

The City of Kyle was very active in their outreach activities used to request public participation in the Hays County HMP Update.

Public Survey Promotion

Kyle advertised the Hays County HMP Update Public Survey on the Weekly E-News newsletter, Kyle Facebook page, Kyle homepage www.cityofkyle.com.

As of March 10, 2017, Kyle had 23 residents respond to the public survey. A copy of the survey questions can be found in Appendix A of the Hays County HMP Update. Details on how the survey data was directly incorporated into the Risk Ranking process for hazards is included in Chapter 2, the Risk Assessment portion of the Hays County HMP Update.

City Council Meeting Announcement

On January 17, 2017, the Stormwater Management Plan Administrator presented information on the Hays County HMP Update to the Kyle City Council. The Council presentation is included in Appendix A of the Hays County HMP Update.

Plan Phase Newsletters

Kyle MPC utilized newsletters for each phase of the planning process in order to share updates on the planning process with stakeholders, elected officials, City staff and the public. Copies of the newsletters can be found in Plan Appendix A of the Hays County HMP Update.

Plan Draft Public Review and Comment Period

The link to the draft Hays County HMP Update was posted on the City of Kyle website from July 12, 2017 to July 26, 2017. A hard copy was placed in the Kyle City Hall. Comments were collected via _____.

Incorporation of Sources

In addition to stakeholder and public input, the MPC also reviewed other planning resources that could provide useful information to the plan update process. Table KY.4 lists the documents reviewed and how they were considered for incorporation in the updated plan.

Table KY.4, Review/Incorporation of Sources

Name of Document	Type	How Incorporated
2013 State of Texas HMP	Plan	Utilized hazard definitions and hazard classification names.
Flood Insurance Study	Study	Incorporated best available hydraulic and hydrologic study results for flood hazard profile.
Resolution 1045 adopting Parks and Recreation Master Plan	Regulations	Kyle passed a resolution to update the 2006 Parks and Recreation Master Plan on December 6, 2016. (City of Kyle, Texas, 2016).
2016 Kyle Parks and Recreation Master Plan	Plan	Consideration of plan goals and actions • Relevance of Parks: 6. …can control stormwater runoff and reduce flooding…parks and greenbelts often represent a community's greatest efforts in open space conservation or preservation. • Goal 3.3 Plan for greenway corridors and nature trails along the Blanco River as feasible. • Goal 3.4 Preserve and utilize drainage, utility and natural creek corridors as primary potential linkage corridors throughout the City. • Goal 4.5 Continue to establish policies and methods to preserve needed floodway and drainage ways throughout the City and keep them as valuable greenbelt corridors. • Goal 4.6 Establish policies that encourage private owners to preserve and protect key natural areas within the City. Incentivize set-asides of upland corridors. • Goal 8.2 Consider the use of native plant materials and xeriscape techniques where appropriate to reduce maintenance and irrigation costs in parks and on City properties. • Action III.I Identify areas within the existing Kyle parks system for natural resource preservation. • Action III.2. Prepare and implement a prairie or woodland restoration plan for 1 or more of Kyle's park properties. • Action III.3 Incorporate tools in the City's land development ordinances which encourage natural resource preservation. • Action III.4 Acquire parcels for the assembly of interconnected greenways. • Action VII.2 clearly define open space types (Amend Chapter 41 Subdivision Regulations and Chapter 53 Zoning of the Code of Ordinances to provide clear distinctions between open space principally set-aside for utility purposes and active or passive recreation space). • Capital Improvement Action for Riparian Corridor Land Assembly for linear park development. (Halff Associates, 2016)

Table KY.4, Review/Incorporation of Sources (cont.)

Name of Document	Type	How Incorporated
City of Kyle 5 Year Capital Improvements Plan- Fiscal Years 2016-20	Plan	Consideration of inclusion of projects that are part of the CIP • Project 1- Repairs to Historic Old City Hall building • Project 20- New Police Station (enhance with mitigation review prior to location selection) • Project 24- Guadalupe-Blanco River Authority Flood Protection Study Phase 3-COMPLETED • Project 27- Stormwater Master Plan and CIP Planning- to provide an analysis of known problem areas where flooding occurs (actually Drainage Master Plan) • Project 28- Repair/regrading of existing open City drainage ditches, repair/replacement of existing City storm drains, culvert pipes, and storm drain manholes. Including all monitoring, sampling, testing associated with stormwater run off • Project 34- Water Improvements-Line Upgrades/Replacements- to provide necessary repairs, line replacements/improvements, upgrades of existing water distribution infrastructure needed to maintain adequate flow and pressure • Project 38- Quick Connect Power Ports- installation of fast connect couplings and associated wiring at water pump stations to allow rapid connection of emergency power generator to station, equipment and motors to provide more reliable service abilities during natural disasters or other emergencies where power has been disrupted • Project 40- Water Improvements- Old Hwy 81- 12 inch water line- Construction of a new water line that will connect 2 existing waterlines to provide adequate fire flows to an area • Project 41- Water Improvements- Pumphouse Rd/Melinda Rd- construction of new 8 inch water line to be installed to eliminate an existing smaller undersized line that is at capacity and to provide fire protection where there is currently none. • Project 42- Water Improvements- Stagecoach, Scott St, Opal St- Construction of new 12 inch water line to eliminate and replace undersized line and add fire protection where there is currently none. • Project 44- Monarch Water System Inter-Connect including SCADA - will provide a water inter-connect that may be utilized by either the City or Monarch during emergency situations to provide an additional source of supply during emergency conditions • Project 64- Engineering & Easement- Lehman Road-…Raise road approximately 15 feet higher at low water crossings minimizing road closures due to rising water. • Project 66- Engineering & Easement- N. Burleson Street- reconstruction that will also provide drainage improvements needed in the area to minimize flooding in downtown area (City of Kyle, 2016)
City of Kyle Economic Development Strategic Plan	Plan	Incorporate plan goals when considering mitigation actions • Encourage landowners/developers to work…in coordination with the City….to identify optimal land use allocations (Sustainable Development Initiative) (Kyle Economic Development, 2015)
Kyle Connected Transportation Master Plan 2040	Plan	Reviewed but did not find obvious mitigation-related items (Lockwood, Andrews & Newnam, 2016)
City of Kyle Stormwater Management Plan	Plan	Review for opportunities to enhance or include items • BMP No. 2- Outreach Material research, production, distribution regarding stormwater public education • BMP No. 9- Stormwater education materials or lectures coordinated with school district (enhance with further mitigation instruction) (City of Kyle, 2014)
City of Kyle Emergency Safety Plan	Outreach Document	Reviewed for enhancement and addition of other instructions/tips for other natural hazards

Continued Public Participation in Maintenance Process

The strategy for updates at the local level for Kyle will include opportunities for public involvement, as shown in Table KY.5.

Table KY.5, Public Involvement for Updates

Activity	Public Involvement	Method Available
Monitoring	The public will be given notice when items will be reviewed and receive the opportunity to review the notes from any notable developments.	Newspaper/Social Media
Evaluation	The public will be given a means to voice their opinion on the completed actions.	SurveyMonkey/Paper Survey
Updates	Once updates are made, the changes will be recorded in a public revision history document.	Newspaper/Social Media/ Council Meeting Announcements/ SurveyMonkey

Maintenance

Table KY.6 lists the method, schedule, and responsible agent for the monitoring, evaluation, and updating of the adopted 2017 HMP within the Plan's 5-year update cycle.

Table KY.6, Hays County HMP Maintenance Schedule, Kyle

Task	Scope	Method	Schedule	Responsible Agent
Monitoring	Jurisdictional	Review of mitigation action items using Mitigation Action Progress Report Worksheets (Appendix C of the Hays County HMP Update).	Every 12 months	City of Kyle, Engineering, Stormwater Management Plan Administrator
Evaluation	Jurisdictional	Complete Online Planner Survey (using SurveyMonkey) with evaluation of plan process.	Every 12 months	City of Kyle, Engineering, Stormwater Management Plan Administrator
Updates	Jurisdictional	Perform updates to Mitigation Strategy to edit/add/omit actions identified during monitoring activities. Conduct post-disaster review of community annex in order to update for significant occurrences, construction of new critical infrastructure or facilities, changes in jurisdictional boundaries and development. Participate in MPC for 5 year HMP update process.	As needed	City of Kyle, Engineering, Stormwater Management Plan Administrator

Section 2: Risk Assessment

City of Kyle Jurisdictional Hazards

This section contains Kyle's hazard profiles for each natural hazard included in the Hays County HMP Update. Profiles include:

- Location - the area where the hazard is known to occur
- Previous Occurrences - a history of reported events for the hazard
- Significant Previous Occurrences (when applicable) - notable hazard events within the community
- Extent - the strength or magnitude of the hazard
- Probability - the likelihood of the hazard event occurring in the future
- Impact - the consequence or effect (or possible effect) of hazard events
- Vulnerability Summary - identification of structures, systems, populations or assets susceptible to loss or damage

Hazard descriptions and extent scales for hazard magnitudes, are found in Chapter 2, the Risk Assessment portion of the Hays County HMP Update.

When available, data specific to Kyle was used for hazard analysis. When no instances were reported specifically for the jurisdiction for regional hazards, County level data was applied.

State and national datasets were used to determine occurrence, extent, and the respective probabilities, rather than verbal testimonies, in an effort to retain data consistency. For some hazards, the National Oceanic and Atmospheric Administration (NOAA) Storm Events Database was used as the most comprehensive data available for hazards. As a result, , injury and damage amounts shown for previous hazard occurrences do not always reflect the most recent totals. The Previous Occurrences paragraph identifies instances in which this may occur. Verbal testimony, when available, was integrated into impact or vulnerability summaries.

Hazards profiled within the Risk Assessment include:

Drought

Extreme Heat

Severe Winter Storms

Lightning

Hailstorms

Windstorms

Tornadoes

Expansive Soils

Floods

Land Subsidence

Hurricanes/Tropical Storms

Earthquakes

Dam/Levee Failure

Wildfires

Drought

Drought: Location

Drought occurs on a regional scale, therefore, all of the City of Kyle is equally at risk as it can occur anywhere in the jurisdiction.

Drought: Previous Occurrences

NOAA Storm Events Database documents 27 drought events for Hays County since the year 1996 (see Table KY.7). Although there were no drought events reported specifically for the City of Kyle, the jurisdiction would have been affected by the events that were reported for the surrounding County area.

Fatality, injury and damage amounts are shown in Table KY.7, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.7, Reported Drought Occurrence, Hays County

Location	Date	Type	Fatalities	Injuries	Property Damage	Crop Damage
HAYS (ZONE)	4/1/1996	Drought	0	0	0.00	0.00
HAYS (ZONE)	5/1/1996	Drought	0	0	0.00	0.00
HAYS (ZONE)	6/1/1996	Drought	0	0	0.00	0.00
HAYS (ZONE)	7/1/1996	Drought	0	0	0.00	0.00
HAYS (ZONE)	8/1/1996	Drought	0	0	0.00	0.00
HAYS (ZONE)	7/1/2000	Drought	0	0	0.00	0.00
HAYS (ZONE)	8/1/2000	Drought	0	0	0.00	0.00
HAYS (ZONE)	9/1/2000	Drought	0	0	0.00	0.00
HAYS (ZONE)	10/1/2000	Drought	0	0	0.00	0.00
HAYS (ZONE)	5/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	6/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	7/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	8/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	9/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	10/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	11/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	12/1/2011	Drought	0	0	0.00	0.00
HAYS (ZONE)	1/1/2012	Drought	0	0	0.00	0.00
HAYS (ZONE)	6/1/2012	Drought	0	0	0.00	0.00
HAYS (ZONE)	12/1/2012	Drought	0	0	0.00	0.00
HAYS (ZONE)	2/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	3/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	4/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	6/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	7/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	8/1/2013	Drought	0	0	0.00	0.00
HAYS (ZONE)	8/1/2014	Drought	0	0	0.00	0.00
Total					$0.00	$0.00

(National Oceanic and Atmospheric Administration Storm Event Database, 2016)

Drought: Significant Past Events

Several significant regional drought events have previously impacted the City. Refer to the *Drought: Significant Past Events* paragraph within Section 2, the Risk Assessment portion of the Hays County Annex for narratives discussing these events.

Drought: Extent

The US Drought Monitor Drought Intensity scale classifies drought by 5 categories, D0 through D4. According to the reported previous drought occurrences in the jurisdiction, the maximum drought extent experienced is a Category D4 drought. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the US Drought Monitor Drought Intensity Index.

Drought: Probability

Based on 6 years with reported drought events from the NOAA Storm Events Database within 20 years, a drought event occurs approximately once every 3 years on average in Hays County. Since drought events can happen anywhere throughout the HMP update area and occur on a regional scale, the City of Kyle's future probability is assumed to be similar to the surrounding County areas, and therefore can expect a drought event approximately once every 3 years on average, with up to a Category D4 Drought.

Number of Years with Reported Event (Drought Year)	Number of Years in Dataset	Probability
6	20	0.30

Drought: Impact

Tables KY.8 and KY.9 list the impact of drought from the years 1996 to 2016 for Hays County according to the Drought Impact Reporter. The DIR is the nation's first comprehensive database of drought impacts. This database contains information from multiple Federal agencies, such as NOAA and United States Geological Survey (USGS), related to drought impacts from a national to city level by category and extent of impact. While there are no impacts reported specifically for the City of Kyle, the effects of drought are not confined to jurisdictional boundaries and occur on a regional scale. Impacts reported at the Hays County level are applicable in illustrating impact to the Kyle.

Table KY.8, Reported Drought Impacts, Hays County

Hays County Drought Impacts 1996-2016	
Category	# of Incidents Reported
Agriculture	45
Business & Industry	3
Energy	2
Fire	24
Plants & Wildlife	33
Relief, Response & Restrictions	48
Society & Public Health	7
Tourism & Recreation	3
Water Supply & Quality	53

(University of Nebraska-Lincoln, 2016)

Table KY.9, Reported Drought Impacts, City of Kyle

City of Kyle Drought Impacts 1996-2016	
Category	# of Incidents Reported
Agriculture	0
Business & Industry	0
Energy	0
Fire	0
Plants & Wildlife	0
Relief, Response & Restrictions	2
Society & Public Health	0
Tourism & Recreation	0
Water Supply & Quality	2

(University of Nebraska-Lincoln, 2016)

Drought: Vulnerability Summary

With rapid growth and development occurring in Kyle at an unprecedented rate, the importance of the availability of water in Kyle is significant. The effects and impacts of an exceptional drought would only worsen water supply and quality. The City has several Capital Improvement Projects focused on creating back-up water supplies and improving water lines. In addition, stormwater and wastewater plans activities are in place to further help with the situation. Until some of these projects are completed and the solutions are in place, vulnerability exists. The community is taking active measures to lessen vulnerability by participating in the Hays Caldwell Public Utility Agency that serves to preserve the long-term water needs of its members.

Extreme Heat

Extreme Heat: Location

Extreme heat occurs on a regional scale; therefore, all of the City of Kyle is equally at risk as it can occur anywhere in the jurisdiction.

Extreme Heat: Previous Occurrences

NOAA's Online Weather Data (NOWData) provides temperature data ranging from the year 2000 to 2016. NOAA's National Weather Service (NWS) Heat Index (located in Chapter 2, the Risk Assessment portion of the Hays County HMP Update) indicates that temperatures meeting or exceeding 90°F are designated with an "Extreme Caution" or greater warning classification. According to Canyon Dam Station, the closest local weather data collection center with comprehensive data, the mean number of days with a daily max temperature equal or greater to 90°F is 94 days. Currently, the greatest number of days during which the jurisdiction experienced extreme heat is 119 in 2008 while the highest temperature experienced was 109°F in August 2011 (a "Danger" NWS Heat Index classification). Canyon Dam Station is the closest reporting NOWData station to the jurisdiction and applies equally to the City of Kyle due to the regional nature of extreme heat occurrence.

Extreme Heat: Extent

Extreme heat extent is classified by temperatures, as well as event level designations, within the NWS Heat Index. The extent of extreme heat that the City of Kyle has experienced can be derived from the data provided from NOWData at Canyon Dam Station since the year 2000. The highest daily mean temperature experienced was 109°F in August 2011. This event is classified by the NWS Heat Index as "Danger".

Extreme Heat: Probability

The probability of future events can be determined by assessing historical averages. Since extreme heat events occur on a regional scale, the City of Kyle's future probability is assumed to be similar to the area surrounding Canyon Dam Station. Based on NOWData, the City can expect, on average, approximately 94 days a year with temperatures equal or greater to 90°F, and up to a "Danger" warning classification per the NOAA NWS Heat Index. As extreme heat events have occurred every year since 2000, the probability of extreme heat affecting the community is 100% in any given year.

Extreme Heat: Impact

Extreme heat has physical impacts on the public and the infrastructure that supports them. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Heat Related Injuries and Trauma, shown in Tables KY.10 and KY.11.

Table KY.10, Hays County Hospital Inpatient Data, Extreme Heat

Description	2010	2011	2012	2013	2014
Accidents caused by excessive heat due to weather conditions	1	3	5	0	0
Accidents due to excessive heat of unspecified origin	1	0	0	0	0

(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)

Table KY.11, Hays County Trauma Data, Extreme Heat

Description	2010	2011	2012	2013	2014
Accidents due to excessive heat of unspecified origin	0	1	0	0	0

(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)

In addition to the physical impacts, an excessive heat event can also be the cause of cascading incidents. Electrical outages could occur due to the high demands of electricity needed to power cooling systems. A loss of critical resources, such as power, has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of the City of Kyle's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the severe temperatures related to excessive heat and/or the loss of electrical energy in their dwellings.

Population over 65 years old	1,261
Population under 16 years old	9,644
Economically Disadvantaged Population ($0-$20k)	635

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following excessive heat events affected electrical availability in the areas in or near Hays County (shown in Table KY.12).

Table KY.12, Extreme Heat Affecting Electrical Availability

Event Description	Year	Start Date	Start Time	End Date	Respondent	Location	Customers Affected
Declared Energy Emergency Alert2/Heat Wave	2007	8/14/2007	2:00 p.m.	8/14/2007	American Electric Power (CSWS)	CSWS Control Area of Southwest Power Pool Parts of Oklahoma, Texas, Louisiana, Arkansas	N/A

(Wirfs-Brock, 2014)

Extreme Heat: Vulnerability Summary

Kyle does not have a cooling station plan for the community but does have locations available in order to cool people. Locations within the City where the public could seek shelter during heat events do not have back-up generator power.

Severe Winter Storms

Severe Winter Storms: Location

Severe winter storms occur on a local or regional scale; therefore, all of the City of Kyle is equally at risk.

Severe Winter Storms: Previous Occurrences

NOAA Storm Events Database documents 13 winter storm events for Hays County since the year 1996 (see Table KY.13). Although there were no winter storm events reported specifically for the City of Kyle, the jurisdiction would have been affected by the events that were reported for the surrounding County area.

Fatality, injury and damage amounts are shown in Table KY.13, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.13, Winter Weather Occurrences, Hays County

Location	Date	Type	Fatalities	Injuries	Property Damage	Crop Damage
HAYS (ZONE)	2/1/1996	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	1/7/1997	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	1/11/1997	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	12/23/1998	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	12/12/2000	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	11/28/2001	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	2/24/2003	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	12/7/2005	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	1/15/2007	Winter Storm	0	0	125,000.00	0.00
HAYS (ZONE)	2/3/2011	Winter Storm	0	0	0.00	0.00
HAYS (ZONE)	11/26/2013	Winter Weather	0	0	0.00	0.00
HAYS (ZONE)	1/23/2015	Winter Weather	0	0	0.00	0.00
HAYS (ZONE)	2/16/2015	Winter Weather	0	0	0.00	0.00
Total			0	0	$125,000.00	$0.00

(National Oceanic and Atmospheric Administration, 2016)

Severe Winter Storms: Significant Past Events

Regionally, there were significant winter weather events reported as Hays (Zone) that may have impacted the City, as shown in Table KY.13. Refer to the Severe *Winter Storms: Significant Past Events* section within the Hays County Annex for narratives discussing these events.

Severe Winter Storms: Extent

Ice accumulation is captured and measured with the Regional Snowfall Index (RSI) and the Sperry-Piltz Ice Accumulation (SPIA) Index, as detailed in Chapter 2, the Risk Assessment portion of the Hays County HMP Update. According to the reported previous winter weather occurrences in the jurisdiction, the maximum winter weather extent experienced is a RSI Category 1 snowfall event or SPIA Ice Index Category 2 ice event.

Severe Winter Storms: Probability

Based on 13 reported events from the NOAA Storm Events Database in 20 years, a winter weather event occurs approximately every 2 years on average in Hays County. There were no events reported specifically for the City of Kyle. Since these events can happen anywhere throughout the HMP update area and occur on a regional scale, the City's future probability is assumed to be similar to the surrounding County areas. The City can expect a winter weather event approximately once every 2 years on average in the future, with up to a RSI Category 1 snowfall event or SPIA Ice Index Category 2 ice event.

Number of Reported Events	Number of Years in Dataset	Probability
13	20	0.65

Severe Winter Storms: Impact

Severe winter weather has physical impacts upon the public and the infrastructure that supports them. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Cold Related Injuries and Trauma (shown in Table KY.14 & KY.15).

Table KY.14, Hays County Hospital Inpatient Data, Severe Winter Storms

Description	2010	2011	2012	2013	2014
Accidents caused by excessive cold due to weather conditions	2	0	0	0	0
Accidents due to excessive cold of unspecified origin	1	0	0	0	1

(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)

Table KY.15, Hays County Trauma Data, Severe Winter Storms

Description	2010	2011	2012	2013	2014
Accidents due to excessive cold due to weather conditions	1	0	0	0	0

(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)

In addition to the physical impacts, a severe winter storm event can also be the cause of cascading incidents. Electrical outages could occur due to the high demands of electricity needed to power heating systems. A loss of critical resources, such as power, has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of the City of Kyle's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the extreme temperature conditions related to severe winter storms and/or the loss of electrical energy in their dwellings.

Population over 65 years old	1,261
Population under 16 years old	9,644
Economically Disadvantaged Population ($0-$20k)	635

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following winter storm events affected electrical availability in the areas in or near Hays County (shown in Table KY.16).

Table KY.16, Severe Winter Storms Affecting Electrical Availability

Event Description	Year	Start Date	Start Time	End Date	Respondent	Location	Customers Affected
Cold Weather Event	2011	2/9/2011	4:30 PM	2/10/2011	ERCOT ISO	Texas	N/A
Public Appeal due to Severe Weather - Cold	2014	1/6/2014	7:01 AM	1/7/2014	ERCOT	Texas	N/A
Public Appeal due to Severe Weather - Cold	2014	3/2/2014	7:00 PM	3/4/2014	ERCOT	ERCOT Region Texas	N/A

**Electrical Reliability Council of Texas (ERCOT)*

(Wirfs-Brock, 2014)

In addition, severe winter storms and the icy roads that accompany them lead to dangerous driving conditions. City level data available from the Texas Department of Transportation's Crash Records Information System shows that between the years of 2010 and 2017, the City of Kyle experienced 26 crashes related to sleet/hail and snow conditions (shown in Table KY.17). Injuries sustained from these crash events included 7 non-incapacitating injuries and 4 possible injuries.

Table KY.17, Severe Winter Storms, Vehicle Accidents, City of Kyle

City	Fatality	Incapacitating Injury	Non-Incapacitating	Possible Injury	Crash Year	Street Name	Surface Condition	Weather Condition
Kyle	0	0	0	0	2010	IH0035	Slush	Sleet/Hail
Kyle	0	0	0	0	2010	IH0035	Slush	Sleet/Hail
Kyle	0	0	0	0	2010	IH0035	Slush	Sleet/Hail
Kyle	0	0	2	0	2010	IH0035	Wet	Sleet/Hail
Kyle	0	0	2	0	2010	IH0035	Wet	Sleet/Hail
Kyle	0	0	0	2	2010	W LOCKHART ST	Wet	Snow
Kyle	0	0	0	2	2010	W LOCKHART ST	Wet	Snow
Kyle	0	0	0	0	2010	IH0035	Wet	Snow
Kyle	0	0	0	0	2010	IH0035	Wet	Snow
Kyle	0	0	0	0	2011	IH0035	Ice	Sleet/Hail
Kyle	0	0	0	0	2011	IH0035	Ice	Sleet/Hail
Kyle	0	0	0	0	2011	IH0035	Ice	Sleet/Hail
Kyle	0	0	0	0	2011	IH0035	Ice	Sleet/Hail
Kyle	0	0	1	0	2013	IH0035	Wet	Sleet/Hail
Kyle	0	0	1	0	2013	IH0035	Wet	Sleet/Hail
Kyle	0	0	1	0	2013	IH0035	Wet	Sleet/Hail
Kyle	0	0	0	0	2013	FM0150	Ice	Sleet/Hail
Kyle	0	0	0	0	2013	FM0150	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2014	FM1626	Ice	Sleet/Hail
Kyle	0	0	0	0	2011	IH0035	Snow	Snow

Crash Records Information System Query for Accidents in Kyle from 2010-2017 from non-Clear Weather Conditions (Texas Department of Transportation, 2017)

Severe Winter Storms: Vulnerability Summary

Outside of newly developed subdivisions, Kyle has mostly surface powerlines. Surface powerlines pose a vulnerability due to the impact on electricity to homes and businesses during cold temperatures, when an accumulation of ice and snow on branches or the lines themselves could cause lines to collapse and interrupt service.

The community has a sand spreader that could be used to begin Sanding operations, that would be supplemented by those done by the County and State for roads that they maintain. Elderly members of the community may be impacted if they are serviced by the Meals on Wheels program that is run within the City. The delivery of the food becomes a high priority as it may be the primary source for the recipients' evening nutrition.

Lightning

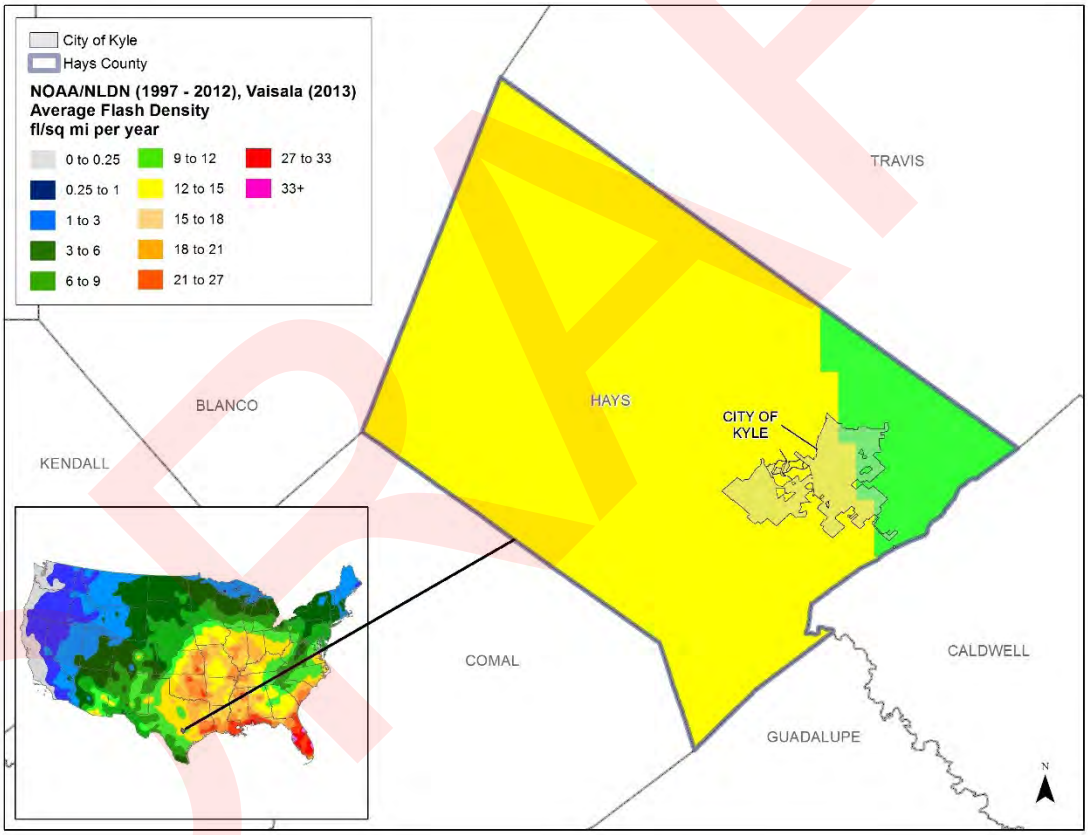
Lightning: Location

The entire extent of the City of Kyle is exposed to some degree of lightning hazard. Since lightning can occur at any location, lightning events could be experienced anywhere within the jurisdiction.

Lightning: Previous Occurrences

Figure KY.4 reflects the City of Kyle within the area that was calculated to receive approximately 9 - 12 lightning strikes per square mile per year on the eastern boundary of the City while the rest of the jurisdiction was calculated to receive 12 – 15 lightning strikes per square mile per year according to NLDN data for the years 1997 to 2012. There were no lightning events reported specifically for the jurisdiction in the NOAA Storm Events Database.

Figure KY.4, Average Annual Lightning Density, City of Kyle



(Vaisala NLDN, 2016)

Lightning: Extent

Due to the lack of reported occurrences, there is not sufficient data to determine the maximum Lightning Activity Level (LAL) for the jurisdiction. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the lightning extent scale LAL Grids. However, with the data available, the magnitudes of lightning events that the City of Kyle has experienced can be derived from the NOAA/NLDL data in Figure KY.4, up to 12 to 15 strikes per square mile per year where the City is approximately 30.39 square miles.

Lightning: Probability

Since lightning can occur at any location, lightning events could be experienced anywhere within the jurisdiction. Based on the data provided in Figure KY.4, the City of Kyle can expect future events to fall in line with NLDN data from previous years with a probability of up to approximately 12 to 15 lightning strikes per square mile per year.

Lightning: Impact

The National Lightning Detection Network (NLDN) reported 217 lightning fatalities within the State between the years 1959 and 2013. According to the Texas Health Care Information Collection and Trauma Registry from the Texas Department of State Health Services' Injury Epidemiology & Surveillance Branch, the following number of patients were received in Hays County medical facilities for Lightning Related Trauma (shown in Table KY.18).

Table KY.18, Hays County Trauma Registry Data, Lightning Events

Description	2010	2011	2012	2013	2014
Accidents due to lightning	0	1	0	0	1

(Texas Department of State Health Services- Injury Epidemiology & Surveillance Branch, 2017)

In addition to the physical impacts that lightning can directly have on human beings, a lightning event can also be the cause of cascading incidents, such as electrical outage events, due to the impact that lightning strikes can have on electrical utility infrastructure. A loss of critical resources such as power has significant impact on the entire population, with higher impacts to those with vulnerabilities to such conditions. The following portion of the City of Kyle's population, according to HAZUS-MH 3.2 updated Census 2010 population estimates, would be greatly impacted by the loss of electrical energy in their dwellings

.

Population over 65 years old	1,261
Population under 16 years old	9,644
Economically Disadvantaged Population ($0-$20k)	635

An organization called Inside Energy (http://insideenergy.org) provided a compiled database outlining 15 years of power outages across the United States from annual data available at the Department of Energy. Within the database, the following thunderstorm/severe storm events affected electrical availability in the areas in or near Hays County (shown in Table KY.19).

Table KY.19, Lightning Affecting Electrical Availability

Event Description	Year	Start Date	Start Time	End Date	Respondent	Location	Customers Affected
Severe Weather	2008	4/9/2008	4:00 p.m.	4/13/2008	Oncor Electric Delivery Company LLC	North, Central and East Texas	488,689
Severe Thunderstorms	2008	6/17/2008	9:01 a.m.	6/19/2008	Oncor Electric Delivery Company LLC	North, Central and East Texas	234,393
Severe Thunderstorms	2008	8/3/2008	1:30 a.m.	8/3/2008	Entergy Corporation	Mississippi, Louisiana, Texas	59,500
Severe Storms	2009	6/10/2009	6:00 p.m.	6/14/2009	Oncor Electric Delivery Company, LLC	North and Central Texas	800,000
Thunderstorms	2010	6/8/2010	11:00 a.m.	6/8/2010	Centerpoint Energy	Southeastern Texas	79,741

(Wirfs-Brock, 2014)

Lightning strikes can also cause wildfire ignitions. According to the National Fire Protection Association (NFPA), "during 2007-2011, U.S. local fire departments responded to an average of 22,600 fires per year that were started by lightning. These fires caused an average of 9 civilian deaths, 53 civilian injuries and $451 million in direct property damage per year." The source also cites that the fires are more common in June through August and in the late afternoon and evening.

Lightning: Vulnerability Summary

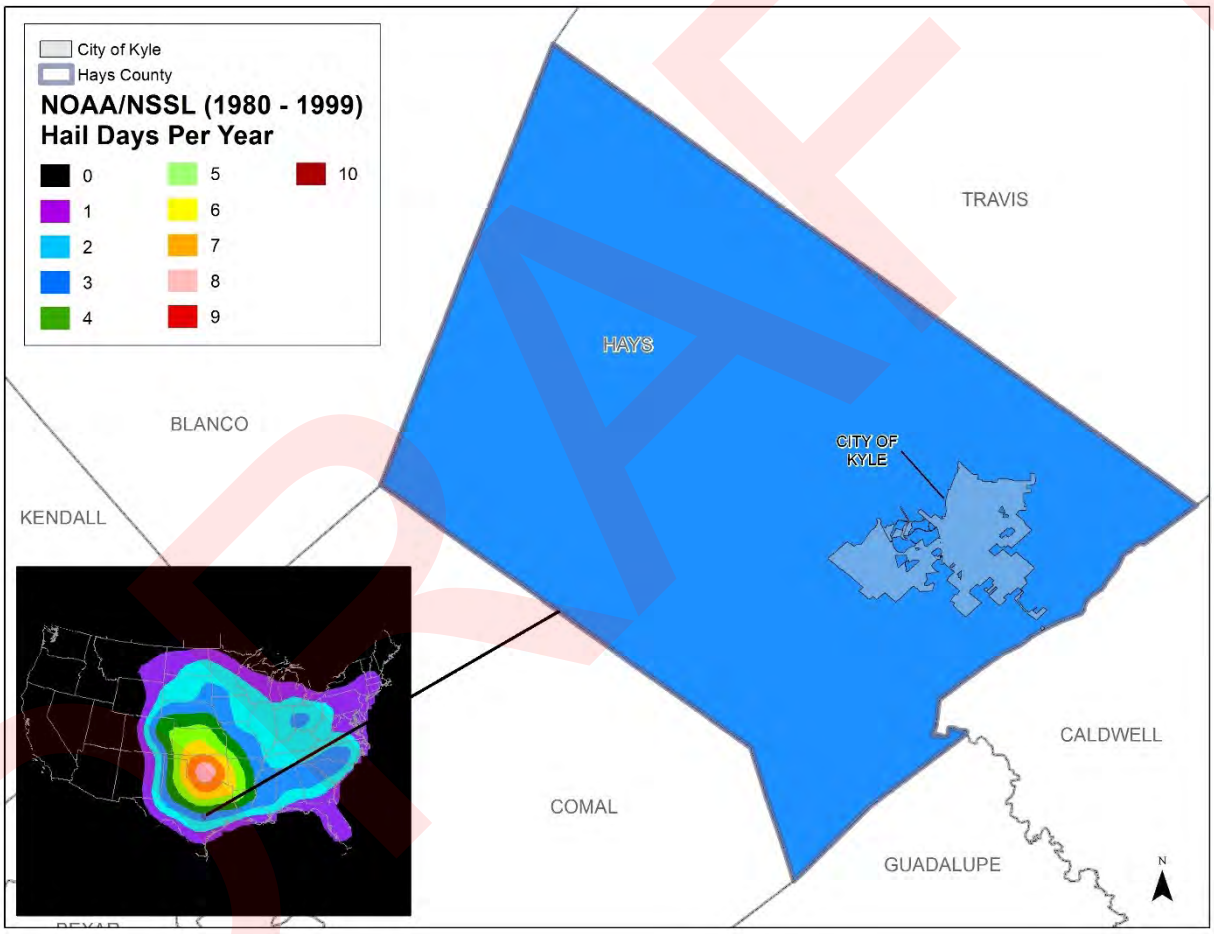
The portion of the community with surface powerlines, rather than subsurface, is more susceptible to natural hazards. In undeveloped areas with high vegetative growth, the risk of wildfire ignition caused by lightning strike is also higher. In addition to property damage and service interruption, citizens attending outdoor events are also at risk for injury or even death during lightning events.

Hailstorms

Hailstorms: Location

The entire extent of the City of Kyle is exposed to some degree of hail hazard. Since hail can occur at any location, hail events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 to 1999 to estimate the daily probability of hail occurrences, of at least 0.75-inch diameter hail across the U.S. Figure KY.5 shows the average number of hail days per year determined from this analysis and the corresponding location of the City. The density of hail days per year in the map's legend indicates the probable number of hail days for each 25-square-mile cell within the contoured zone that can be expected per year. It should be noted that the density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more event occurring within each cell.

Figure KY.5, National Hail Days Per Year, City of Kyle



(National Severe Storms Laboratory, 2016)

Hailstorms: Previous Occurrences

According to the NOAA Storm Events Database, there were 7 documented hail events listed for the City of Kyle and 57 documented events listed for Hays County and its unincorporated jurisdictions from year 1967. While the NOAA Storm Events Database lists events since the year 1967 for the County, events were not documented per jurisdiction until 1993. The hail events reported for the City of Kyle are shown in the Table KY.20. Note that multiple listings for the same dates are the result of reports from different affected parts of the County for the given event.

Fatality, injury and damage amounts are shown in Table KY.20, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.20, Hail Events, City of Kyle

Location	Date	Type	Extent (mm)	Fatalities	Injuries	Property Damage	Crop Damage
KYLE	10/20/2002	Hail	19.05	0	0	0.00	0.00
KYLE	4/13/2007	Hail	19.05	0	0	0.00	0.00
KYLE	5/27/2014	Hail	44.45	0	0	0.00	0.00
KYLE	5/27/2014	Hail	25.4	0	0	0.00	0.00
KYLE	5/27/2014	Hail	44.45	0	0	0.00	0.00
KYLE	5/27/2014	Hail	38.1	0	0	0.00	0.00
KYLE	4/1/2016	Hail	22.352	0	0	0.00	0.00
Total				**0**	**0**	**$0.00**	**$0.00**

(National Oceanic and Atmospheric Administration Storm Event Database, 2016)

Hailstorms: Extent

The Tornado and Storm Research Organization (TORRO) created a hail extent index to measure hail called the Hailstorm Intensity Scale. According to the reported previous hail occurrences in the jurisdiction, the maximum hail extent experienced is hail up to 1.75 in., or 44.45 mm. in diameter, corresponding to a TORRO Hailstorm Intensity Scale classification of "Destructive." Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for hail extent scale descriptions.

Hailstorms: Probability

Figure KY.5 reports 3 hail days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 7 reported events in 23 years, the City of Kyle can expect a hail event approximately once every 3 years on average in the future with hail up to 1.75 in., or 44.45 mm. in diameter, corresponding to a TORRO Hailstorm Intensity Scale classification of "Destructive."

Number of Reported Events	Number of Years in Dataset	Probability
7	23	0.30

Hailstorms: Impact

Although there are no specific occurrences for which hailstorm damages are captured, based on the maximum hail extent experienced (44.45 mm), the TORRO Hailstorm Intensity Scale (found in Chapter 2, the Risk Assessment portion of the Hays County HMP Update) indicates that impact can be expected to include any of the following:

- Varying degrees of damage to vegetation and crops
- Damage to plastic structures
- Varying degrees of damage to glass
- Paint and wood scored
- Vehicle bodywork damage
- Varying degrees of roof damage
- Varying degrees of risk of injuries
- Varying degrees of aircraft damage
- Brick walls pitted

Hailstorms: Vulnerability Summary

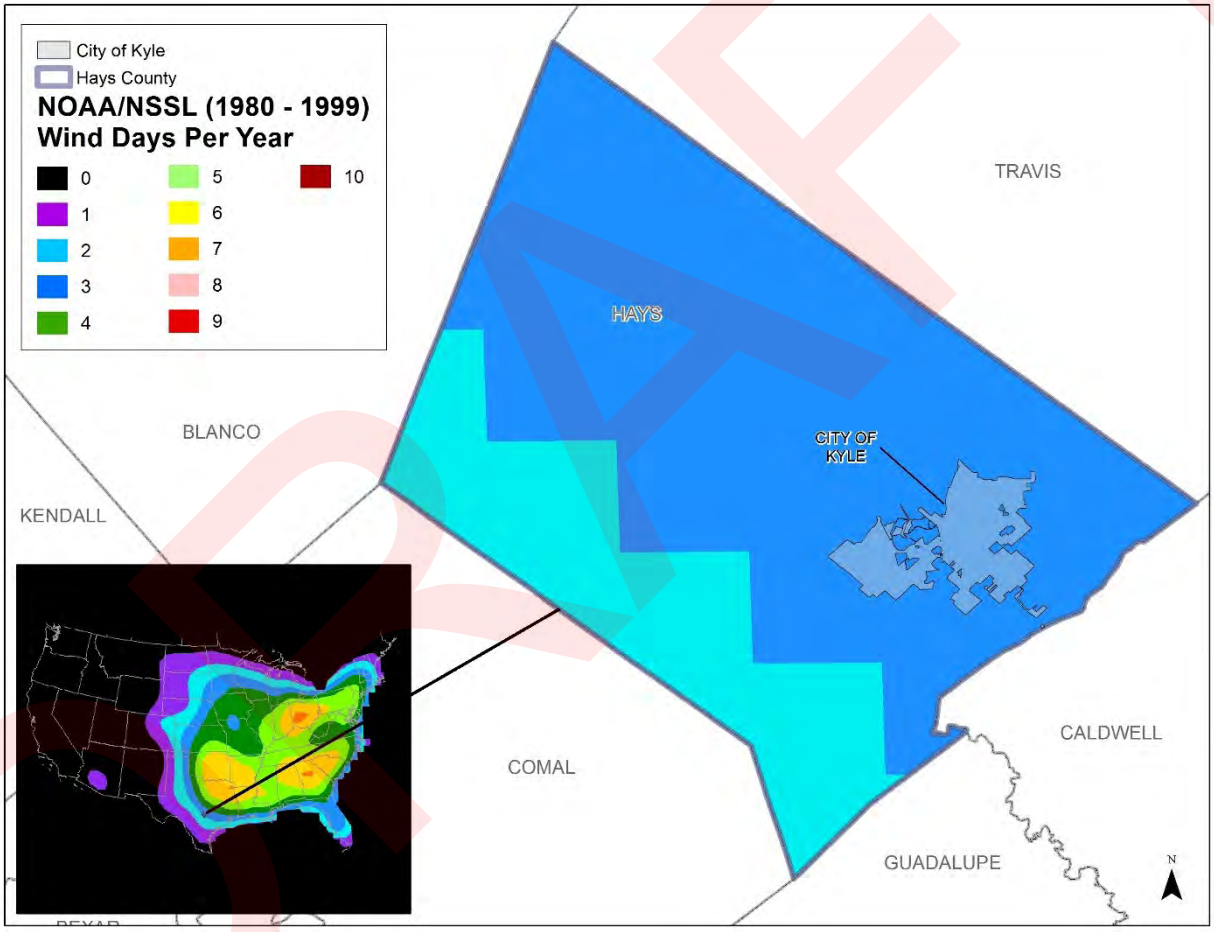
The roof types on the City structures could be susceptible to hail. There is not a dedicated sheltering structure for protecting critical City equipment or vehicles.

Windstorms

Windstorms: Location

The entire extent of the City of Kyle is exposed to some degree of wind hazard. Since wind can occur at any location, wind events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 - 1999 to estimate the daily probability of wind occurrences across the U.S., with gusts of at least 58 mph. Figure KY.6 shows the estimates for wind days determined from this analysis and the corresponding location of the City. The density of wind days per year in the map's legend indicates the probable number of wind days for each 25-square-mile cell within the contoured zone that can be expected per year. It should be noted that the density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more events occurring within each cell.

Figure KY.6, National Wind Days Per Year, City of Kyle



(National Severe Storms Laboratory, 2016)

Windstorms: Previous Occurrences

According to the NOAA Storm Events Database, there were 5 documented wind events listed for the City of Kyle and 38 documented events listed for Hays County and its unincorporated jurisdictions since the year 1974. While the NOAA Storm Events Database lists events since 1974 for the County, events were not documented per jurisdiction until 1994. The wind events reported for the City of Kyle are shown in Table KY.21.

Fatality, injury and damage amounts are shown in Table KY.21, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.21, Reported Wind Events, City of Kyle

Location	Date	Type	Extent (knots)	Fatalities	Injuries	Property Damage	Crop Damage
Kyle	10/22/2000	Thunderstorm Wind	NA	0	0	15,000.00	0.00
Kyle	6/12/2014	Thunderstorm Wind	56 kts. EG	0	0	5,000.00	0.00
Kyle	6/12/2014	Thunderstorm Wind	52 kts. EG	0	0	0.00	0.00
Kyle	3/18/2016	Thunderstorm Wind	52 kts. EG	0	0	0.00	0.00
Kyle	4/30/2016	Thunderstorm Wind	61 kts. EG	0	0	0.00	0.00
Total				**0**	**0**	**$20,000.00**	**$0.00**

**NA - No data available*
EG = Estimated Gust

(National Oceanic and Atmospheric Administration, 2016)

Windstorms Extent

Wind is measured by the Beaufort Wind Scale that relates wind speed to observed conditions on land and sea. According to the reported previous windstorm occurrences in the jurisdiction, the maximum wind extent experienced was 61 knots (Beaufort Wind Scale Classification: Violent Storm). Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of wind extent scales.

Windstorms Probability

Figure KY.6 reports 3 wind days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 5 reported events in 22 years, the City of Kyle can expect a wind event of up to 61 knots or 70.2 miles per hour (Beaufort Wind Scale Classification: Violent Storm) approximately once every 4 years on average in the future.

Number of Reported Events	Number of Years in Dataset	Probability
5	22	0.23

Windstorms: Impact

City level data available from the Texas Department of Transportation's Crash Records Information System shows that between the years of 2010 and 2017, the City of Kyle experienced 3 crashes related to severe crosswind weather conditions (shown in KY.22). Injuries sustained from these crash events included 3 Non-Incapacitating Injuries and 3 Possible Injuries.

Table KY.22, Windstorms, Vehicle Accidents, Hays County

City	Fatality	Incapacitating Injury	Non-Incapacitating	Possible Injury	Crash Year	Street Name	Surface Condition	Weather Condition
Kyle	0	0	1	1	2010	IH0035	Wet	Severe Crosswinds
Kyle	0	0	1	1	2010	IH0035	Wet	Severe Crosswinds
Kyle	0	0	1	1	2010	IH0035	Wet	Severe Crosswinds

(National Oceanic and Atmospheric Administration Storm Event Database, 2016)

Windstorms: Vulnerability Summary

Kyle has previously experienced debris accumulation on roadways during past windstorm events. Such incidents could cause impact on the ability of public safety officials to access emergency calls.

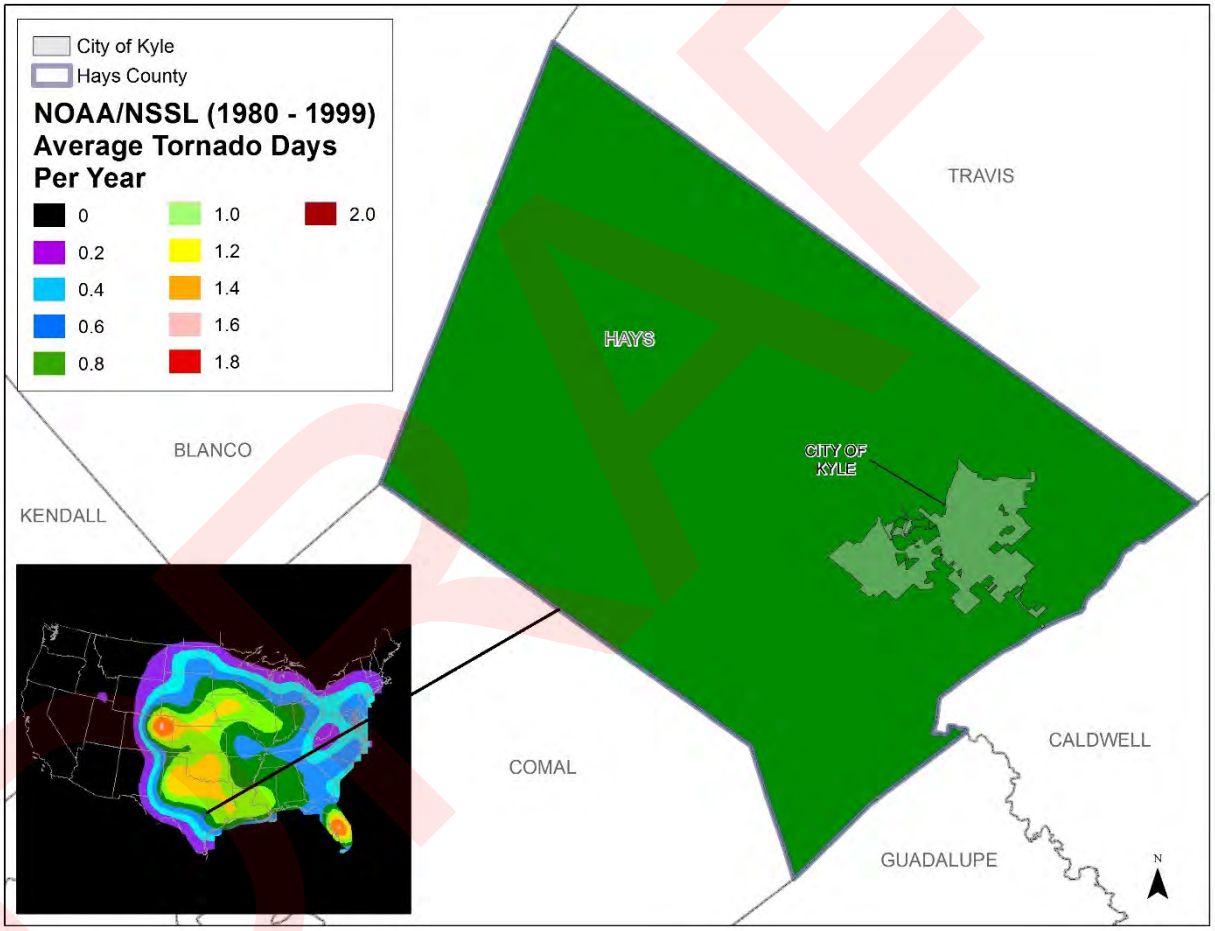
In addition, those swerving to avoid debris in the road could damage their vehicles or experience physical harm during a collision.

Tornadoes

Tornadoes: Location

The entire extent of the City of Kyle is exposed to some degree of tornadoes hazard. Since tornadoes can occur at any location, tornadoes events could be experienced anywhere within the jurisdiction. NOAA's National Severe Storms Laboratory used historical data from 1980 to 1999 to estimate the daily probability of tornadoes occurrences across the U.S., regardless of tornadoes magnitude. Figure KY.7 shows the average number of tornadoes days resulting from this analysis and the respective location of Kyle. The density of average tornado days per year in the map's legend indicates the probable number of tornadoes days for each 25-square-mile cell within the contoured zone that can be expected per year. This density number does not indicate the number of events that can be expected within each cell, rather the average number of days per year with 1 or more events occurring within each cell.

Figure KY.7, National Tornado Days Per Year, City of Kyle



(National Severe Storms Laboratory, 2016)

Tornadoes: Previous Occurrences

According to the NOAA Storm Events Database, there were 3 documented tornadoes events listed for the City of Kyle and 16 documented events listed for Hays County since the year 1953. While the NOAA Storm Events Database lists events since 1953 for the County, events were not documented per jurisdiction until 1997. The tornadoes events reported for the City of Kyle are listed in Table KY.23.

Fatality, injury and damage amounts are shown in Table KY.23, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.23, Tornado Events, Hays County

Location	Date	Type	Extent	Fatalities	Injuries	Property Damage	Crop Damage
Kyle	5/27/1997	Tornado	F1	0	0	5,000.00	0.00
Kyle	11/15/2001	Tornado	F1	0	3	500,000.00	0.00
Kyle	11/15/2001	Tornado	F1	0	3	500,000.00	0.00
Total				0	6	$1,005,000.00	$0.00

(National Oceanic and Atmospheric Administration Storm Event Database, 2016)

Tornadoes: Extent

Tornadoes are measured by severity on the Enhanced Fujita Scale, with a range 0-6. According to the reported previous tornadoes occurrences in the jurisdiction, the maximum tornadoes extent experienced was a category F1. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the Fujita (F) Scale and Operational Enhanced Fujita (EF) Scale.

Tornadoes: Probability

Figure KY.7 reports 0.8 tornado days per year as a result of NLDN's nationwide analysis. Since this calculation is based on national data, a more specific calculation based on local-level NOAA reports was utilized to calculate probability. Based on 3 reported events in 19 years, the City of Kyle can expect a tornadoes event approximately once every 6 years on average in the future, with up to an F1 magnitude.

Number of Reported Events	Number of Years in Dataset	Probability
3	19	0.16

Tornadoes: Impact

Tornadoes in the City of Kyle could impact roadways due to the large amount of vegetation and other objects that could become debris in the event of the high winds that accompany a funnel cloud. This debris could also cause physical harm to residents who may be outside during such an event. The wind speeds and debris caused by tornadoes can impact all residents in the community.

Based on Kyle having experienced tornadoes at F1 levels in the past, if similar events were to happen in the future in the City, the type of impacts that the jurisdiction can expect associated with that magnitude would include, from least to greatest:

- Light Damage- Broken branches; shallow rooted trees pushed over; some chimney damage.
- Moderate Damage- Surface damage to roofs; mobile homes pushed off foundation; moving vehicles pushed off the road.

(Tornado Facts, 2016)

Additional impacts from tornado events could include downed utility poles, communication towers, street signals, and debris created from residential and urban property.

Critical infrastructure could be disrupted, resulting in periods of impact to service due to the lack of back-up utility resources. See Lightning: Impact section within this annex for more information on utility interruption.

Tornadoes: Vulnerability Summary

The City of Kyle has a history of small tornadoes (none exceeding F1 magnitude) that indicates that while the community is vulnerable the impact of the winds associated with an event, the impact will be limited. Compared to other regions where tornadoes can result in total destruction of site-built structures, the tornadoes extent in Kyle is more likely to result in cosmetic damage to temporary structures and trees. Cascading impacts could include power failure events.

Expansive Soils

Expansive Soils: Location

Areas within the City of Kyle with structures that are underlain by soils containing clays with swelling potential are most affected by expansive soils. Figure 2.4 within the Chapter 2, the Risk Assessment portion of the Hays County HMP Update, shows the location of expansive soil areas for the City.

Expansive Soils: Previous Occurrences

There was no documentation of site-specific past events for structural damage due to expansive soils from local, state, or national databases queried.

Expansive soils cannot be documented as a time-specific event, except when they lead to structural and infrastructure damage. There are no specific damage reports or historical records of events in the City, however future events can occur.

Expansive Soils: Extent

According to the USGS Expansive Soils Regions, Figure 2.4 in Chapter 2 (the Risk Assessment portion of the Hays County HMP Update), the western side of the City has less than 50% is underlain with soils with clay textures that have high shrink-swell properties. The eastern side of the jurisdiction is over 50% underlain with soils with abundant clays with high swelling potential and is the area with the highest magnitude of expansive soil potential within the jurisdiction.

Expansive Soils: Probability

Considering the amount of swelling potential within the jurisdiction, as well as the lack of reported events, the probability of a future event is low, (unlikely in next 10 years).

Expansive Soils: Impact

There have been few undocumented foundation problems that have occurred within the community that could possibly be attributed to the presence of expansive soils.

Expansive Soils: Vulnerability Summary

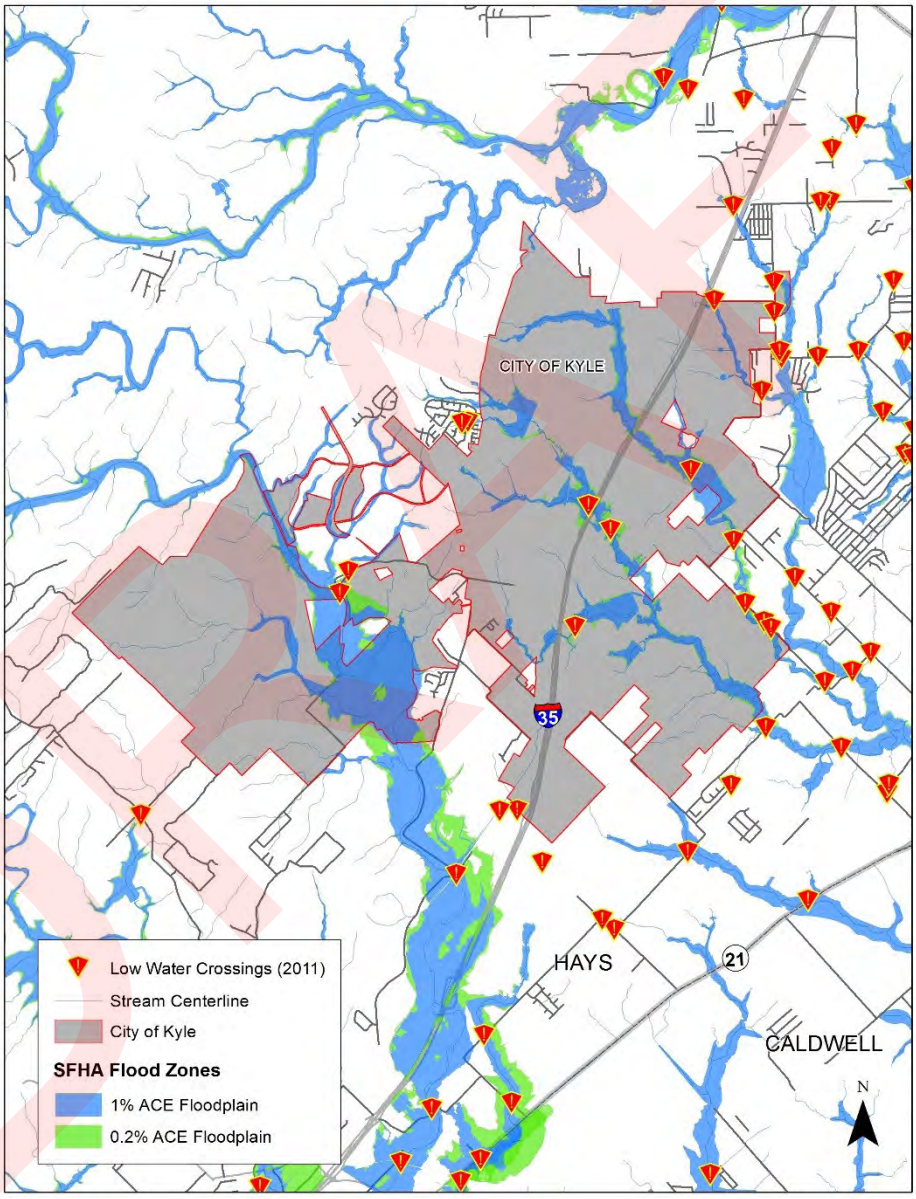
Although the City of Kyle is rapidly becoming a community made up of mostly newer residential structures, there is still a portion of the community in which the structures were constructed before the National Building Codes were adopted with specific codes for foundation work. As time progresses and the structures continue to age, the number of foundation issues could begin to emerge. A general lack of knowledge and concern from the public for the hazard creates a vulnerability due to a resulting lack of individual-level (homeowner) mitigation action for expansive soils.

Floods

Floods: Location

The location of low water crossings as well as the 1% (100 year) and 0.2% (500 year) Annual Chance Event (ACE) floodplains for the City of Kyle are shown in Figure KY.8 and are the locations within the jurisdiction that are most affected by flooding. This figure is based upon newly developed hydrologic and hydraulic analysis and is the best information available to date. Table KY.24 provides the total acreage in the jurisdiction that is located in the 1% and 0.2% floodplains.

Figure KY.8, Special Flood Hazard Areas and Low Water Crossings, City of Kyle



(Texas Natural Resources Information System, 2011)

Table KY.24, City of Kyle Floodplain Acreage

Jurisdiction	100yr (1%) Floodplain Acres (Includes Floodway)	500yr (0.2%) Floodplain Acres (Includes 100yr)
City of Kyle	2,470	2,819

Floods: Previous Occurrences

The County received 3 disaster declarations for flooding since October of 2013. According to the NOAA Storm Events Database, there were 7 documented flood events listed for the City of Kyle and 54 documented events listed for Hays County from year 1997. While the NOAA Storm Events Database lists events since 1997 for the County, events were not documented per jurisdiction until 2004. The flood events reported for the City of Kyle are shown in Table KY.25.

Fatality, injury and damage amounts are shown in Table KY.25, per the NOAA Storm Events Database. Community testimony indicates that these amounts do not reflect the most recent totals, however NOAA data is being used as the best source of information available for the record period.

Table KY.25, Flood Events, City of Kyle

Location	Date	Type	Fatalities	Injuries	Property Damage	Crop Damage
Kyle	1/13/2007	Flash Flood	0	0	0.00	0.00
Kyle	6/20/2007	Flash Flood	0	0	0.00	0.00
Kyle	7/25/2007	Flash Flood	0	0	0.00	0.00
Kyle	6/9/2010	Flash Flood	0	0	0.00	0.00
Kyle	5/24/2015	Flash Flood	0	0	100,000.00	0.00
Kyle	10/30/2015	Flash Flood	0	0	0.00	0.00
Kyle	10/30/2015	Flash Flood	0	0	0.00	0.00
Totals			0	0	$100,000,000.00	$0.00

(National Oceanic and Atmospheric Administration Storm Event Database, 2016)

Floods: Significant Past Events

According to NOAA Storm Events Database, in October of 2013 (Disaster 4159-DR), thunderstorms produced heavy rain that led to flash flooding in Wimberley, San Marcos, Buda, and Kyle. Public reports of 14 inches of rain fell near Wimberley and this rainfall made its way into the Blanco River Watershed and the Onion Creek Watershed. Rainfall totals near Buda and Kyle were upwards of 8-10 inches. The Blanco River USGS gage at Kyle crested at 35.92 feet. Reports indicate that the Blanco River was near or slightly higher than the 1998 flood of record. The Blanco River was 100 feet out of its banks. In many areas along the Blanco River, debris was found 15 to 20 feet up. Several roads needed repair and several homes were flooded out. Across Hays County, 47 homes sustained minor damage, 24 sustained major damage, and 1 home was destroyed. 4 businesses also sustained major damage.

According to NOAA Storm Events Database, in May of 2015 (Disaster 4223-DR), thunderstorms produced heavy rain that caused flash flooding in Kyle and San Marcos. The majority of the flooding was along the Blanco and San Marcos Rivers. A massive floodwave came down the Blanco River from Wimberley. Huge amounts of debris came with the flood waters. All along the Blanco River in Hays County 1,515 structures were impacted with 321 houses destroyed and an additional 376 receiving major damage according to assessments. According to the Office of Emergency Services, FEMA awarded over 3.5 million dollars in public assistance to Hays County in response to this disaster.

According to NOAA Storm Events Database, in October of 2015 (Disaster 4245-DR), thunderstorms produced heavy rain that caused flash flooding sending creeks feeding into the Blanco River out of their banks southwest of Kyle. Tremendous rainfall totals in excess of 5-10 inches of rain fell across this area during the morning hours. River and creek flooding was extensive across Hays, Travis, Bastrop, Caldwell, and Comal Counties. Estimates of 2000 homes were flooded in or near the IH-35 corridor, many of them destroyed or sustained major damage.

Floods: Extent

Flood extent is described by a combination of ground elevation, river heights, 100 year Water Surface Elevations (WSE's) and HAZUS depth grids. An example of flooding within the jurisdiction are areas along the Blanco River as these are exposed to the greatest extent of an event. These areas along the Blanco River have an approximate overbank ground elevation of 660 feet with an intersecting 100 year WSE of 662.5 feet. For a 100 year event, water depth of approximately 2.5 feet can be expected within this area. A further analysis of the Blanco River height is described below.

With the Blanco River having an approximate average normal in-channel elevation of 625 feet (per Light Detection and Ranging [LiDAR] data and USGS gauge data) adjacent to community, and an intersecting WSE of approximately of 662.5 feet, flood depths would be 37.5'. Such an event is categorized as a "Major Flood Stage." Refer to the Water Depth Extent Scale in Chapter 2 (the Risk Assessment portion of the Hays County HMP Update).

Floods: Probability

Probability has been calculated on the basis of NOAA reported events, as a standard, consistent calculation method for all hazards profiled with the Hays County HMP. Based on 7 reported events in 12 years, a flood event occurs approximately 2 times per year on average in Kyle. The City can expect a flood event approximately once every 2 years on average in the future, up to a "Major Flood Stage."

Number of Reported Events	Number of Years in Dataset	Probability
7	12	0.58

Floods: Impact

The following describes the inventory counts and building replacement values for the jurisdictional area.

Kyle Building Counts			
Residential	Commercial	Other	Total
8,975	127	85	9,187

Kyle Building Replacement Value		
Building ($)	Content ($)	Total ($)
2,481,513,426	1,290,672,254	3,772,185,681

A Probabilistic 100-year Return Period HAZUS-MH 3.2 analysis was run on the participating community. HAZUS results are calculated to census blocks. This analysis utilized the best available LiDAR (COA 2012 and CAPCOG 2008) and Depth Grids. The following describes the inventory counts and building replacement values for the jurisdictional area. These blocks where then intersected with the participating community to run a weighted area analysis to get jurisdictional results. The following describes results of the 100-year Return (1% Annual Chance Event) weighted area analysis.

HAZUS-MH Results

General Building Stock Damage

HAZUS estimates that 103 buildings will be at least moderately damaged in the City of Kyle. 'At least moderately damaged' is defined by HAZUS as greater than 10% damage to a building. For this scenario, only residential buildings were at least moderately damaged.

Residential Buildings	Commercial Buildings	Other Buildings	Total Buildings
103	0	0	103

Building-Related Losses

Exposed Value is the total building and content values for structures within the community. The exposed value for the community is $3,772,185,681. The total building-related losses were $23,503,072 for this scenario. This represents 0.6% of the total replacement value of the community. Loss values are divided into building and content loss dollars.

Building Loss ($)	Content Loss ($)	Total Loss ($)
14,666,526	8,836,545	23,503,072

Essential Facility Damage

HAZUS does not estimate any critical facilities or infrastructure to be out of service for more than 1 day on the day of the event. Additionally, the model estimates that 100% of available hospital beds are ready for use by patients already in the hospital and for those injured by an event.

Debris Generation

HAZUS estimates the amount of debris that will be generated in this scenario. The model estimates that a total of 3,053 tons of debris will be generated. If the building debris tonnage is converted to an estimated number of truckloads, it will require 122 truckloads (with 1 to 25 tons per truck) to remove the building debris generated in this scenario.

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those people displaced that will require accommodations in temporary public shelters. The model estimates 302 people will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 285 people will seek temporary shelter in public shelters.

Floods: Vulnerability Summary

The Kyle Master Parks and Recreation Plan states that, "Even though the Blanco River and its tributaries flow through Kyle, only small portions of the City are actually located within the 100 year floodplain. However, over the past 2 decades many residential developments have started to encroach on the river's tributaries and Plum Creek specifically. This is a serious issue for the City (as evidenced by devastating floods in late 2015 and early 2016). The City's comprehensive plan recommends that lands surrounding waterways should be regulated and growth should be managed. These waterways and associated floodplains provide excellent opportunities to consolidate a network of preserved natural lands linked by greenbelt corridors."

As the community continues to grow and the impervious surfaces continue to increase, the effects could result in adverse impact to other properties or areas if not mitigated properly.

National Flood Insurance Program Repetitive Loss

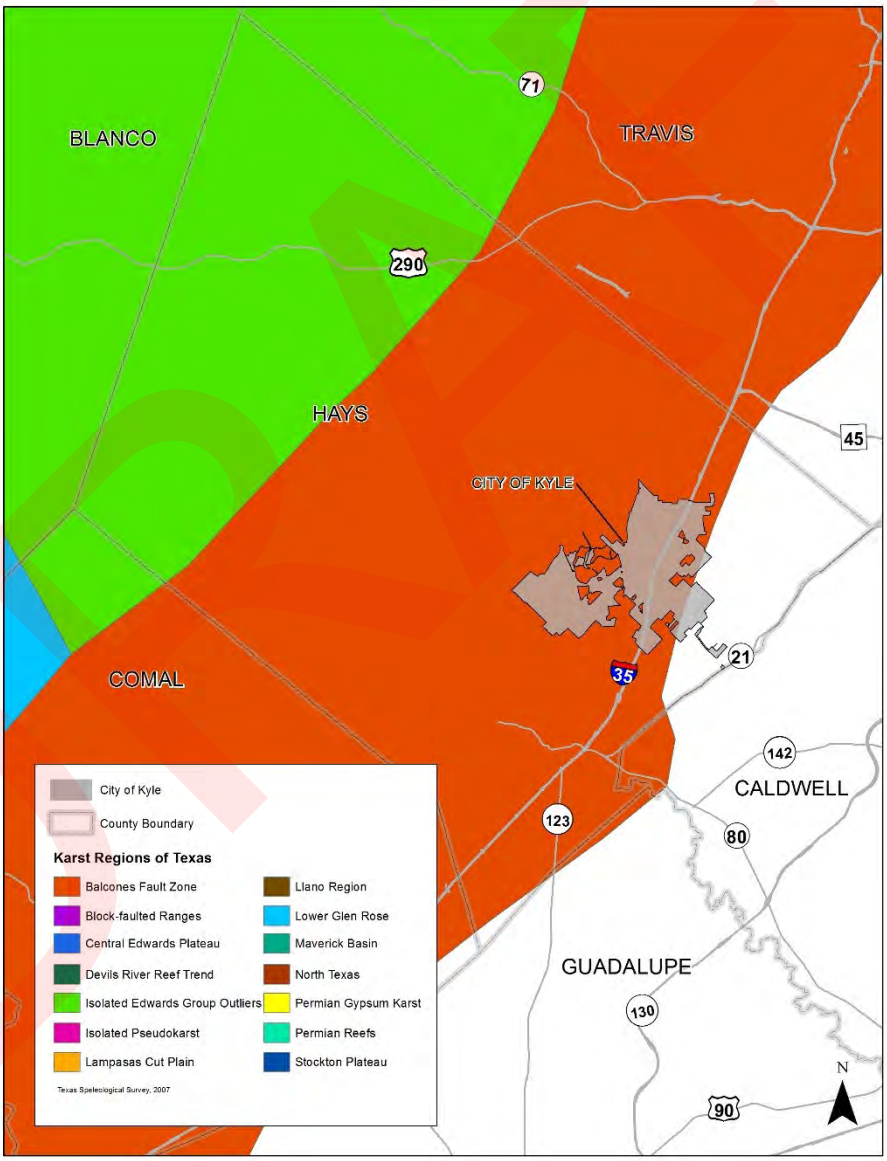
The City of Kyle is a current participant in the National Flood Insurance Program (NFIP). As of September of 2016, the City does not have any listed Repetitive Loss (RL) or Severe Repetitive Loss (SRL) properties according to FEMA RL/SRL data.

Land Subsidence

Land Subsidence: Location

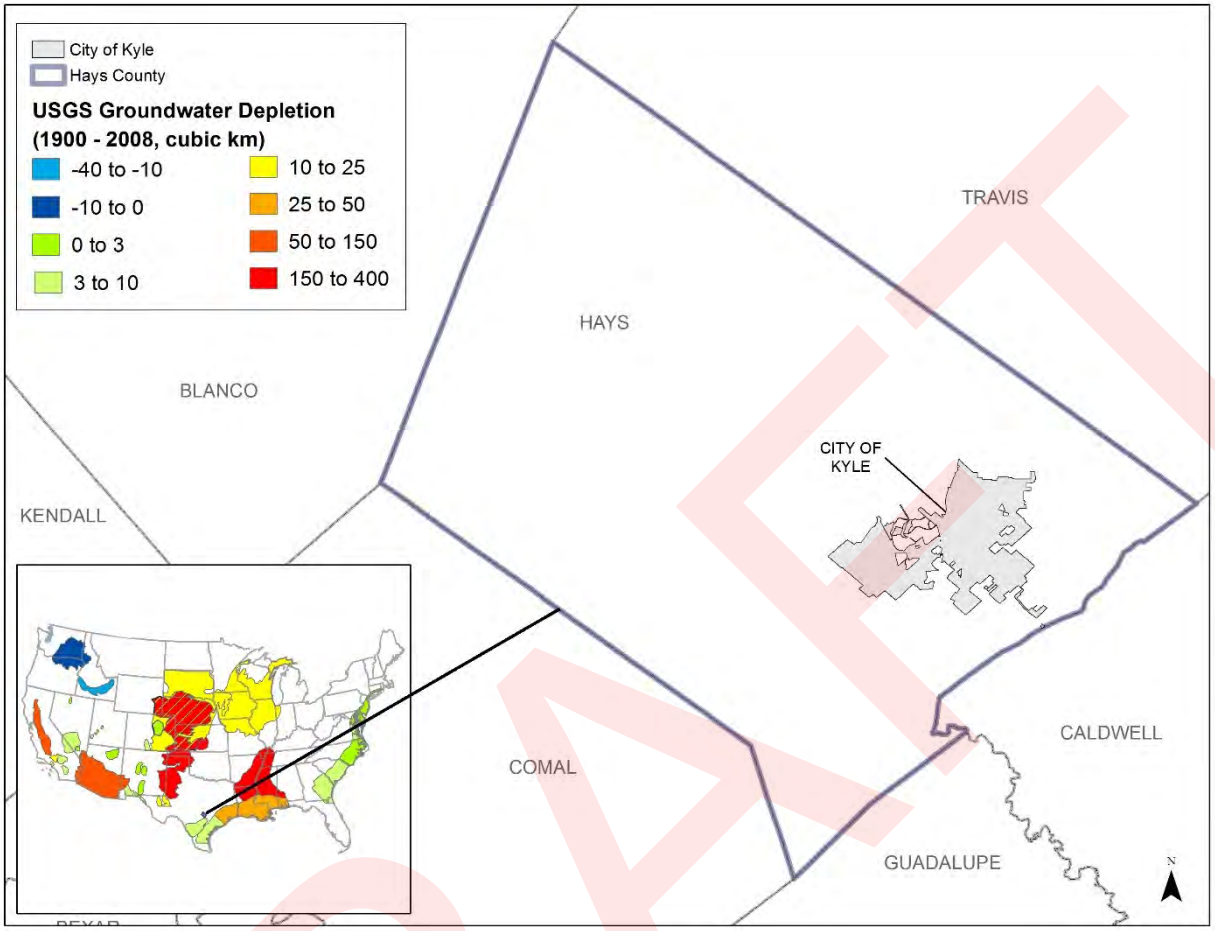
Karst features are a landscape formed from the dissolution of soluble rocks, such as limestone, that can cause sinkholes and caves. Locations within Kyle that are underlain by karst features or that are experiencing extensive groundwater depletion, are most at risk. Figures KY.9 and KY.10 illustrate the jurisdiction's location in conjunction with the karst regions of Texas and USGS Groundwater Depletion Zones. According to Figure KY.9, Kyle is located within the Balcones Fault Zone.

Figure KY.9, Karst Regions of Texas, City of Kyle



(Texas Speleological Survey, 2007)

Figure KY.10, Groundwater Depletion Zones, City of Kyle



(Groundwater depletion in the United States (1900–2008), 2013)

Land Subsidence: Previous Occurrences

There were no sinkhole or land subsidence events documented specifically for the City of Kyle. As the data displayed in Figure KY.10 illustrates, the HMP update area does not have a significant history of groundwater depletion.

However, land subsidence can occur in the Central Texas Hill County areas. Recently, a small event occurred in Travis County (located ~ 15 miles northwest of the study area) when a 25-foot-wide and 12-foot-deep sinkhole opened up at a Costco parking lot in Austin, Texas (Mashhood, 2012), *Shopping center sinkhole provides chance to study runoff,* www.statesman.com). The update area could potentially experience an event of similar depths, widths, and impact as the event described above, but conditions would vary depending on the location of the event. Since future events cannot be predicted, the estimated extents previously described are hypothetical.

Land Subsidence: Extent

Due to the lack of reported occurrences, there is not sufficient data to determine the maximum extent of land subsidence for the jurisdiction. However, if a future event were to occur, it can be assumed it would be similar in extent to previous events in the region. This includes the aforementioned sinkhole in Austin, Texas measuring 25 feet wide and 12 feet deep.

Land Subsidence: Probability

The occurrence of subsidence is an ongoing process resulting from natural and human-induced causes. As seen in Figure KY.9, the majority of the City of Kyle is located within a known karst region, the Balcones Fault Zone. However, with no documented history of subsidence, the probability of a future land subsidence event for the jurisdiction is low (unlikely in next 10 years). If a future event were to occur, however unlikely, it can be assumed that it would be similar in extent to previous events in the region. This includes the previously mentioned sinkhole documented in Austin, Texas.

Land Subsidence: Impact

When considering the impact of land subsidence, it is important to note that many areas within the karst zone have structures and infrastructure that could be affected by a collapsed area. The possible impact of isolated incidents within the karst region could include damage to any, but not all, of the 9,229 structures located in the zone in the unlikely event of a future occurrence. All structures are cumulatively valued at approximately $3,662,433,261 based on HAZUS building and content values.

Land Subsidence: Vulnerability Summary

The lack of incidences and testimony of impact can lend to a general dismissal of the risks of land subsidence. If the community experiences periods of a depletion of groundwater, the chances of land subsidence would be increased and may impact the community. As water may become a more scarce resource in the State, and in the County, a lack of mitigation could lead to increased damages to structures and roads.

Risk Assessment

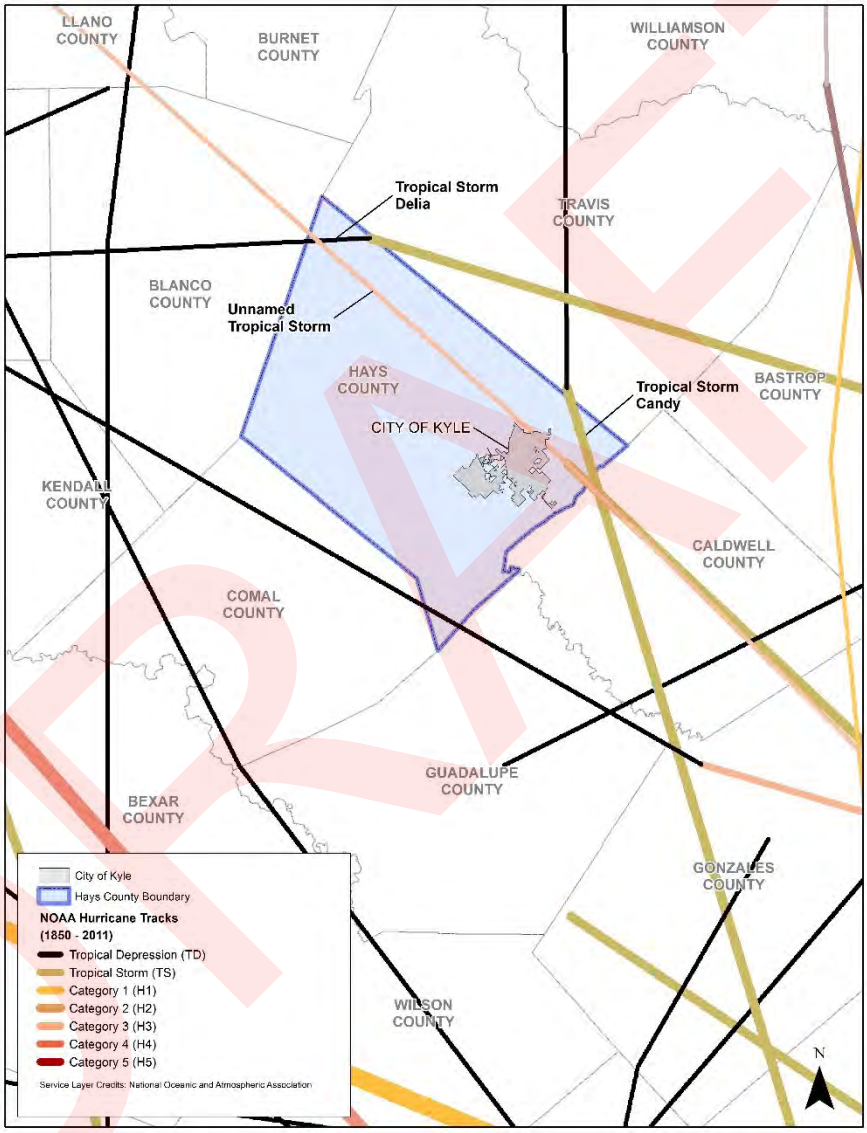
Man-made hazard: sink hole on Lehman Road in Kyle, Texas is not a land subsidence feature.

Hurricanes/Tropical Storms

Hurricanes/Tropical Storms: Location

Due to the regional nature of a hurricane or tropical storm event, the entire extent of the City of Kyle is equally exposed to a hurricane or tropical storm. Figure KY.11 illustrates the location of the jurisdiction with historical hurricane and tropical storm paths documented by NOAA's Hurricane Tracker from 1850 to 2011.

Figure KY.11, Historical Hurricane/Tropical Storm Paths, City of Kyle



(National Oceanic and Atmospheric Administration, 2016)

Hurricanes/Tropical Storms: Previous Occurrences

Previous events are listed below from NOAA Storm Events Database for Tropical Storm Hermine and NOAA Hurricane Tracker for all other events. By the time most hurricanes reach the County, they are tropical storms, depressions or thunderstorms. Because hurricane and tropical storm events occur on a regional scale, all events listed for Hays County have been included as they would impact the City of Kyle.

July 13 to July 22, 1909 – An unnamed storm made landfall near Freeport, as a Category 3 Hurricane. This storm impacted Hays County and participating communities as a tropical depression with wind speeds up to 30 knots. No significant damages, injuries, or fatalities were reported for the City.

June 22 to June 26, 1968 – Tropical Storm Candy made landfall near Port Aransas. This storm impacted Hays County and participating communities as a tropical storm with wind speeds slowing to 30 knots as a tropical depression just after leaving the County. No significant damages, injuries, or fatalities were reported for the jurisdiction.

September 1 to September 7, 1973 – Tropical Storm Delia made landfall near the border of Brazoria and Matagorda Counties. This storm impacted Hays County and participating communities as a tropical storm with wind speeds slowing to 30 knots as a tropical depression just after leaving the County. No significant damages, injuries, or fatalities were reported for the HMP update area.

September 6 to September 8, 2010 – According to the NOAA Storm Events Database, Tropical Storm Hermine made landfall near the Texas/Mexico border on the night of September 6. South Central Texas was hit very hard with widespread rains of 8-12 inches across much of the IH-35 corridor from Austin down to San Antonio.

Hurricanes/Tropical Storms: Extent

The Saffir-Simpson Scale measures pressure, wind speed, and storm surge in 5 categories. According to the reported previous hurricane occurrences in the jurisdiction, the maximum hurricane extent experienced was categorized as a Tropical Storm. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of storm extents.

Hurricanes/Tropical Storms: Probability

Based on 4 reported events in 107 years, a hurricane or tropical storm event occurs approximately every 27 years on average in Hays County. Since hurricane and tropical storm events can happen anywhere throughout the HMP update area, the City of Kyle's future probability is assumed to be similar to the surrounding County areas. In the future, the City can expect an event approximately once every 27 years on average, of up to a magnitude of a Tropical Storm based on historical extents for the jurisdiction.

Number of Events Reported	Number of Years in Dataset	Probability	100yr Max Wind Speed (mph)
4	107	0.04	76

Hurricanes/Tropical Storms: Impact

Exposed Value ($) (Building + Content)	Building Loss ($)	Content Loss ($)	Total Loss ($)
3,772,185,681	2,965,009	1,401	2,966,410

A Probabilistic 100-year Return Period HAZUS-MH 3.2 analysis was run on the participating community. The following describes the results of this analysis.

HAZUS-MH Results

General Building Stock Damage

The total property damage losses were $2,965,009. The majority of damage can be expected to impact residential areas (98%). The remaining damages (2%) are for commercial, industrial, agricultural and religious buildings. While some building damage is experienced, it is estimated that no buildings will be completely destroyed or experience severe damage. Exposed Value is the total building and content values for structures within the community. Loss values are divided separately for building and content loss in dollars.

Essential Facility Damage

HAZUS does not estimate any critical facilities or infrastructure to be out of service for more than 1 day on the day of the event. Additionally, the model estimates that 100% of available hospital beds are ready for use by patients already in the hospital and for those injured by the hurricane.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane at a total of 11 tons. Of the total amount, Brick/Wood comprises 100% of the total. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1 truckload (with 1 to 25 tons per truck) to remove the building debris generated by the hurricane.

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates no households to be displaced due to the hurricane. While there is an estimation of over $2.9 million in property damages expected, it is aforementioned that “no buildings would be completely destroyed or experience severe damage.” Residents would likely remain in their homes as damages were repaired, therefore no temporary shelter is needed.

Hurricane/Tropical Storms: Vulnerability Summary

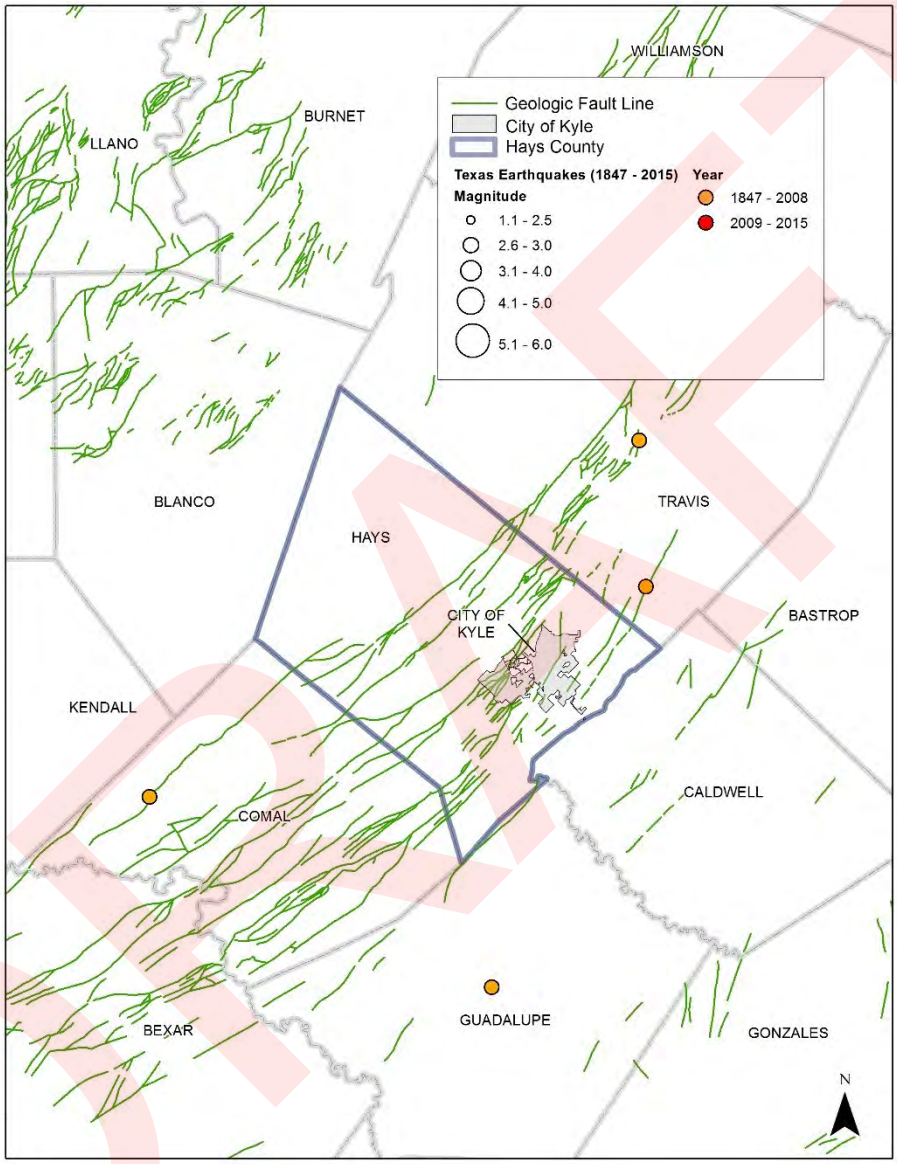
Similar to the impacts of Windstorms, Hailstorms and Lightning, Kyle can expect to be impacted with debris and possible utility interruptions of critical infrastructure. In addition, the community’s proximity to IH-35 could lead to traffic delays caused by major evacuation efforts if the highway is used as an evacuation route for coastal residents.

Earthquakes

Earthquakes: Location

Figure KY.12 shows no notable locations of USGS documented earthquake events in Texas from 1847 to 2015 and the respective location of the City of Kyle.

Figure KY.12, Texas Earthquakes, 1847 – 2015, City of Kyle



(USGS Earthquake Hazard Program, 2015)

Earthquakes: Previous Occurrences

There have been no documented earthquake events for the City of Kyle according to USGS 1847-2015 data as illustrated in Figure KY.12.

Earthquakes: Extent

Earthquakes are measured by Peak Ground Acceleration (PGA). The HAZUS Peak Ground Acceleration (PGA) for the jurisdiction is 1.59% (see City of Kyle Earthquakes: Impact Section for a description of the HAZUS Analysis). This corresponds to the Modified Mercalli Scale Category IV, with light perceived shaking and no potential structure damage. HAZUS measures PGA on a census tract level. Cities within more than 1 census tract were assigned the highest PGA level to reflect the maximum possible extent. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for extent scale and PGA descriptions.

Number of Events Reported	Number of Years in Dataset	500yr PGA
0	170	1.58

Earthquakes: Probability

As there have been no recorded previous occurrences of earthquakes for the City of Kyle and the PGA is less than 2% for the area, the probability of an earthquake in the City in the future is low (unlikely within the next 10 years).Earthquakes: Impact

The FEMA How-To Guidance, Understanding Your Risks (FEMA 386-2, page 1-7), suggests the earthquake hazard should be profiled if the PGA is greater than 3%g, where PGA is measured in the acceleration of gravity (g). The participating City's PGA is less than 3%g (0.03) and there have been no recorded earthquakes in or near the jurisdiction. Therefore, only a minimum level-1 HAZUS analysis was profiled using the 500-year probability event scenario. The HAZUS analysis produced a PGA of 1.58%. HAZUS also produced $0 in building damages (Residential, Commercial, Agriculture, Religious and Government) from an event. Critical facilities and Infrastructure did not experience any loss of service. There were no critical facilities or infrastructure that experienced moderate to complete damage. No debris was generated from this event and no people or households required temporary housing. There were no moderate, extensive or completely damaged buildings by this event. HAZUS estimates no households are expected to be displaced from their homes or will require accommodations in temporary public shelters due to the earthquake. Additionally, there were no causalities or fatalities from this event.

Earthquakes: Vulnerability Summary

While the probability of an earthquake in Kyle is low, with no significant prior events on file, there are fault lines within the community that could cause impact if there were to be an increase in seismic activity in the area. There are 13 fault lines located within the jurisdiction according to USGS data. Kyle could expect to be impacted with debris and utility possible interruptions if an event were to occur in this unlikely and unprecedented scenario. If an event were to incapacitate a roadway, emergency responders would be hindered from responding, thus leaving the residents who were affected at risk.

The following thoroughfares are crossed by the USGS fault lines displayed on Figure KY.12: IH-35, Post Road, Kohlers Crossing, East Post Road, Elmhurst Drive, Kyle Center Drive, and Goforth Road.

Additionally, the following critical facilities and infrastructure are located within 1 mile of a fault line within the community (according to HAZUS and community submitted critical facility data): Seton Medical Center, Constable Precinct #2, Health Department, Kyle Correctional Center, Wallace Middle School, Hays CISD Special Education, Kyle Elementary School, Fuentes Elementary School, and Hays CISD Administration.

Pages 41-44, Dam/Levee Failure have been redacted from this copy of the plan.

Pages 41-44, Dam/Levee Failure have been redacted from this copy of the plan.

Wildfires

Wildfires: Location

The Texas A&M Forest Service's Texas Wildfire Risk Assessment Portal (TxWRAP) can be used to help communities understand their wildfire risk. Figure KY.15 below shows the location of TxWRAP's documented wildfire occurrences with Wildland Urban Interface (WUI) classifications within the City of Kyle. The WUI illustrates areas of development that are abutting natural areas. Here, communities and the built environment have an increased vulnerability to a wildfire event. Wildfires can be ignited from a variety of sources including lightning or human activity such as campfires, smoking, arson, or equipment use.

Figure KY.15, Wildland Urban Interface (WUI) and Reported Wildfire Ignitions, City of Kyle

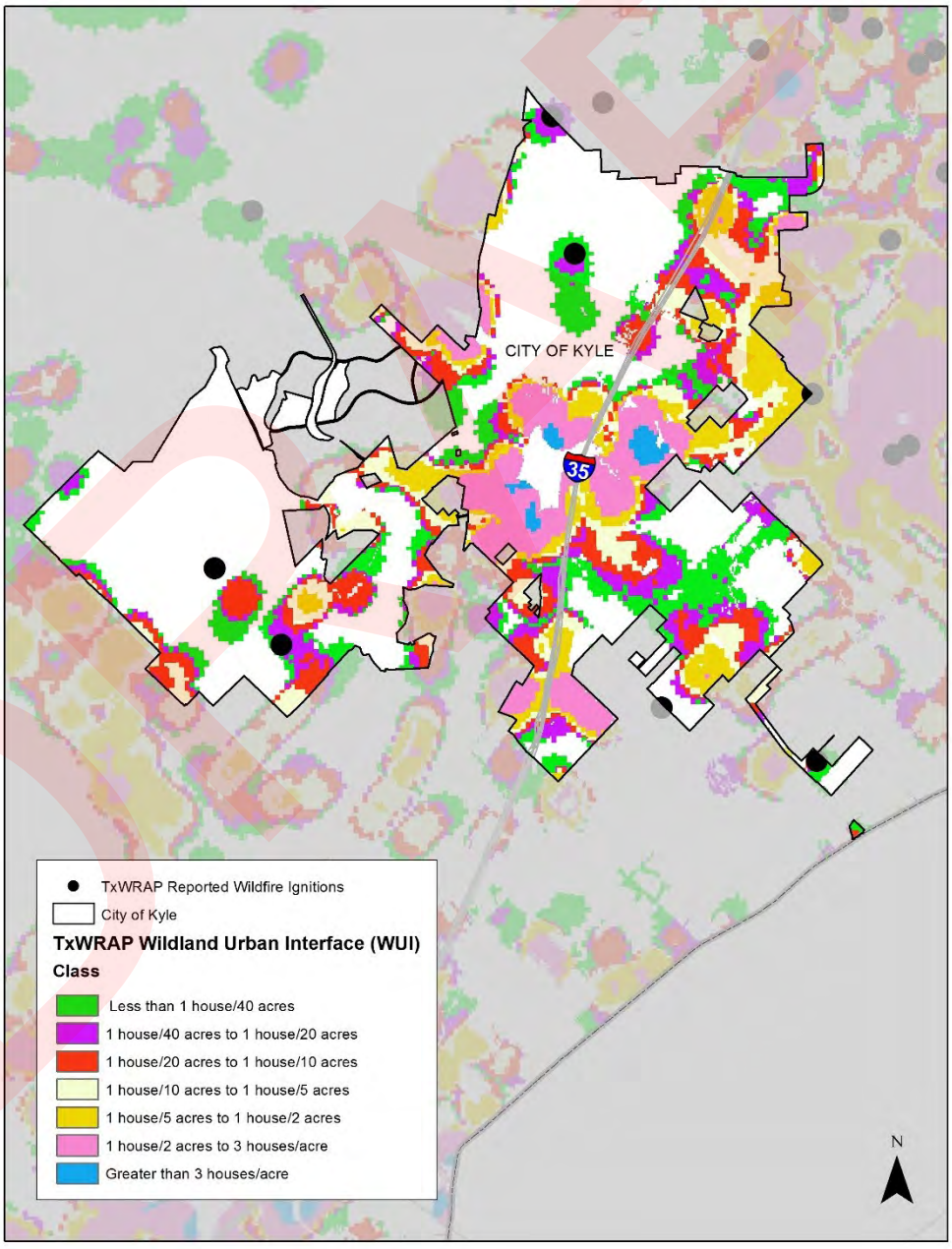


Figure 17 (Texas A&M Forest Service, 2016)

Wildfires: Previous Occurrences

Table KY.27 shows the reported wildfire ignitions within the City of Kyle according to TxWRAP and USGS Federal Fire Occurrence data from the years 1980 to 2015.

Table KY.27, Wildfire Ignitions, City of Kyle

FPA ID	Date	Fire Size (Acres)
SFO-TX02240706-42835	4/1/2006	200
SFO-TX0482-115401	1/5/2008	27
SFO-TX0482-154378	4/18/2008	0.5
NA	NA	10

**N/A - Data not available*

Wildfires: Extent

Table KY.28 lists the Fire Intensity Acreage for the City according to the Texas A&M Forest Service TxWRAP Community Summary Report. Refer to Chapter 2, the Risk Assessment portion of the Hays County HMP Update, for a description of the Characteristic Fire Intensity Scale (FIS),.

Table KY.28, TxWRAP Fire Intensity Acreage, City of Kyle

Class	Acres	Percent
Non-Burnable	4,153	34.60%
1 (Very Low)	147	1.20%
1.5	346	2.90%
2 (Low)	144	1.20%
2.5	3,425	28.50%
3 (Moderate)	2,394	19.90%
3.5	1,201	10.00%
4 (High)	80	0.70%
4.5	115	1.00%
5 (Very High)	0	0.00%
Total	12,004	100.00%

Wildfires: Probability

Based on 4 reported events in 35 years, the City of Kyle can expect a wildfire event approximately once every 8 to 9 years on average in the future, with up to a potential fire intensity of 4.5, or “High” classification on the TxWRAP Characteristic Fire Intensity Scale.

Number of Reported Events	Number of Years in Dataset	Probability
4	35	0.11

Wildfires: Impact

Impact on the community can be measured using TxWRAP Housing Density levels within the WUI. Areas with a higher housing and population density would be affected to a greater extent than more rural areas, and especially areas near burnable fuels. Table KY.29 below lists the population, percent of total population, WUI acreage and percent of WUI acreage for the City of Kyle, according to the Texas A&M Forest Service TxWRAP Community Summary Report. See Figure KY.15 for the location of WUI areas within the jurisdiction.

Table KY.29, WUI Acreage, City of Kyle

Housing Density		WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
	LT 1hs/40ac	40	0.50%	1,523	20.40%
	1hs/40ac to 1hs/20ac	79	0.90%	954	12.80%
	1hs/20ac to 1hs/10ac	156	1.80%	1,071	14.30%
	1hs/10ac to 1hs/5ac	262	3.00%	1,056	14.10%
	1hs/5ac to 1hs/2ac	789	9.00%	1,257	16.80%
	1hs/2ac to 3hs/1ac	5,395	61.80%	1,463	19.60%
	GT 3hs/1ac	2,008	23.00%	147	2.00%
Total		8,729	100.00%	7,471	100.00%

Wildfires: Vulnerability Summary

The City of Kyle has the unique benefit of having 2 Emergency Services District stations within its City limits. With most communities within the County being lucky to have 1 nearby or within their jurisdiction, they have access to services with fast response times. Interstate Highway 35 passing through the community does weigh on the emergency responder availability, as many accidents occurring within the County occur on this roadway. If a wildfire event was to occur, the responders located within the community (independent of City of Kyle control as they are standalone organizations) may need to seek backfill from other organizations to meet the demands of IH-35 while fighting a fire. The community has fire hydrants, however there are parts of the community that do not have adequate fire flow, according to the Capital Improvements Plan.

Risk Ranking Result

On January 12, 2017, planning representatives from the City of Kyle completed a questionnaire as part of the Hays County HMP Update: Risk Assessment. The questions covered the risk associated with the hazards that affect each community based on the level of concern over each profiled hazard, the hazards' impact on health and safety as well as property damage and business continuity. The answers from this questionnaire were combined with public survey results on perception of risk, and the values from both sources were analyzed using the Halff Risk Ranking Tool (details regarding the risk ranking tool are in Chapter 2, the Risk Assessment portion of the Hays County HMP Update). The results provided a quantified ranking of risk with values ranging from 0 to 100. The results for Kyle are shown below (hazard values are shown from highest to lowest risk):

Ranking Order	Hazard	Risk Ranking Value
1	Floods	94.7
2	Expansive Soils	87.3
3	Dam/Levee Failure	84.1
4	Extreme Heat	74.1
5	Severe Winter Storms	72.2
6	Wind Storms	71.9
7	Hail Storms	71.6
8	Lightning	57.3
9	Wildfire	51.7
10	Tornadoes	48.9
11	Land Subsidence	48.6
12	Drought	48.3
13	Earthquakes	46.1
14	Hurricanes/Tropical Storms	43.0

Section 3: Mitigation Strategy

This section examines the jurisdiction's ability to perform mitigation (review of existing capabilities, shown in Table KY.30) and identifies specific actions to address vulnerabilities for each hazard profiled in the Hays County HMP Update. The mitigation strategy is the application of actions into an approach for performing structural and non-structural mitigation efforts within the jurisdiction. Actions are also prioritized and considered for incorporation into other community programs, regulations, projects or plans.

Completed and canceled actions are also included in a separate section for future reference.

Table KY.30, Existing Capabilities

Capability Name	Capability Type	How it can Accomplish Mitigation
Chapter 211 of the Local Government Code: Zoning	Authority	Authorizes the City to regulate Zoning.
Chapter 213 of the Local Government Code: Municipal Comprehensive Plans	Authority	Authorizes the City to adopt a comprehensive plan for the long-range development of the City.
Chapter 214 of the Local Government Code	Authority	Authorizes the City to have regulatory authority as it related to building code (such as structural integrity and plumbing)
City of Kyle Code of Ordinances Chapter 8: Building Regulations	Authority	Regulatory power over the construction of new structures. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 17: Floods	Authority	Regulatory control over development in the floodplain and protection of special flood hazard areas (Municode, 2017)
City of Kyle Code of Ordinances Chapter 20: Law Enforcement and Civil Emergencies	Authority	Regulation over actions for emergency communications and evacuations. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 23: Miscellaneous Offenses	Authority	Ability to enforce ordinances. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 41: Subdivisions	Authority	Regulation over subdivision development. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 44: Taxation	Authority	Regulation over the ability to tax to fund possible mitigation actions. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 50: Utilities	Authority	Regulation over the use and installation of utilities. (Municode, 2017)
City of Kyle Code of Ordinances Chapter 53: Zoning	Authority	Regulation over zoning within the community. (Municode, 2017)
Mayor	Elected Official	Provides political support for approving and funding mitigation actions.
Council Members	Elected Officials	Supplement political support for implementation of mitigation actions.

Table KY.30, Existing Capabilities (cont.)

Capability Name	Capability Type	How it can Accomplish Mitigation
Emergency Management Coordinator	City Staff	Coordinates MPC, implementation of mitigation actions, and monitoring/evaluation/updating HMP.
Floodplain Administrator	Various Engineers City Staff	Ensures enforcement of existing flood damage prevention ordinance, and continued compliance with NFIP requirements.
Civil Engineer	City Staff	Provides expertise and guidance for structural mitigation actions.
Chief Building Official	City Staff	Collaborates with MPC on ensuring compliance with existing mitigation-related building requirements and consideration of new building practices to increase mitigation.
Community Planner	City Staff	Considers HMP-identified risk areas when consulting with community planning stakeholders.
GIS Coordinator	City Staff	Can graphically demonstrate changes in development and changes in hazard areas.
Parks and Recreation Director	City Staff	Assists in identifying opportunities for integration of mitigation activities into long-term park development plans. Can also assist with coordinating public outreach events.
Police Chief	City Staff	Assists with flood-related traffic control and evacuation planning.
Fire Chief	City Staff	Assists with wildfire-related mitigation through existing programs and efforts as well as implementation of new measures.
Sales Tax	Funding	Provides potential funding for Hazard Mitigation items
Property Tax	Funding	Provides potential funding for Hazard Mitigation items
Franchise Tax	Funding	Provides potential funding for Hazard Mitigation items
Permitting and Licensing Fees	Funding	Provides potential funding for Hazard Mitigation items
Capital Improvement Plan Funding	Funding	Budget dollars obligated to projects that involve multiple mitigation-related actions.

National Flood Insurance Program Participation

The City of Kyle participates in the National Flood Insurance Program. There are 3 Certified Floodplain Managers on staff who run the floodplain program as an auxiliary function. The administration of the program consists of permit review, inspections and engineering services. Their Flood Damage Prevention Ordinance meets Federal and State minimum requirements. The permitting process consists of the completion of a Flood Hazard Development permit by the applicant and the review of that document by City of Kyle Staff. The community does not participate in the Community Rating System program. The City of Kyle has 100 NFIP policies in force as of June 2016, with $22,498,400 of insurance coverage.

Mitigation Goals

The plan-level Mitigation Goals can be found in Chapter 3, the Mitigation Strategy portion of the Hays County HMP Update. These goals apply to each community and were mutually decided upon as the guiding goals for the development of actions in each jurisdiction.

Mitigation Actions

***E= Actions reducing risk to existing buildings and infrastructure**
F= Actions reducing risk to new development and redevelopment

Number/Title	Hazard	Item Description	Implementation Agency
1 Flood Insurance Information Campaign (previously action 1 on 2011 plan, modified)	Floods	Promote the flood insurance program to lessen the number of structures uninsured from flood loss by providing citizens access to brochures about the NFIP at the local City Hall and links to resources on website.	City of Kyle Stormwater, City of Kyle Communications

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing City staff and free NFIP materials from FEMA publication warehouse	3 months	Not started	N/A

Cost and Benefit Considerations
This project would indirectly benefit residents who need information about the hazard at little cost.

Number/Title	Hazard	Item Description	Implementation Agency
2 Adopt City Engineering Design Manual with Drainage Incorporated (previously action 2 in 2011 plan, modified)	Floods, Expansive Soils, Tornadoes, Windstorms	Taking action to incorporated existing engineering manual that includes drainage standards.	City of Kyle City Council, City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing City staff	12 months	In progress	E/F

Cost and Benefit Considerations
This project would be a low-cost method of ensuring that new development and substantial improvements are done with less risk for flood damage.

Number/Title	Hazard	Item Description	Implementation Agency
3 Attend Advanced Local Floodplain Management Courses (previous action 3 in 2011 plan, modified)	Floods	Send member of the staff or elected official to training in order to become a received advanced floodplain management training.	City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff, cost of accommodations for traveling to training	6 months/then ongoing	Not started	E/F

Cost and Benefit Considerations
If attending the course at the Emergency Management Institute, the cost of the course would be very low, and only include a minimal meal ticket purchase. The benefit of an informed floodplain administrator would help both new and existing residents through guidance on how to mitigate flood damages to development.

Number/Title	Hazard	Item Description	Implementation Agency
4 CodeRed Registration Drive (previously action 4 in 2011 plan)	All Hazards except Expansive Soils and Land Subsidence	Marketing a registration drive to encourage those who live and work in the community to register their devices in the CodeRed database.	City of Kyle Stormwater, City of Kyle Communications

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff Resources	6 months	Not started	N/A

Cost and Benefit Considerations

This low cost effort using existing outreach methods will increase the number of contacts on the CodeRed system and improve the span of reach for messages.

Number/Title	Hazard	Item Description	Implementation Agency
5 StormReady Designation for Kyle (previously action 6 in 2011 plan)	Windstorm, Hailstorm, Severe Winter Storms, Lightning, Hurricanes/ Tropical Storms, Tornadoes, Floods	Application preparation and submission for StormReady designation from the National Weather Service that attests to the community's level of preparedness for severe weather.	City of Kyle Stormwater

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff	12 months	Delayed	N/A

Cost and Benefit Considerations

This free application would benefit all members of the community in increasing the preparedness of the local government.

Number/Title	Hazard	Item Description	Implementation Agency
6 Increase Public Awareness of Hazards (previously action 9 in 2011 plan)	All Hazards	Creating resource page on City website to promote information about the hazards that exist in the community and how to take mitigation actions at the individual level.	City of Kyle Communications Department

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff	6 months	Ongoing	N/A

Cost and Benefit Considerations

This free enhancement to the City's existing website would benefit all with internet access at little to no cost, except the staff resources required to do so.

Number/Title	Hazard	Item Description	Implementation Agency
7 Installation of Generators for City Owned Facilities and Procedures for Providing Temporary Sheltering (previously action 7 in 2011 plan, modified)	Lightning, Extreme Heat, Severe Winter Storm, Windstorms, Hurricanes/ Tropical Storms, Tornadoes	Back-up electrical power available to City structures to ensure continuity of government operations and to also provide temporary sheltering for vulnerable populations in the City.	City of Kyle City Council

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff, grant writing assistance, Hazard Mitigation Grant program funding, if applicable and eligible	18 months	Not started	E

Cost and Benefit Considerations
If grant funding is eligible, the cost/benefit of this project would have to be positive. Only the fire department stations have a back-up source for power and those belong to the Emergency Services District, not the City.

Number/Title	Hazard	Item Description	Implementation Agency
8 Adopt Firewise hazard information from Hays County for mitigation activities (previously action 10 in 2011 plan, modified)	Drought, Land Subsidence	Formal adoption of Hays County Firewise maps and data for purposes of mitigating against wildfire risk and planning activities.	ESD #5 Fire Marshall

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff	6 months	Not started	E/F

Cost and Benefit Considerations
Building upon an existing and funded County level project, the community can take action to adopt Wildfire maps and data at no cost.

Number/Title	Hazard	Item Description	Implementation Agency
9 Energy Prioritization Collaboration with Electric Cooperative (previously 13 in 2011 action plan, modified)	Extreme Heat, Severe Winter Storms, Lightning, Windstorms, Tornadoes, Hurricanes/ Tropical Storms	Working with electricity providers to create a citizen registration system for requesting prioritization for power restoration according to special need or circumstance during hazards that could affect access to electricity. This could be done as an additional question added to the CodeRed registration.	City of Kyle Emergency Management

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff, Electric Companies	6 months	Not Started	N/A

Cost and Benefit Considerations
This low cost project for prioritizing energy restoration for those with special needs within the community that would be impacted by hazards that are known for affecting impact to electrical power. All those with special needs from electrical resources would benefit.

Number/Title	Hazard	Item Description	Implementation Agency
10 Street Prioritization Procedure for Sanding (previously action 14 in 2011 plan)	Severe Winter Weather	Creation of a plan that provides established procedures and prioritization for Sanding efforts.	City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff	12 months	Not Started	N/A

Cost and Benefit Considerations

This low cost planning activity will ensure that careful consideration is made for road prioritization for Sanding activities that will benefit many residents and visitors.

Number/Title	Hazard	Item Description	Implementation Agency
11 Coordination of Limb and Large Item Pick-up day for Wildfire Mitigation (previously action 15 in 2011 plan, modified)	Wildfire, Severe Winter Weather, Lightning	Cross marketing of existing brush collection efforts from new trash vendor in order to promote mitigation.	City of Kyle Stormwater, City of Kyle Communications

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff, trash provider	2 months	In Progress	N/A

Cost and Benefit Considerations

At only the cost of the staff for coordination, the community cross-marketing new resources for collecting/accepting brush in order to promote cleaning brush and dead trees to decrease fuel for wildfire, potential debris that could fall on power lines during freezing conditions and that could ignite during lightning strike. This would benefit any citizen that resides in a location with vegetation and trees. This will benefit the whole community.

Number/Title	Hazard	Item Description	Implementation Agency
12 Engineering review of New Police Department construction (CIP project) to ensure soundness against natural hazards (previously actions 16, 17 in 2011 plan, modified)	Flood, Tornadoes, Windstorm, Hurricanes/ Tropical Storms, Hailstorms	Contract with a firm to review the new Police Department building to ensure its resiliency.	City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff, cost of engineer study	12 months	Not started	E/F

Cost and Benefit Considerations

The cost of this review will benefit the City government as it will assist with the assurance of the continuity of operations for the community during disaster conditions.

Number/Title	Hazard	Item Description	Implementation Agency
13 Evacuation Plans/ Alternate road consideration (previously action 19 in 2011 plan, modified)	Hurricanes/ Tropical Storms, Floods, Dam/ Levee Failure, Wildfire	Documentation of an evacuation plan that includes multiple exits.	City of Kyle Stormwater, City of Kyle Emergency Management

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff, possible cost of buy out for an easement of land to develop an additional emergency exit for the community, pursuit of grant funding for effort	18 months	Not started	F

Cost and Benefit Considerations
The cost of not establishing a way out of the community would greatly outweigh the cost of mitigating this risk of not being to get citizens out of danger.

Number/Title	Hazard	Item Description	Implementation Agency
14 Expansive Soil Online Information Sheet	Expansive Soils	Creating and providing information regarding expansive soils to developers and citizens building in the community. The sinformation about the hazard will provide recommendations for soil compaction and engineered foundations, especially for non-site built structures.	City of Kyle Stormwater

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff, website maintenance costs	3 months	Not started	E/F

Cost and Benefit Considerations
This free effort would provide awareness and public information that will benefit those looking to perform new development and those who are improving or repairing existing property.

Number/Title	Hazard	Item Description	Implementation Agency
15 Plum Creek Dam Evacuation Plan Request (previously action 18 in 2011 plan, modified)	Dam/Levee Failure, Floods	Coordination dam owners to provide the City with disaster procedures and evacuation plans associated with dam failure.	City of Kyle Stormwater

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Cost covered by USACE, existing staff	3 months	Not started	N/A

Cost and Benefit Considerations
This request for information from dam owners would require very little effort from the community and would benefit all that are downstream of the structure.

Number/Title	Hazard	Item Description	Implementation Agency
16 WaterWise Campaign (previously action 12 in 2011 plan, modified)	Drought, Land Subsidence	Promotion commercial for WaterWise Conservation program for the City-enhancement to existing program.	City of Kyle Communications, City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Cost for commercial production, internal	9 months	Ongoing	N/A

Cost and Benefit Considerations
Promoting this existing program will potential improve water usage within the community.

Number/Title	Hazard	Item Description	Implementation Agency
17 Drought Monitoring Program (previously action 11 in 2011 plan, modified)	Drought, Land Subsidence	Provide widget on City homepage that provides the latest US Drought Monitor conditions for the day during drought conditions.	City of Kyle Communications, City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing staff	6 months	Not started	N/A

Cost and Benefit Considerations
This low cost monitoring and inclusion of drought water conservation measures will take more time than money to institute and could save the community from a water shortage. All residents that use the water source would benefit.

Number/Title	Hazard	Item Description	Implementation Agency
18 Riparian Zone Sign GIS Layer	Floods, Drought, Land Subsidence	Enhancement on existing Parks program item that placed Riparian Zone signs in place in areas where parkland vegetation is left natural. Action would map the points of the sign placement for GIS purposes.	City of Kyle GIS, City of Kyle Parks and Recreation Department

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Existing Staff	6 months	Ongoing	N/A

Cost and Benefit Considerations
Being able to map assigned riparian locations would assist with better understanding where these zones are and benefit multiple programs involved in development within the City.

Number/Title	Hazard	Item Description	Implementation Agency
19 Creation of Drainage Master Plan	Floods, Drought, Land Subsidence	Contracting of Drainage Master Plan for the community.	City of Kyle Engineering Department

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$200,000- general fund	18 months	Ongoing	E/F

Cost and Benefit Considerations
This project is already an existing priority and has obligated funding.

Number/Title	Hazard	Item Description	Implementation Agency
20 Creation of Drainage Crew on City Staff	Floods, Drought, Land Subsidence	Drainage project construction crew being hired for implementation of drainage projects.	City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Annual cost of salary, vehicles and equipment for team	12 months	Ongoing	N/A

Cost and Benefit Considerations
The creation of this team is an existing priority that is already funded and currently being implemented.

Number/Title	Hazard	Item Description	Implementation Agency
21 Water Improvements- Line Upgrades and Replacements (CIP 34)	Drought, Wildfires	An existing CIP project to provide necessary repairs, line replacements/improvements, upgrades of existing water distribution infrastructure. These are needed to maintain adequate flows and pressure to provide necessary compliance with TCEQ regulations.	City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$1,200,000 from Utility Fund phased over 4 years	48 months	Ongoing	E

Cost and Benefit Considerations
This existing project is already a priority in the Capital Improvement Plan and has obligated funding.

Number/Title	Hazard	Item Description	Implementation Agency
22 Water Improvements-Pumphouse Rd/ Melinda Lane Project (CIP 41)	Drought, Wildfires	The construction of a new 8" water line to be installed down Pumphouse Rd that will eliminate an existing smaller undersized line that is currently at capacity. Project will also provide fire protection where there is currently none.	City of Kyle Public Works, City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$120,000 from Water Impact Fees	12 months	Ongoing	F

Cost and Benefit Considerations
This existing project is already a priority in the Capital Improvement Plan and has obligated funding.

Number/Title	Hazard	Item Description	Implementation Agency
23 Quick Connect Power Ports (CIP 38)	Extreme Heat, Severe Winter Storms, Lightning, Windstorms, Tornadoes, Hurricanes/ Tropical Storms	Installation of fast connect couplings and associated wiring at water pump stations to allow rapid connection of emergency power generator to station, equipment and motors.	City of Kyle Public Works

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$40,000 from Utility Fund	12 months	Ongoing	E

Cost and Benefit Considerations
This project that will provide more reliable water service abilities during natural disasters or other critical emergencies where normal power has been disrupted is an existing Capital Improvement Plan project and has funding.

Number/Title	Hazard	Item Description	Implementation Agency
24 Water Improvements-Stagecoach, Scott Street, Opal Street	Floods, Drought, Wildfires	Phase I to a project that involves the construction of a new 12" water line along Stagecoach. This line is essential to eliminate an existing, small, undersized line that has already reached capacity. The new line will add fire protection where there currently is none.	City of Kyle Public Works and Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$185,000 from Water Impact Fees	12 months	Ongoing	E/F

Cost and Benefit Considerations
To reduce cost, the project is proposed to be completed in-house by City staff and already is a project within the Capital Improvement Plan.

Number/Title	Hazard	Item Description	Implementation Agency
25 Monarch Water System Inter-Connect using SCADA	Drought	This project will provide a water inter-connect that may be used by either the City or Monarch during emergency situations.	City of Kyle Public Works, Monarch Water

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Cost will be split between City and Monarch. $70,000	12 months	Ongoing	E

Cost and Benefit Considerations
This will provide an additional source of water during emergency situations and will benefit the entire population utilizing the water supply. This is an existing project in the Capital Improvement Plan.

Number/Title	Hazard	Item Description	Implementation Agency
26 Engineering & Easement of Lehman Road	Floods	This reconstruction to a 2 lane road with an additional turn lane and a bridge over Plum Creek will minimize road closures due to rising water.	City of Kyle Public Works, City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$7,895,448 from Road Bonds, phased over 24 months	24 months	Ongoing	E

Cost and Benefit Considerations
Existing Capital Improvement Plan project with bond funding associated with it.

Number/Title	Hazard	Item Description	Implementation Agency
27 Engineering & Easement- N. Burleson Street	Floods	This reconstruction of a 2 lane roadway will include drainage improvements that will enhance land use in the area.	City of Kyle Public Works, City of Kyle Engineering

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
$9,052,355 from Road bonds	36 months	Ongoing	E

Cost and Benefit Considerations
Existing Capital Improvement Plan project with bond funding associated with it.

Number/Title	Hazard	Item Description	Implementation Agency
28 Prepare and implement a prairie or woodland restoration plan for 1 or more of Kyle's park properties	Floods	Selection of a municipal park where all or a portion of the site may be restored to a natural grassland or woodland.	City of Kyle Parks

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Parks funding	36 months	Not stated	E

Cost and Benefit Considerations
Existing Parks Master Plan project with bond funding associated with it.

Number/Title	Hazard	Item Description	Implementation Agency
29 Acquire parcels for the assembly of interconnected greenways	Floods	For improved drainage and public recreation, this project also called a Riparian Corridor Land Assembly will be a project that interconnects greenways into a trail system that connects across Kyle.	City of Kyle Parks, Stormwater

Cost Estimate/Funding	Schedule	Status as of 2017	*Risk Focus:
Parks Funding	36 months	Ongoing	E

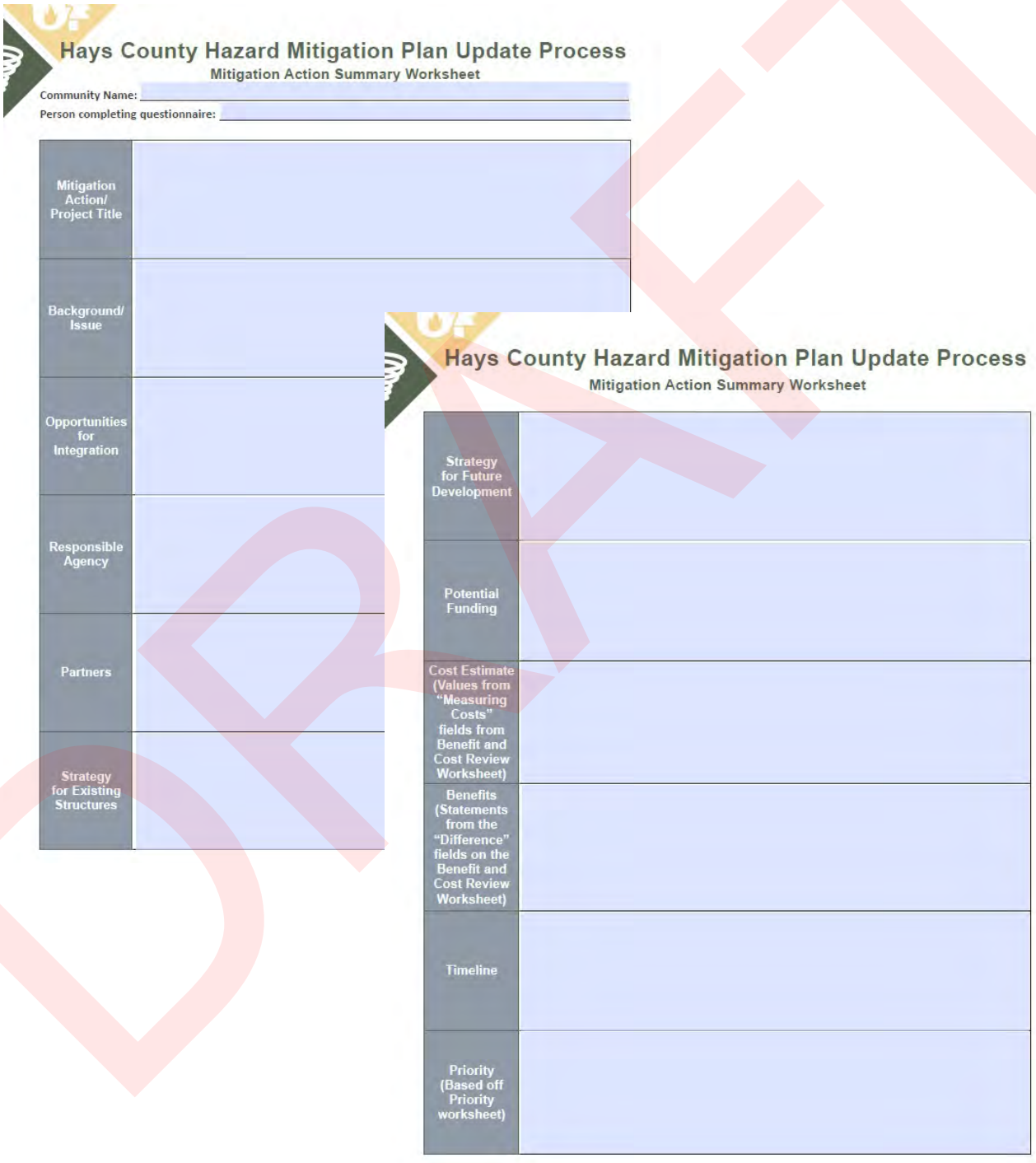
Cost and Benefit Considerations
Existing Parks Master Plan project with bond funding associated with it.

Capabilities Assessment

Evaluation/Prioritization of Actions

Each action added to the plan was developed using the Mitigation Action Summary Worksheet shown in Figure KY.16. Non-cost effective projects were not included in prioritization activity.

Figure KY.16, Mitigation Action Summary Worksheet



Hays County Hazard Mitigation Plan Update Process

Mitigation Action Summary Worksheet

Community Name: _____

Person completing questionnaire: _____

Mitigation Action/ Project Title	
Background/ Issue	
Opportunities for Integration	
Responsible Agency	
Partners	
Strategy for Existing Structures	

Hays County Hazard Mitigation Plan Update Process

Mitigation Action Summary Worksheet

Strategy for Future Development	
Potential Funding	
Cost Estimate (Values from "Measuring Costs" fields from Benefit and Cost Review Worksheet)	
Benefits (Statements from the "Difference" fields on the Benefit and Cost Review Worksheet)	
Timeline	
Priority (Based off Priority worksheet)	

Table KY.31, Mitigation Action Prioritization (with Hazards in order of highest priority to lowest)

Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community	Risk Ranking Score	Total Score
19. Creation of Drainage Master Plan	1	1	1	1	0	1	1	1	1	1	95	104
6. Increase Public Awareness of Hazards	1	1	1	1	0	1	1	1	0	1	95	103
20. Creation of Drainage Crew on City Staff	1	1	1	1	0	0	1	1	1	1	95	103
26. Engineering & Easement of Lehman Road	1	0	1	1	1	0	1	1	1	1	95	103
13. Evacuation Plans/Alternate road consideration	1	0	1	1	1	0	1	1	0	1	95	102
18. Riparian Zone Sign GIS Layer	0	0	1	1	0	1	1	1	1	1	95	102
24. Water Improvements- Stagecoach, Scott Street, Opal Street	1	0	1	1	0	0	1	1	1	1	95	102
27. Engineering & Easement- N. Burleson Street	1	0	1	1	0	0	1	1	1	1	95	102
3. StormReady Designation for Kyle	1	0	1	1	0	0	1	1	0	1	95	101
21. Water Improvements- Line Upgrades and Replacements	0	0	1	1	0	0	1	1	1	1	95	101
22. Water Improvements- Pumphouse Rd/Melinda Lane Project	0	0	1	1	0	0	1	1	1	1	95	101
28. Prepare and implement a prairie or woodland restoration plan for 1 or more of Kyle's park properties	0	0	1	1	0	1	1	1	0	1	95	101
4. CodeRed Registration Drive	1	0	1	1	1	0	1	-1	0	1	95	100
1. Promote Flood Insurance in the community	0	0	1	1	0	0	1	1	0	0	95	99
15. Plum Creek Dam Evacuation Plan Request	1	0	1	1	0	0	1	-1	1	1	94	99
12.Engineering review of New Police Department and Old City Hall to ensure soundness against natural hazards	1	1	1	-1	0	0	0	1	0	0	95	98
2. Adopt City Engineering Manual with Drainage Incorporated	1	1	1	0	0	0	-1	-1	0	0	95	96
7. Installation of Generators for Old City Hall and Library and Procedures for Providing Temporary Sheltering	1	0	1	1	1	0	1	1	0	1	84	91

Table KY.31, Mitigation Action Prioritization (with Hazards in order of highest priority to lowest)

Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community	Risk Ranking Score	Total Score
10. Street Prioritization Procedure for Sanding	1	0	1	1	1	0	1	-1	0	0	84	88
11. Coordination of Limb and Large Item Pick-up day for Wildfire Mitigation	1	1	1	1	1	1	-1	-1	0	0	84	88
9. Energy Prioritization Collaboration with Electric Cooperative	1	0	1	0	-1	0	1	1	0	0	84	87
23. Quick Connect Power Ports	1	0	1	1	0	1	1	1	1	1	72	80
25. Monarch Water System Inter-Connect using SCADA	0	0	1	1	1	1	1	1	1	1	72	80
17. Drought Monitoring Program	1	0	1	1	0	1	1	1	0	1	72	79
29. Acquire parcels for the assembly of interconnected greenways	0	0	1	1	0	1	1	1	1	0	72	78
16. WaterWise Campaign	0	0	1	1	0	1	1	-1	1	0	72	76
8. Adopt wildfire maps from Hays County Firewise project	1	1	1	1	0	1	1	1	1	1	49	58
14. Expansive Soil Information Sheet	0	1	1	-1	0	0	1	-1	0	0	48	49

Mitigation Actions by Hazard

The mitigation actions in Table KY.32 are shown with corresponding hazards.

Table KY.32, Mitigation Action Impact, City of Kyle

Action Number	Drought	Extreme Heat	Severe Winter Storms	Lightning	Hailstorms	Windstorms	Tornadoes	Expansive Soils	Floods	Land Subsidence	Hurricanes/ Tropical Storms	Earthquakes	Dam/ Levee Failure	Wildfire
1									X					
2									X					
3									X					
4	X	X	X	X	X	X	X		X		X	X	X	X
5			X	X	X	X	X		X		X			
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7		X	X	X		X	X				X			
8	X									X				
9	X	X	X	X		X	X				X			
10			X											
11			X	X										X
12					X	X	X		X		X			
13									X		X		X	X
14								X						
15									X				X	
16	X									X				
17	X									X				
18	X								X	X				
19	X								X	X				
20	X								X	X				
21	X													X
22	X													X
23		X	X	X		X	X				X			
24	X								X					X
25	X													
26									X					
27									X					
28									X					
29									X					

Integration Efforts

Table KY.33 captures ways that the Risk Assessment, Goals and Actions developed in the HMP can be integrated into other City of Kyle documents, programs, and regulations.

Table KY.33, Plan Integration Efforts, City of Kyle

Name of Document	Type	Item Type	Opportunity for Integration
City of Kyle Emergency Safety Plan	Outreach Document		Addition of following language to Flood section: • If floodwaters rise around your car but the water is not moving, abandon the car and move to higher ground. Do not leave the car and enter moving water. • Avoid camping or parking along streams, rivers, and creeks during heavy rainfall. These areas can flood quickly and with little warning. • Tornado sheltering/when in a car • Lightning when outdoors instructions • Icy roads tips • How to know if you are experiencing heat casualty symptoms • How to know if you are experiencing extreme cold symptoms • More specific evacuation route reference
Hays Inform	Program	Action	Link to existing Hays County HaysInformed.com emergency preparedness/awareness page when creating Public Awareness Page for hazards on Kyle website (Action 6)
City of Kyle Budget	Funding	Action	Seek training funds for Floodplain Administration training on future budgets through Kyle Engineering General Fund Line Item 18 for training
Parks Master Plan	Program	Goals	Seek participation from Parks Director in Kyle Mitigation Planning Committee in order to further collaborate efforts that can meet objectives from both the HMP and Parks Master Plan.
Hazard Mitigation Grant Program (HMGP)	Funding	Action	Identify actions that can be funded through new and existing grant awards.
Pre-Disaster Mitigation (PDM)	Funding	Action	Identify actions that can be funded through new and existing grant awards.
Flood Mitigation Assistance (FMA)	Funding	Action	Identify actions that can be funded through new and existing grant awards.
TWDB Flood Protection Planning (FPP) Grant	Funding	Action	Identify actions that can be funded through new and existing grant awards.
TWDB Clean Water State Revolving Fund (CWSRF)	Funding	Action	Identify actions that can be funded through new and existing grant awards.
Texas Water Development Fund (DFund)	Funding	Action	Identify actions that can be funded through new and existing loans.

Section 4: Finalize Plan Update (Review, Evaluation, and Implementation)

Changes in Development

Like most of Hays County, the City of Kyle is experiencing a large influx of growth and residential development. 77% of existing dwelling units in Kyle were built since 2000. The benefit of recent development is that any building codes instituted from 2000 on were regulated against for the structures and in turn the development is more resilient to hazards. The population continues to grow as more people from the Austin area seek a less populated community in which to raise a family.

New development is a sign of the growth that is occurring in Kyle, Texas.

Past Mitigation Action Progress Reports Summary - Completed and Canceled

2011 Action Number	Hazard	Item Description	Lead Department
5	All hazards	Development of and maintenance of Countywide and individual community HAZMAP Plans	City of Kyle

Cost Estimate/Funding	Schedule	Status as of 2017
Existing staff resources	Original Plan adopted on 4/20/2004. Update in 2011	Completed.

Cost Effectiveness
Not independently cost-effective

2011 Action Number	Hazard	Item Description	Lead Department
8	Flood	Promote Flood Insurance	City of Kyle

Cost Estimate/Funding	Schedule	Status as of 2017
$2,000	Ongoing	Canceled. This item duplicates the effort of Action 1.

Cost Effectiveness
Not independently cost-effective, but the initial step identifying appropriate mitigation actions.

Changes in Priorities

As the City of Kyle continues to grow, the community demand for water in order to meet the needs of new citizens is creating a priority for water conservation and availability. This priority has led to the creation of the Hays County Public Utilities Agency, an alliance made up of San Marcos, Kyle and Buda and was done in an effort to ensure the availability of water for years to come.

In addition to the concerns for water conservation, the community also has a recent push for flood safety that has increased the number of flood-related mitigation actions in the community mitigation strategy.

Section 5: Approval and Adoption

Approval and Adoption Procedure

Table KY.34, Municipal Jurisdiction Adoption Date

Municipality	APA Date	Adoption Date
City of Kyle		

Jurisdiction Adoption Documentation Placeholder

References

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