Travis County

Texas

2011 Hazard Mitigation Plan Update

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Executive Summary

Background

Travis County, Texas undertook development of the original *Hazard Mitigation Plan* because of increasing awareness that natural and man-made hazards, especially flood hazards, may affect many people and property in the area. The Plan was a requirement associated with receipt of Federal Emergency Management Agency (FEMA) mitigation grant program funds, administered by the Texas Division of Emergency Management (TDEM) and the Texas Water Development Board (TWDB). In addition, the Plan is a pre-qualification of eligibility for other mitigation funds.

The original Plan, prepared in 2004 and approved in 2005, (hereinafter referred to as the 2004 Plan) was prepared by a Mitigation Planning Committee (MPC) composed of County staff from Emergency Management Services and the Transportation & Natural Resources Department, with input from representatives from the Lower Colorado River Authority, City of Austin and Texas Water Development Board. The 2011 update was completed using a similar process, with a Mitigation Planning Committee that included representatives from Travis County EMS, TNR, and the Cities of Sunset Valley, Pflugerville, and Village of the Hills. Specifics of the process are discussed in Section 4 of the update, Introduction to Mitigation Planning.

Hazards and Risk

This Plan update includes a re-evaluation of Travis County's risks from natural hazards, and quantitative risk assessments for the County as a whole, with more detailed assessments for certain asset classes. Good indications of the hazards that have affected the Travis County area in the past are the Emergency Operations Center (EOC) activations. Since 1994, the EOC has been activated 83 times. Many of these were associated with natural hazards. A summary of the natural hazard related activations since 1994 include: twenty six activations due to flooding (five of these were Presidential disaster declarations directly affecting Travis County); eleven activations due to ice storms; nine activations due to high wind events (including tornadoes); one activation due to wildfire (this was also a State of Texas declaration); and two due to drought conditions (one of which was also a Presidential disaster declaration). The remaining activations were primarily related to non-natural hazard events, such as the swine flu outbreak.

Eight hazards were initially identified and profiled by the MPC. These hazards included: Floods; Tornadoes; Wildland Grass/Brush Fire; Drought; Severe Storms; Winter Storms; Seismic/ Earthquakes; and Landslides. After these initial eight hazards were profiled, the MPC used a ranking system with five criteria to reduce the list of hazards to those with the most potential to impact the County. The criteria included: (1) History, (2) Potential for mitigation, (3) Presence of susceptible areas, (4) Data availability, and (5) Federal disaster declarations and local emergency declarations. This classification allowed the County to focus its update efforts on the most significant hazards. This assessment, which is consistent with the original plan, resulted in two hazards of significance, for which a more detailed risk assessment was completed. These two hazards are; floods and tornadoes: The following table is a summary of the flood and tornado risk assessment completed as part of the Plan update process.

Summary of Travis County Flood and Tornado Risks
by Asset and Hazard Type (100-year horizon)

Asset	Hazard	Risk (100-year horizon)
Residential repetitive loss (RL) properties	Floods	$6,766,163
Residential severe repetitive loss (SRL) properties	Floods	$2,033,208
Per capita (Countywide)	Tornado wind (life safety)	$1,498

Flooding poses the most significant risk in Travis County. Most rivers and streams in the planning area have some existing buildings that are exposed to flood damage. It is estimated that about 20 percent of buildings in Travis County are exposed to some degree of flooding. Travis County has experienced periodic flooding, often resulting in localized damage. It is estimated that nearly 6,800 buildings and many more parcels of undeveloped land in Travis County are located within areas shown on flood hazard maps prepared by the Federal Emergency Management Agency (FEMA).

FEMA maintains statistics on prior flood losses within each NFIP participating jurisdiction. They categorize the most flood-prone properties as Repetitive Loss (two or more paid building losses of at least $1,000 over a 10 year period) and Severe Repetitive Loss (four paid building losses of at least $5,000 over a 10 year period or two losses exceeding the building's value). There are 97 repetitive loss properties in unincorporated Travis County and one in the City of Pflugerville. Of the repetitive loss properties in Travis County, 17 are also categorized as severe repetitive loss. The following is a summary of the repetitive loss property claim history.

Residential

Unincorporated Area/City	Properties	Building	Contents	Total	# Claims	Average
Unincorporated Travis County	96	$7,589,183	$801,020	$8,390,202	252	$33,294
City of Pflugerville	1	$129,558	$15,000	$144,558	2	$72,279
Total / Average	97	$7,718,741	$816,020	$8,534,760	254	$33,601

Non-Residential

Street Name	Properties	Building	Contents	Total	# Claims	Average
FM Road 969	1	$0	$86,284	$86,284	2	$43,142
Total	1	$0	$86,284	$86,284	2	$43,142

Mitigation Action Items

The original *Hazard Mitigation Plan* set the stage for long-term disaster resistance through identification of actions that reduce the exposure of people and property to natural hazards. The list of actions in the original mitigation plan was reviewed as part of the update, and the status of each action determined and recorded in the updated table in Section 7 of this document. A series of new actions was also identified and included in the section.

The following is an overview of the significant actions from the 2004 plan with progress made since the original plan's adoption.

Action Item Description	Status as of 2011
Develop a communications plan to improve consistency and efficiency of dealing with the public before and after natural hazard events.	Several initiatives have been completed over the past 5 years – others are ongoing. Completed initiatives include: • Expand County Web page; explore linking County Web page to other sources (City of Austin, Travis Conservation, Texas Cooperative Extension/TAMU, TX Forest Service). • Prepare handouts for property owners and permit applicants; keep at permit counter. • Develop brief presentation that can be made to local groups (homebuilders, realtors, neighborhood organizations, employers) • Establish central phone number that County residents can call for information about post-disaster recovery, cleanup, mitigation, and permits. • Translate certain materials into Spanish.
Review floodplain and subdivision regulations and develop recommended revisions and clarifications to facilitate administration and public understanding.	Action completed – the County's floodplain regulations were updated in 2008. The County is implementing a process of updating its floodplain regulations on a four year cycle.
Review flood history and vulnerability of top flood-prone roads and bridges. Communicate priorities and concerns to the appropriate Agency (County or TXDOT). Request that safety be factored into upgrade review.	In cooperation with the Texas Water Development Board (through a 50/50 cost-shared grant of $400,000), the County completed a County-wide drainage study that includes detailed assessments of flood-prone roads.
Acquire and demolish flood prone homes in Timber Creek Subdivision.	The County acquired and demolished flood-prone properties in this area, starting in 1998, and its efforts continue. As of the 2011 HMP update, the County has purchased and demolished 105 properties, using a range of federal programs sponsored by FEMA and the U.S. Army Corps of Engineers, and Travis County bond funds.
Acquire and demolish flood prone homes in Grave Yard Point and Citation Ave.	The County acquired and demolished one flood-prone property in Graveyard point and eighteen on Citation Avenue, using FEMA grant funds and Travis County bond funds.
Provide community outreach and education to individuals and businesses concerning winter storm alerts and preparatory actions for homes and businesses.	September 2009- "Too Prepared to be Scared" Campaign - 10,000 children activity books printed (English and Spanish) - distributed to area schools and various community safety fairs. March 2010- Travis County developed and distributed Public

Action Item Description	Status as of 2011
	Service Announcements in conjunction with the "Turn Around Don't Drown" campaign. August 2009 & August 2010 -Travis County sponsored pages in the City of Austin Home Safe Calendar with information on Wildland/Urban Interface safety and fireworks safety. July 2010-Travis County participated in the development of a PSA regarding the dangers of flash flooding.
Encourage the construction of tornado safe community shelters.	In 2004, the Combined Transportation, Emergency and Communications Center (CTECC) was commissioned. The facility serves as the 911 center for the City of Austin and Travis County with the exception of Pflugerville. The facility houses the City of Austin, Travis County, Texas Department of Transportation and Capital Metropolitan Transit Authority. CTECC has numerous redundancies incorporated into its design and was built to withstand a direct hit from an F2 tornado without interruption of service.
Join the NFIP Community Rating System.	As of 2011 HMP update, Travis County is in the process of applying for entry into the CRS.

The County has made significant progress in removing flood-prone homes from harm's way. The following is an overview of the areas where acquisitions have occurred.

Acquisition Mitigation Projects in Travis County					
Program	# Acquired	Location	Total Funds	Federal Funds	Local (TC) Funds
HMGP DR 1257	40	Timber Creek	$ 1,600,000.00	$ 1,200,000.00	$ 400,000.00
FMA 05	3 1	Thoroughbred Farms Graveyard Point	$ 750,000.00	$ 562,500.00	$ 187,500.00
PDM 05	10	Timber Creek	$ 400,000.00	$ 300,000.00	$ 225,000.00
TC Bond Funds	55	Timber Creek	$ 5,000,000.00		$ 5,000,000.00
TC Bond Funds	11	Thoroughbred Farms	$ 1,300,000.00		$ 1,300,000.00
HMGP DR 1697	4	Thoroughbred Farms	$ 320,000.00	$ 240,000.00	$ 80,000.00
Total	124		$ 9,370,000.00	$ 2,302,500.00	$ 7,192,500.00

The following is an overview of the significant actions that were added or updated as part of the 2011 plan update process.

New Actions for 2011 Hazard Mitigation Plan Update
Evaluate the feasibility of structural elevations as flood mitigation for properties on Lake Travis.
The restudy of Lake Travis has resulted in a significant increase in the actual Base Flood Elevation (BFE) around the Lake. It was always known the area was flood-prone, but the new maps and BFEs provide the empirical data to prove various mitigation measures would be cost effective. Consider multiple mitigation alternatives to remove these homes from harm's way to include: Elevation,

Mitigation Reconstruction, and Acquisition/Demolition. Apply for grant funds and implement when feasible, cost effective, and supported by the Travis County Commissioners' Court.
Establish central phone number that County residents can call for information about post-disaster recovery, cleanup, mitigation, and permits. (carryover from original plan) This already exists for flood 512-854-4215
Complete acquisitions and demolitions in the Timber Creek area to remove all remaining properties within the 25-year floodplain from the area.
Continue to pursue acquisition/demolition as the preferred mitigation alternative on Citation Avenue.
Post information from the Elevation Mark Database on the County's web site.

Review and Adoption

Commissioners' Court is responsible for approving and adopting the 2011 Hazard Mitigation Plan Update. The FEMA requirement relative to approval and adoption is for the County to submit the final draft of the Plan for FEMA review. Once FEMA has completed its' review and determines the plan is ready for adoption, they will inform the County and the County will then adopt the plan. For this reason, the adoption date is not yet identified. The Court adoption date will be referenced only in the executive summary section this plan. The following table will be filled in when the final Plan is adopted and the adopted resolutions can be found in Appendix C

Commissioners' Court reviewed and approved the Plan update on [insert date]. The three participating municipal jurisdictions adopted the Plan update on the following dates.

Municipal Participants in the Plan Update

Municipality	Approval Date	Adoption Date
City of Pflugerville	Pending	Pending
City of Sunset Valley	Pending	Pending
Village of the Hills	Pending	Pending

The Plan update was submitted to the Texas Division of Emergency Management (TDEM) by:

Travis County Transportation and Natural Resources
Current POC: Melinda Mallia
Phone: (512) 854-4460
Email: melinda.mallia@co.travis.tx.us

Acknowledgments

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Section 3
Background

Contents of this Section

3.1 Scope of the Plan

The original Travis County HMP was a concerted effort on the part of the County to develop anall-hazards, County-wide approach to disaster damage reduction. In order to focus on a process needed to attain a sustainable future, Travis County employed a FEMA-approved process to identify and assess all potential hazards that may affect the unincorporated areas of the County, and to develop an action plan to address those hazards. The original Plan was completed in December 2004 and approved by the FEMA in 2005. It has been used to better articulate specific needs for the community, based on a process that involved all stakeholders, including the general public, government and non-government organizations.

The Travis County HMP update included re-evaluating the original hazards, the risk assessment, mitigation goals, and mitigation priorities. As part of the update process, these sections of the Plan were re-assessed to identify changes and updates that may have occurred since December 2004. It should be noted that as part of the 2011 update, the County determined that man-made hazards would be eliminated from the Plan.

There are 22 municipal jurisdictions in Travis County. The development and adoption of the original 2004 Plan included only unincorporated Travis County. Three jurisdictions (the Cities of Pflugerville, Sunset Valley, and Village of the Hills) requested that the County include them in the 2011 Travis County update. Each of these jurisdictions has its own appendix:

- Pflugerville Appendix H
- Sunset Valley Appendix I
- Village of the Hills Appendix J

Hazard identification, risk assessments, background, goals, and mitigation actions were developed for each jurisdiction.

3.2 Organization and Mission of Travis County

This subsection describes the purpose, structure and operations of Travis County. The Texas Constitution outlines the structure of County governments, thereby making counties functional agents of the State. Thus, counties, unlike cities, are limited in their actions to areas of responsibility specifically addressed in laws passed by the Texas Legislature. The section was reviewed in detail by the Mitigation Planning Committee as part of the 2011 HMP update, and modifications were made where appropriate.

At the heart of Texas county government is the Commissioners Court, composed of a county judge and four precinct commissioners. Although this body conducts the general business for each county and oversees financial matters, the Texas Constitution established a strong system of checks and balances by creating other elective offices in each county, including the county attorney, county and district clerk, county treasurer, sheriff, tax assessor-collector, justice of the peace, and constable. The county auditor is appointed by the district court. See the jurisdiction-specific appendices for an overview of the government structure for the City of Pflugerville, Village of the Hills, and City of Sunset Valley.

Travis County government is generally organized based on this prescribed structure. With respect to planning for and responding to natural hazard events, the key elements of the Travis County organization (www.co.travis.tx.us) are:

- **Commissioners Court** is the governing body of Travis County. As a group, the county judge and the four commissioners are the chief policy-making and administrative branch of County government. Among their many functions, the Court is responsible for the County's budget, sets the tax rate, determines fees for many County services, and determines how the collected revenues will be distributed among County departments to provide services to the community.
- **Transportation & Natural Resources Department** (TNR) is a diverse department, responsible for the engineering, design, construction, and maintenance of Travis County roads, drainage, and bridges; fleet services for all County vehicles and equipment; natural resource and environmental quality protection; TPDES Storm Water Management Program (SWMP); park system development and management; capital improvement projects; land development review, including subdivision review, permits and floodplain management regulations in Travis County.
- **Emergency Services** provides for the safety of Travis County residents through emergency preparedness and response. The Office of Emergency Management serves as the coordinating point of disaster preparedness, mitigation, response, and recovery capabilities for Travis County in cooperation with the County's various municipal governments. Travis County assists in staffing and sponsoring a joint City of Austin-Travis County Emergency Operations Center.
- **Facilities Management** coordinates the construction of new County facilities, implements and monitors how those facilities are used, coordinates the maintenance and renovation of existing County property, and negotiates contracts.

The State of Texas has not specifically authorized counties to adopt building codes other than fire safety for commercial buildings. Travis County does not administer a building code and has not been assigned a Building Code Effectiveness Grading Schedule classification (BCEGS). A number of Emergency Service Districts administer a fire safety code. The Fire Marshal conducts fire safety

inspections of public buildings, day care centers, nursing homes, and schools. For years 2006 to 2009, there were approximately 680 fire inspections conducted.

The State of Texas has not specifically authorized regulate land use or implement zoning. Therefore, Travis County cannot use these development tools.

Mission Statement

Travis County has a broad mission statement to guide its long-term and short-term actions.

Travis County Mission Statement

To preserve health, provide a safety net for the needy, ensure the public safety, facilitate the resolution of disputes, foster an efficient transportation system, promote recreational opportunities, and manage County resources in order to meet the changing needs of the community in an effective manner.

How the County Addresses Hazards

As part of the Plan update, members of the Mitigation Planning Committee (MPC) were interviewed to gain an understanding of hazards and how they are addressed, and to gather information about damage associated with past hazard events.

The following is an overview of how the different entities that make up Travis County government address hazards.

Transportation & Natural Resources Department

- **Natural Resources and Environmental Quality Division.** This office is charged with coordinating development of environmental policies and intra-departmental review of development proposals. It conducts compliance reviews of specific County capital projects (primarily new roads and bridges) and serves a key function in coordinating with State and Federal environmental programs. Identifying, applying for, and managing grants for a variety of projects are ongoing functions.

  This Division is also responsible for managing the Balcones Canyonlnads Perserve. Located in western Travis County, the Balcones Canyonlands Preserve contains 28,497 of the 30,428 acres set aside as protected habitat by the Balcones Canyonlands Conservation Plan. It includes land owned or managed by several property owners, including Travis County. The Preserve System was established to meet the terms and conditions of a regional permit, issued in 1996, by the U.S. Fish & Wildlife Service under Sec. 10(a)(1(B) of the Endangered Species Act. The regional permit for the BCCP requires Travis County and the City of Austin to protect 30,428 acres of golden-cheeked warbler habitat by 2016. Significant portions of the Preserve are uplands or steep canyons where the land is so steeply sloped that stream

channels run in narrow valleys with little or no floodplain. Wildfire is the most significant hazard threatening the lands of the Preserve, due not only to the nature of the vegetation and geography, but also the build-up of woody materials that results when ice storms cause tree damage and limb falls.

The Division is also responsible for the implementation and coordination of the Texas Pollutant Discharge Elimination System (TPDES) Phase II Storm Water Management Program (SWMP) for the Travis County Municipal Separate Storm Sewer System (MS4). The SWMP is a comprehensive long-range plan of on-going activities performed by the County to prevent and reduce storm water pollution as mandated by the Federal Clean Water Act. Travis County was issued an MS4 Permit from the Texas Commission on Environmental Quality (TCEQ) to perform the SWMP activities in the Travis County MS4, which includes all unincorporated areas. The SWMP includes seven primary program areas, called Minimum Control Measures (MCMs), which include: Public Education, Public Participation, Illicit Discharge Detection and Elimination (pollution discharge control), Construction Site Runoff Controls, Post-Construction Storm Water Management, Pollution Prevention for County Operations, and Authorization of County Construction Activities. Each MCM area consists of multiple specific Best Management Practices (BMPs) activities and tasks to be performed.

- **Development Services Division.** This group processes applications for subdivisions, development permits, utility permits, driveway permits, and onsite sewerage permits. As of 2011, three members of Development Services are nationally Certified Floodplain Managers.

  The functions of TNR Development Services that address threats from natural hazards, particularly from flood hazard, include processing proposals for development, onsite sewage systems, improvements of existing buildings, subdivision of land, and stormwater management.

  Development Services inspectors are charged with performing inspections of permitted activities, with particular emphasis on Class "B" development permits (activities that are affected by floodplain or drainage). A formal enforcement policy sets forth procedures to inform property owners of permit requirements, to encourage compliance, and to allow referral of unresolved situations for legal action. Inspectors routinely check for unpermitted activities, including building and fill or dumping. If a permit is not produced during inspections, a "red tag" is issued and work suspended until a permit is obtained.

- **Road & Bridge Maintenance Division.** Primary functions of Road & Bridge Maintenance include rebuilding and maintaining approximately 1,200 miles of County-owned roads, including mowing and cleaning drainage ditches. Maintenance includes debris removal within the County's right-of-way. If debris appears to pose an imminent threat, maintenance crews can go outside the right-of-way. As of 2011, there were approximately 10,000 culverts and 144 bridges (clear span of +20 feet) located within the County. Routine inspections are conducted to evaluate the structural conditions of bridges and culverts and to check for scour.

The County has roughly 110 low water crossings that are expected to flood even under minor increases in flow rates. Although originally installed on roads with low traffic volume, a number of these crossings now carry considerably increased numbers of vehicles.

The Road & Bridge Maintenance staff has significant responsibilities related to flooding. When floods are predicted, emergency teams are organized, roads are closed (based on experience), and teams are prepared to respond to problems. While damage to roads has been minimal (primarily shifted asphalt), debris has been the biggest flood-related expense. After heavy rains, maintenance crews inspect areas that historically have had problems to check for debris and damage. With respect to non-flood hazards, Road & Bridge Maintenance stockpiles sand to use on roads and bridges during icy conditions, and has equipment used to assist in firefighting efforts.

- **Public Works Division.** Planning, design, and engineering of County roads are the primary responsibilities of Public Works. Developers must build roads to County standards before the County takes ownership. Designs are based on traffic volume and road classification. Most waterway crossings and highway projects are funded by the County. The TXDOT periodically inspects every bridge with a clear span of more than 20-feet to examine structural integrity and look for evidence of scour. County bridges and culvert openings are generally sized to minimize floodway impacts, result in no more than 6–9 inches of water over the road surface during the Base Flood, minimize backwater increases to the water surface of the Base Flood (typically 3–4 inches, but not more than 1-foot), and protect piers and abutments against erosion.

- **Parks Division.** Every five years, the County undertakes a revision to its comprehensive master plan for parks and recreation. The revision cycle is conducted according to State guidelines and includes an evaluation of population growth and trends in park usage and demand. The most recent master plan, *Travis County Parks and Natural Areas Master Plan* was adopted by the Travis County Commissioners Court in May 2006. As part of the Plan update, this version of the master plan updated the goals and objectives of the previous master plan completed in 2000. As stated in the 2006 master plan, part of the mission of Travis County Parks is to "focus on the development of a system of greenways and riparian corridors that link parks and natural areas within the County." To achieve this mission, the Plan includes twelve goals (A – L) with supporting objectives. As demonstrated by approval of bonds in 2005 to support park development, the citizens of the County support the master plan's goal and objectives, which also include acquiring and managing land of significant environmental value and protecting and improving environmental quality of natural resources. This, in part, resulted in the acquisitions and demolition of properties in the Timber Creek subdivision, along Onion Creek.

- **Planning and GIS Program.** The Geographical Information System (GIS) technology used by Planning and GIS allows the graphical representation of spatial information to provide an organized view of a community, its environment, and its development impacts. Analysis of the interrelationships among many types of information is a key function of the Travis County GIS. The Digital Floodplain Insurance Rate Map (DFIRM) was prepared by FEMA and was effective September 28, 2008. Other types of data and map layers are available and were

used to create the characterizations of hazards and risks in included in Section 5 and 6 of this Plan update.

- **Office of Emergency Management.** The Travis County Department of Emergency Services, Office of Emergency Management (OEM), provides for the safety of residents through emergency preparedness and response. Founded in 1992 to comply with State and federal regulations, OEM maintains the County's Emergency Operations Plan (EOP), which covers the County and 16 cities. The primary purpose of the EOP is to promote County preparedness in handling disasters by coordinating emergency planning and response, defining responsibilities, and establishing protocols. The County operates a joint Emergency Operations Center with the City of Austin. The OEM coordinates mitigation and recovery in cooperation with other governmental units.

- **Public Safety Answering Program** is a system that receives emergency calls and routes them to the appropriate police, fire, or EMS dispatcher. Outside the City of Austin, 13 Emergency Service Districts (ESDs) serve the County, providing fire and emergency medical services. The ESDs coordinate through the County if incidents require additional resources.

- **Facilities Management.** Facilities Management coordinates the construction of new County facilities, implements and monitors how those facilities are used, and coordinates the maintenance and renovation of the facilities. The Risk Management office manages property insurance on County facilities. The County's property insurance coverage for buildings and improvements has a $500,000 deductible. Covered losses include those associated with natural hazards, such as wind and lightning. Individual flood insurance policies are not maintained on County facilities located in flood hazard areas, although flood damage has been sustained by these facilities on a number of occasions. It is notable that most damaged facilities have been park and recreational facilities, some of which are not insurable under the NFIP because they do not qualify as insurable structures (which must be walled and roofed).

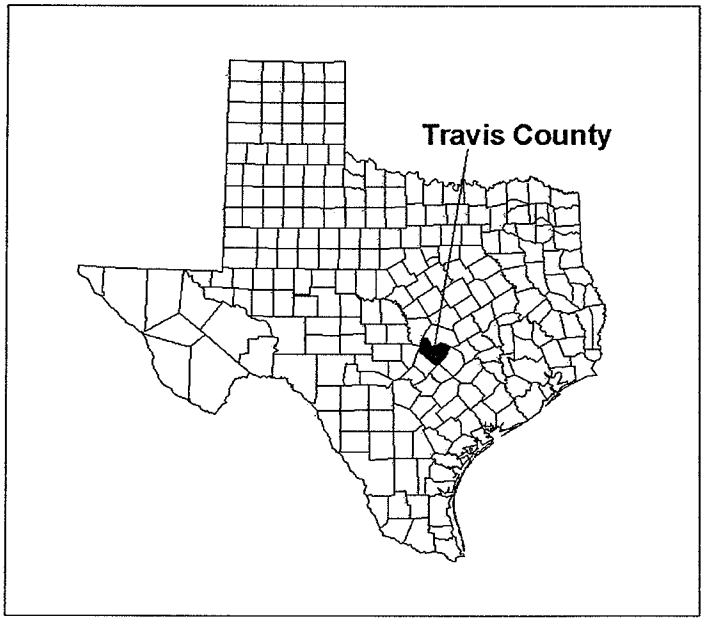
3.3 Background Information about Travis County

Prior to addressing the hazards that our community faces, this Plan Update presents a brief overview of Travis County, taking into account the geography, history, climate, transportation, community assets, and population and growth.

3.3.1 Travis County's Location and Geography

Travis County is located in Central Texas, 150 miles inland from the Gulf of Mexico (Figure 3-1). The County's geographic features are relatively diverse. The northern and western portions are characterized by the hilly and rugged topography of the Edwards Plateau and the Balcones Escarpment. The remainder of the County is characterized by the gently rolling hills and plains of the Blackland Prairies to the east and the Gulf Coast Plains to the south. As of 2011, Travis County consists of 1,024 square miles (including incorporated areas). The hilly, karst topography of the far western part of the County limits new development, leading to greater activity in those areas which contain more land that is subject to flooding.

Figure 3-1
State of Texas
Location Map Showing Travis County
(Source: Travis County Archives)



Soils throughout the County reflect the geographic diversity. Calcareous stony clays and some clay loams are found in the Edwards Plateau region. Moving eastward into the southern plains, the soils grade into dark calcareous clays interspersed with acidic sandy loams.

3.3.2 Planning Area

As mentioned earlier, this Plan Update is prepared for the unincorporated areas of Travis County and three of the 22 municipal jurisdictions within the County. The three jurisdictions include the Cities of Pflugerville, Sunset Valley, and Village of the Hills. Figure 3-2 displays the current municipal jurisdictions in Travis County, Texas. The map was developed by the Travis County Department of Natural Resources in March 2007 and identifies the 22 municipal jurisdictions. The County-wide map is followed by Figures 3-3 to 3-5, displaying the geographic location within Travis County for the three participating municipal jurisdictions.

Figure 3-2
Municipal Jurisdictions in Travis County, Texas
(Source: Travis County – Transportation and Natural Resources Department, March 2007)

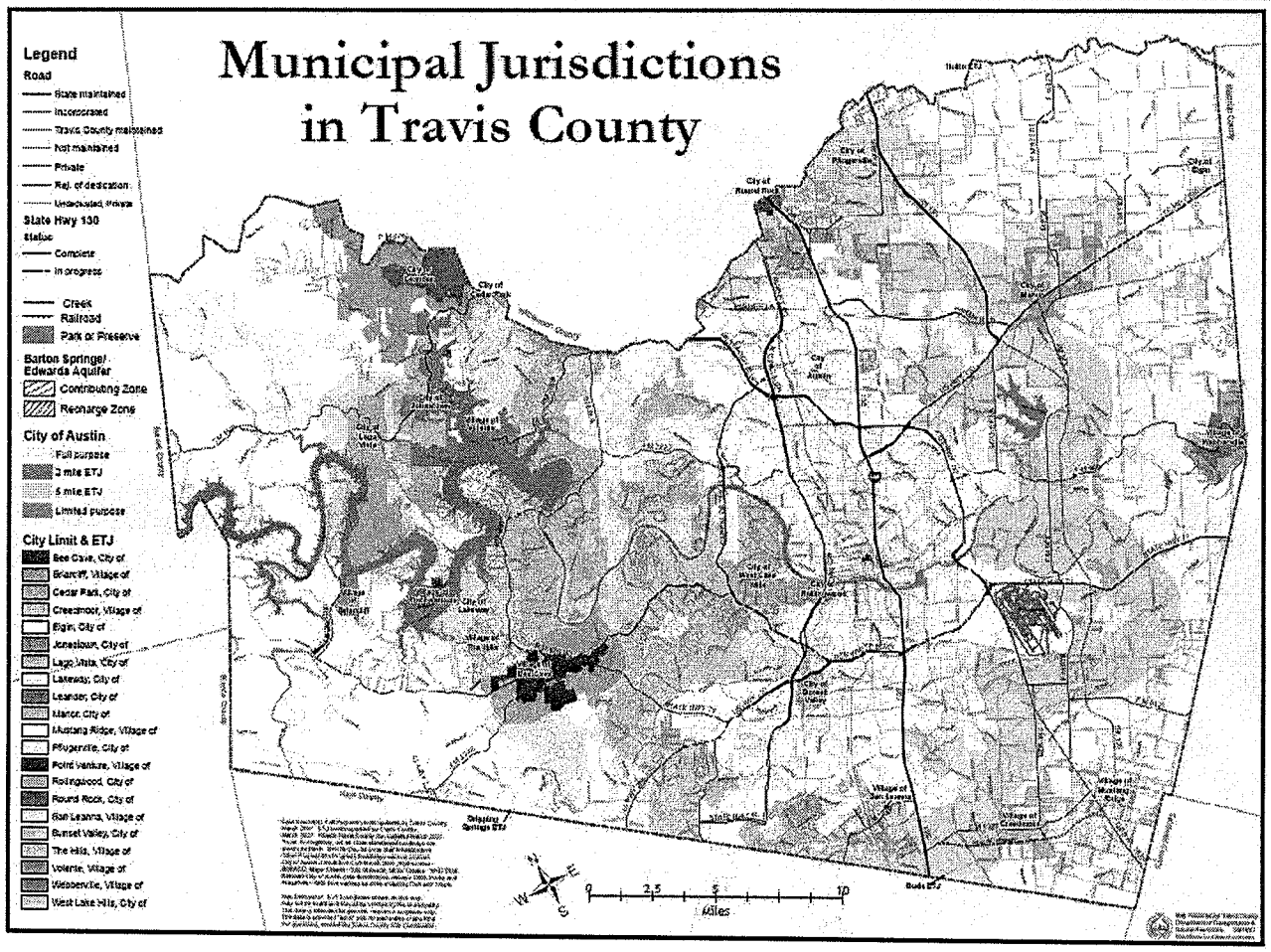


Figure 3-3 identifies the geographic location within Travis County for the City of Pflugerville. The City boundary is shaded pink on the map.

Figure 3-3
City of Pflugerville, Texas
(Source: Travis County – Transportation and Natural Resources Department, March 2007)

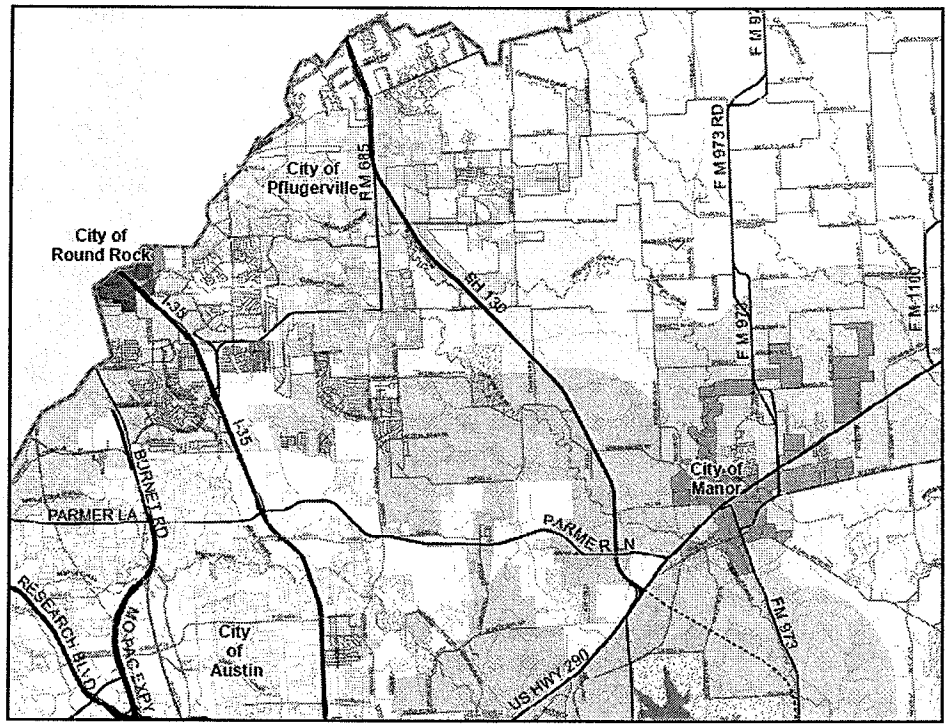


Figure 3-4 identifies the geographic location within Travis County for the City of Sunset Valley. The City boundary is shaded green on the map.

Figure 3-4
City of Sunset Valley, Texas
(Source: Travis County – Transportation and Natural Resources Department, March 2007)

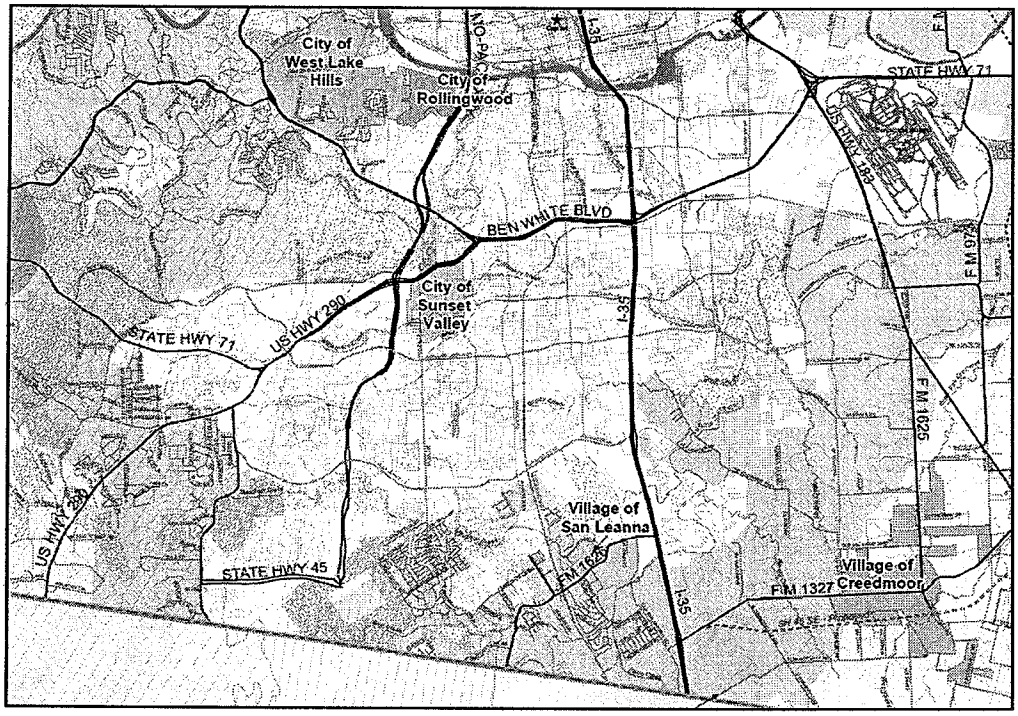
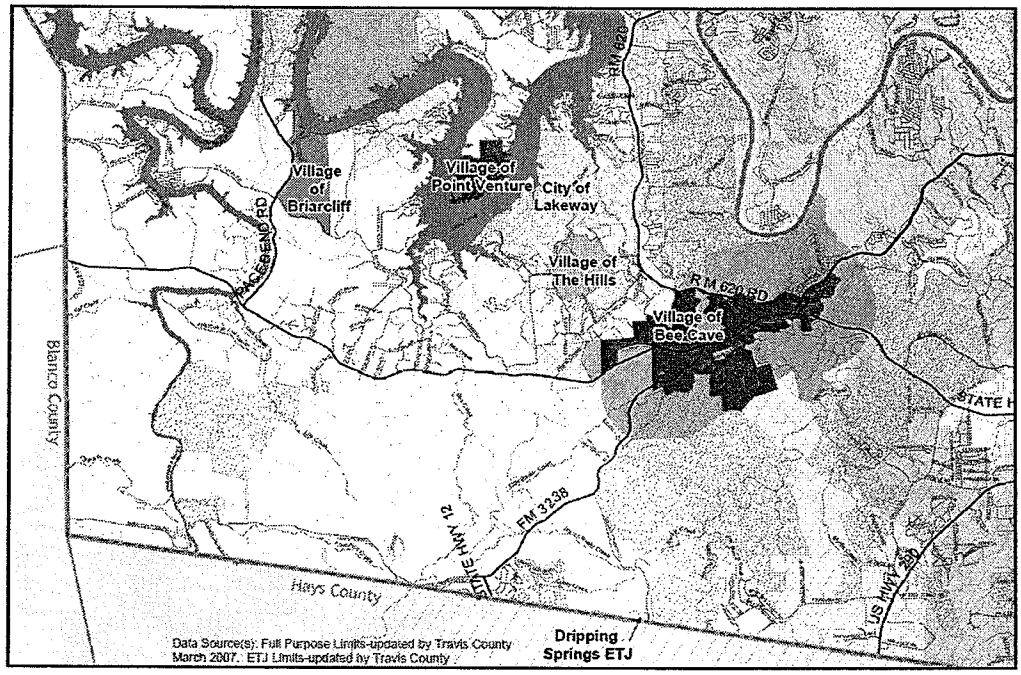


Figure 3-5 identifies the geographic location within Travis County for the Village of the Hills. The City boundary is shaded light green on the map.

Figure 3-5
Village of the Hills, Texas
(Source: Travis County – Transportation and Natural Resources Department, March 2007)



3.3.3 County History

Travis County, located in Central Texas, was established on January 25, 1840, by an act of the Fourth Congress of the Republic of Texas, days after the community of Waterloo had been renamed Austin and designated the capital city. The County was named after William Barret Travis, legendary commander of the Republic of Texas forces at the Battle of the Alamo.[1]

Travis County was created from Bastrop County, one of the original twenty-three counties formed in 1836. The encompassing area was known as the Travis District, which consisted of roughly 40,000 square miles. As mentioned earlier, Travis County currently consists of approximately 1,025 square miles.

The first election of County officials was held in February,1840, at which time the population was reported to be 856.[2] The first officially recognized courthouse was constructed in 1855. Since then, Travis County government has operated out of two additional Courthouses, including the ornate 1876 structure, and the current Courthouse building, which was constructed in 1930. Travis County and its

[1] *The Heman Marion Sweatt Travis County Courthouse, Austin, Texas: A Historical Perspective* (Austin, Texas, 2008).
[2] Handbook of Texas Online, Travis County.

government have grown rapidly since its formation. Offices such as the Commissioners Court, County Clerk, Treasurer, Sheriff, Courts of Law and Judges have been a part of Travis County government since establishment. Over the years, numerous new offices and departments have been added; currently there are over 40 departments, including 48 elected offices, within the County.[3]

3.3.4 Climate

The climate of the region is humid subtropical, with hot summers and relatively mild winters. A wide variation between maximum and minimum temperatures is experienced due to the interplay of warm and humid weather moving northward from the Gulf of Mexico and strong, polar fronts from the north. Prevailing winds are from the southeast and frequently persist for several days. The strongest winds are from the north, with recorded wind speeds in excess of 50 miles per hour.

Generally, the heaviest precipitation occurs as thunderstorms in late spring or early fall, and often is associated with tropical systems and hurricanes moving through the region. Rainfall averages about 33 inches per year and, although evenly distributed, the heaviest occurs in late spring or early fall, with much of it a direct result of thunderstorm activity associated with seasonal cold fronts.

3.3.5 Transportation

The principal highways in Travis County are Interstate 35 (I-35) and State Highway Loop 1 (known locally as MoPac). Other important arteries in the County and immediate vicinity are US Highway 183, US Highway 290, State Highway 71, and State Highway Loops 275 and 360. Further out, two toll roads, State Highway 45 and State Highway 130, also serve the metropolitan area.

3.3.6 Community Assets

Travis County's asset inventory comprises slightly more than 3 million square feet of owned assets, and about 35,000 square feet of leased assets. Assets include a typical range of government-owned and –operated facilities, infrastructure, fire and police facilities, and municipal buildings, among other types.

[3] Travis County. Travis County Archives. Austin, Texas. A Brief History of Travis County.

Population and Growth of the Planning Area

3.3.7 Population

The estimated population for Travis County for the year 2008 was 954,973, a 26% increase since 2000.[4] The population of the unincorporated area is estimated to be 172,650. As of 2000, the most recent reported by the US Census, the average population density in Travis County was 821 persons per square mile (the statewide average was 79.6 persons per square mile). The Texas Department of Human Services (TDHS) reports 16,152 births and 4,339 deaths in 2006. This rapid population increase contributes to development pressure and has the potential for long-lasting impacts on the quality of life.

Travis County is partitioned into four precincts for the purpose of election of and representation by precinct commissioners. As of July 2009, the geographic boundaries of the precincts are as shown in Figure 3-6.

Figure 3-6
Travis County Commissioners Precinct Map
(Sources: Travis County- maps (County website), Google Maps)

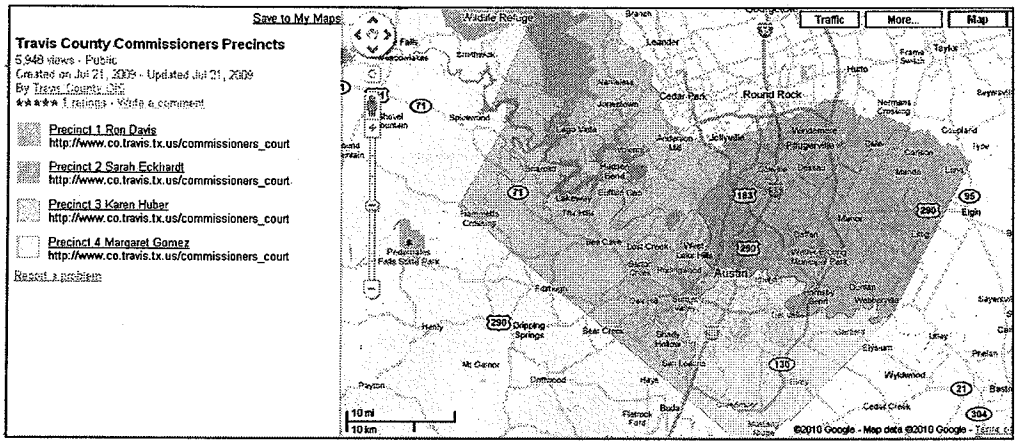


Table 3-3 shows population and approximate number of buildings in each precinct. The population estimates by precinct were developed by the Capital Area Metropolitan Planning Organization in 2008 for use in the Travis County 2035 Comprehensive Plan. The table shows that the highest population for unincorporated Travis County is located in Precinct 3. This unincorporated area of this precinct has a total population of 92,404. Buildings are grouped by size. Although not a definitive characterization, it is reasonable to assume that buildings with a footprint of more than 4,000 square feet are likely to be non-residential or multi-family residential buildings. The building statistics were provided by the Travis County Department of Transportation and Natural Resources and are current as of August, 2010.

[4] U.S. Census Bureau – State and County Quickfacts. Travis County, Texas.

Table 3-1
Travis County Population and Buildings, by Precinct
(Source: CAMPO, 2008, Department of Transportation and Natural Resources, 2010)

	Precinct 1	Precinct 2	Precinct 3	Precinct 4
Incorporated areas of Travis Co.	181,494	206,212	192,118	202,499
Unincorporated Travis County	34,295	32,873	92,404	13,078
Total Population	215,789	239,085	284,522	215,577
Buildings (smaller than 4,000 s.f.)	11,443	22,284	34,960	4,028
Buildings (larger than 4,000 s.f.)	287	536	1,476	122

Table 3-4 summarizes the total population and building statistics for the three jurisdictions participating in the 2011 Travis County Plan update. Of the three jurisdictions, the table shows that the City of Pflugerville has the highest population and number of housing units. Additional population statistics for the three participating jurisdictions can be found in Appendices H, I, and J.

Table 3-2
Population and Building Statistics for Pflugerville, Sunset Valley and Village of the Hills
(Sources: Us Census Bureau, City of Pflugerville - 2030 Plan, 2010 Sunset Valley Comprehensive Plan)

Municipality	Population	Housing Units
City of Pflugerville	50,850	5,239
City of Sunset Valley	575	154
Village of the Hills	1,492	585

Growth

As of 2008, the US Census Bureau reported 430,741 housing units in Travis County. This is a 25.5 percent increase over the past 10 years when the US Census Bureau reported 320,766 households in 2000. Approximately 64.2 percent of the housing units in Travis County are located in the City of Austin. As of 2000, the US Census reported 276,842 housing units in the City of Austin. The percentage of housing units located in the City of Austin is most likely slightly higher than 64 percent since the most recent US Census reporting statistics for housing units in Austin was 2000, while the Travis County statistics are for 2008. In 2000, the most recent year data was available, the US Census indicated median value of owner-occupied housing units was $134,700.[5]

The City of Austin is part of the Austin-Round Rock-San Marcos Metropolitan Statistical Area (MSA). This area covers a portion of several counties including; Travis, Williamson, Hays, Bastrop, and Caldwell Counties. The Austin MSA is one of the fastest growing areas in the Country, with the U.S. Census reporting that population has increased in this area from 1,249,763 people in 2000 to an

[5] US Census Bureau – State and County Quickfacts. Travis County, Texas.

estimate of 1,705,075 people in 2009.[6] Based on the results of the 2000 US Census, the Austin MSA was estimated to have a total of 496,004 housing units. The majority of the homes in the Austin metro area are 10–30 years old. This is notable because Travis County began managing mapped floodplain areas in March 1982, thus homes in flood hazard areas should be reasonably protected through elevation.

Travis County surrounds the City of Austin, the State capital. Table 3-5 identifies the employment percentage by category for Travis County. The Table shows that Federal, State, and local government positions comprise 22 percent of the employment in Travis County. The information provided in the Table is based on figures from Travis County Department of Health and Human Services for the year 2009. The statistics in the Table indicate that employment is not dominated by any single industry.

Table 3-3
Employment, by Category
(Source: Travis County – 2009 Community Impact Report Part 1: Community Condition Highlights)

Category	Percentage
Federal, State, and local Government	22%
Professional and Business Services	16%
Trade, Transportation, Utilities	15%

As of April 2010, the unemployment rate in Travis County was 7 percent. This figure is 1.2 percent lower than the State unemployment rate of 8.2 percent.[7] The unemployment percentage in the County has increased slightly since March 2002, when the unemployment rate was 5.4%.

Land Use and Development

The State of Texas has not specifically authorized counties to develop and adopt comprehensive plans for land use or zoning. Therefore, Travis County does not use these development tools. However, as detailed in Section 6, Table 6-10, development permits are the clearest indication of land use and development trends throughout Travis County. Between calendar years 2003 and 2009, a total of 21,791 development permits were issued in Travis County. The western half of Travis County (including Lake Travis) is experiencing the fastest development and growth. Additional details about future development trends can be found in Section 6.6 of the Plan Update.

[6] US Census Bureau. Annual estimates of the Population of Metropolitan and Micropolitan Statistical Areas. April 1, 2000 to July 1, 2009.
[7] Bureau of Labor Statistics. Economic News Release. Regional and State Employment and Unemployment Summary. April 16, 2010.

3.4 Special Consideration Communities

For the purpose of this Plan update, Travis County, Texas, is not a "special consideration community." The federal government defines special consideration communities to be those with 3,000 or fewer individuals that is a rural community, and is not a remote area within the corporate boundaries of a larger community. Such communities are economically disadvantaged, with residents having an average per capita annual income not exceeding 80% of the national per capita income, based on best available data. Further, special consideration communities have a local unemployment rate that exceeds by one percentage point or more, the most recently reported, average national unemployment rate.

The *Travis County 2006-2010 Consolidated Plan (August 2007 Amendment)* noted that slightly less than 107,000 residents (12.6%) were living at or below the poverty level. In 2009, the "federal poverty level" was defined as incomes of $10,830 (individual) and $22,050 (family of four) per year. Service gaps to low-income residents, including legal immigrants, were identified. Gaps included a shortage of subsidized housing and affordable housing. Since 1990, average rental costs in the area increased 12–16% per year, while construction of new rental units declined. The number of housing units without plumbing was reported to have steadily declined, from 1.2% in 1980 to 0.5% in 1990.

3.5 The Texas State Hazard Mitigation Plan

The State of Texas has long been aware that it is exposed to a variety of natural hazards. Of particular concern are flood hazards associated with thunderstorms, hurricanes, and tropical storms. The 2010 *State of Texas Hazard Mitigation Plan Update* is summarized below.

Originally prepared by TDEM to fulfill the requirements set forth by Congress in the Stafford Act (Section 409), the State's Hazard Mitigation Plan was completed in 2004 and was updated in 2007 and again in 2010 to satisfy new planning requirements prompted by the Disaster Mitigation Act of 2000.

The State's Plan acknowledges that people and property in Texas are at risk from a variety of hazards that have the potential to cause widespread loss of life and damage to property, infrastructure, and the environment. The Plan "establishes hazard mitigation goals, strategies, and specific measures designed to reduce the occurrence or severity of the consequences of hazards." It also documents procedures for implementation and administration of certain mitigation grant programs.

The State Hazard Mitigation Team is designated to coordinate and influence mitigation and is composed of several agencies that participate on the Emergency Management Board. Primary agencies are the Texas Division of Emergency Management; Texas Water Development Board Texas Department of Housing and Community Affairs; Texas Parks and Wildlife Department; Texas Department of Environmental Quality (formerly the Texas Natural Resource Conservation Commission); Texas Department of Transportation, General Land Office; Railroad Commission of Texas; Texas Department of Insurance; Texas Forest Service; and Texas Engineering Extension Service;. Brief summaries of each of these primary agencies are provided in the State Plan, noting key natural hazard mitigation measures associated with each agency. For the most part, existing measures are ongoing agency functions and responsibilities.

As currently structured, the State's Hazard Mitigation Plan contains attachments outlining specific strategies for dealing with hazards related to floods, tornadoes, hurricanes and tropical storms, wildfires, and drought. Strategies particularly pertinent to local jurisdictions are described below:

Flood Mitigation

Historically, floods are and continue to be one of the most frequent, destructive, and costly natural hazards facing the State of Texas, constituting over 90% of the disaster damage in the State. Texas, on average, suffers approximately 400 floods annually, double the number of the second highest State. State Strategies include: 1. Mitigating severe repetitive loss properties (SRL) either by elevation or acquisition. According the 2010 State Hazard Mitigation Plan, there were 3,162 properties on the SRL list (Statewide); 2. Redirect $6.1 million in taxes and license fees collected by TDI biannually and give to TWDB so they can fund floodplain management training compliance functions and other mitigation activities; and 3. Adopt a —No Adverse Impact Policy to ensure that future development activity both in and out of the floodplain be part of mitigation planning.

Tornado Mitigation

Tornadoes occur annually and most frequently in the northern two-thirds of the State caused by cool frontal systems that enter from the north and west, and in the remainder of the State primarily caused as a cascading hazard from tropical storms. State Strategies include: 1. Adopt and enforce building codes and/or design criteria for construction of storm shelters and the construction of safe rooms, 2. Promote and provide for expanded coverage options for standard peril and windstorm insurance coverage for public and private property; and 3. Promote and provide enhanced statewide awareness concerning the risks and consequences of tornadoes. Promote and provide enhanced warning capabilities.

Hurricane/Tropical Storm Mitigation

Texas has experienced 23 Federal disaster declarations due to hurricane/ tropical storm events, the most recent events being Hurricane Rita (DR-1607) that was declare on September 24, 2005, Hurricane Dolly (DR-1780) that was declared on July 24, 2008, Hurricane Ike (DR-1791) that was declared on September 13, 2008, and Hurricane Alex (DR-1931) that was declared on September 16, 2010. State Strategies include: 1. Continue to fund Coastal Erosion and Response Act Projects, and 2. Continue to promote the Hurricane Local Grant Program.

Wildfire Mitigation

With the semi-arid climate of the western, southern and panhandle counties of the State, wildland fires are most common in the spring and summer months, but can occur at anytime during the year. These wildland fires can have significant economic impact to local and regional economies. Threats to improved structures are a growing problem. State Strategies include: 1. Provide Urban Forestry Grants to improve community forestry programs, 2. Establish and implement burning standards, 3. Continue Urban Wildfire Interface, a traveling exhibit maintained by the Texas Forest Service (TFS) and 4. Continued maintenance of the TFS website that contains fire safe mitigation initiatives.

Drought Mitigation

Given the expanse of the land mass within Texas and the geographic location of 2/3rds of the counties of the State are located either in an arid or semi-arid climate, roughly those west of a North-South line formed by Interstate Highway 35, are almost always in varying stages of drought. During the past 15 years, the worst droughts in Texas occurred in 1996, 2000, 2002, 2006, and 2009. Mitigation Strategies include providing training and education programs for EMCs. The Texas Department of State Health Services maintains a web site that provides tips and actions for citizens, governments and medical facilities.

Section 4
Planning Process

Contents of this Section

This Plan update was prepared in accordance with the guidelines provided by the Federal Emergency Management Agency (FEMA), advice from the Texas Division of Emergency Management (TDEM) and the Texas Water Development Board (TWDB). The 2004 Plan was used as a basis for this Plan update. The team reviewed each section of the 2004 Plan to address hazards and impacts that affected the planning area between 2004 and 2010. Each section was updated as required to incorporate these new data. In addition, status was provided for each action in the 2004 Plan and new actions were added as appropriate.

The *Hazard Mitigation Plan* serves several purposes. It sets the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to hazards. Completion of the original Plan and Plan update also provides additional credit under the NFIP's Community Rating System (CRS), and maintains eligibility for certain mitigation grant funds.

The Plan provides overviews of the natural hazards that threaten the County, the people and property exposed to those hazards, the planning process, how hazards are recognized in the County's normal processes and functions, and priority mitigation action items. The hazards summary and disaster history help to characterize future hazards. In terms of sheer numbers, more wildfire incidents occur. However, when magnitude of past events, the number of people and properties affected, and the severity of damage is taken into account, flood hazards clearly are the most significant natural hazard to threaten Travis County. Therefore, the Plan concentrates primarily on flood hazards.

This Plan update acknowledges that many buildings were built before the adoption of regulations for development in floodplains of the County's lakes and waterways. Current regulations require new development to recognize reasonably anticipated flood hazards. Older buildings, then, may reasonably be expected to sustain more property damage than newer buildings.

Travis County followed a well-established planning process to develop the original *2004 Hazard Mitigation Plan* and to complete this update. The update process included a Mitigation Planning Committee, which carried out most of the planning duties, and a Stakeholders group, which was responsible for reviewing the document at key points, and providing feedback.

4.1 Interim Final Rule Requirements for the Planning Process

IFR §201.6(c)(1): *[The Plan shall document] the planning process used to develop the Plan, including how it was prepared, who was involved in the process, and how the public was involved.*

IFR §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

(1) An opportunity for the public to comment on the Plan during the drafting stage and prior to Plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing Plans, studies, reports, and technical information.

IFR §201.6(c)(4)(ii): *[The Plan shall include a] process by which local governments incorporate the requirements of the mitigation Plan into other planning mechanisms such as comprehensive or capital improvement Plans, when appropriate.*

4.2 Agencies and Organizations Addressing Hazard Mitigation

At the federal level, the Federal Emergency Management Agency (FEMA) administers mitigation programs that foster planning and project implementation to address existing risks. At the State and regional levels, several agencies and organizations sponsor programs that support hazard mitigation. The following sections provide an overview of existing Texas agencies, organizations, and programs addressing hazard mitigation.

Texas Division of Emergency Management

The Texas Division of Emergency Management (TDEM) (www.txdps.State.tx.us/dem) is designated by the Governor as the State's coordinating agency for disaster preparedness, emergency response, and disaster recovery assistance. TDEM is also tasked with coordinating the State's natural disaster mitigation initiatives, chairing the State Hazard Mitigation Team, and maintaining the State of Texas Emergency Management Plan. TDEM supports and reviews local mitigation plans and administers Hazard Mitigation Grant Program funds provided through FEMA.

Texas Water Development Board

The Texas Water Development Board (TWDB) (www.twdb.State.tx.us) administers a variety of programs related to water. The TWDB is the agency charged with Statewide water planning and administration of

financial assistance programs for the planning, design, and construction of water supply, wastewater treatment, flood control, and agricultural water conservation projects. TWDB administers funding from FEMA under the Flood Mitigation Assistance Program (FMA) and Severe Repetitive Loss Program (SRL) (see Section 5.8). In addition, TWDB is designated by the Governor as the State Coordinating Agency for the National Flood Insurance Program. In this capacity, the agency assists communities with floodplain mapping matters and interpretation and enforcement of local floodplain management regulations.

Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ; www.tceq.State.tx.us) is a diversified agency dealing with permitting, licensing, compliance, enforcement, pollution prevention, and educational programs related to preservation and protection of air and water quality and the safe disposal of waste. Related to mitigation of natural hazards are TCEQ programs that deal with drought, dam safety, flood control, and floodplain management.

Lower Colorado River Authority

Created by the Texas Legislature in 1934, the Lower Colorado River Authority (LCRA; www.lcra.org) is a conservation and reclamation district created to improve the quality of life in Central Texas serving all or parts of 58 counties. Through a system of dams, LCRA supplies electricity to more than one million Texans. It also serves numerous water customers, including cities, the rice-growing industry, and municipal utility districts. Other LCRA services include managing floods, protecting the quality of the lower Colorado and its tributaries, providing parks and recreational facilities, offering economic development assistance, helping water and wastewater utilities, and providing soil, energy, and water conservation programs.

LCRA manages Marshall Ford Dam (also known as Mansfield Dam), which impounds Lake Travis. One of the primary purposes of the dam is to manage flood flows to minimize downstream flood damage.

Texas Colorado River Floodplain Coalition

The Texas Colorado River Floodplain Coalition (www.tcrfc.org) is a partnership of cities and counties in the Colorado River basin seeking better ways to reduce and mitigate flood damage. Established by the Texas Legislature by resolution in 2001, it was formed in response to a combination of rapid growth, significant increases in the number of flood-prone homes and businesses, and devastating floods throughout the basin.

The mission statement of the Coalition reflects the cooperative spirit of the partnership:

> "Encourage comprehensive, consistent management of the floodplain along the Colorado River and its tributaries; provide a forum for data exchange; and facilitate a structured approach to managing the complex issues related to floodplain management."

A series of Coalition objectives are set forth under four categories: technical, emergency management, training, and legislative/legal/funding. An early initiative undertook an "independent review" of the floodplain management programs of Coalition partner communities. The LCRA provides administrative and technical support to the Coalition.

4.3 Federal Mitigation Planning Requirements

The Disaster Mitigation Act of 2000 requires State and local governments to develop and adopt natural hazard mitigation plans in order to be eligible for some types of federal assistance, including mitigation grants. The Act authorizes up to seven percent of HMGP funds available to a State after a disaster to be used for the development of State, tribal, and local mitigation Plans.

In addition to the Disaster Mitigation Act of 2000, mitigation planning requirements are set forth in various FEMA policies and guidance documents, including the Interim Final Rule of February 26, 2002, and the "386" series of mitigation planning how-to guides. There are five FEMA hazard Mitigation programs. The Flood Mitigation Assistance program, Hazard Mitigation Grant Program, Pre-Disaster Mitigation grant program, and the Severe Repetitive Loss program all require a FEMA approved Hazard Mitigation plan as a prerequisite to grant funding. The Repetitive Flood Claim program is the only FEMA mitigation program that does not require a Mitigation Plan.

NFIP Community Rating System (CRS) offers recognition to communities that exceed minimum requirements of the National Flood Insurance Program. Recognition comes in the form of discounts on flood insurance policies purchased by citizens. The CRS offers credit for mitigation plans that are prepared according to a multi-step process. As of the 2011 Plan update, the County is completing an application for entry into the CRS program.

4.4 Description of the Planning Process

How the Plan was Prepared and Updated

The Plan Update process followed the FEMA guidance document titled *Local Multi-Hazard Mitigation Planning Guidance (July 1, 2008)*. This document describes the Local Hazard Mitigation Plan regulations from the 44 Code of Federal Regulations (CFR) Part 201, and is FEMA's official source for defining the requirements for original and updated local hazard mitigation plans. The mitigation planning regulation at 44 CFR 201.6 (d) (3) states that a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and re-submit it for approval within five years in order to continue to be eligible for mitigation project grant funding

This guide provides the structure for the process that was used to develop the Plan update. Other sections of this Plan include details about how the IFR requirements were met, and the process that was used to obtain and interpret data, and eventually make decisions in such areas as mitigation goals, as well as project and action priorities. These are discussed only generally in this section.

As part of the 2011 Plan Update, there was a particular focus on incorporating new hazard information, updating the County risk assessment, providing status on all prior actions, and identifying new actions.

Step 1 Organize Resources

Travis County used a standard organization to develop its original Hazard Mitigation Plan and for the 2011 Update. The Travis County Department of Transportation & Natural Resources (TNR) was charged by the Commissioners Court with coordinating a committee comprised of County departments that are responsible

for drainage permits, subdivision approvals, community development, parks and recreation, roads and bridges maintenance, public facilities, and emergency management.

The organization of the Plan update has three tiers. The Mitigation Planning Committee (MPC), the Stakeholders group, and Travis County Commissioners' Court/participating jurisdictions' City Council.

The Travis County Plan update was funded through a grant from the Texas Water Development Board. Early in the Update process, Travis County secured the services of a professional planning consultant to facilitate the process.

Composition of the Travis County Mitigation Planning Committee Team

As part of the update, government officials from several jurisdictions were members of the MPC. The MPC is comprised of the following individuals found in table 4-1:

Table 4-1
2011 Travis County Hazard Mitigation Plan Update, Mitigation Planning Committee

Team Member	Job Title	Organization
Melinda Mallia	Environmental Project Manager	Travis County TNR
Stacey Scheffel	OSSF Program Manager / Floodplain Administrator	Travis County Transportation and Natural Resources (TNR)
Mickey Roberts	Senior Environmental Specialist	Travis County TNR
David Shore	GIS Coordinator	Travis County TNR
Pete Baldwin	Emergency Management Coordinator	Travis County Emergency Services
Stacy Moore-Guajardo	Assistant Emergency Management Coordinator	Travis County Emergency Services
Don Ward	Road Maintenance, Bridge, Fleet Division Director	Travis County TNR
Brandon Wade	City Manager	City of Pflugerville
Jim McLean	Assistant Chief of Police	City of Pflugerville – Police Department
Chuck Hooker	Chief of Police	City of Pflugerville – Police Department
Clay Collins	City Administrator	City of Sunset Valley
Sara Wilson	Assistant City Administrator	City of Sunset Valley
Terry Browder	Emergency Management Coordinator	Village of the Hills
Dan Roark	City Administrator	Village of the Hills

Mitigation Planning Committee (MPC) Meeting Schedule

The County maintains a copy of the original Plan on the County website, or can be reviewed upon request.

The MPC and the consultant hired by the County were responsible for completing the Plan update. The MPC met twice during the Plan Update. The initial MPC meeting took place on April 30, 2010 at the Travis

County Office of Emergency Management (OEM) in Austin, Texas. Some of the topics discussed at the first MPC meeting included: the purpose of the Plan update, identify the MPC members and Stakeholders, discuss the planning process and mitigation strategies section, and review the request for information (RFI). The second MPC meeting was held on August 5, 2010 and was also held at the County Office of Emergency Management (OEM). Appendix A of the updated Plan includes minutes and attendees of all meetings.

Meeting 1	April 30, 2010
Meeting 2	August 5, 2010

MPC members had an opportunity to provide input and feedback on the content and process of the Plan Update during these meetings. The Stakeholders group was periodically contacted by email to review and provide comments on meeting minutes, the updated Plan structure, as well as the draft and final Plan updates. Copies of all meeting agendas, sign-in sheets, and minutes can be found in Appendix A of the updated HMP.

Composition of the Stakeholders Group

Early in the update process, the County determined that a group of interested organizations, neighboring communities, businesses, academia and individuals with an interest in the Travis County Plan update should be identified. This Stakeholders Group was provided regular updates on the planning process and given the opportunity to review the draft Plan Update at key points in its development. Members of the Stakeholders group were also invited to attend and participate in public meetings. This Stakeholder group, found in Table 4-2 below, was identified by the MPC.

As drafts of the Plan update were prepared, the County used email to distribute them to Stakeholders and requested that they provide comments. Stakeholders were requested to provide feedback through email or by telephoning the Travis County POC or a member of the consultant team. The consultant was responsible for archiving the comments and including them in edited versions of the Plan Update.

Table 4 -2
Travis County Hazard Mitigation Plan 2011 Update, Stakeholders Group

Group Member	Organization
Joe Gieselman	Travis County TNR
Jon White	Travis County TNR
Tom Weber	Travis County TNR
Dave Folwer	Travis County TNR
Steve Schiewe	Travis County TNR
Ed Schaefer	Capital Area Council of Governments
Jo Moss	Pflugerville Independent School District
John Gaete	Austin Independent School District
Jarred Thomas	Williamson County
Brad Bradford	Round Rock
Billy Atkins	City of Austin Homeland Security
Kevin Braun	Wildland Fire

Group Member	Organization
Rich Gray	Wildland Fire
Glen Gillman	City of Austin Water Utility
Carolyn Sudduth	Texas Division of Emergency Management
Gilbert Ward	Texas Water Development Board
Ivan Ortiz	Texas Water Development Board
Jim Weatherford	Texas General Land Office
Mitch Hibbs	Lower Colorado River Authority
Mike Segner	Texas Commission on Environmental Quality

Step 2 Assess Risks

In accordance with general mitigation planning practice, as well as the process FEMA established in its Planning "How-To" series of guides, the risk assessment forms the basis for the hazard mitigation Plan by quantifying and rationalizing information about how natural hazards affect the County. The processes used to complete the hazard identification and risk assessments, and the results of these activities, are described in detail in Sections 5 and 6 of this Plan update. The assessment determined several aspects of the risks of natural hazard faced by the County and each jurisdiction:

- The natural hazards that are most likely to affect the County
- How often hazards are expected to impact the County
- The expected severity of the hazards
- What areas of Travis County are likely to be affected by hazards
- How County assets, operations, people and infrastructure may be impacted by hazards
- How private and commercial assets, operations, and infrastructure may be impacted by hazards
- The expected future losses if the risk is not mitigated

Through a qualitative ranking (explained in detail in Section 5 of this Plan update), the MPC reduced the initial hazard profile list from eight to two. These are the predominant risks to the area: floods and tornadoes. The planning team completed risk assessments (calculations of expected losses) for these two hazards, in addition to the required profiling for the larger list of hazards. These findings were presented to the MPC, discussed by the group, and reviewed by the Stakeholders Group as the basis for later phases of the planning process. The results of the risk assessment were also made available to the public during the public presentations noted elsewhere in this Plan Update.

Step 3 Develop the Mitigation Plan/Update

Throughout the document there are cross references to Interim Final Rule and FEMA crosswalk criteria.

Early in the Plan update process, the MPC and consultant team completed a detailed review of every section of the existing plan, and prepared a comprehensive gap analysis. The purpose of this analysis was two-fold. First, it identified all the subject areas in the 2004 version of the Plan where specific updates were required. For example, census figures, the numbers and locations of City-owned buildings, impacts of recent

hazard events, and so on. The second purpose of the gap analysis was to ensure that the updated Plan is fully compliant and responsive to recent FEMA guidance, specifically the "Blue Book" of July 2008.

The gap analysis showed that while changes and updates were needed throughout the document, most of the modifications were relatively small, and did not require a significant initial public component such as focus groups or surveys.

The Plan update process took place in multiple steps:

MPC and Consultant	Detailed review of the 2004 version of the County HMP
MPC	Discussion, modifications and approval of updates
Consultant	Updated planning process and non-technical sections
Consultant	Updated technical sections (Hazard Identification and Risk Analysis (HIRA) and mitigation strategy)
Consultant and MPC	Review of complete first draft
Consultant	Modifications based on review, Stakeholder feedback
Consultant	Presentation to public, compile feedback
Consultant	Final draft
Consultant	Second public presentation, compile feedback
Consultant	Prepare and submit final draft
TDEM and FEMA	Review and letter of approvability
MPC, Commissioners' Court and City Councils	Final approval and adoption

Step 4 Implement the Plan and Monitor Progress

Once approved by FEMA and formally adopted by Travis County and the three participating jurisdictions, the 2011 Plan Update must be updated every five years in order for the County to maintain its eligibility for various FEMA grant programs. During this five year period, the Plan is periodically reviewed to ensure compliance with FEMA and the State of Texas requirements for Plan maintenance (See Section 8 – Plan Monitoring and Maintenance for more details). After the 2011 Plan update is approved, the County and Cities will attempt to implement specific actions to achieve the goals described in the Mitigation Strategies section. In addition to listing the mitigation goals and actions the County and Cities are pursuing, the section describes the progress the County has made towards reaching the individual goals and actions since the original Plan was adopted.

The Travis County Commissioners Court governs the County and has the final decision on what projects are funded and initiated. The City Councils have the same authority of each of the participating Cities. The action items fall under their jurisdiction and they will delegate the tasks of the action items. Therefore, the Commissions Court (or City Council) will coordinate with the County OEM, Floodplain Manager and Lead Manager for each mitigation item to accomplish the goals and action items

4.5 How the Public and Jurisdictions were involved

During the 2011 Plan update, the public was involved by requesting their attendance and participation at public presentations during a public meeting held at Sunset Hills on November 16, 2010 and a Commissioners' Court meeting on Jan 20, 2011. More information on the public meeting held in Sunset

Valley is provided in the Sunset Valley Appendix I. The purpose of these meetings was to solicit input from the public. The January 20th meeting was to solicit input from the public and the Commissioners' Court and to request approval from the Court to submit the Plan update to the State and FEMA for review. Drafts of the Plan Update were available for public review, and the public was invited to provide input on the document. Public Notice of the January 20, 2011 Commissioner's Court meeting followed normal Commissioner's County public notice procedure and the meeting was televised live and then replayed on Travis County Cable TV Channel 17.

The public had a second opportunity to review the final draft Plan prior to submittal to the State and FEMA for review and approval. As discussed in the January 20, 2011 Commissioner's Court meeting, the plan was posted on Travis County's website (www.co.travis.tx.us) with the following introduction: "Public Comment Invited on Travis County Hazard Mitigation Plan . Deadline - February 28, 2011: The Travis County Hazard Mitigation Plan addresses natural and man-made hazards, such as flood, tornado, and fire that affect people and property in the surrounding regions.

The County encouraged members of the public to review the draft and provide feedback. No comments or questions were submitted by the public during this time period. In addition, Civic groups and academia were notified via email about the availability of the Plan update on the County's website and encouraged review and comment on the draft Plan update.

4.6 Incorporating Mitigation Plan Requirements into Other Local Planning Mechanisms

As required by the FEMA Interim Final Rule that governs mitigation planning, actions from the County mitigation plan must be incorporated into other planning mechanisms, as applicable, during the routine re-evaluation and update of the County HMP. It should be noted that Counties in Texas, such as Travis County, have very little land use and zoning authority. Travis County, as well as the Cities of Pflugerville and Sunset Valley are members of the NFIP and have Floodplain Management Ordinances. When the municipalities or County update their Floodplain Ordinances, the requirements from this HMP will be included in the revisions. This HMP update will be made available to each committee leader responsible for revising their Floodplain Ordinances.

Both the County and the municipalities will use the specific actions from this Plan as part of their capital budgeting processes, in particular when projects require local match for federal grants. Where possible, the County will use elements of this HMP to supplement Community Rating System (CRS) planning and mitigation activities. The County will also look for opportunities to use the updated HMP in conjunction with drainage plans.

The County follows the International Residential Building Code guidelines. On September 1, 2009, Travis County adopted the provisions of House Bill (HB) 2833 enacted by the 81st Texas Legislator. By adopting the provisions, the County required that professional home builders use a version of the International Residential Code to construct new single family homes and duplexes. If the County decides to amend any of the International Residential Code, within the process of amending them, Travis County will take into account the requirements from this HMP.

4.7 Review and Incorporation of Plans, Studies, Reports and other Information

Other planning documents can be used as a valuable resource for integrating information related to hazard mitigation into the HMP. The Plan update included the review and incorporation of other Plans, studies, and reports that are applicable to the hazards discussed in the Plan.

The following Plans and other documents were considered during the Travis County Plan update: Onion Creek Interim Feasibility Report (October, 2006); Travis County Parks and Natural Areas Master Plan; The Texas State Hazard Mitigation Plan (2007),Travis County Greenprint for Growth; and the Southwest Travis County Growth Dialog. This HMP Plan update has been made available to each committee leader responsible for updating these other Plans. In addition, any changes or updates to the Flood Insurance Study (FIS), Flood Insurance Rate Maps (FIRMs) are reflected in the Plan update.

The specific Plans, Studies and Reports are listed below along with a discussion on how they were incorporated into the HMP Update.

- **Onion Creek Interim Feasibility Report (October, 2006):** In October, 2006 the United States Army Corps of Engineers (USACE) completed the *Onion Creek Interim Feasibility Study*. The report included two volumes with Volume II dedicated to Onion Creek which is partially located in both Hays and Travis County. The report was completed in coordination with the Lower Colorado River Authority (LCRA) and three additional cost sharing sponsors- the City of Austin, Travis County, and City of Sunset Valley. The Onion Creek portion of the study was reviewed to identify details about flood hazard data and some of the more historical flood events that have occurred within the Travis County portion of the Onion Creek watershed
- **The 2007 and 2010 Texas State Hazard Mitigation Plans**: See Section 3.5 for a detailed summary and overview of the 2010 Texas State Plan. The goals and strategies in the State Plan were considered by the MPC as the planning team updated the Travis County Plan, and to the extent possible, the team patterned the update to reflect the spirit and details of the State document.
- **Floodplain Ordinances:** Travis County, Sunset Valley, and Pflugerville participate in the National Flood Insurance Program (NFIP) and therefore have adopted floodplain ordinances (Village of the Hills does not participate in NFIP). These ordinances were reviewed to incorporate any new requirements. Discussion of the updated Floodplain Ordinances can be found in Section 7.2, Mitigation Goals and Accomplishments of the Updated Plan.
- **Travis County Parks and Natural Areas Master Plan (2006):** The Parks Master Plan was used to identify areas of the County that are set aside for greenways and riparian corridors. A summary of the Plan was included in Section 3 of the Plan update.
- **Travis County Flood Insurance Study**: The revised FIS for Travis County is dated September 26, 2008. This FIS compiles all previous flood information and includes data collected on numerous waterways. The FIS was used to identify floodprone areas of the County (See Section 5.4.1).
- **Travis County Greenprint for Growth:** This report was published in October 2006 and applies Geographical Information System modeling to recommend land conservation priorities.

The model identifies currently unprotected areas in Travis County that offer the highest conservation benefit based on locally identified goals and criteria. This report was used to identify proposed conservation areas in Travis County as part of the future development trends section (See Section 6.6).

- **Southwest Travis County Growth Dialog:** The report was developed and funded by Travis County and LCRA to seek community and stakeholder input on growth-related issues in southwestern Travis County. The Advisory Panel Final report was completed in May 2005. This report was used to identify future development trends in southwestern Travis County (See Section 6.6).
- **Travis County Drainage Basin Study:** The report was completed and approved in 2009, and included the results of extensive drainage studies throughout the County, as well as numerous drainage improvement projects. These include dozens of road drainage projects, and seven subdivision drainage projects. All of these possible projects are prioritized based on a series of criteria that were developed for the report. The 2011 HMP update incorporates numerous projects from this study. These are listed in the main table in Section 8 of this document.

Step by Step process for incorporating the mitigation strategy and other information contained in the plan into other planning mechanisms.

Step 1. When an update to an existing local plan, such as the CIP, Flood Ordinance, Bond Committee recommendations, Building Codes, Land Use plan, the plan POCs (MPC committee member for County and Cities) will provide a copy of the most recent HMAP, specifically highlighting the action items

Step 2. The planning process for the plan updates will include a review of the most current HMAP and the actions to ascertain if any of the plan data (strategy and actions) are relevant for inclusion in the specific plan update. Particular attention will be given to incorporating action items that would enable the potential reduction in future damages from an identified hazard

Step 3. Incorporate the relevant HMAP plan data or actions into the draft plan update

Step 4. Get feedback on the recommended incorporation from Management and Stakeholders

Step 5. Incorporate the relevant HMAP plan data or actions in the final plan update

The above process was discussed and documented during this plan update. This process has been followed informally since the original plan was adopted and was followed during the plan update process.

Section 5
Hazard Identification and Profiling

Contents of this Section

5.1 IFR Requirement for Hazard Identification and Profiling

IFR §201.6(c)(2)(i): *[The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

5.2 Hazard Identification

In accordance with IFR requirements, and as part of its efforts to support and encourage hazard mitigation initiatives, Travis County's Mitigation Planning Committee (MPC) prepared this general assessment of the hazards that have potential to impact the County. The following subsections provide an overview of past hazard events in Travis County and brief descriptions of the potential for future losses. Section 6 (Risk Assessment) includes much more detailed information about past and potential losses (risk) from a subset of the most significant hazards in Travis County.

The term "planning area" is used frequently in this section. This term refers to the geographic limits of the County, but specifically excludes jurisdictions that are not included in the Plan, except where noted. The risk assessment section addresses the effects of hazards on Travis County and its citizens.

Overview of Travis County's Natural Hazards History

According to the National Oceanic Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) database (and other sources), between 1950 and 2009, Travis County has experienced:

- 113 Floods
- 61 Tornadoes (25 F0s, 24 F1s, 8 F2s, 3 F3s, and 1 F4)
- 6 Droughts
- 174 Severe thunderstorms
- 10 Winterstorms
- 0 Seismic/Earthquake

Numerous federal agencies maintain a variety of records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. The Federal Emergency Management Agency (FEMA) maintains records on federal expenditures associated with declared major disasters. The U.S. Army Corps of Engineers (USACE) and the Natural Resources Conservation Service (NRCS) collect data on losses during the course of some of their ongoing projects and studies. Additionally, NOAA and the NCDC collect and maintain data about natural hazards in summary format. The data includes occurrences, dates, injuries, deaths, and costs. The basis of the cost estimates, however, is not identified.

Some Historic Events: Greater Austin Area

- *1869: rain lasted 64 hours, damage was catastrophic*
- *1900: 7-inch rain storm created a wall of water claiming 23 lives*
- *1913: 10-day storm with 14 inches of rain*
- *1974: flooding claimed 13 lives*
- *1981: 10-inch rain resulted in $35.5 million damage and killed 13 people*

In the absence of definitive data on some of the natural hazards that may occur in Travis County, illustrative examples are useful. In 1965, the federal government began to maintain records of events deemed significant enough to warrant declaration of a major disaster by the U.S. President. Since 1965, Travis County has received five Presidential Disaster Declarations which are included as part of the summary below in Table 5-1. Of the five Presidential Disaster Declarations that Travis County received between 1965 and 2009, 4 were flood related and one tropical storm. This list is not meant to capture every event that has affected the area, but rather to highlight significant events that have occurred here in the past. A number of these events caused property damage and injuries.[8] These figures and events are discussed in more detail in the hazard-specific subsections that follow.

Table 5-1
Natural Hazards and Declared Major Disasters in Travis County (1965 to 2009)
(Sources: Public Entity Risk Institute (PERI) website, FEMA, NCDC database)

Date	Nature of Event
July, 1869	**Flooding.** Probably the biggest flood in Texas history - Produced by heavy rain, which extended into Northwest Texas - Tremendous flooding down the Colorado River from the headwaters to the mouth. The rise was estimated at forty-six feet. The mass of waters rushed down from the narrow and confined channel between the mountains above, to the wider one below, with such fearful velocity that the middle of the stream was higher than the sides.
September 6, 1921	**Flooding.** A tropical storm formed the morning of Sep 6, 1921 - made hurricane intensity that afternoon - made landfall near Vera Cruz the early morning of Sep 7 - veered right and fell below depression intensity just as it crossed the Rio Grande. The storm total was 39.7" in 36 hrs - With 215 drownings Statewide, this was the deadliest flood in Texas history.
June 9- 15, 1935	**Flooding.** During the peak of normal flood season – the storm stalled west of Central Texas for six days. A low-level jet from Gulf and mid and upper level flow off Eastern Pacific over Central Texas caused widespread, disastrous flooding over the Texas Hill Country.

[8] National Oceanic and Atmospheric Administration (NOAA) – National Climatic Data Center

Table 5-1
Natural Hazards and Declared Major Disasters in Travis County (1965 to 2009)
(Sources: Public Entity Risk Institute (PERI) website, FEMA, NCDC database)

Date	Nature of Event
September 11, 1952	**Flooding.** In 1952 during the worst drought in Texas history, a disastrous flood occurred. This flood followed the El Nino winter of 1951/1952. The highway 281 bridge was washed away and destroyed at Johnson City on the Pedernales River. Major flooding also passed down from the mid Guadalupe River.
December 25, 1991 (DR-930)	**Flood.** Heavy rains produced the historical maximum flood on Lake Travis. Residents and businesses affected in Travis County were primarily those situated within the flood pool of Lake Travis, along the Colorado River, and along the creeks in the southeast part of the County that feed into the Colorado river. Federal declaration was for Individual Assistance only. (DR 930)
1994	**Wildfires/Brush Fire.** One of the worst brush fires in Travis County history, the "Dessau Road" fire burned over 600 acres, destroyed two abandoned buildings, and damaged a fire truck. Eleven fire departments were involved in containing and extinguishing the blaze.
April 5, 1996	**Lightning.** Lightning struck a 51-year-old visitor from Scotland as he was playing golf in the southeast part of Austin. He remained in critical condition for nearly 2 weeks after the strike, and died on April 13th.
May 27, 1997	**Tornado.** The (F4) Pedernales Valley tornado began on the shore of Lake Travis, destroying trees and a floating marina, where nearly all of the watercraft were destroyed. Numerous trees were twisted and uprooted, a Southwestern Bell building housing telephone switching equipment destroyed, and 50 houses/mobile homes destroyed. The only death associated with this tornado occurred when a man's mobile home was demolished and his vehicle tossed several hundred feet. Survey team members were unable to determine whether he was in the mobile home or had left it to drive away.
June 22, 1997 (DR-1179)	**Lake Travis Flood.** Heavy rains inundated more than 100 homes in the flood pool of Lake Travis. Additionally, homes in southeast Travis County along several creeks were affected by this event. Residential damage was estimated to be over $1M.
October 17, 1998 (DR-1257)	**Flood.** Hurricane Georges caused extensive flooding throughout the County. The storm dumped over 8 inches of rain on Travis within a 24-hour period. Roads, culverts, and other public facilities sustained over $200,000 in damages.
July 23, 2000	**Excessive Heat.** A 2-year-old boy died of heat stroke. He had a temperature of 108 degrees when he reached the hospital. He was left on the floor of a sunroom and his mother had fallen asleep. A 72-year-old woman also died of heat stroke. Although air conditioning was available in her home, she had not turned it on.

July 31, 2000	**Drought.** In spite of the rainfall east of I-35 in June, the severe drought that began early in 2000 across the southwest parts of South Central Texas spread again in July to cover all but the southeast counties. Little to no rain was recorded across these counties in July, and nearly all river levels were reported to be low. Aquifer levels and lake levels were approaching all-time low readings, and strong conservation measures were enacted across much of the area. Numerous small creeks and streams ceased flowing. Agricultural activities were essentially brought to a halt.
November 15, 2001	**Flood and Flash Floods.** Heavy rains caused flash flooding and power outages for several hours to almost 40,000 homes. Most low-water crossings flooded and dozens of rescues were required. More than 80 people were evacuated from around the Onion Creek area south of Austin. Onion Creek went above flood stage, in some of the worst flooding since October of 1998, cresting at 36.5' (flood stage is 17.0'). There were two deaths, 50 injuries, and $500,000 in property damage as a result of these storms.
June 26, 2002	**Hail, Thunderstorms, and Wind.** High winds and large hail struck Lake Travis, causing damage to windows and roofs of homes and boats in the area. The worst damage occurred when the high winds shoved a boat into the wall at Mansfield Dam with sufficient force to sink the boat. Severe thunderstorm winds knocked down trees across the city of Austin. Many of these trees fell on utility lines, knocking out power to one thousand residents for several hours.
July 01, 2002 (DR-1425)	**Flood and Flash Floods.** Heavy rains fell over a four-day period causing damage to homes, roads, and bridges. Barton Creek crested at 17.9 feet, where flood stage is 11.0 feet. Onion Creek crested at 23.8 feet, where flood stage is 17.0 feet. There was one death and significant property damage as a result of these storms. Federal emergency declaration – IA only.
June 28, 2007 (DR-1709)	**Severe Storms, Tornadoes, and Flooding.** The heavy rains produced flash flooding along Interstate Highway 35 corridor from Georgetown southward to San Antonio on the morning of June 28, 2007. Heavy thunderstorms over northern Travis and southern Williamson Counties produced two to four inches of rain with localized areas receiving higher amounts. The highest rain total in Travis County was six inches reported in Jollyville.

5.3 Losses Due to Major Disasters

No definitive record exists of all losses – public and private – due to disasters for Travis County. For the United States as a whole, estimates of the total public and private costs of natural hazards range from $2 billion to over $6 billion per year. Most of those costs can only be estimated. In most declared major disasters, the federal government reimburses 75% of the costs of cleanup and recovery, with the remaining 25% covered by the State and affected local jurisdictions.

The Federal Emergency Management Agency's estimate of its expenditures in the State of Texas for flood disasters alone for the period from 1991 through 2009 exceeds $7 billion. This period includes Tropical Storm Allison, which inflicted damages in excess of $1 billion, and Hurricanes Rita and Ike, which inflicted damages in excess of $4B. These costs, which do not include costs incurred by other federal agencies or by State and local agencies, include:

- Public assistance for debris removal, emergency works, roads and bridges, flood control facilities, public buildings and equipment, public utilities, and parks and recreational facilities;
- Assistance paid out for individual and family grants, emergency food and shelter, National Flood Insurance Program payments, and other assistance to individuals; and
- Funds set aside to support hazard mitigation grants.

Travis County has been part of five Presidential Disaster Declaration and received federal hazard mitigation funds to support the following mitigation initiatives:

Table 5-2
FEMA Mitigation Funding in Travis County

Mitigation Funding in Travis County					
Program	Year	Location	Federal Funds	Project Type	# or Properties Acq
	1997		$ 6,000.00	Encoder/Decoder	
HMGP DR 1257	1998	Timber Creek	$ 1,200,000.00	Acq/Demolition	40
FMA	2004		$ 35,000.00	Plan Development	
FMA	2006	Thoroughbred Farms Graveyard Point	$ 562,500.00	Acq/Demolition	3 1
PDM	2006	Timber Creek	$ 300,000.00	Acq/Demolition	10
HMGP DR 1697	2008	Thoroughbred Farms	$ 240,000.00	Acq/Demolition	4
FMA	2009	Plan Update	$ 30,000.00	Plan Update	
Total			$ 2,373,500.00		58

Natural Hazard Related Deaths, Injuries and Property Damage

According to the NCDC database, Travis County has experienced 23 deaths and 250 injuries from natural hazards in the period from 1950 to 2009.[9] Property damage from natural hazards in Travis County during this same time period was estimated at slightly more than $810 million.

5.4 Overview of the Type and Location of Natural Hazards that can affect Travis County

The MPC determined that the focus of the Plan update should be on natural hazards and therefore hazardous materials - which was included in the original plan - was deleted in the 2011 version. In the initial identification process of this Plan update, the MPC catalogued potential hazards to identify those with the most chance to significantly affect the County. The hazards include those that have occurred in the past and may occur in the future. A variety of sources were used in the investigation. These included national, regional, and local sources such as websites, published documents, newspapers, databases, and maps, as well as discussion with the MPC staff. In the initial phase of the

[9]National Oceanic and Atmospheric Administration (NOAA) – National Climatic Data Center

planning process, Travis County's MPC identified eight natural hazards and the risks they create for the County, its material assets, operations, and staff. These hazards were selected for inclusion in the Plan by the MPC. The hazards selected to be profiled include the following:

- Floods
- Wildland/grass/brush fire
- Tornadoes
- Drought
- Severe storms
- Winter storms
- Seismic/Earthquake
- Landslides

The following section profiles the eight hazards listed above, and includes descriptions of the hazards, location and extent of the hazards, severity of the hazards, impact on life and property, and past occurrences.

For each hazard profiled in Section 6.4, the planning team assigned a high, medium, or low probability of future occurrences. The hazard probability was assigned based on calculating the annual percent probability of occurrence by dividing the number of previous events by the duration in years of historical data. Table 5-3 summarizes the annual percent probability ranges for assigning the low, medium, and high probability for a particular hazard. Note that the percent ranges in the Table below are not exact probabilities and are estimates made by the planning team, intended to be used as a general guide for future planning purposes. Also note that future probability is only one component of the risk calculation. Some hazards, such as major hurricanes and earthquakes, have a low probability but potentially very high impact on life and property in the planning area.

Table 5-3
Annual Percent Probability Ranges

Probability	Annual Percent Probability Range (%)
Low	1-9
Medium	10-24
High	25-100

5.4.1 Floods

Description of the Flood Hazard

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

Hundreds of floods occur each year in the United States, including overbank flooding of rivers and streams and shoreline inundation along lakes and coasts. Flooding typically results from large-scale weather systems generating prolonged rainfall. Flooding in Travis County can be the result of the following weather events: hurricanes, thunderstorms (convectional and frontal), storm surge or winter storms. For a more detailed description of flood hazards visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Flood Hazard

The Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide an overview of flood risk, but can also be used to identify the areas of the County that are vulnerable to flooding. FIRMs are used to regulate new development and to control the substantial improvement and repair of substantially damaged buildings. Flood Insurance Studies (FISs) are often developed in conjunction with FIRMs. The FIS typically contains a narrative of the flood history of a community and discusses the engineering methods used to develop the FIRMs. The study also contains flood profiles for studied flooding sources and can be used to determine Base Flood Elevations for some areas.[10]

The revised FIS for Travis County is dated September 26, 2008. This FIS compiles all previous flood information and includes data collected on numerous waterways. Review of the FIS indicates that

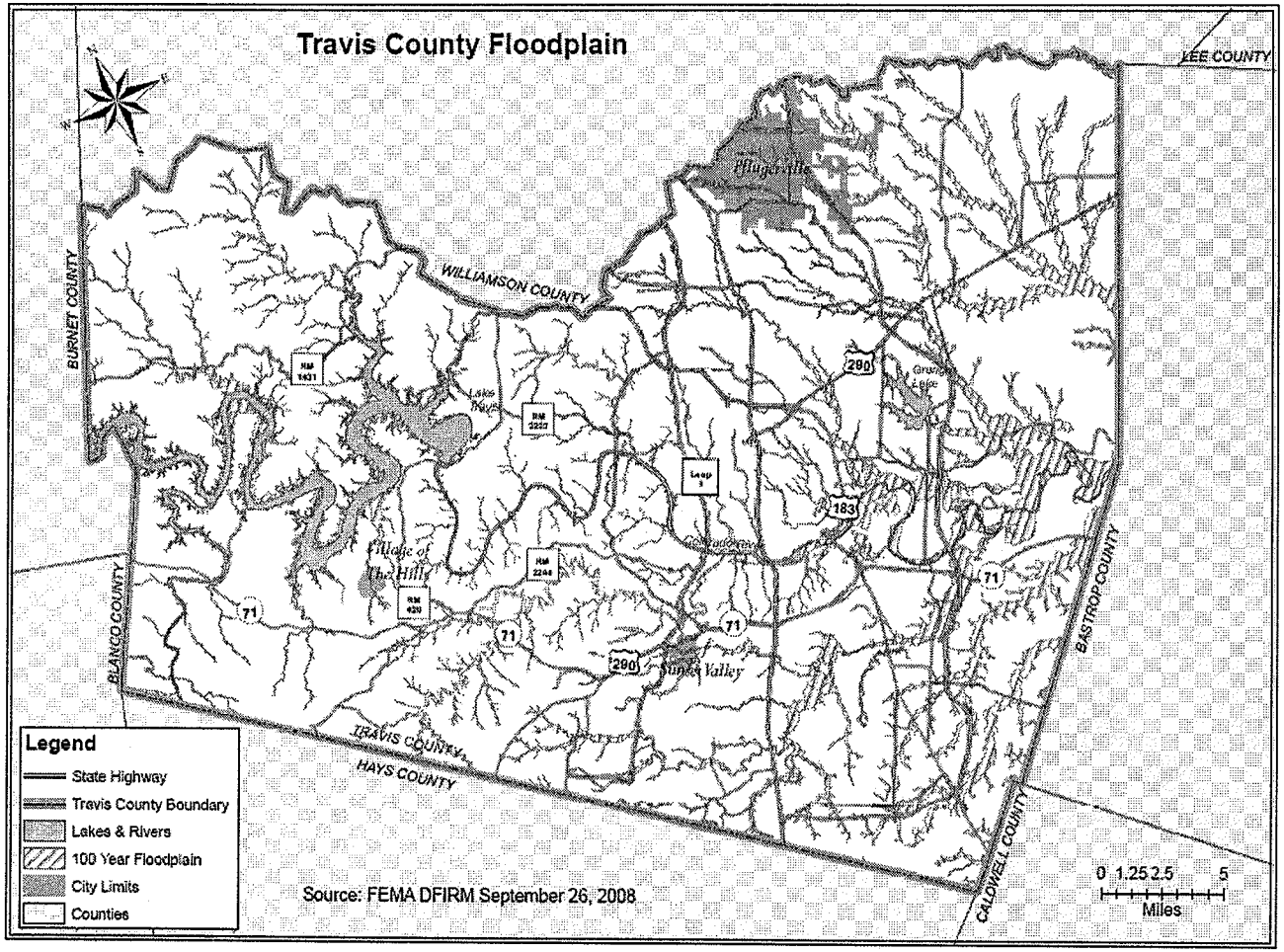
> *Stream channels along the north and west of the Balcones Escarpment tend to be narrow, with rock beds and banks of high relief. Because soils in these areas are relatively nonporous, there is considerable runoff and, hence, a possibility of flash flooding. As the soils change into clay and sand toward the south and east, the stream channels widen, increasing the area of floodplain.* [11]

Certain tributaries of the Colorado River within Travis County have experienced significant flooding in the past. The FIS indicates that the flood of September, 1952 produced a peak discharge along the Pedernales River, a tributary of the Colorado River, not seen since 1869. Sections of the Llano River have also been susceptible to flooding in the past.

Figure 6-1 identifies the Special Flood Hazard Areas (or 100-year floodplain) for Travis County. The map shows the 100-year floodplain is predominately found along Lake Travis, Lake Austin, and the Colorado River. At 146 square miles, the 100-year floodplain makes up 14.7 percent of the total land area in Travis County (total land area is 989 square miles, and total County area, including water bodies and incorporated cities, is 1,024 square miles). Floodplain maps for the Cities of Pflugerville, City of Sunset Valley, and the Village of the Hills can be found in Appendices H, I, and J respectively.

[10] FEMA –Flood Insurance Study definition
[11] FEMA. Travis County Flood Insurance Study (FIS), Page 18

Figure 5-1
Travis County Floodplain Map
(Sources: FEMA – DFIRM, Travis County –Transportation and Natural Resources Department)



FIRMs for Travis County show the following flood zones:

- AE Zones along rivers and streams for which detailed engineering methods were used to determine Base Flood Elevations. AE Zones (or A1-30 Zones) are shaded in gray. Most of the waterways mapped using detailed methods have designated floodways.
- A Zones or "approximate" flood zones, where detailed information on the Base Flood Elevations (elevation to which flood waters associated with the 1-percent-annual chance flood are predicted to rise) has not been developed. A Zones are shaded in gray.
- B Zones and Shaded X Zones, which are areas of "moderate" flood hazard, typically associated with the 500-year flood (or 0.2% annual chance).
- C Zones and Unshaded X Zones are areas of "minimal" flood hazard, typically considered to be "out of the floodplain." Although local drainage problems and ponding may still occur, these minor flood problems typically are not shown on the FIRM.

Major flood protection is provided by a system of dams and reservoirs developed along the Colorado River that stretches from Lake Buchanan in Llano and Burnet Counties to Lake Austin, the site of the Tom Miller Dam (formerly Lake Austin Dam). Six dams comprise the system, stretching like massive steps down the length of the lower Colorado River. The six dams are maintained by the Lower Colorado River Authority. Below this chain lies the smaller channel lake, Town Lake, which is impounded by Longhorn Dam, built and maintained by the City of Austin. Travis County has adopted ordinances for subdivision design and drainage, and floodplain management regulations. The City of Austin has installed a Flood Early Warning System.[12]

Onion Creek Watershed

In October, 2006 the United States Army Corps of Engineers (USACE) completed the *Onion Creek Interim Feasibility Study*. The report included two volumes with Volume II dedicated to Onion Creek which is partially located in both Hays and Travis County. The Onion Creek portion of the study was reviewed to identify details about flood hazard data and some of the more historical flood events that have occurred within the Travis County portion of the Onion Creek watershed. The report was completed in coordination with the Lower Colorado River Authority (LCRA) and three additional cost sharing sponsors that included the City of Austin, Travis County, and City of Sunset Valley.

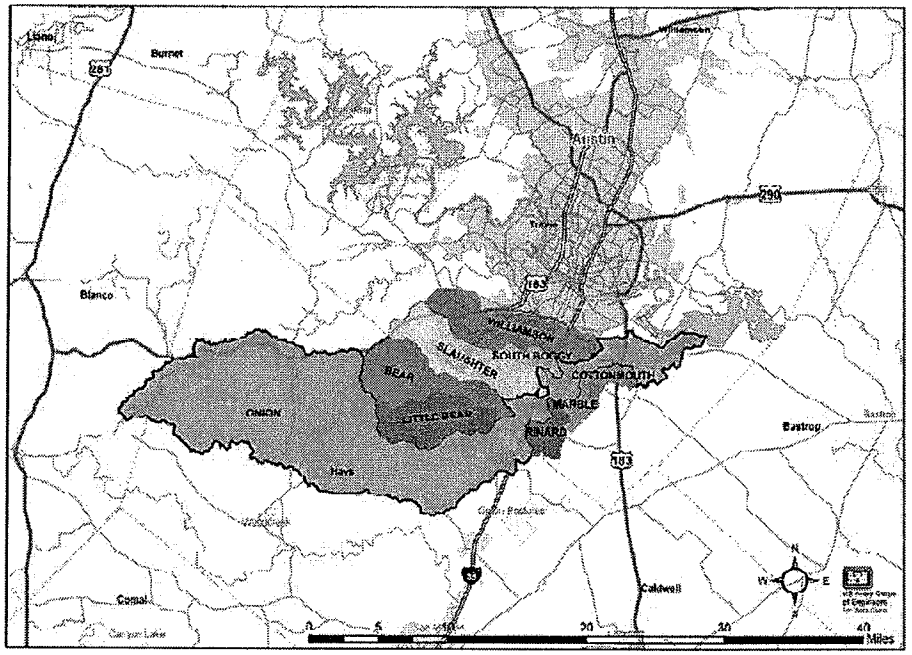
The Onion Creek watershed encompasses approximately 343 square miles and is located primarily in southern Travis and northern Hays Counties with a minor portion of the upper portion of the basin extending into eastern Blanco County. The longest stream length, from the headwaters to its confluence with the Colorado River, is approximately 78 river miles. Major tributaries on Onion Creek include Cottonmouth, Williamson, Marble, South Boggy, Slaughter, Rinard, Bear and Little Bear Creeks.[13] Figure 5-2 identifies the Onion Creek Watershed.

The extent of the flood hazard in the County is primarily expressed in the Flood Insurance Rate Maps and Flood Insurance Studies. The FIRMs and FISs provide detailed information regarding both the two-dimensional (i.e. area) extent of potential flooding, and to a lesser degree the elevation. However, it

[12] Travis County Flood Insurance Study (FIS)
[13] USACE Onion Creek Interim Feasibility Study, October 2006

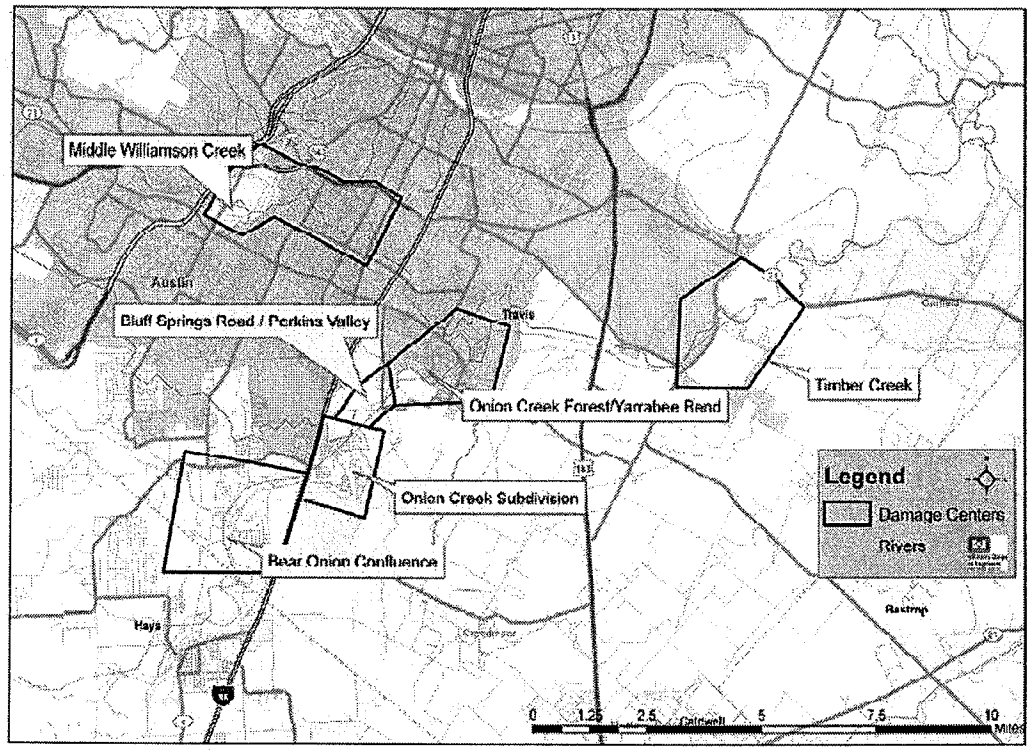
should be recognized that such information is *highly* location-specific. Thus, it is neither possible nor meaningful to include detailed site-specific discussions of these aspects of extent in the County-wide hazard mitigation plan. Information from FIRMs and FISs is included in this and other sections of the HMP update, and the maps and studies are incorporated by reference. It is useful to mention in this context that most of the potential for flooding in Travis County is related to either flash flooding/overbank and sheet (overland) flow. Since these kinds of flooding are nearly always related to unpredictable weather (severe storms), it is nearly impossible to state the potential elevations of floods. In fact, the FIRMs usually offer a state-of-the-art indication of areas that may be subject to inundation in the 100-year flood, and FISs include engineering data that can be used in combination with other information to determine the probability of individual sites being impacted by floods of various probabilities. Again, however, it is not practical to describe these measures of extent on a County-wide scale. The County intends to continue its involvement and cooperation with FEMA and other agencies to refine its understanding of flood extent and impacts.

Figure 5-2
Onion Creek Watershed Location Map
(Source: USACE – Onion Creek Interim Feasibility Study)



Although the feasibility study covered the entire Onion Creek watershed, the primary focus was limited to six specific areas of interest within the Onion and Williamson Creek Watersheds. Figure 5-3 shows the designated areas of interest for the study area. Three of these areas are located in the unincorporated areas of Travis County and the City of Sunset Valley. The three areas include Timber Creek, Onion Creek Subdivision, and Rear Onion Confluence. Recent flood events in the Onion Creek watershed are described in the *Occurrences of the Flood Hazard* subsection.

Figure 5-3
Designated Areas of Interest within Onion Creek
(Source: USACE – Onion Creek Interim Feasibility Study)



Severity of the Flood Hazard

Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. In Travis County, characterizing the severity of the flood hazard depends on what part of the County is being considered, but generally speaking the issues relate to how often floods occur. Historically, floods are and continue to be the most frequent, destructive, and costly natural hazard facing the State of Texas. Most recently, the County has been impacted by four significant flood events: in 1997, 1998, 2001, and 2007.

Impact on Life and Property

The National Climatic Data Center (NCDC) database indicates that there have been 113 floods in Travis County in the period from 1950 to 2009, with property damages slightly over $7.6 million. The NCDC database indicates the events occurred between 1994 and 2009. The database provides no indication as to why there are no events recorded prior to 1994, but presumably past flood events follow a similar pattern as the 16 years of historical data.

Figures maintained by NCDC indicate that Travis County has experienced no deaths or injuries due to floods from 1994 on.[14] Section 6 of this plan includes a much more detailed discussion of flood impacts on the County, in particular the history of National Flood Insurance Program (NFIP) claims, and the number of FEMA "repetitive loss" properties.

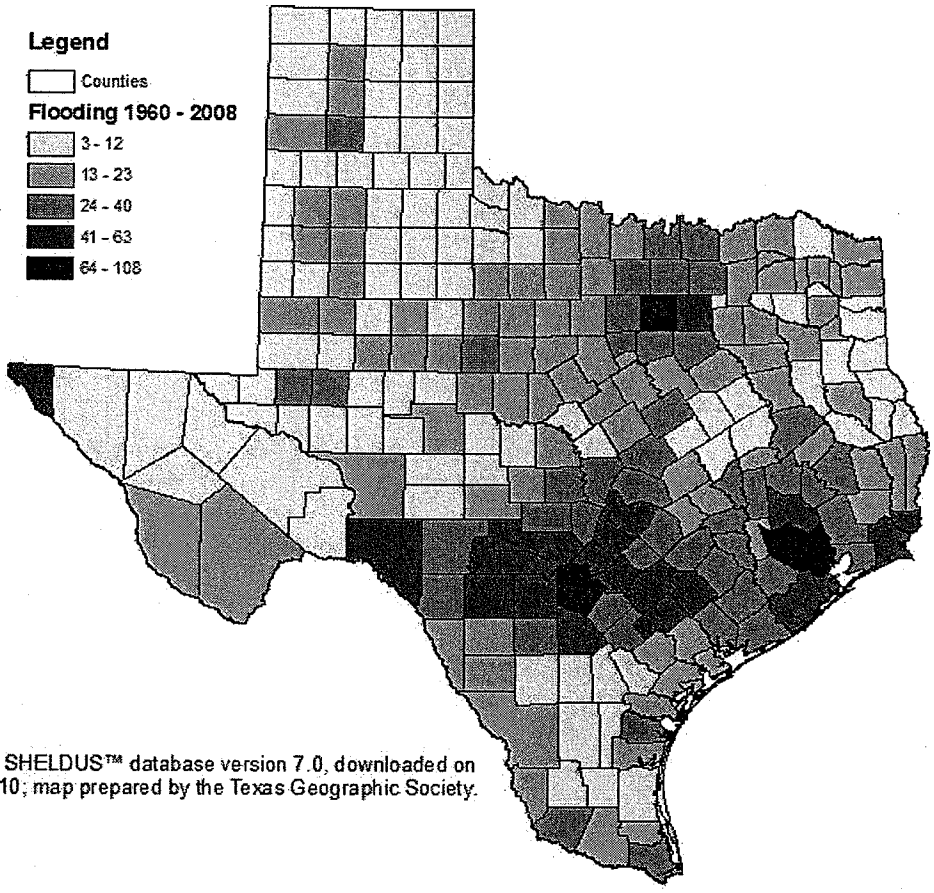
Occurrences of the Flood Hazard

Figures maintained by the NCDC and the Centers for Disease Control indicate that Texas leads the country with more flood-related deaths than any other State. Deaths due to floods, tropical storms and flash floods accounted for 38% of all weather-related deaths statewide.

Figure 5-5 below is a map from the 2010 Texas State Hazard Mitigation Plan that displays both previous flood occurrences and location of floods, by county, for the State between 1960 and 2080. The map is classified into four value ranges using the natural breaks (Jenks) method. The State Plan indicates that Travis County falls within the second highest class (24 - 40 floods). Counties that fall within this category are considered to have a moderate to high risk for experiencing a flood event again.

[14] NOAA, NCDC – Texas – Flood Events

Figure 5-4
Flood Occurrences in Texas 1961-2008
(Source: State of Texas Hazard Mitigation Plan, 2010)



Source: SHELDUS™ database version 7.0, downloaded on 7/25/2010; map prepared by the Texas Geographic Society.

As mentioned above, the NCDC indicates there have been 113 flood events in Travis County. Note that the NCDC reports data at a County level, so there are flood events that may be specific to some of the individual jurisdictions (not participating in the Plan update), and therefore outside of the planning area. With the data reported at the County level it is not possible to separate out these events. Of the 113 floods, 21 resulted in property damage in excess of $25,000. These flood events are listed below.

Table 5-4
Travis County: Flood Events Resulting in Property Damage, 1950 – 2009
(Source: NOAA/NCDC)

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TRAVIS	10/07/1994	2000	Flash Flood	N/A	0	0	50K	3K
2 Countywide	05/29/1995	0230	Flash Flood	N/A	0	0	40K	5K
3 Austin	08/24/1996	11:30 AM	Flash Flood	N/A	0	0	30K	0
4 TXZ171>172 - 192	10/28/1996	08:00 AM	Flood	N/A	0	0	250K	70K
5 Countywide	05/23/1997	05:00 PM	Flash Flood	N/A	0	0	50K	0K
6 Countywide	06/08/1997	11:30 PM	Flash Flood	N/A	1	10	100K	0
7 Countywide	06/22/1997	01:00 PM	Flood	N/A	0	0	1.0M	50K
8 Austin	07/30/1997	06:00 PM	Flash Flood	N/A	0	0	50K	0
9 Countywide	12/20/1997	08:45 PM	Flash Flood	N/A	1	0	50K	0K
10 Countywide	10/17/1998	08:30 AM	Flash Flood	N/A	1	50	1.5M	100K
11 TXZ192	10/17/1998	10:00 AM	Flood	N/A	0	50	1.0M	50K
12 Southwest Portion	06/09/2000	12:30 PM	Flash Flood	N/A	0	0	30K	0
13 Countywide	05/20/2001	08:30 PM	Flash Flood	N/A	0	5	60K	0
14 Countywide	08/26/2001	07:15 PM	Flash Flood	N/A	0	0	30K	0
15 Countywide	11/15/2001	10:00 AM	Flash Flood	N/A	2	50	500K	0
16 Countywide	09/08/2002	09:15 AM	Flash Flood	N/A	0	2	30K	0
17 Oak Hill	06/03/2007	20:50 PM	Flash Flood	N/A	0	0	50K	0K
18 Pflugerville	06/25/2007	13:00 PM	Flash Flood	N/A	0	0	30K	0K
19 Pflugerville	06/28/2007	00:00 AM	Flash Flood	N/A	0	0	50K	0K
20 Austin	06/11/2009	21:00 PM	Flash Flood	N/A	0	0	2.0M	0K
21 Lake Travis	10/22/2009	10:31 AM	Flood	N/A	0	0	500K	0K
				TOTALS:	5	167	7.400M	278K

The September 2008 Travis County FIS also indicates that in addition to the events listed in Table 5-5 above, significant flood events in Travis County after 1950 have occurred in September 1952, June 1957, October 1959, 1960, 1961, May 1965, May 1970, May 1981, June 1981, December 1991 through February 1992.

The FIS indicates the greatest flood on record in Travis County occurred on July 7, 1869. This flood event created flood heights in area creeks and rivers greater than any recorded flood since 1833. Since the completion of Lake Travis reservoir in 1940, there have been no floods on the Colorado River comparable in magnitude to the flood of 1869. The NCDC data and other sources indicate more recent significant flood events in Travis County have occurred in October 1998, and November, 2001.

Within the Onion Creek watershed, recent flood events occurred in June 1981, October 1998, and November, 2001. These peak flows for each event are summarized below in Table 5-6. The USACE study indicates that according to a 1997 Loomis & Moore Onion Creek Study, the 1% annual chance of exceedence (ACE) flood flow around the Onion Creek Forest/Yarrabee Bend area is 117,000 cubic feet per second (CFS) and the 4% ACE is 55,000 cfs.[15]

Table 5-5
Peak Flow for Recent Flood Events
(Source: USACE – Onion Creek Interim Feasibility Study)

Date	Peak Flow (CFS)	Annual Chance Exceedence
June, 1981	46,200	4-10%
October, 1998	53,900	4-10%
November, 2001	92,200	1-2%

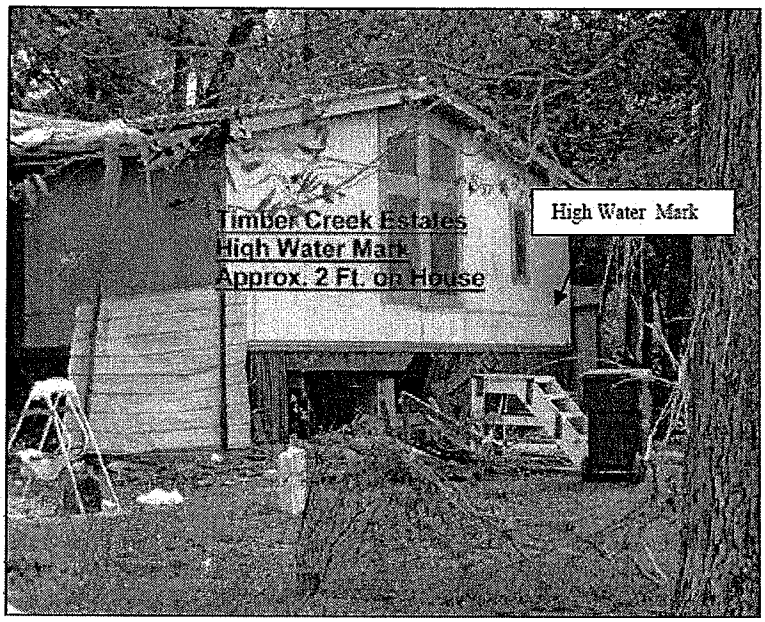
June, 1981: Two major flood events occurred in one weekend. On Thursday, June 11, 1981 there were unofficial reports of up to 8 inches of rainfall in south Austin which produced overbank flooding in Williamson and Onion Creeks in Austin. Several homes were flooded, but no lives were lost. Then on the evening of June 13, the creek experienced out of bank flooding again. According to the USACE's reconnaissance reports, significant damages occurred in Timber Creek with five mobile homes being completely destroyed and 29 more damaged. According to local newspapers, the flooding damage in the Austin area was estimated at over $40 million (in 1981 dollars).

October, 1998: An approximate 25-year flood event (4% annual chance of occurrence) occurred in the Onion and Williamson Creek watersheds. Flows in Onion Creek at the Highway 183 Bridge were approximately 53,900 cubic feet per second. Many homes were damaged, but no loss of life occurred on Williamson or Onion Creek.

November, 2001: A major flood event occurred with an estimated return interval of approximately once every 40 years (2.5% annual chance of occurrence), struck the Onion and Williamson Creek watershed. The storm inundated hundreds of homes and caused millions of dollars in property damage. Numerous homes in the Timber Creek neighborhood were flooded. Figure 5-7 shows the high water mark for a home located within Timber Creek Estates. After the flood event Travis County applied for federal grant funds to acquire structures within Timber Creek. As of 2011, 105 properties have been acquired. See Section 7.4, Ongoing and Previous Mitigation Initiatives for additional details about the Timber Creek acquisition project.

[15] USACE Onion Creek Interim Feasibility Study, October 2006. Chapter 3 - Identification of Problems and Needs.

Figure 5-5
Timber Creek Flooded Property – High Water Mark
(Source: USACE – Onion Creek Interim Feasibility Study)



Future Flood Probability for Travis County

With a total of 113 flood events between 1950 and 2009, Travis County experiences, on average, slightly less than two floods per year. As with most areas of its size, there is a virtual 100% chance that a flood of some magnitude will occur somewhere in Travis County. As noted above, the NCDC reports data at a County level, so separating all past flood events specific to the unincorporated areas was not possible. Based on the high, medium, and low ranges identified in Table 5-3, there is a high probability of future floods occurring in Travis County. This is not intended to be an exact, scientific assessment of probability – site-specific engineering studies such as the FIS should be used to determine flood probability on a case-by-case basis when specific metrics are needed.

5.4.2 Wildland Grass/Brush Fire

Description of the Wildland Grass/Brush Fire

Wildfires are uncontrolled fires often occurring in wildland areas, and can consume houses or agricultural resources if not contained. Wildfires/urban interface is defined as the area where structures and other human development blend with undeveloped wildland. For a more detailed description of the wildland/grass/brush fire hazard visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Wildland Grass/Brush Fire

The State of Texas faces major wildfire problems each year. The risk for wildfire is increased and compounded by increasing development within the zone commonly referred to as the "urban-wildland interface." Within this zone of natural landscape, buildings become additional fuel for fires when fires do occur. Most wildland fires are man-caused and occur in the interface of developed lands and forest and range lands. In particular, the dry conditions, high temperatures, and low humidity that characterize drought periods set the stage for wildfires.

As reported by the City of Austin, the Assistant Fire Chief and Fire Marshall of the Austin Fire Department completed a comprehensive, GIS-based, multivariate analysis of the numerous factors that influence wildland fire risk. The study identified the levels of risk, based on an identified risk model, within the west Austin and Travis County urban-wildland interface. For the most part, Travis County's Precinct 3 is considered to have a relatively high risk for wildland fire. The factors assessed by the City included fuel types and sizes, burn behavior of predominate vegetation, fuel densities, topography (slope and aspect), weather, spatial relationships to human values, and temporal elements of frequency.

The extent of the wildland grass/brush fire hazard is directly related to: (a) the presence and amount of fuel; (b) antecedent conditions such as drought and wind; and (c) the proximity of the built environment to areas that are likely to experience fires. Like most areas of Texas, Travis County has recently experienced a prolonged and severe drought, which significantly increases the potential for grass and brush fires. At the time of this update, the County has no information to support analysis or conclusions about the potential extent of the fire hazard. This HMP includes a new mitigation action to develop more information and a better understanding of this hazard on the community.

Severity of the Wildland Grass/Brush Fire

Travis County is at risk for wildfire year-round. Wildfires can spread quickly and may affect large areas of the County in a very short period of time. Continued growth and development throughout the County have increased the threat from wildfire, especially in the west of the County, where subdivisions abut grasslands and wooded areas in and adjacent to the Balcones Canyonlands Preserve. Narrow roads and long driveways, which increase response time, intensify the risk.

Impact on Life and Property

The U.S. Department of the Interior has developed the Wildland Fire Assessment System website to communicate information to the public via the Internet. Web visitors can view maps showing potential for fire, including satellite-derived "greenness" maps. The system shows each day's high-risk areas in real time.

Occurrences of the Wildland Grass/Brush Fire

The NCDC indicated there were no wildfire incidents between 1950 and 2009. However, review of the other sources identified several significant past events for Travis County. In 1998, in what is considered the worst wildfire in State history, wildfires throughout the State burned a total of 422,939 acres and threatened 4,031 structures. Records exist for the brief period from mid-1997 to October 1998, reporting that 693 wildfires burned more than 500 acres during this time period. It is also known that

one of the worst wildfires in recent memory, known as the Dessau Road Fire, swept through more than 600 acres southwest of Pflugerville in 1994. A new wildfire risk assessment tool has recently been developed/launched by the Texas Forest Service. This tool can be found at http://www.texaswildfirerisk.com. This tool will be used for a more detailed wildfire risk assessment between now and the nest plan update. Travis County is participating as part of a task force in the development of Regional Community Wildfire Protection Plan (CWPP) and individual community CWPPs. These plans will likely not be completed until 2013 but will be referenced and incorporated, as appropriate, into our next plan update.

In terms of probability, although incidents are expected to occur more frequently due to the increase in human activity in forested areas, there is no acceptable mechanism to assign a probability to specific fire occurrences. No estimate is available as to the dollar value damage to existing or future buildings due to wildfires. As noted, wildfire incidents are directly related to weather patterns and antecedent conditions, and thus probabilities are dynamic. Travis County considers this hazard to have a medium probability of occurrence on an annual basis (see Table below). However, it should be recognized that this rating refers to the County as a whole, and that most fires are small, and because of detection and suppression capabilities are quickly addressed.

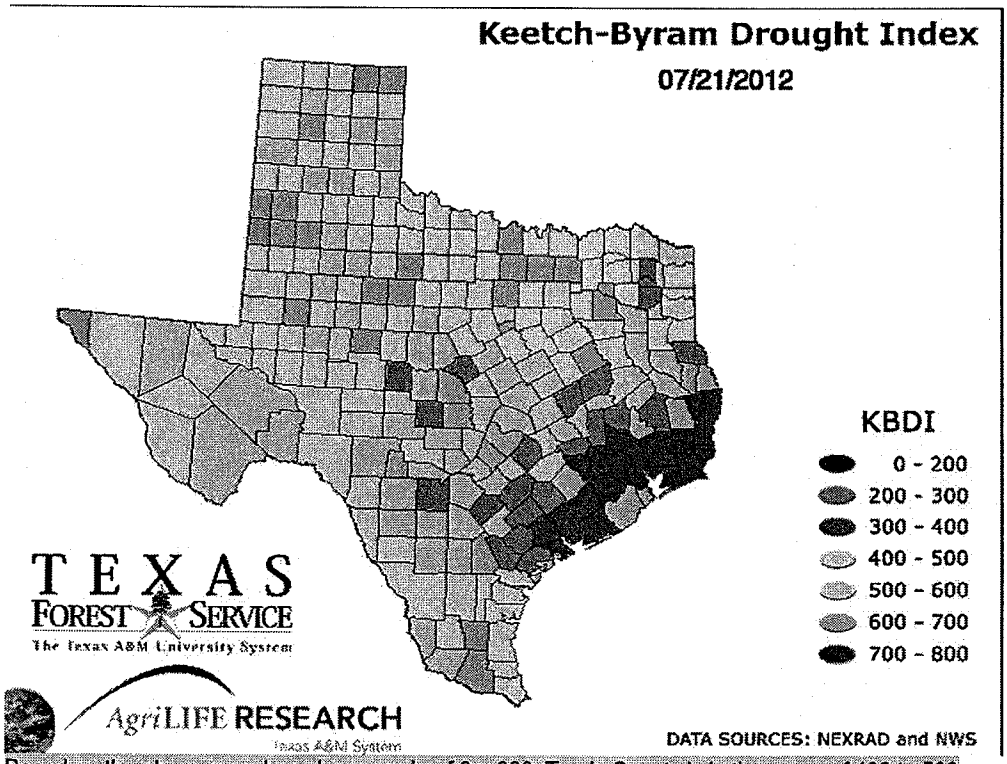
Probability	Annual Percent Probability Range %
Low	1-9
Medium	10-24
High	25-100

Located in western Travis County unicorporated, the Balcones Canyonlands Preserve contains 30,428 acres set aside as protected habitat by the Balcones Canyonlands Conservation Plan. This area of the County is most susceptible to damage from wildfires. If a wildfire were to ignite in the Preserve, thousands of acres of forest and many endangered species would be impacted.

There are many additional areas of the county susceptible to wildfire, to include grasslands, power lines and developed neighborhoods. Developed and incorporated areas (such as Pflugerville, Sunset Valley, and Village of the Hills) have ignition sources and wildfire than the preserve, greenbelt and other wildlands. At high risk levels, the entire county is medium risk, as shown on the maps from the TXWRAP website. Under the right conditions, a wildfire anywhere in the County (unincorporated and incorporated areas) hundreds to thousands of acres could burn, endangering structures and infrastructure.

Under most conditions, when there is sufficient fuel moisture in the trees, low to moderate drought conditions, and normal winds, fires generally start in developed areas and put themselves out when they reach the forest mat or tight canopy. Shaded fuel breaks are a proven method for keeping grasses down and cultivating dense canopies that prevent or deter the spread of wildfire, especially grass fires. While preserve areas are much slower to ignite, but once ignited under extreme conditions, ember lofting from a crown fire in junipers can be 400-500 ft – endangering all of Western Travis County.

Looking at the Labor Day Fires – it was an extreme drought county-wide and statewide, trees had very low fuel moisture, and winds were high. Airplane pilots saw embers loft into the preserve but the fires didn't catch there like they did in residential areas– they caught in grass, ran along power line easements, ran up wooden fence lines like a wick, got sucked up in attics through soffits, then embers lofted to the next house, and so on.



Based on the above map, based on a scale of 0 – 800, Travis County is in the range of 400 to 500 (medium) for the threat of droughts. As stated previously, droughts have a direct correlation to risk of wildfire.

5.4.3 Tornadoes

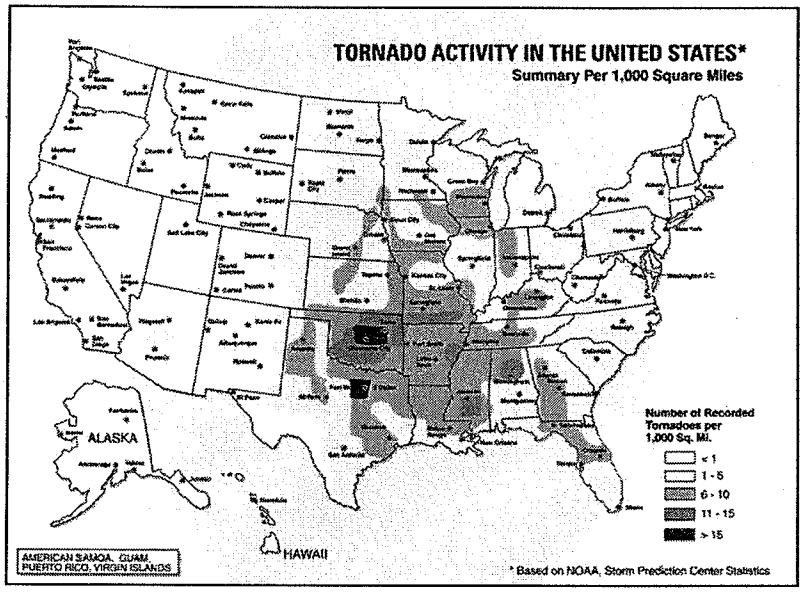
Description of the Tornado Hazard

The National Weather Service (NWS) defines a tornado as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. Tornadoes can form any time of the year; but the season of greatest activity runs from March to August. Tornadoes are related to larger vortex formations, and therefore often form in convective cells such as thunderstorms or in the right forward quadrant of a hurricane, far from the hurricane eye. For a more detailed description of tornado hazards, visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Tornado Hazard

From 1953 to 1993, Texas experienced the highest average annual number of tornadoes with 128, followed by Oklahoma (52), Kansas (47), Florida (46), and Nebraska (38). Figure 5-8 illustrates the frequency of tornado strikes in the U.S. per 1,000 square miles. The map indicates that NOAA has recorded 6-10 tornadoes per 1,000 square miles in central-eastern Texas including Travis County.

Figure 5-6
Tornado Activity in the United States
(Source: FEMA)



With an average of 153 tornadoes touching down each year, Texas is considered the U.S. "tornado capital", although this is obviously a function of the State's size as well as its location. While Texas tornadoes can occur in any month and at all hours of the day or night, they occur with greatest frequency during the late spring and early summer months during late afternoon and early evening hours. In Travis County, most wind damage has been limited to downed trees, blocked roads, and disabled power lines.

Figure 5-9 provides the "basic wind speed" map for the western Gulf of Mexico coastline. The map was developed by the International Code Council (ICC) and is referenced in model building codes as the International Building Code (IBC). The map is used to assist with designing buildings to withstand reasonably anticipated winds in order to minimize property damage.[16] The map shows that Travis County falls within the area where the "design wind" speed is 90 to 95 miles per hour.

Figure 5-7
Basic Wind Speed: Texas

[16] American Society of Civil Engineers, 2002

(Source: International Building Code)

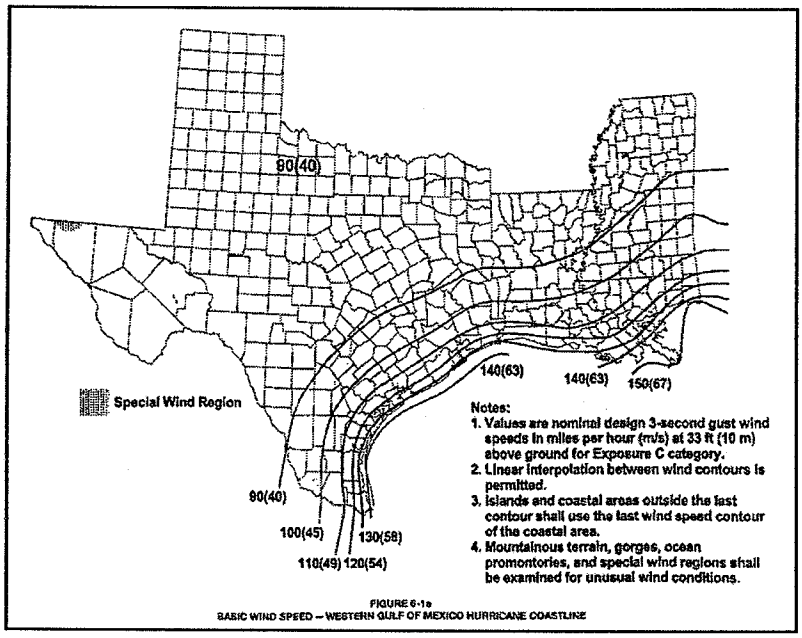


FIGURE 6-1a
BASIC WIND SPEED – WESTERN GULF OF MEXICO HURRICANE COASTLINE

Severity of the Tornado Hazard

Tornado damage severity is currently measured by the Enhanced Fujita Tornado Scale (F-Scale), named after Dr. T. Theodore Fujita who first introduced the scale in 1971. The original Fujita Scale, used until February of 2007, assigned numerical values based on wind speeds and categorizes tornadoes from 0 to 5. The scale was based on damage caused by a tornado related to the fastest ¼ mile wind speed at the height of a damaged structure.

In February, 2007 the F-Scale was replaced with a more accurate Enhanced Fujita Scale (EF-scale). It was the Jarrell, Texas tornado of May 27, 1997 and the Oklahoma City/Moore tornado of May 3, 1999 that brought to the forefront the problem that perhaps the wind estimates were too high in the F-Scale. The changes to the original scale were proposed by a committee of meteorologist and engineers searching for a more accurate method of assessing the magnitude of tornadoes. The modifications made to the F-scale were limited to ensure that the new Enhanced F-scale could continue to support the original tornado database found within the NCDC.

The Enhanced F-scale is a set of wind estimates (not measurements) based on observed damages after a tornado. Its uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to 28 indicators that include various commercial and residential building types, transmission towers, poles and trees. Similar to the original scale, the new Enhanced F-scale includes five classes ranging from EF0 to EF5 (Source: NOAA, National Weather Service – Storm Prediction Center). The wind speeds from the Fujita Scale were used as basis for development of the Enhanced F-scale. Table 5-10 displays the wind speed ranges for the original Fujita Scale, the derived wind speeds (Enhanced F-scale), and the new Enhanced F-scale currently in use since February of 2007.

Table 5-6
Wind Speed Comparison of the Fujita Scale and Enhanced Fujita Scale
(Source: NOAA – National Weather Service)

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

Within the planning area it is possible for a tornado of any magnitude to occur, with the probability decreasing as the intensity scale increases. Although the NCDC indicates the strongest historical tornadoes in Travis County were rated F4 on the Fujita scale, the climate in southeastern Texas, and the potential for extreme atmospheric instability, allow for the possibility that tornadoes in the planning area could reach EF-5 severity. For example the Jarrell, Texas tornado in 1997 was officially categorized by NOAA as an F5. This tornado occurred in neighboring Williamson County where climate conditions are similar to Travis. With wind speeds over 200 mph, a tornado of this magnitude would potentially cause catastrophic damage to a localized area of Travis County.

Between 1975 and 1995, 106 major federal disaster declarations included impacts caused by tornadoes. The States with the greatest number of tornado-related disasters were: Mississippi (14); Alabama and Illinois (9 each); Oklahoma (8); Wisconsin (7); Ohio (6); and Missouri, Minnesota, Louisiana, Georgia, and Arkansas (5 each).

According to NOAA, between 1950 and 1994 Texas ranked first in the United States for frequency of tornadoes when compared to other States. The State of Texas also ranked first in the number of fatalities and injuries.[17] Tornadoes have an impact on Travis County equally and uniformly. The severity of the tornadoes identified in the NCDC database for Travis County ranged from F0 to F4.

Impact on Life and Property

Tornadoes pose a significant threat to life and safety in Travis County. Historically, lightly constructed residential structures (in particular, manufactured housing) located within the planning area are most vulnerable to the tornado hazard. Data related to the number of structures by building type and past damages for specific building types was unavailable at the time of the 2011 Plan update. The NCDC database reports there have been two deaths and 38 injuries from tornadoes in Travis County. The tornadoes caused an estimated $268 million in property damage. Section 7 of the Plan update includes a more detailed assessment of the tornado hazard.

[17] NOAA – Tornado Numbers, Deaths, Injuries, and Adjusted Damage 1950 - 1994

Occurrences of the Tornado Hazard

The NCDC reports that 61 tornadoes have occurred in Travis County between 1950 and 2009. As mentioned, the NCDC reports data at a County level, so there are tornado events that may be specific to some of the individual jurisdictions, and therefore outside of the planning area. The database indicates there were 25 FO, 24 F1s, eight F2s, three F3s and one F4 tornadoes. Table 5-11 summarizes the 12 tornado events categorized as F2 or greater. These 12 events caused property damage totaling approximately $266.3 million.

Table 5-7
Travis County: Tornado Events – F2 and Stronger 1950 – 2009
(Source: NOAA/NCDC)

Query Results

12 TORNADO(s) of magnitude F2 and Higher were reported in Travis County, Texas between 01/01/1950 and 01/31/2010.

Click on Location or County to display Details.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TRAVIS	04/30/1954	0610	Tornado	F3	0	0	0K	0
2 TRAVIS	03/31/1957	0905	Tornado	F2	0	0	250K	0
3 TRAVIS	03/31/1957	1050	Tornado	F2	0	0	25K	0
4 TRAVIS	05/10/1959	1520	Tornado	F3	0	0	250K	0
5 TRAVIS	07/04/1970	1800	Tornado	F2	1	4	0K	0
6 TRAVIS	01/20/1973	2100	Tornado	F2	0	0	25K	0
7 TRAVIS	05/07/1975	1600	Tornado	F2	0	0	250K	0
8 TRAVIS	04/14/1977	1720	Tornado	F2	0	0	250K	0
9 TRAVIS	04/07/1980	1730	Tornado	F3	0	3	250K	0
10 TRAVIS	08/10/1980	1340	Tornado	F2	0	4	250.0M	0
11 Four Pts	05/27/1997	03:11 PM	Tornado	F2	0	0	50K	10K
12 Lakeway	05/27/1997	03:50 PM	Tornado	F4	1	5	15.0M	0K
				TOTALS:	2	16	266.350M	10K

The strongest tornado in Travis County was an F4 tornado on May 27, 1997 that caused an estimated $15 million in damages. This event was known as the Pedernales Valley tornado and began on the shore of Lake Travis destroying trees and a floating marina where nearly all of the watercraft were destroyed. A number of structures sustained varying damage until the tornado reached Bee Creek Road. At this location, a Southwest Bell building housing telephone switching equipment was destroyed. The building was well constructed and was one of several buildings which indicated an F4 rating for this tornado. In the Hazy Hills subdivision, numerous houses and several mobile homes were totally destroyed. Several houses in this subdivision survived but sustained major damage. The tornado caused one death when a mobile home was demolished and a vehicle was tossed several hundred feet.[18]

Although the F4 tornado in 1997 was the strongest in Travis County, the tornado on August 10, 1980 caused the greatest property damage. This event caused an estimated $250 million in property damage.[19] The NCDC provides no detailed description of the event.

With a total of 61 tornado events between 1950 and 2009, Travis County experiences on average approximately one tornado per year, and based on this information it is possible to infer an approximate 100% annual probability of occurrence County-wide. Clearly it is possible, however, for zero tornadoes or many tornadoes to occur in any specific year. This percentage would be somewhat lower if only events within unincorporated Travis County (and the three incorporated areas) were included in such

[18] NOAA/NCDC Database: Travis County, Texas - Tornado events
[19] NOAA/NCDC Database: Travis County, Texas - Tornado events

an assessment. Based on the high, medium, and low ranges identified in Table 5-3, there is a high probability of future tornadoes occurring in Travis County. It is predicted that tornados have the same probability of impacting current and future buildings throughout the planning area.

5.4.4 Drought

Description of the Drought Hazard

A drought is an extended dry climate condition when there is not enough water to support urban, agricultural, human, or environmental water needs. It usually refers to a period of below-normal rainfall, but can also be caused by drying bores or lakes, or anything that reduces the amount of liquid water available. Drought is a recurring feature of nearly all the world's climatic regions. For a more detailed description of drought hazards visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location of the Drought Hazard

Droughts may occur anywhere in the United States. Effects seen in different regions vary depending on normal meteorological conditions such as precipitation and temperature, as well as geological conditions such as soil type and subsurface water levels. Texas is divided into ten climatic divisions that range from substantially heavy precipitation through semi-arid to arid climates. Most of Texas is prone to periodic droughts of differing degrees of severity. One reason is the State's proximity to the Great American Desert of the southwestern United States. In every decade of this century, Texas has fallen victim to one or more serious droughts. The severe-to-extreme drought that affected every region of the State in the early to mid-1950s was the most serious in recorded U.S. history.
Drought is possible throughout the planning area and the central Texas region in general. Because there is no defined geographic boundary for this hazard, all property in Travis County is exposed to the risk of drought. The probability of a drought occurring in any specific region depends on certain atmospheric and climatic conditions. Duration and frequency can be used as indicators of potential severity. Effects seen in different regions vary depending on normal meteorological conditions such as precipitation and temperature, as well as geological conditions such as soil type and subsurface moisture. Variations in drought risks to people and property cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire County.

Severity and Extent of the Drought Hazard

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity[20]. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

One method used by scientists to calculate the severity and duration of a drought is the Palmer Drought Severity Index (PDSI). The PDSI indicates the prolonged and abnormal moisture deficiency or excess and indicate general conditions, not local variations caused by isolated rain. The PDSI is an important

[20] FEMA, 1997

climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather.[21] The equation for the PDSI was empirically derived from the monthly temperature and precipitation scenarios of 13 instances of extreme drought in western Kansas and central Iowa and by assigning an index value of -4 for these cases. Conversely, a +4 represents extremely wet conditions. From these values, 7 categories of wet and dry conditions can be defined. Table 5-12 identifies the values used to define the PDSI.[22]

As noted elsewhere, much of the southwestern U.S. and Texas (including Travis County) is presently in a long-term drought, although rains in early 2012 have slight alleviated the ongoing problem. According to the National Drought Mitigation Center (via http://www.lcra.org/water/drought/index.html), as of February, 2012, Travis County remains in conditions of severe or extreme drought. The potential for drought extent increasing to an "exceptional" condition is high across the area for the immediate future.

Table 5-8
Palmer Drought Severity Index
(Source: NOAA, National Weather Service - Climate Prediction Center)

Palmer Drought Severity Index
-4.0 or less (Extreme Drought)
-3.0 or -3.9 (Severe Drought)
-2.0 or -2.9 (Moderate Drought)
-1.9 to +1.9 (Near Normal)
+2.0 or +2.9 (Unusual Moist Spell)
+3.0 or +3.9 (Very Moist Spell)
+4.0 or above (Extremely Moist)

Impact on Life and Property

Droughts have the ability to impact many sectors of the economy, and reach well beyond the area experiencing drought. Drought impacts are commonly referred to as direct and indirect. Reduced crop productivity, increased fire hazard, reduced water levels, and damage to wildlife and fish habitat are a few examples of direct impacts. Drought can cause extensive damage to commercial and residential structure foundations, framing and walls, levees, roads, bridges, pipelines and other integral infrastructure. Indirect impacts of drought include increased food prices, unemployment, and reduced tax revenues because of reduced supplies of agriculture products. There are no known deaths or injuries from droughts in the planning area.

The NCDC indicates that droughts have caused an estimated $140 million dollars in property damage and crop loss.[23] The drought hazard affects all residential and commercial building types about equally within the planning area. Data related to the number of structures by building type and past damages for specific building types was unavailable at the time of the 2011 Plan update.

[21] NOAA. NWS. Climate Prediction Center. Drought Indices – Explanation.
[22] NOAA. NWS. Climate Prediction Center. Drought Indices – Explanation.
[23] NOAA NCDC database. Texas – Travis County. Drought event history.

Occurrences of the Drought Hazard

According to the NCDC database, Travis County has experienced nine drought events in the period from 1950 to 2009. All nine events are between 1996 and 2000. The database provides no indication as to why there are no events prior to 1996, although presumably occurrences follow the same pattern and frequency as shown in the NCDC list. Also note that the events are listed by months. For example, if a drought lasts several continuous months, it is listed in the database as separate events. If the continuous months are combined into single events, the number of events is reduced from nine to two events.

Table 5-9
Travis County: Drought Events 1996 - 2000
(Source: NOAA/NCDC)

9 DROUGHT event(s) were reported in Travis County, Texas between 01/01/1950 and 01/31/2010.

Click on Location or County to display Details.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228>230 - 233>234 - 239 - 247	04/01/1996	12:01 AM	Drought	N/A	0	0	0	0
2 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	05/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
3 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	06/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
4 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	07/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
5 TXZ171>173 - 183 - 183>194 - 202>209 - 217>225 - 228	08/01/1996	12:01 AM	Drought	N/A	0	0	20.0M	40.0M
6 TXZ171>173 - 183>194 - 202>208 - 217>221 - 228	07/01/2000	12:01 AM	Drought	N/A	0	0	0	0
7 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	08/01/2000	12:01 AM	Drought	N/A	0	0	0	0
8 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	09/01/2000	12:01 AM	Drought	N/A	0	0	0	0
9 TXZ171>173 - 183>194 - 202>209 - 217>225 - 228	10/01/2000	12:01 AM	Drought	N/A	0	0	0	0
				TOTALS:	0	0	80.000M	160.000M

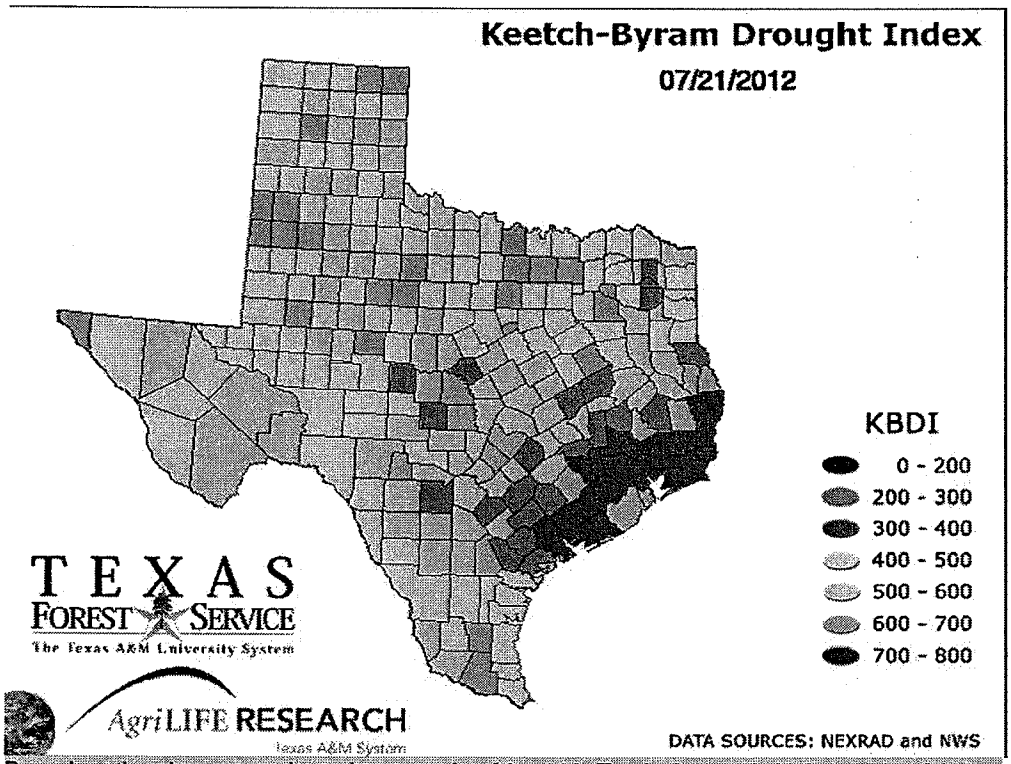
Review of various other sources indicates that severe droughts in central Texas, including Travis County have also occurred between 1950-1957, 1998, 2006, and 2007 – 2009. The most recent severe drought occurred between 2007 and 2009. The head of the Department for Soil and Crop Sciences at Texas A & M indicated that this drought was considered one of the worst dry spells to impact the State since the 1950's. For nearly two years, Texas suffered through one of the worst droughts in State history. According to the Lower Colorado River Authority (LCRA) meteorologist when taking the entire period since the summer of 2007 into consideration, this drought was more intense than the 1950s. The only other drought in recorded history that was worse was between 1917-1918. So, when talking about the intensity of the drought, this was worse than the 1950s. It has a much stronger correlation to the drought of a century ago.[24] The drought from 2007 - 2009 cost farmers an estimated $1 billion in failed

[24] Lake Travis View. Current Drought is the Worst Since 1917-1918. Charles McClure. May 14, 2010.

crops and dead or undernourished livestock; fueled wildfires that in 2009 destroyed 200 homes and scorched 424,000 acres across the State, including 1,500 in a Bastrop blaze in February 2009. The drought conditions have also threatened coastal wildlife, including crabs and whooping cranes.[25]

The second most severe drought recorded in Texas history stretched from 1950 to 1957. That drought caused agricultural damage equaling more than $3 billion, according to a 1959 report by the Texas Board of Water Engineers, or roughly $24 billion in 2008 dollars.[26]

With a total of six significant drought events between 1950 and 2009, Travis County experiences a severe drought event on average slightly less than every 10 years. The six events have occurred over a period of 59 years, which calculates to approximately a 10% annual probability of future drought occurrences. Based on historical drought data, the probability of future events occurring in Travis County is considered medium. See Table 5-3 for the definition of high, medium and low probability of occurrence. It should be noted that climate change experts suggest increased patterns of drought over the next 10 years. This does affect our probability estimate.



Based on the above map, based on a scale of 0 – 800, Travis County is in the range of 400 to 500 (medium) for the threat of droughts. As stated previously, droughts have a direct correlation to risk of wildfire.

[25] The Statesman. Despite Recent Rains, Drought Persists. Andrea Ball. April 25, 2009.
[26] The Statesman. Despite Recent Rains, Drought Persists. Andrea Ball. April 25, 2009.

5.4.5 High Wind/Severe Storms

Description of the High Wind/Severe Storm Hazard

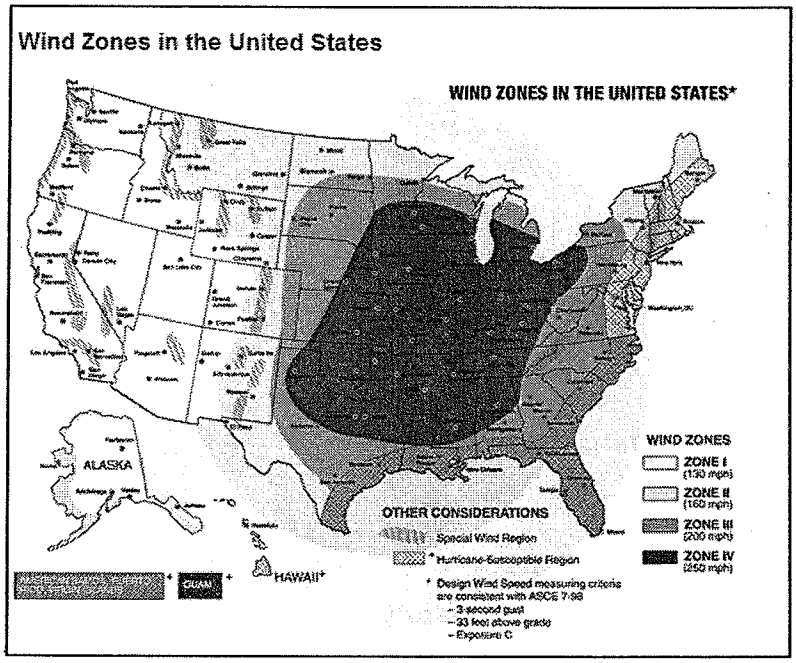
Thunderstorms are local storms produced by cumulonimbus clouds, and always accompanied by lightning and thunder. Thunderstorms are the by-products of atmospheric instability, which promotes vigorous rising of air particles. A typical thunderstorm may cover an area three miles wide. The National Weather Service (NWS) considers a thunderstorm "severe" if it produces tornadoes, hail of 0.75 inches or more in diameter, or winds of 58 miles per hour or more. Structural wind damage may imply the occurrence of a severe thunderstorm. The high wind/severe storms hazard affect the entire planning. For a more detailed description of high wind/severe storms hazards visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the High Wind/Severe Storm Hazard

The entire planning area is subject to the wind effects from high wind/severe storms hazard. Figure 5-14 shows how the frequency and strength of extreme windstorms vary across the United States. The map is based on a combination of all past occurrences and shows that Texas, and Travis County, falls within wind Zone III, where wind speeds can reach as high as 200 mph.[27]

[27] Source: FEMA, Wind Zone map

Figure 5-8
Wind Zones in the United States
(Source: FEMA)



See Section 5.4.3, Tornadoes which shows the basic wind speed map from the International Building Code. As mentioned, this map is used to design buildings to withstand reasonably anticipated winds in order to minimize property damage.[28] The County falls within the area where the "design wind" speed is 90 to 95 mph. The building code administered by the County requires all new construction to be designed and constructed for 95 mile per hour wind loads.

Severity of the High Wind/Severe Storms Hazard

Severe storms are frequent in Texas and occur throughout the year, with highest frequency during the spring and summers months. The severity of the wind hazard is measured primarily by velocity, although effects are clearly exacerbated by duration and the presence of windborne debris. Inland Texas is not particularly prone to high wind hazards, but occasionally thunderstorms are severe enough to cause moderate damage in the area. The severity of thunderstorms can be categorized primarily by their wind speed and rainfall.

Impact on Life and Property

All people and assets in Travis County are considered to have the same degree of exposure to the high wind/severe storms hazard. Within Travis County, the risk to people and property from the high wind

[28] American Society of Civil Engineers, 2002

hazard cannot be distinguished by area; the hazard is expected to have a relatively uniform probability of occurrence across the entire County.

Several meteorological conditions can result in winds severe enough to cause property damage. In Travis County, most wind damage has been limited to downed trees, blocked roads, and disabled power lines. Typically, assets of lighter construction (such as mobile homes) are most vulnerable to the high winds hazard. Data related to the number of structures by building type and past damages for specific building types was unavailable at the time of the 2011 Plan update.

The NCDC database indicates that between 1950 and 2009 Travis County experienced no deaths, injuries or property damage from high wind events. Statistics indicate that in the seven-county Greater Austin area, 7% of weather-related deaths have been associated with lightning and severe thunderstorms combined.

Occurrences of the High Wind/Severe Storms Hazard

The NCDC database indicates that between 1950 and 2009, Travis County experienced no high wind/severe storm events. With no reported high wind events reported in the database, County officials were interviewed during the development of the 2004 Plan to identify past high wind events. The County staff and the 2011 MPC reported past storm damage, including:

- Lightning and high winds damaged trees and sport field light poles in County parks in May 2001. Repairs were under warrant; and
- The Exposition and Heritage Center in East Austin sustained damage to windows due to wind in March 1995; the repairs cost $15,300 and were covered by insurance.

The most probable source of extremely high winds in Travis County is tornado, and this is reflected in Figure 5-8, which indicates a potential 250-mph wind event as one basis for building codes in the area. Although the NCDC database does not indicate any high wind events in Travis County between 1950 and 2009, it is very likely that such events have occurred, but they were (a) not recorded by wind gauges or (b) were not reported to the NCDC because there was no damage from them. Wind damage from storms or tornadoes is generally covered by private-sector insurance (when owners have purchased it), and claims information is unavailable to the public because it is highly proprietary. The County estimates the annual probability of high winds and severe storms as Medium (see table 5-3).

5.4.6 Winter Storm

Description of the Winter Storm Hazard

Winter storms bring various forms of precipitation that occur only at cold temperatures, such as snow, sleet, or a rainstorm where ground temperatures are cold enough to allow icy conditions. These cold weather storms can also take the form of freezing rain or a wintry mix.

Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding,

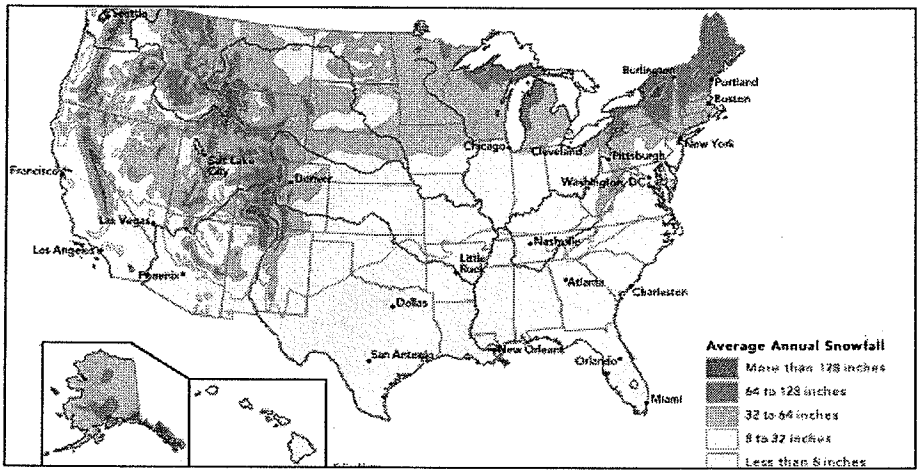
storm surge, closed highways, blocked roads, downed power lines and hypothermia. For a more detailed description of winter storm hazards visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Winter Storm Hazard

Generally, the winter storm season in Texas runs from late November to mid-March, although severe winter weather has occurred as early as October and as late as May in some areas. Within Travis County, the risk to people and property from winter weather cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire County. All people and assets are considered to have the same degree of exposure.

Figure 5-15 shows the average annual snowfall totals for the United States. The map shows central Texas receives less than eight inches of snow per year. NOAA indicates that over the past 57 years, Austin, Texas has averaged slightly less than one inch of snow per year.

Figure 5-9
United States Average Annual Snowfall Map



Severity of Winter Storm Hazard

With the County's generally dry climate, any frozen precipitation falling in Travis County poses a potentially hazardous situation due to ice, wind, and cold temperature. During these cold periods, the weather is often volatile, changing from warm and sunny to freezing in just a few hours. Many homes generally have inadequate cold-weather pipe protection, so are at a greater risk of freezing and bursting water pipes when the outdoor temperature drops to 20°F. In Travis County, where the climate is considered subtropical, winter storms of such severity that property damage results are rare.

Based on past winter storm events, it would be possible for Travis County to experience an occasional snow or ice storm. Accumulations of up to a foot of snow are possible in the higher elevations of the planning area. An occasional ice storm is also possible with accumulations up to a ¼ inch of ice coating

all surfaces such as road and trees. An extreme cold event with temperatures in the single digits and wind chills below zero are possible in Travis County.

Travis County has sustained damage from winter storm events. While infrequent, such storms have affected the entire County, restricting travel, downing trees, interrupting electrical power, and causing water main breakage. Although the NCDC database has not categorized any previous storms in Travis County as blizzards, this is perhaps the most severe type of winter storm, characterized by low temperatures, strong winds, and heavy blowing snow.

Impact on Life and Property

Winter storms in Texas, although not as numerous or severe as in the northern States, do occur often enough and with sufficient severity to be a minor threat to people and property. The NCDC reports there have been no injuries or deaths due to snow and ice conditions. The database reports approximately $7.5 million in property damages related to three past winter storms. The winter storm hazard affects all residential and commercial building types about equally within the planning area.

Travis County is in a climatic region that is extremely unlikely to experience snow depths sufficient to cause property damage such as collapsed roofs. Burst pipes do cause minor property damage, and icing causes transportation problems and affects power lines. However, on the whole, Travis County is not exposed to any significant risk of major property damage due to winter storms. Figure 5-16 summarizes the winter storm events in Travis County between 1996 and 2009. Note, three of these storms resulted in property damage.

Table 5-10
Travis County: Winter Storm Events Travis County, 1996 – 2009
(Source: NOAA/NCDC)

10 SNOW & ICE event(s) were reported in Travis County, Texas between 01/01/1950 and 01/31/2010.

Click on Location or County to display Details.

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Texas

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 TXZ171>173 - 185>194 - 204>209	02/01/1996	01:40 AM	Winter Storm	N/A	0	0	1.5M	50K
2 TXZ183>192	01/07/1997	08:00 AM	Winter Storm	N/A	0	0	5.0M	100K
3 TXZ183>192 - 202>209 - 217>225	01/11/1997	08:00 PM	Winter Storm	N/A	0	0	1.0M	20K
4 TXZ171>173 - 186 - 188>193 - 205>206	12/23/1998	02:00 AM	Winter Storm	N/A	0	0	0	0
5 TXZ171>173 - 183>194 - 202>209 - 221 - 223	12/12/2000	02:00 PM	Winter Storm	N/A	0	0	0	0
6 TXZ171>173 - 183>192 - 194 - 202>208 - 217	11/28/2001	07:00 AM	Winter Storm	N/A	0	0	0	0
7 TXZ171>173 - 184>194 - 204>209	02/24/2003	07:00 PM	Winter Storm	N/A	0	0	0	0
8 TXZ173 - 192	12/07/2005	09:00 PM	Winter Storm	N/A	0	0	0	0
9 TXZ192 - 208	01/15/2007	15:00 PM	Winter Storm	N/A	0	0	0K	0K
10 TXZ171>173 - 184>186 - 188 - 190 - 192 - 206	01/27/2009	18:00 PM	Winter Storm	N/A	0	0	0K	0K
				TOTALS:	0	0	7.500M	170K

When ice storms are predicted, bridges are sanded to improve road safety. Sand is stockpiled for spreading on bridges when icy conditions occur. The State's ice response plan addresses major roads throughout the County. Statistics on weather-related deaths indicate that in the seven-county Greater Austin area, 4% of all weather-related deaths have been associated with winter storms.

Occurrences of the Winter Weather Hazard

In Travis County, the NCDC reports there have been ten snow and ice events between 1950 and 2009. Although the query results begin in 1950, the first reported event is in 1996. It is unclear why the database does not include any events prior to 1996, although presumably occurrences prior to this date follow the same pattern as found in the NCDC list.

The NCDC indicates that one of the most severe winter storms in Travis County occurred on January 7, 1997 when an ice storm caused more than $5 million in damages. Over 60,000 residents suffered power outages across the area due to tree limbs falling onto power lines. Many of the outages continued for as long as five days.[29] Many residents considered this to be one of the worst winter storms in the past 25 years. The winter storm in 1996 was also relatively severe. This storm resulted in the Travis County Emergency Operations Center (EOC) being activated for three days to coordinate Countywide emergency service delivery. A major storm in 2000 caused widespread damage in the Balcones Canyonlands Preserve.

[29] NOAA. NCDC. Texas – Travis County – Winter Storm events. January, 7, 1997

With a total of ten winter storm events between 1996 and 2009, the County experiences a winter storm on average slightly less than once per year. With one event every 1.3 years, there is a 77% annual probability of a winter storm event occurring in Travis County. Based on the high, medium, and low ranges identified in Table 5-3, there is a high probability of future winter storms occurring in Travis County.

5.4.7 Seismic/Earthquake

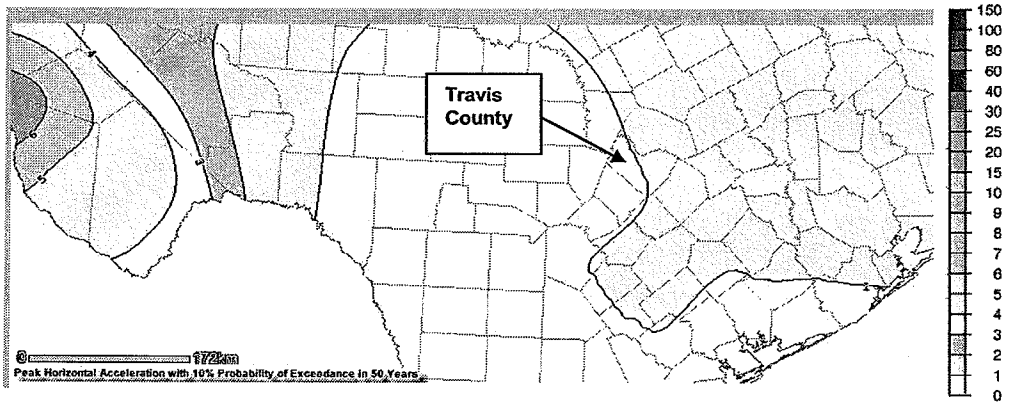
Description of the Earthquake Hazard

An earthquake is a sudden release of energy from the earth's crust that creates seismic waves. Tectonic plates become stuck, putting a strain on the ground. When the strain becomes so great that rocks give way, fault lines occur. At the Earth's surface, earthquakes may manifest themselves by a shaking or displacement of the ground, which may lead to loss of life and destruction of property. Size of an earthquake is expressed quantitatively as magnitude and local strength of shaking as intensity. The inherent size of an earthquake is commonly expressed using a magnitude. For a more detailed description of seismic/earthquake hazards visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Earthquake Hazard

The entire planning area is susceptible to the effects of earthquakes. Figure 5-17 displays the central Texas portion of a United States Geological Survey (USGS) earthquake hazard map produced in 2008. The map shows peak ground acceleration (pga) with a 10% chance of being exceeded over 50 years is in the 0 to 1%g range across most of central Texas, including Travis County. The eastern part of Travis County is in the 1%g range. The *FEMA How-To Guidance, Understanding Your Risks*, FEMA 386-2, p. 1-7, suggests the earthquake hazard should be profiled if the pga is greater than 3%g.

Figure 5-10
Texas Seismic Hazard Map, showing Peak Ground Acceleration in Percent of *g*, with 10 % exceedence in 50 years
(Source: USGS, 2008)



Severity of the Earthquake Hazard

Most past earthquakes in Texas have been of low magnitude and have mainly occurred in west Texas, or the Panhandle area. As shown in Figure 5-17 above, the probability of any severe earthquake in the area is low. Although there have been no known earthquakes that have impacted the planning area, an earthquake in the Richter magnitude 4 range is possible in Travis County. The severity of earthquakes is influenced by several factors, including the depth of the quake, the geology in the area, and the soils. The severity of soil liquefaction is dependent on the soils grain size, thickness, compaction, and degree of saturation.[30]

Impact on Life and Property

There are no known deaths or injuries from earthquakes in Travis County. Some of the past earthquake events were severe enough in Texas to cause minor property damage such as broken windows or contents falling from shelves. The very low probability of an event suggests that potential for these impacts is minimal.

Occurrences of the Earthquake Hazard

The USGS earthquake history was reviewed for the State of Texas to identify past earthquake occurrences that have impacted Travis County. The USGS earthquake history for Texas indicates there have been 12 earthquakes statewide between 1882 and 2009. Of the 12 events in Texas, the earthquake descriptions provided by the USGS indicates none of the events affected Travis County.[31]

With no earthquakes affecting Travis County in the past, there will most likely be minimal future impacts to the planning area. Based on previous data, the probability of earthquakes occurring in the future is considered low. Due to the extremely low probability of an earthquake within Travis County and the fact that there is no record of any historical building damage as a result of seismic activity in the County a more detailed risk assessment was not performed for this hazard.

5.4.8 Landslide

Description of the Landslide Hazard

A landslide is a natural geologic process involving the movement of earth materials down a slope, including rock, earth, debris, or a combination of these, under the influence of gravity. However, there are a variety of triggers for landslides such as: a heavy rainfall event, earthquakes, or human activity. The rate of landslide movement ranges from rapid to very slow. A landslide can involve large or small volumes of material. Material can move in nearly intact blocks or be greatly deformed and rearranged. The slope may be nearly vertical or fairly gentle[32].

[30] USGS
[31] USGS. Earthquake Hazards Program – Texas Earthquake History.
[32] Delano and Wilshusen, 2001

Landslides include mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and earth flows. Most landslides are associated with heavy and prolonged rains, which saturate soils. For a more detailed description of landslide hazard visit FEMA's web site on hazards, http://www.fema.gov/hazard/.

Location and Extent of the Landslide Hazard

Landslides are usually associated with mountainous areas but can also occur in areas of generally low relief. In low-relief areas, landslides occur due to steepening of slopes: as cut and fill failures (roadway and building excavations), river bluff failures, collapse of mine waste piles, and a wide variety of slope failures associated with quarries and open-pit mines[33] .

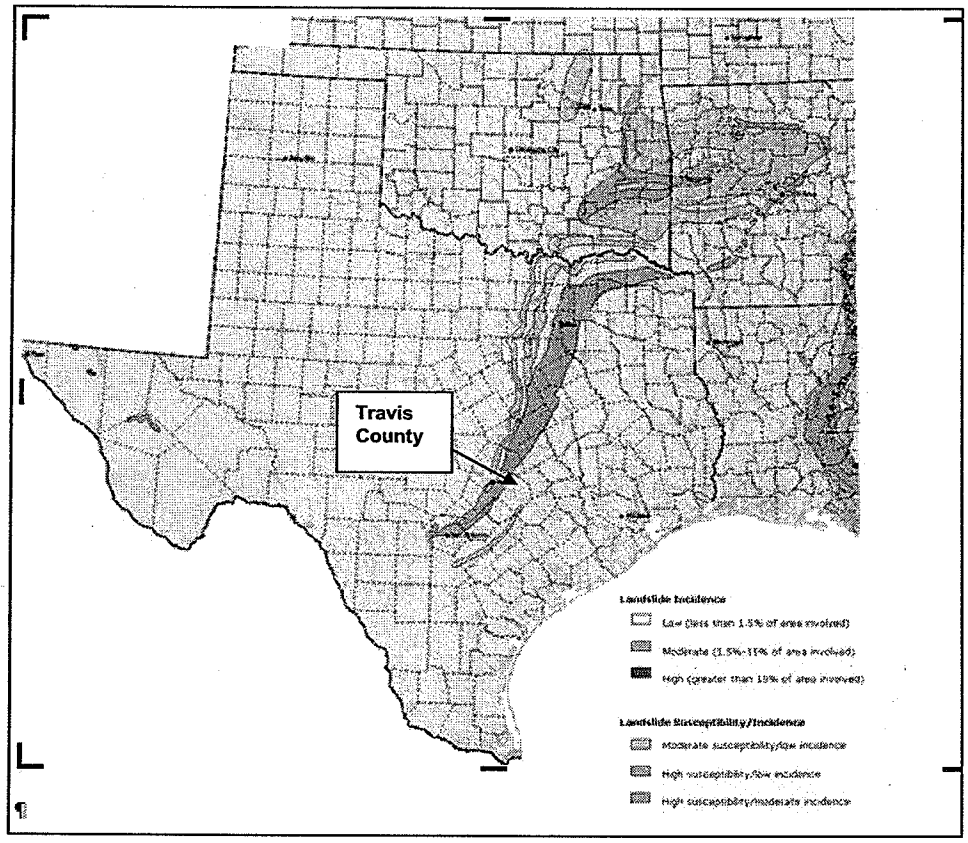
In 1997, the U.S. Geological Survey (USGS) published a national map to illustrate landslide risk areas. The map combines past incidents with a measure of "susceptibility", defined as the "probable degree of response of rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation." Figure 5-18 displays the USGS landslide map for the State of Texas. The map indicates that central Texas, including the majority of Travis County, is shown as having had less than 1.5% of its land area affected by movement of soils on slopes (no planning period is identified). The map shows that the western part of the County, known as the Hill Country, is shown as having moderate susceptibility.

As discussed elsewhere in this subsection, the probability of landslides of any meaningful magnitude in Travis County is Low (see table below for a definition of Low probability). The extent of the hazard is small both geographically and in terms of potential magnitude. The County presently has a data deficiency regarding information to adequately evaluate landslide hazard, and has added a mitigation action to address this deficiency.

Probability	Annual Percent Probability Range (%)
Low	1-9
Medium	10-24
High	25-100

Figure 5-11
Landslide Overview Map for the State of Texas
(Source: USGS, 1997)

[33] USGS, Landslide Types and Process, 2004



Severity of the Landslide Hazard

Landslides are considered highly site-specific events and are concentrated in areas of steep slopes. The severity of the landslide hazard depends on a combination of slope angle and the geologic material underlying the slope.

Impact on Life and Property

In the planning area, landslide risks to people and property cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence (extremely rare) across the entire County. All people and assets are considered to have the same degree of exposure. There are no known instances of injuries or death from past events in the County. Most likely impacts on life and property in the planning area will continue to be minimal.

Occurrences of the Landslide Hazard

As part of the 2011 Plan update, the MPC reviewed the landslide hazard and identified no significant landslide events since the original Plan was prepared in 2004.

Landslide probabilities are largely a function of surface geology, but are also influenced by both weather and human activities. The probability of future landslides having a significant impact on property and life in the planning area is considered low.

Due to the extremely low probability of landslides within Travis County, the limited number of buildings near the susceptible areas and the fact that there is no record of any historical building damage as a result of landslides in the County, the estimated dollar value damage to existing or future buildings due to landslides is zero. For these reasons, landslides have been eliminated from further evaluation and risk assessment.

5.5 Methodology for Identifying Hazards of Concern

In accordance with the requirements of the Interim Final Rule, all hazards with potential to affect Travis County are profiled in this section of the Plan. However, because this is a County-level hazard mitigation plan, it is useful to identify the hazards that are of the most concern Countywide, so these can be the focus of more detailed assessment. It is important to note, however, that many hazards and risks are very site-specific, so as local municipalities perform more detailed risk assessments and identify mitigation actions they should recognize that this process and the resulting table should be used only as a guide.

Various national, regional and local sources were used to identify and classify different hazards for Travis County. The criteria used were:

1. **History** – incorporating historical accounts and records that the hazard has affected the County often in the past, and that the hazard has occurred often and/or with widespread or severe consequences.
2. **Potential for mitigation** – acknowledging that there are ways to address the hazard, and that the methods are technically feasible and have the potential to be cost-effective [i.e. mitigation measures are available at a reasonable cost, and damages to property, lives and/or community functions would be reduced or eliminated.]
3. **Presence of susceptible areas or vulnerability** – indicating that Travis County has numerous facilities, operations or populations that may be subjected to damage from the hazard.
4. **Data availability** – demonstrating that sufficient quality data is available to permit an accurate and comprehensive risk assessment.
5. **Federal disaster declarations and local emergency declarations** – noting that Travis County has received numerous disaster declarations for the particular hazard.

The Table 5-19 lists the hazards, describes the rationale for identifying (or not identifying) hazards as significant, shows sources of information that were consulted for the determination, and the disposition of the hazard with regard to hazard identification and risk assessment in this Plan Update. The initial

hazards in the shaded portion of the table are those that were identified by Travis County's MPC as significant enough to warrant a full risk assessment.

Table 5-11
Travis County Qualitative Hazard Ranking

Hazard	Rationale	Sources	Disposition
Flood	Widespread impacts, history of occurrences in the County, significant annual damages	FEMA Flood Insurance Studies, FEMA Flood Insurance Rate Maps, FEMA Public Assistance records, FEMA National Flood Insurance Program claims data, US Army Corps of Engineers (USACE), and National Oceanographic and Atmospheric Administration (NOAA), studies and records.	Profile and risk assessment
Tornado	High annual probability, widespread impacts, losses generally limited except in most extreme events.	NOAA -NCDC, National Weather Service	Profile and risk assessment
Wildland Grass/Brush Fire	High annual probability of site-specific events, with moderate impacts	NOAA and National Climatic Data Center (NCDC) records,	Profiled, but not part of detailed risk assessment
Drought	High annual probability, but impacts generally limited.	NOAA – NCDC;	Profiled, but not part of detailed risk assessment
Severe Storms	High annual probability, widespread impacts, but losses generally limited except in most extreme events.	NOAA, NCDC, National Weather Service (NWS),	Profiled, but not part of detailed risk assessment
Winter Storms	Low to moderate annual probability with impacts relatively limited	NOAA, NCDC, National Weather Service (NWS),	Profiled, but not part of detailed risk assessment
Earthquake / Geological	Low annual probability, but potential for significant consequences.	United States Geologic Survey (USGS),	Profiled, but not part of detailed risk assessment
Landslide (non-seismic)	Low probability with losses typically limited	USGS	Profiled, but not part of detailed risk assessment

Section 6
Risk Assessment

Contents of this Section

6.1 Interim Final Rule Requirement for Risk Assessments

IFR §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

IFR §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

IFR §201.6(c)(2)(ii): *[The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

IFR §201.6(c)(2)(ii)(B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.*

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

6.2 Public Awareness of Hazards and Risk

The public becomes aware of local hazards in a number of ways. For example, public awareness of flood hazards is enhanced during the following activities:

- Buying property in a floodplain triggers the federal requirement to obtain flood insurance when obtaining a federally insured and regulated mortgage. Federally insured and regulated mortgage lenders are required to make homebuyers purchase flood insurance if the building is located in a mapped flood hazard area. Buyers are supposed to be notified well in advance of closing.
- Applying for permits may lead to a determination that the property or construction site is within a mapped floodplain and therefore subject to the drainage and floodplain management requirements.
- When flooding occurs, the news media frequently carries stories about travel hampered by flooded roads and homes damaged by floodwaters. Research has shown that many flood victims themselves tend to discount the likelihood that flooding will occur again. This tendency is attributed to a general lack of understanding of probability (see Comparing Risks, below). All too often, people interpret the phrase "100-year storm" to mean that it only occurs once every 100 years, rather than that such an event has a 1-in-100 chance of happening each year. FEMA reports that, based on insurance statistics, a building in the floodplain is five times more likely to be damaged by flood than to sustain major damage by fire.
- Flood warnings reach the Travis County public as regional warnings from the National Weather Service or local warnings in areas covered by The City of Austin's Flood Early Warning System.

Weather-Related Deaths

The National Weather Service (NWS) and the Travis County Office of Emergency Management (OEM) maintain data on weather-related deaths. Summary statistics based on those data are provided in Table 6-1. Because the reporting periods are different, percentages, not actual numbers, are provided. Deaths due to floods and flash floods accounted for 30% of all weather-related deaths Statewide, and 35% in the seven-county Greater Austin area. Figures maintained by the National Climatic Data Center (NCDC) and the Centers for Disease Control (CDC) indicate that Texas leads the country with more flood-related deaths than any other State.

Table 6-1
Weather-Related Deaths
(as percent of all weather-related deaths)

Hazard	Statewide (1950–2010)	Greater Austin (1970–2010)
Flood/Flash Flood	30%	35%
Tornado	15%	9%

Table 6-1
Weather-Related Deaths
(as percent of all weather-related deaths)

Lightning	6%	4%
Winter Storm	6%	0%
Extreme Heat	33%	35%
Severe Thunder Storm	6%	17%
Hurricane/Tropical Storm	4%	0%

6.3 Overview and Analysis of Travis County's Vulnerability to Hazards

This section describes the risks to Travis County, including its citizens, residential, government and commercial assets, and County operations. These include flooding and tornadoes. As noted above, risk is an expression of expected future monetary losses resulting from the impacts of natural hazards. Risk assessment methodologies differ based on the nature of data that is available, the hazard, and the way that the results are expressed.

6.4 Estimate of Potential Losses (Risk Assessment)

This section describes the risks to Travis County, including its citizens, residential, government and commercial assets, and County operations. These include flooding and tornadoes. As noted above, risk is an expression of expected future monetary losses resulting from the impacts of natural hazards. Risk assessment methodologies differ based on the nature of data that is available, the hazard, and the way that the results are expressed. The sections below provide brief descriptions of the methodologies.

6.4.1 Flood Risk in Travis County

This subsection of the Plan update provides estimates of future flood losses, i.e. risk. Each of the loss calculations is based on best available data, but they must be considered estimates because highly detailed engineering studies were not performed as part of this planning process. This subsection is intended to provide a moderately-detailed overview of risk in the County.

Flood Risk - Buildings

The Travis County Geographic Information System (GIS) maintains and accesses numerous digital map products and electronic data files. Among the data and maps are FEMA's Q3 Digital Flood Data map (derived from the Flood Insurance Rate Maps), and maps showing County/City boundaries, waterways and watershed boundaries, and "footprints" of buildings and other facilities.

As of 2011, there are 21,630 parcels in the County with at least some overlap with the 100-year floodplain. As a practical matter, it is not possible to complete a risk assessment with this level of information because of the uncertainty about the number and size of buildings that are exposed to flooding.

Approximately 9% of all buildings in the County are prone to some degree of flooding. The database of buildings does not allow determination by use (residential versus non-residential), but it did allow discrimination by size (smaller than or larger than 4,000 sq ft). The fact that most buildings in the County are smaller than 4,000 sq ft suggests that the majority of buildings in the floodplain were single-family homes.

NFIP Policies In-Force. Data provided by FEMA indicates that as of January 2010, federal flood insurance policies were in-force on 1,905 buildings in Travis County. These policies are administered by the National Flood Insurance Program (NFIP). This represents a dollar value of property and contents coverage in excess of $469 million. For the most part, two factors prompt people to purchase flood insurance – when mortgage lenders require it and when actual flood damage makes it clear to homeowners that a building is, indeed, located in a flood-prone area. Thus, the number and distribution of flood insurance policies is one way to characterize potential risk throughout the County.

NFIP Claims Paid. Between 1978 and May 2010, there have been 712 paid losses in Travis County totally over $13.8 million. Review of the NFIP claims data for Travis County indicates that the large majority of these claims were for residential properties. Table 6-2 summarizes the number of polices, number of losses and total paid claims for the three participating municipalities in Travis County between 1978 and May 2010. The number of policies in force indicated for each municipality is current as of May, 2010.

Table 6-2
NFIP Claims for the City of Pflugerville, City of Sunset Valley, and the Village of the Hills
(Source: FEMA – NFIP Statistics, May 2010)

Municipality	# of Polices	# of Losses	Total Paid Claims
City of Pflugerville	68	4	$169,847
City of Sunset Valley	30	10	$210,584
Village of the Hills	0	0	–0–

Analysis of the National Flood Insurance Program Repetitive Loss and Severe Repetitive Loss Data

The flood risk assessment method is based on analysis of NFIP data on repetitive loss (RL) and severe repetitive loss (SRL) properties. The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of Spring 2010, Travis County had 98 such properties, based on a query of the FEMA BureauNet NFIP interface. Of this total, there are 97 residential and one non-residential property. SRL properties are discussed in greater detail later in this section.

Residential Repetitive Loss Properties

Table 6-3 provides a summary of residential repetitive loss claims for unincorporated Travis County and the City of Pflugerville. As of spring 2010, no repetitive loss properties were identified in Sunset Valley or Village of the Hills. The table below includes the number of repetitive loss properties, building and contents damages, the total number of claims, and the average claim amounts. The City of Pflugerville has one residential repetitive loss property.