

EXHIBIT
"A"

THE CITY OF **ROUND ROCK**



HAZARD MITIGATION PLAN 2018-2022

**PREPARING FOR A SECURE AND
SUSTAINABLE FUTURE**



ROUND ROCK TEXAS
FIRE DEPARTMENT

Written comments should be forwarded to:

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Homeland Security and Emergency Management Division
203 Commerce Blvd.
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INTRODUCTION

Background

The Federal Emergency Management Agency (FEMA) defines mitigation as “any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.”¹ Mitigation differs from emergency preparedness and protective measures, which focus on activities designed to make communities more prepared to take appropriate action in a disaster with emergency response and equipment. Mitigation activities involve alteration of physical environments to reduce risks and vulnerabilities to hazards and make it more cost-effective to respond to and recover from disasters.

The City of Round Rock is susceptible to a wide range of natural and human-caused hazards, including flooding, tornadoes and wildfires. These life-threatening hazards can destroy property, disrupt the economy and lower the overall quality of life for individuals. This was most recently evident with flash flooding that occurred during the 2013 and 2015 Memorial Weekend and 2013 Halloween flooding occurrences. In maintaining the City’s commitment to safety and sustainability, Round Rock has updated this Hazard Mitigation Plan (HMP or Plan) entitled *Preparing for a Secure and Sustainable Future*, to reduce risks from all hazards.

While it is impossible to prevent a hazardous event from occurring, the impact of hazards can be lessened in terms of their effect on people and property through effective hazard mitigation planning and implementation. This Plan provides an opportunity for the City of Round Rock and RR ISD to evaluate successful mitigation actions and explore opportunities to avoid future loss due to an emergency or disaster.

¹ <http://www.fema.gov>

Scope and Participation

The participating entities in this Plan include:

- The City of Round Rock
- Round Rock Independent School District (ISD)

The focus of the Plan is to mitigate those hazards classified as “high” or “moderate” risk as determined through a detailed hazard risk assessment review and update for the City of Round Rock and Round Rock ISD. Hazards that pose a “low” or “negligible” risk will continue to be evaluated during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk. This enables both entities to prioritize mitigation actions based on hazards which are understood to present the greatest risk to lives and property.

Purpose

The overarching goal of the HMP is to minimize or eliminate long-term risks to human life and property from known hazards by identifying and implementing cost-effective mitigation actions. The purpose of the Plan is twofold: to protect people and structures, and to minimize the costs of disaster response and recovery.

The Mission Statement for the Plan is, *“Preparing for a secure and sustainable future through the Development of targeted mitigation actions to reduce and eliminate loss of life and property damage from identified hazards.”*

Authority



The Plan will be tailored specifically for the City of Round Rock and Round Rock ISD. When complete, the Plan will comply with all requirements promulgated by the Texas Division of Emergency Management (TDEM) and all applicable provisions of the Robert T. Stafford Disaster Relief and

Emergency Assistance Act, Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108-264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). It will also comply with FEMA’s February 26, 2002 Interim Final Rule (“the Rule”) at 44 CFR Part 201, which specifies the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA’s “Local Multi-Hazard Mitigation Planning Guidance” (released July 1, 2008). The Plan will also be developed in accordance with FEMA’s Community Rating System (CRS) Floodplain Management Plan standards and policies.

Plan Review and Revision Process

Planning Team

The Round Rock Hazard Mitigation Planning Team was formed to review and revise the current plan. Topics covered addressed the annual review process and roles and responsibilities of key partners.

The Executive Committee is comprised of the Emergency Management Coordinator, Assistant Emergency Management Coordinator and the Fire Chief. There were verbal and written invitations sent to prospective planning team participants. The overall Planning Team was made up of multiple city departments, including General Services, Utilities and Environmental Services, Parks & Recreation, Transportation, Finance, Police and Fire Departments, Risk Management, and the Round Rock ISD Safety & Security Director.

Some of the responsibilities of the Planning Team included: reviewing the hazard mitigation projects from the current plan and reporting the status of each, creating a community survey, providing input regarding the identified hazards, reviewing/revising current mitigation goals, and updating the mitigation strategies.

Planning Process

After the Planning Team was organized, the current capability assessment and list of hazards and mitigation goals were distributed at the Kick-Off Workshop. These were discussed and revised by the team. The goals and objectives were revised due to several factors including but not limiting to: removing redundancy, updating accomplishments and updating risks. Refer to the Mitigation Strategy Section for details.

The mitigation projects were sent out via email to the team in advance of the second meeting. Based on the City's and School District's current vulnerabilities, specific mitigation strategies were discussed and reviewed with changes being made as agreed upon by the planning team. The mitigation projects were also updated after meetings and discussions with departments. A chart was produced to show their status.

A community survey was created and made available to the public (February 2017 through April 2017) for over 30 days via Facebook, the City website, Nextdoor (social media), and utility bills. The results from the survey are provided in Appendix A. The planning team discussed the results and any changes to mitigation projects and/or strategies that were appropriate. The mitigation actions were updated and deleted as appropriate. Please refer to Table MA-1 and MA-2 in the Mitigation Action Section for disposition of previous mitigation actions. Several mitigation actions were accomplished while a couple new ones were added thus requiring the team to re-rank the mitigation actions.

Finally, plan maintenance and implementation was discussed, and are included with this Plan. Documentation of participation in each workshop is found in Appendix B.

At the HMP development workshops held throughout the planning process described herein, the following factors were taken into consideration:

- The nature/magnitude of risks currently affecting the community and school district;
- Mitigation goals to address current and expected conditions;
- Whether current resources will be appropriate for implementing the Plan;
- Implementation problems, such as technical, political, legal or coordination issues that may hinder development;
- Anticipated outcomes; and
- How the City, ISD, agencies and partners will participate in the implementation process.

Kickoff Meeting

The Kickoff Meeting was held at the City of Round Rock's Emergency Operations Center (EOC) on August 2, 2016. This initial meeting was an opportunity to inform city officials and key department personnel about how the planning process pertained to their distinct roles and responsibilities, and to involve stakeholder groups such as the Round Rock ISD and area partners. In addition to the kickoff presentation, participants received the following information:

- Copy of the current plan
- Current mission statement and goals

Hazard Identification

At the close of the Kickoff Meeting, the group reviewed and considered the identified range of natural and man-caused hazards, and agreed that the 14 previously identified natural and man-made hazards that could affect the area would still be the focus. The team was also prompted to review the State of Texas Hazard Mitigation Plan, and initial study results from reputable sources such as federal and state agencies.

Risk Assessment

An initial risk assessment for the City was completed in February 2011. The planning team reviewed the hazards that were identified and was asked to rank them to reflect our current state (any big changes in area, land mass, etc.) and any additional unique and varied risks across the planning spectrum. Participants ranked hazards in terms of the probability or frequency of occurrence, extent of spatial impact, and the magnitude of impact. The City and ISD have experienced significant growth in the last five years. Policy and planning efforts have mitigated the risk to new development to the maximum extent practicable. The growth did not introduce new hazards. The team unanimously agreed that our hazards had not changed from the previous plan.

The assessment was also used to set priorities for mitigation strategies based on potential dollar losses and loss of lives. A hazard profile and vulnerability analysis for each of the hazards can be found in Section 3 of this Plan.

Mitigation Review and Development

The mitigation strategy review for the Plan involved reviewing mitigation goals, and developing new goals and mitigation actions as necessary during the kick off meeting.

An inclusive and structured process was used to develop and prioritize new mitigation actions for this plan, including the following steps:

- A list of current mitigation actions was handed out and sent in email. The participants reviewed the mitigation actions, and each department/stakeholder went down the list down of those that were their area of responsibility and provided updates to the planning team as accurate as possible. Some mitigation actions had to be researched for an accurate update.
- Team Members discussed any new mitigation actions and then selected and prioritized mitigation actions.

We kept the previous prioritization method, which was based on FEMA's STAPLE+E criteria. The criteria included social, technical, administrative, political, legal, economic and environmental considerations. As a result of this evaluation, an overall priority review was assigned to each mitigation action by each Team Member. The overall priority of each action is reflected in the mitigation actions found in Section 4.

Team Members developed action plans identifying proposed actions, costs and benefits, the responsible organization(s), effects on new and existing buildings, implementation schedules, priorities, and potential funding sources.

Mitigation Actions identified in the process were made available to the Planning Team for review. In addition, the Plan will be made available for review and comment on the City of Round Rock's website.

Review and Incorporation of Existing Plans

Review

A variety of existing studies, plans, maps, reports, and technical information were reviewed as part of the planning process. Sources of the information included FEMA, the United States Army Corps of Engineers (USACE), the U.S. Fire Administration, National Oceanic and Atmospheric Administration (NOAA), the Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), the State Comptroller, the Texas State Data Center, Texas Forest Service, the Texas Division of Emergency Management (TDEM), and local hazard assessments and plans.

Some of these documents, including those from FEMA, provided information on risk, existing mitigation actions currently underway and ideas for possible future mitigation actions. Other documents, including those from NOAA, provided histories of disasters in the area. The USACE studies were reviewed for their assessment of risk and potential projects in the region. State Data Center documents were used to obtain population projections. Materials from FEMA and TDEM were reviewed for guidance on plan development

requirements. Communities included actions from other plans, such as Floodplain Management Plans, and developed actions to implement and incorporate other plans, such as Stormwater Management Plans.

More recently, the City participated in the TWDB sponsored Flood Protection Plan (2012-2016) for the Upper Brushy Creek WCID (UBCWCID). The Flood Protection Plan (FPP) and included identification of flood risk and levels of risk in a rapidly developing watershed (including Round Rock), approximately 187 square miles in area. The study involved all stakeholders and the District working together for comprehensive, reliable data to better understand the current flood risks. The project was supported with a planning grant and technical oversight support from the Texas Water Development Board (TWDB). The plan addressed the following tasks:

- Watershed hydrologic and hydraulic models were updated to reflect current land use (level of development), and calibrated to replicate flooding from 2007, 2010 and 2012 major local flood events. Hourly stage and rain data collected at District dams since 2007 were used in the calibration; as well as event high water marks;
- Structures at risk from flooding (from the 50%, 10%, 4%, 2%, 1% and 0.2% annual chance floods) were identified;
- Thirteen priority areas were identified where multiple structures were identified as being at risk;
- 23 Mitigation Actions were developed to address these thirteen priority areas. Each action included a concept design and high-level cost estimate. Benefits for each action were developed in terms of a Flood Risk score, determined by a method developed through regional public stakeholder consensus. These actions form the basis for numerous actions proposed in this Plan. The high priority areas identified in the study were already addressed in our previous HMP; however, the mitigation actions were updated utilizing the new data.

Additionally, the City was active participants in the UBCWCID led efforts to update the FEMA risk models and mapping throughout our watersheds. This effort primarily took place from 2013 to 2016 and included development of FEMA Phase I Preliminary regulatory products including a Terrain package, Field Survey, Hydrology and Hydraulic data, Flood Hazard Mapping, and Non-Regulatory products. Each package includes spatial data, models, metadata, and a report summarizing the methodology for each task. Watershed characteristics include: 187 square miles, 228 miles of hydraulically modeled streamlines. The effort included conduct of the FEMA Discovery process within the San Gabriel Watershed, which required several meetings with each community within the watershed to discuss their flooding risk, and potential mitigation actions. In this study, a Hazus analysis was performed using the modeled flood data. The new FEMA risk maps are currently in the Appeal Period and are expected to be adopted in 2019.

Incorporation of Existing Plans

Previous hazard events, occurrences and descriptions were identified through NOAA's National Climatic Data Center (NCDC). Results of past hazard events were found through searching the NCDC and included in Section 5 of this Plan. The preliminary results were also presented at the Risk Assessment Workshop

held in February 2011 in order to facilitate a discussion on risk to help participants appropriately rank hazards for their jurisdiction.

The TWDB studies were reviewed for population and other projections and included in Section 3 of the Plan. Further, these studies were used as a starting point for suggesting grant and mitigation activities based on flood-related funding availability. The State Comptroller materials were reviewed for regional economic projections, which were also used to fully develop Section 3 of the Plan. Information from the Texas Forest Service was used to appropriately rank the wildfire hazard, and to help identify potential grant opportunities. The State of Texas Mitigation Plan, developed by TDEM, was discussed in the initial planning meeting in order to develop a specific group of hazards to address in the planning effort. The State Plan was also used as a guidance document, along with FEMA materials, in the development of the Plan.

Appropriate elements, data and public involvement elements from the UBCWCID FPP and FEMA risk map update were incorporated in this HMP update.

Public and Stakeholder Involvement

An important component of mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns, and increases the likelihood of successfully implemented mitigation actions. If citizens and stakeholders, such as local businesses, non-profits, hospitals and schools, are involved, they are more likely to gain a greater appreciation of the hazards present in their community and take steps to reduce their impact.

Public Participation

Public involvement in the development of the City of Round Rock Hazard Mitigation Plan was sought at two separate periods of the planning process: (1) at the beginning of the planning process; and (2) during mitigation development, but prior to official plan approval and adoption. Public input was sought using two methods: (1) survey instrument; and (2) making copies of draft Plan deliverables available for public review in public libraries. We also participated in the WCID's FPP process which included a public meeting held at the Baca Center in Round Rock.

Public Participation Survey

The City of Round Rock was able to solicit input from citizens and stakeholders through the use of a public participation survey. This survey was designed to obtain data and information from the residents of Round Rock.

The survey was publicized using various methods, including the City website and social media accounts. A total of 300 responses to the survey were submitted, which provided valuable input in the development of the Plan. A summary of the survey findings is provided in Appendix B.

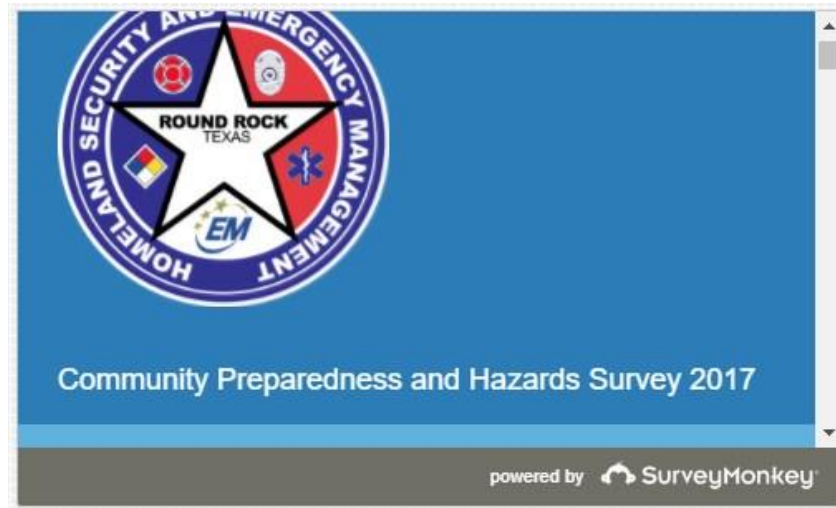


Figure 2-3. Screen Shot of the City of Round Rock's Online Public Survey

Stakeholder Involvement

Stakeholders provide an essential service in hazard mitigation planning; therefore, throughout the planning process, local businesses, schools, and multiple departments were invited to workshops held. During meetings, telephone calls and/or emails all the following stakeholders were invited to participate in the process:

Position	Agency	Jurisdiction
EMC	Georgetown Fire	Georgetown
EMC	Williamson County OEM	Williamson County
Asst. EMC	Leander Fire	Leander
Asst. Fire Chief	Leander Fire	Leander
Director of Safety & Security	Round Rock ISD	Round Rock
Finance Director	Round Rock Finance	Round Rock
Liaison officer	RR Police	Round Rock
Parks Director/Manager	RR Parks & Recreation	Round Rock
Liaison/Battalion Chief	RR Fire Dept	Round Rock
General Svcs Director	RR General Services	Round Rock
Utilities Director	RR Utilities/Environmental Services	Round Rock
Storm Water Manager	RR Utilities/Env Services	Round Rock

Round Rock ISD participated in planning meetings and became involved in discussions from the beginning of the planning process. The School District maintained being a key planning partner of the Planning Team.

Round Rock ISD's Safety and Risk Management Department is committed to providing resource services for the active protection of the District's assets and resources by managing and ultimately minimizing both internal and external exposures and associated risks. One of the Department's objectives is to include, develop, implement and administer a comprehensive District-wide safety, crisis response and risk management program. This includes progressively promoting the protection of the environment and encouraging the efficient use and preservation of natural resources. The Safety and Risk Management Division also serve as the District's primary liaison with emergency response agencies. The Division worked closely with the City of Round Rock's Homeland Security and Emergency Management Division and other City Departments in meeting goals and objectives in development of the Hazard Mitigation Plan.

COMMUNITY PROFILE

Overview

The City of Round Rock is located within both Travis and Williamson County in the State of Texas. It is part of the Austin-Round Rock metropolitan area. Located about 15 miles north of downtown Austin, Round Rock shares a common border with Austin at SH 45.

This location places our city within three hours driving time of ninety percent of the population of the State of Texas. The location is within minutes of the State Capitol, multiple colleges and universities, several large hospitals and a long list of high tech industries. It has an award-winning park system, school district and is one of the safest cities with a population of at least 100,000 population in the United States.

Located in Central Texas, it has its share of natural hazards. In addition to periodic flooding from Brushy Creek, the City of Round Rock is subject to the natural and man-caused hazards discussed in Sections 4 and 5 of this Plan. This section looks at a general profile of the City, as a whole, providing data, including:

- Population and Demographics;
- Housing and Household Income;
- Economy and Industry; and
- Land Use and Development Trends.

Figure 3-1. Location of Round Rock and Austin Metropolitan Area

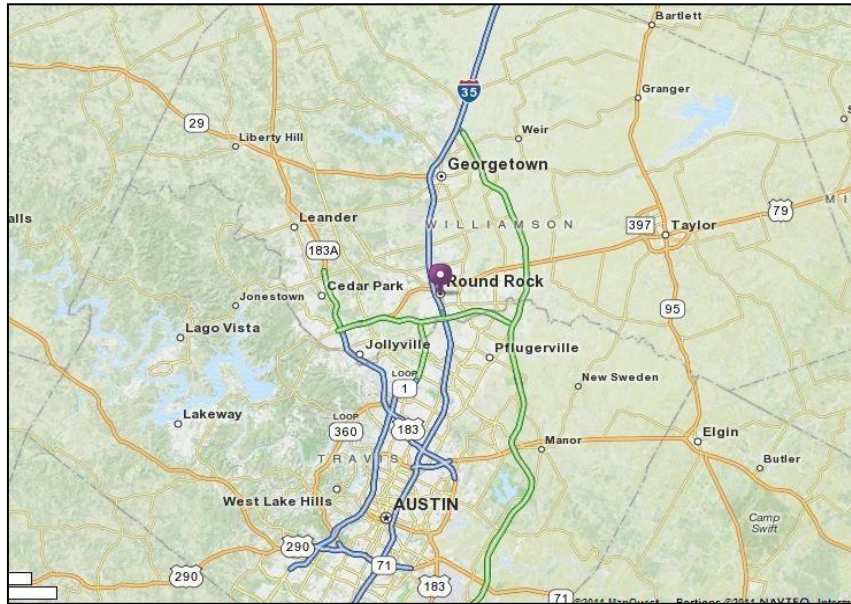
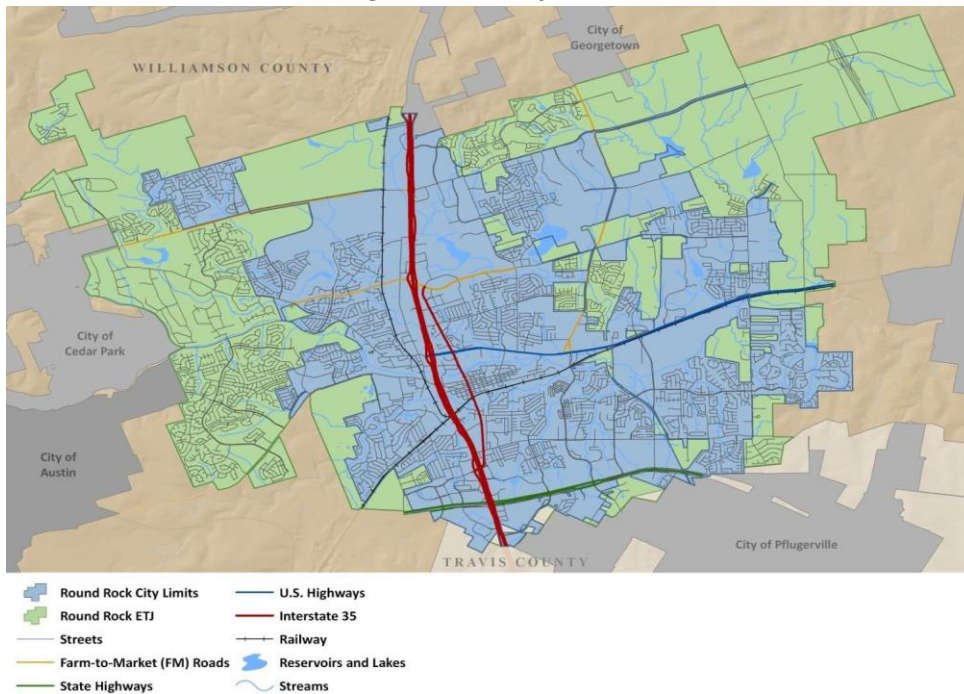


Figure 3-1 shows the location of the City of Round Rock and Figure 3-2 profiles the study area. All areas of the City, including the School District, are covered in the risk assessment to the Plan, including small portions of the City that extend into neighboring Travis County along the southern boundary of the community.

Figure 3-2. Study Area




Population and Demographics

In the 1990s, Round Rock had few major employers and jobs other than local retail, or ranching and farming. But in the late 1990s, that began to change as economic development became a major focus of the City and the Chamber of Commerce. Dell Corporation moved its headquarters to Round Rock—and provided a significant increase in jobs, with 16,000 employees at its Round Rock headquarters. Also, other major employers began allowing many residents to work in the community where they live.

Table 3-1 - Population Growth of Round Rock 2010-2030 ²

City of Round Rock and Greater Round Rock Population Projections
2010-2030



Year	2010 City Projections	2010 City Growth Rate	2010 Greater Round Rock	2010 Greater Round Rock Growth Rate
2010 (Census)	99,887	-	141,807	-
2011	100,659	0.8%	143,960	1.5%
2012	101,702	1.0%	146,380	1.7%
2013	102,349	0.6%	151,133	3.2%
2014	103,107	0.7%	155,613	3.0%
2015	105,405	2.2%	160,385	3.1%
2016	106,591	1.1%	165,024	2.9%
2017	108,353	1.7%	169,213	2.5%
2018	120,440	11.2%	173,490	2.5%
2019	123,812	2.8%	177,859	2.5%
2020	127,279	2.8%	182,323	2.5%
2021	130,461	2.5%	186,062	2.1%
2022	133,723	2.5%	189,881	2.1%
2023	137,066	2.5%	193,508	1.9%
2024	140,492	2.5%	197,218	1.9%
2025	143,302	2.0%	200,312	1.6%
2026	146,168	2.0%	203,462	1.6%
2027	149,092	2.0%	206,670	1.6%
2028	152,073	2.0%	209,651	1.4%
2029	155,115	2.0%	212,693	1.5%
2030	158,217	2.0%	215,795	1.5%
Notes:				
2010 is the base year for these projections				
Greater Round Rock projections include City of Round Rock, and the ETJ, including Municipal Utility Districts				
About Annual Adjustments				
Projections for years beyond new City estimate not adjusted when new estimate is released, nor are Greater Round Rock Projections. While the City population has been growing slower than initially projected, recent new permits for single family and multi-family projects indicate that we should "catch back up" to the trend initially projected.				
Annual Estimates for the City of Round Rock are developed each year to reflect the April 1 population projection				
4/1/2017				

² Source: City of Round Rock Historical Collection

Economy and Industry

Round Rock is currently transitioning from a successful suburb into a prosperous and attractive



midsize city. This transition presents major changes in Round Rock's quality of life and business environment, from the ways people move about the city to the number and types of places people can do business or have fun.

The City of Round Rock has maintained a high quality of life while becoming a major center for economic growth in Central Texas, with industry clusters in clean energy, advanced manufacturing, life sciences, and computer and computer software development.

Round Rock has more than twenty major employers including: Toppan Photomasks, Emerson, IKEA, Round Rock Premium Outlets, Bass Pro Shop, KoMiCo Technology Inc., Texas Guaranteed Student Loan Corp. (TGSL), Cintas, Dresser, Hospira, TECO-Westinghouse, Cerilliant Corporation and Dell.

Dell is a multinational computer and information technology corporation based in Round Rock, which develops, sells and supports computers and related products and services. The company employs about 16,000 people in the Round Rock facilities. The presence of Dell, along with other major employers, a strong economic development program, favorable tax rates, and major retailers such as IKEA and a Premium Outlet Mall, have changed Round Rock from a sleepy bedroom community into its own self-contained "super suburb."

Per capita income for the city was \$37,115 in 2016, with approximately 2.8 percent of families below the poverty line. Unemployment in 2017 was 3.2%.

Land Use and Development Trends

The City of Round Rock has a total land area of 26.1 square miles and a total water area of 0.1 square miles. Generally, the land surface can be characterized as broad and nearly level. The City straddles both sides of the Balcones Escarpment fault line. One side of the Escarpment is roughly east of IH-35, and is flat and characterized by the black, fertile soils of the Blackland Prairie. The west side of the Escarpment consists mostly of hilly terrain with little topsoil and higher elevations, and is part of the Texas Hill Country. Elevation ranges from 454 to 1265 mean sea level in the northwest part of the county (NRCS soils survey, 1985). Land use countywide supports the leading industries which include agriculture, oil and gas, shipping, and tourism.

Significant changes in land use occurred in the past decade. The most notable change was an increase in developed acreage. Including the ETJ, the amount of developed land has nearly doubled since 2000.

The City has expanded land use to make room for regional attractions such as:

- Dell Diamond, home to the Triple-A Round Rock Express;
- Round Rock Premium Outlets;
- Bass Pro Shop;
- Scott & White Hospital and Seton Medical Center;
- Austin Community College;
- Kalahari Resort;
- Texas State University;
- Texas A&M Health Science Center; and
- IKEA.

These developments not only assist in diversifying the local economy, but also foster increased opportunities for families to live, work, and play. These developments have also changed the demographics and business dynamics of the City. Round Rock has a negotiated ETJ boundary, which will not be subject to significant change. The total acreage within that boundary is currently 43,320. The total acreage within City limits is currently 22,038. Approximately 60% of the land area within the City and ETJ has been developed. Within the municipal boundaries, approximately 73% of the land is developed. The remaining area consists of agricultural and vacant land. The largest land use in the City and ETJ is single-family residential. Forty-four percent (44%) of the developed land within the municipal boundaries consists of single-family homes (48% when including the ETJ).

The largest land use in the City remained residential (single-family, multi-family, and two-family), accounting for 51%. The largest sum of new residential acreage was added to the single-family classification (3,300 acres; a 41% increase). The single-family housing stock accounts for approximately 93% of the residential total.

The fastest growing segment of residential land use was multi-family. There was an approximately 150% increase in the amount of land devoted to multi-family use in comparison to trends cited in Round Rock's 2000 General Plan. This trend can be explained by market demand for a diverse housing stock, most likely due to the planned college facilities and a previous shortage of multi-family housing units.

As per the City's subdivision ordinance, residential developers are required to donate land or make a payment in-lieu of park land. The City also acquired two large tracts for passive park uses, and Williamson County has developed a major regional park in the Round Rock ETJ.

Lake Georgetown, located 3 miles west of Georgetown, Texas, was constructed by the U.S. Army Corps of Engineers, Fort Worth District, to control flooding along the San Gabriel River. Impounded in 1980, Lake Georgetown serves as a water supply for Round Rock, Georgetown and the Brushy Creek Municipal Utility District.

Current and Future Water Supply

Lake Georgetown has 247 square miles of drainage, contributing to a total capacity of 124,610 acre-feet. At normal levels, this capacity is equivalent to more than 40 billion gallons of water. The surface area of the lake is 1,310 acres and it is approximately 423 miles from the Gulf of Mexico. Lake Georgetown is in the Brazos River Basin. Since 2004, the City of Round Rock, the City of Georgetown, Brushy Creek MUD and Chisholm Trail Special Utility District, have participated in a 26-mile pipeline from Stillhouse Hollow Lake in Bell County, a much deeper lake on the Brazos River, to Lake Georgetown in Williamson County. The Brazos River Authority (BRA) operates the two reservoirs as one system, moving water to Lake Georgetown for the four entities.

In May 2011, the BRA installed two new high-volume pumps at Stillhouse Hollow Lake to help keep water levels at Lake Georgetown from getting too low. The additional pumps made a total of four pumps available to move water from Lake Stillhouse Hollow to Lake Georgetown. The new pumps are a collaborative effort by all four entities, coordinated by the BRA. When Lake Georgetown reaches predetermined water levels, it triggers the use of the two new pumps in Lake Stillhouse Hollow. In addition, the City of Round Rock partnered with the cities of Cedar Park and Leander to build a system to draw water from Lake Travis in 2012.

Municipal Utility Districts

Municipal Utility Districts, commonly called "MUDs", play a significant role in Round Rock. Each is a special-purpose district that provides public utilities such as water, wastewater, storm water, and sometimes, roads, parks, solid waste and other infrastructure services to the residents of that district. MUDs are typically formed by a residential developer as a means to install utilities and roads to a project when a city is not ready or able to provide them. The developer gets reimbursed over time from the fees levied by the MUD, and at some point, the area may be annexed by the City to bring the development into the City's tax base once the basic infrastructure costs are paid off. The MUD is represented by its own board of directors who are voted on by the residents of the district, and it has the authority to condemn land, add additional land area, and levy fees in lieu of property taxes to maintain the utilities and other facilities.

There are currently ten MUDs in Round Rock: Brushy Creek, Fern Bluff, Highlands at Mayfield Ranch, Meadows at Chandler Creek, Paloma Lake, Parkside at Mayfield Ranch, Siena, Terravista, Vista Oaks, and Walsh Ranch. Total population living within these MUD's is 47,648 (2010 city estimate).

School Districts

The only school district in the City of Round Rock and surrounding ETJ is Round Rock Independent School District (RRISD). RRISD covers southern Williamson County and northwest Travis County and includes the City of Round Rock and portions of the City of Austin and the City of Cedar Park. The area covers 110 square miles. Roughly 48,500 students attend the district's seven high schools, eleven middle schools, 34 elementary schools, and three alternative learning centers. During the past five years, the number of students has increased by nearly 15%, and enrollment continues to grow by more than 1,200 students per year. Due to the growing student population and need to protect lives and property from natural hazards and possible acts of terrorism, RRISD participated in the Plan with the City of Round Rock.

HAZARD IDENTIFICATION

This is the first section of the risk assessment, which includes hazard profiles found in Section 5 and the vulnerability assessment found in Section 6. The purpose of this section is to provide background information for the hazard identification process as well as descriptions for the hazards identified in the Plan.

Hazards Considered

After the initial Kickoff Workshop, the Planning Team reconfirmed that the identified 14 significant hazards be addressed in the Plan. These hazards were identified through an extensive process utilizing input from Planning Team Members, research of past disaster declarations and a review of the current State of Texas Hazard Mitigation Plan (“State Plan”). Readily available online information from reputable sources such as federal and state agencies was also evaluated to supplement information as needed. Natural hazards are profiled in Sections 5 and 6 of the Plan and technological or human-caused hazards are addressed in Appendix A.

To identify risks to the area, an examination of historic trends was conducted for relevant background information. This included reviewing disaster declarations for the area.

The State of Texas claims the highest number of disaster declarations, at 318, for any state or territory from 1953 to 2011.³ From 2000 to 2010, the state experienced 16 declared disasters, including Hurricanes Dolly and Ike. In 2008 alone, the state suffered 36 fatalities, 103 injuries and over 15 million dollars’ worth of property damage.

The City of Round Rock is in Williamson County with the southern city limits extending into Travis County. The City has had a significantly lower amount of declarations than the state as a whole.

State and Local Plan Review

Hazard Considered	Identified as Significant	Reason for Determination
Dam Failure	Yes	Included in the State Plan. Although the risk of failure is low, the hazard should be included as dams are located within the City.

³ Source: <http://www.fema.gov/femaNews/disasterSearch.do?pageInfo.pageStart=1>

Hazard Considered	Identified as Significant	Reason for Determination
Drought	YES	Included in the State Plan. Drought can occur throughout the state and Round Rock experienced a period of extreme drought in 2000, 2009 and 2011.
Earthquake	NO	According to the State Plan, an earthquake occurrence for the South-Central Region, where Round Rock is located, is considered rare.
Extreme Heat	YES	Included in the State Plan; high frequency of occurrence.
Flood	YES	Included in the State Plan; high frequency of occurrence.
Hail	YES	Included in the State Plan; high frequency of occurrence.
Hurricane Wind	YES	The City and School District have a potential risk for hurricane winds.
Land Subsidence	NO	There is no historical occurrence of land subsidence for the City or the ISD. The impact would be limited and the frequency of occurrence is unlikely according to the State Plan.
Thunderstorm	YES	Included in the State Plan; high frequency of occurrence.
Tornado	YES	Included in the State Plan; high frequency of occurrence.
Winter Storm	YES	Review of the State Plan and the NOAA National Climatic Data Center (NCDC) indicate that winter storms are a significant threat.
Wildfire	YES	Included in the State Plan; high probability of occurrence.
Windstorm	NO	The NCDC does not list a historical hazard windstorm event for the region separate from hurricane winds or winds associated with severe thunderstorms.
Infectious Disease	YES	Communicable diseases can occur at any geographic location.
Hazardous Materials Release	YES	Hazardous Material Releases and toxic releases can have a substantial impact which can include property damage.
Pipeline Failure	YES	Fuel pipelines are located throughout the City.
Terrorism	YES	Although there has been no past occurrence in the City, the potential impact of a Terrorism event could be great.

The City of Round Rock and Round Rock ISD have experienced many small-scale hazards. Recent noteworthy events were the severe storms of both Memorial Weekend and Halloween (2013 and 2015). These severe storms dumped heavy rains throughout the region, leaving behind power outages and flooding in Round Rock and Williamson County. Smaller scale disasters such as severe thunderstorms threaten public safety and can cost the school district, city government, businesses and residents millions of dollars in direct and indirect damages; therefore, an extensive range of hazards was considered in the identification process. This included an evaluation of the State Plan, and federal and state resources.

Hazard Descriptions

The 14 hazards identified as significant according to Table 4-1 are divided into two main categories: natural and technological. Natural hazards are further categorized as atmospheric, hydrologic, and other.

Atmospheric hazards are events or incidents associated with weather generated phenomenon. Atmospheric hazards identified as significant include: hail; hurricane wind; severe thunderstorms; tornadoes; winter storm; extreme heat. Hydrologic hazards are events or incidents associated with water related damage and account for over 75 percent of Federal disaster declarations in the United States. Flooding (inland) is the hydrologic hazards identified as significant in this assessment. For the purposes of the risk assessment, “other” natural hazards consist of wildfire, dam failure, and drought.

The term “technological hazards” refers to the origins of incidents that can arise from human activities such as the use of gas and oil pipelines and the manufacture, transportation, storage, and use of hazardous materials. These hazards are distinct from natural hazards primarily in that they originate from human activity. While the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human-induced. Human-caused hazards are those hazards originating directly from human activity, such as terrorism or pandemics. The State Plan does not address these hazards or require that they be addressed in a mitigation plan, however, an analysis has been provided in Appendix A.

Table 4-2 provides descriptions for each of the natural, technological, other, and human-caused hazards included in the plan.

Table 4-2. Hazard Descriptions

Hazard	Description
ATMOSPHERIC	
Hail	Any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant. With hail comes lightning; an abrupt, discontinuous natural electric discharge in the environment. Thunderstorms are also associated with hail storms. Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms.
Severe Thunderstorm	A thunderstorm that produces a tornado, winds of at least 58 mph (50 knots or ~93 km/h), and/or hail at least 1" in diameter . Structural wind damage may imply the occurrence of a severe thunderstorm. A thunderstorm wind equal to or greater than 40 mph (35 knots or ~64 km/h) and/or hail of at least ½" is defined as approaching severe. (NWS, Severe Weather definitions 2018)
Tornado	A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph.
Winter Storm	Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads and other hard surfaces.
Extreme Heat	Severe, excessive summer heat characterized by a combination of exceptionally high temperatures and humidity. When these conditions persist over time, it is called a heat wave.
Hurricane Wind	A hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher.
HYDROLOGIC	
Flood	The accumulation of water within a water body, which results in the overflow of excess water onto adjacent lands, usually floodplains. 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. Most floods fall into the following three categories: riverine flooding, coastal flooding, or shallow flooding.

Hazard	Description
OTHER	
Dam Failure	A systematic failure of the dam structure resulting in the uncontrolled release of water, often resulting in floods that could exceed the 100 year flood plain boundaries.
Wildfire	An uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase the risk for people and property located within wildfire hazard areas or along the urban/wildland interface.
Drought	Period of time without substantial rainfall that persists from one year to the next. A normal part of all climatic regions, including areas with high and low average rainfall. Drought is classified as meteorological, hydrologic, agricultural, or socioeconomic.
TECHNOLOGICAL	
Hazardous Materials Release	Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. A hazardous material (HAZMAT) incident involves a substance outside normal safe containment in sufficient concentration to pose a threat to life, property, or the environment.
Pipeline Breach	An estimated 2.2 million miles of pipelines in the United States carry hazardous materials such as oil and natural gas. Pipelines are out of sight and unnoticed, yet have caused fires and explosions that have killed more than 200 people and injured more than 1,000 people nationwide in the last decade.
HUMAN-CAUSED	
Pandemic	An epidemic that becomes very widespread and affects a whole region, a continent, or the world (e.g., the 1957 flu pandemic caused at least 70,000 deaths in the United States and 1-2 million deaths worldwide). Fears of pandemic have risen in recent years as our globalized economy and growing population fosters large scale international travel and trade. Also, growing populations increase the vulnerability of all areas to disease as it can travel more quickly and creates difficulty in preventing the spread of infection.
Terrorism	Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom. It is categorized as either domestic or International, referring to where the terrorist act takes place.

HAZARD PROFILE

Overview

This section contains profiles for the natural hazards that were identified in Section 4. All human caused hazards are addressed in Appendix A. All hazards are discussed in terms of location, extent, previous occurrences and probability of future events, including any specific or detailed items noted by the Planning Team as it relates to historical hazard information. A full vulnerability assessment for each is included in Section 6.

The detailed profiles in this section are discussed according to category, and included in the following order:

- Atmospheric
 - Hurricane Wind
 - Severe Thunderstorm
 - Tornado
 - Severe Winter Storm
 - Hail
- Hydrologic
 - Flood
 - Drought
- Other Natural Hazards
 - Wildfire
 - Extreme Heat
- Technological
 - Dam Failure

Atmospheric

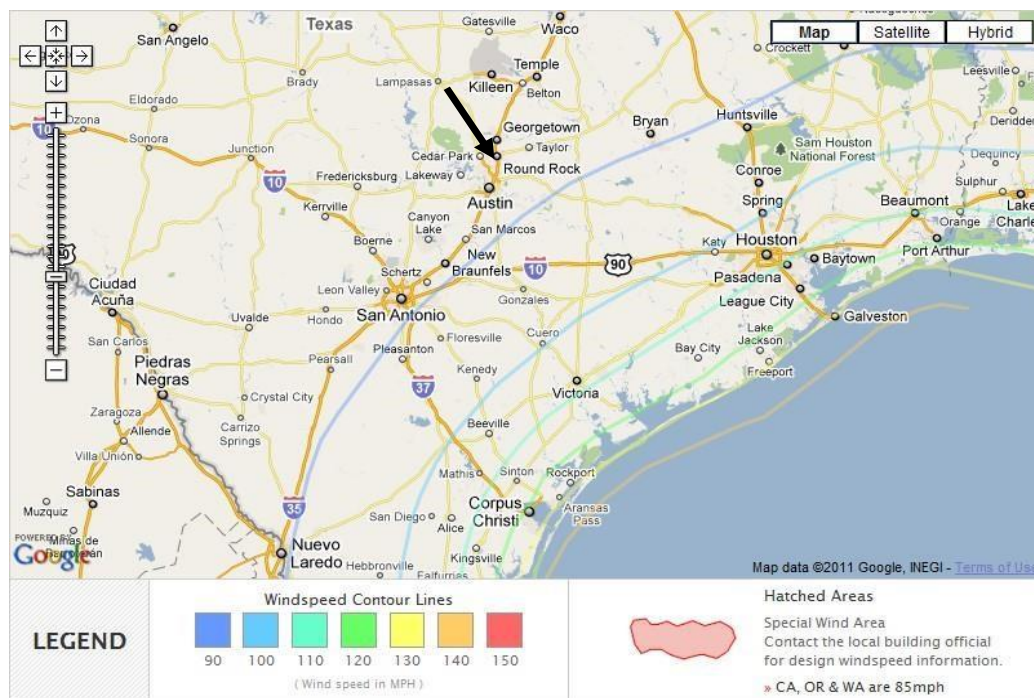
Hurricane Wind

Hurricanes often begin as tropical depressions that intensify into tropical storms when maximum sustained winds increase to between 35-64 knots (39 – 73 mph). At these wind speeds the storm becomes more organized and circular in shape and begins to resemble a hurricane. Tropical storms can be equally problematic without ever becoming a hurricane, resulting in high winds and heavy rainfall, as Tropical Storm Hermine did for the City of Round Rock and Round Rock ISD in September 2010. Once sustained winds reach or exceed 74 mph, the storm becomes a hurricane. The intensity of a land falling hurricane is expressed in categories relating wind speeds and potential damage. Tropical storm-force winds are strong enough to be dangerous to those caught in them.

Location

The City of Round Rock is vulnerable to threats indirectly related to a hurricane event, such as high-force winds and heavy rainfall, which is addressed with the subsections on flooding. Round Rock ISD and the City are located inland from the coast, which makes them less vulnerable to high winds from a hurricane event. Schools are also used as shelters for hurricane evacuees from the Texas Coast. Therefore, both the City and School District are in a low risk area for hurricane wind speeds of 90 miles per hour (mph) or less as shown in Figure 5-1.

Figure 5.1 – Location of Hurricane Wind Zones ⁴



⁴ Source: American Society of Civil Engineers (ASCE)

Extent

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (See Table 5-1). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. This scale only ranks wind speed, but lower category storms can inflict greater damage than higher category storms depending on where they strike, the amount of storm surge, other weather they interact with and how slow they move.

Table 5.1 - Extent Scale for Hurricanes ⁵

CATEGORY	MAXIMUM SUSTAINED WIND SPEED (MPH)	MINIMUM SURFACE PRESSURE (MILLIBARS)	STORM SURGE (FEET)
1	74–95	Greater than 980	3–5
2	96–110	979–965	6–8
3	111–130	964–945	9–12
4	131–155	944–920	13–18
5	155 +	Less than 920	19+

Reading Table 5-1 in conjunction with Figure 5-1, the average extent to be mitigated for the City and ISD is a Category 1 storm. Round Rock is located in the 80-90 mph zone in terms of average wind speeds that should be mitigated in the event of a hurricane. This data is based on the design wind speeds for a 100year event.

Previous Occurrences

Previous occurrences include storms that had an indirect impact on the City of Round Rock. These storms did not follow a direct route through the City, but followed a track near the county, impacting surrounding areas. Figure 5-2 displays historic events that have followed the track indicated.

⁵ Source: National Hurricane Center

Figure 5.2 – Location of Historic Hurricane Tracks⁶

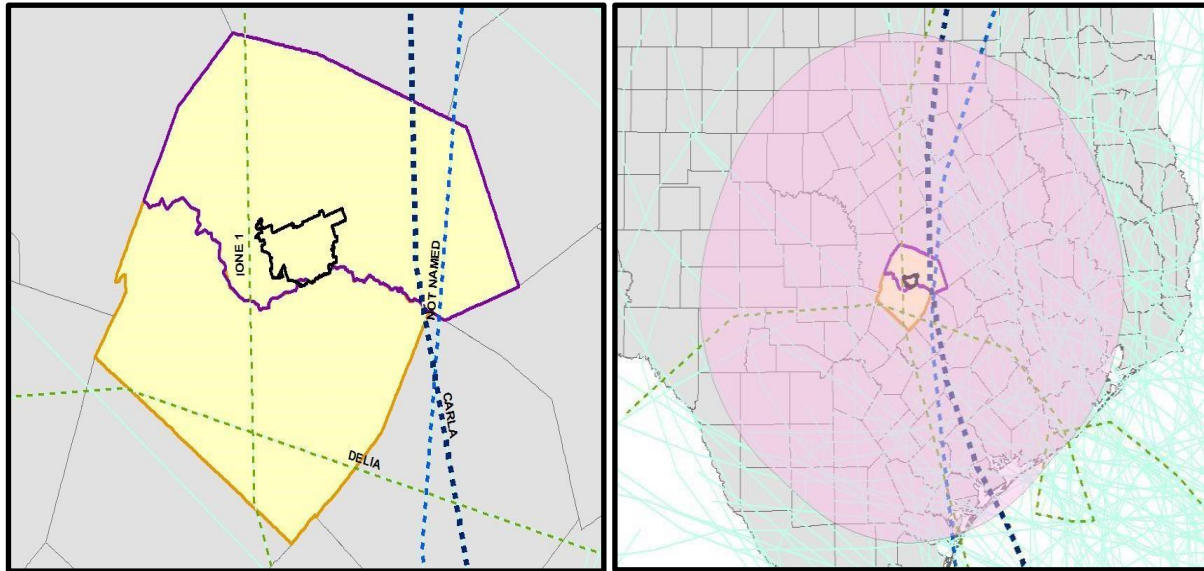


Table 5-2 lists the storms that have impacted Williamson and Travis Counties during the years 1902 – 2010 as shown in Figure 5-2.

Table 5-2. Hurricane Events (1902-2010) ⁷

Hurricane Season (Yr.)	Storm Name	Category	Track w/in County
1902	Not Named	H1	Williamson
1961	Carla	H5	Williamson & Travis
1970	Ione 1	TS	Williamson & Travis
1973	Delia	TS	Travis
2010	Hermine	TS	Williamson & Travis

^{6 7} Source: NOAA: National Hurricane Center

Probability of Future Events

Due to the inland location, and the previous history of hurricanes for the area, the probability of a future tropical storm event or hurricane in the City of Round Rock, including Round Rock ISD, is unlikely, meaning it is possible that the area will be impacted by a hurricane event in the next 10 years.

Severe Thunderstorm

Thunderstorms are created when heat and moisture near the Earth's surface are transported to the upper levels of the atmosphere. By-products of this process are the clouds, precipitation, and wind that become the thunderstorm, and sub hazards of thunderstorms are hail, lightning and tornados. According to the National Weather Service (NWS), a thunderstorm occurs when thunder accompanies rainfall. Radar observers use the intensity of radar echoes to distinguish between rain showers and thunderstorms. Along with rolling thunder, lightning detection networks routinely track cloud-to-ground flashes to help track thunderstorms.

Location

Thunderstorms can develop in any geographic location, and are considered a common occurrence in Texas. A thunderstorm could occur at any location within the City of Round Rock's planning area, including the Round Rock ISD campus, as these storms develop randomly and are not confined to any geographic area within the county. It is assumed that the City of Round Rock is uniformly exposed to the threat of thunderstorms. The entire planning area is at risk for severe thunderstorms. Extent

The extent or magnitude of a thunderstorm event is measured by the Beaufort Wind Scale. Table 5-3 describes the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

Table 5-3. Beaufort Wind Scale ⁸

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move

⁸ Source: World Meteorological Organization (WMO)

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Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-18	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	19-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-31	Strong Breeze	Larger tree branches moving, whistling in wires
7	32-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Whole trees in motion, resistance felt walking against wind
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	Violent Storm	If experienced on land, widespread damage
12	73+	Hurricane	Violence and destruction

On average, the planning area experiences several thunderstorms each year, which is not usually accompanied by maximum wind speeds. In the past, the City of Round Rock has experienced a significant wind event, or an event with winds in the range of “Force 10” on the Beaufort Wind Scale, although the average measurement of severe winds with a thunderstorm event in Round Rock is "Force 8" with winds at 52-60 knots. Therefore, planning participants on average could experience a range of wind speeds where trees are in motion and resistance is felt walking and driving against the wind.

Previous Occurrences

Table 5-4 on the following page depicts historical occurrences of thunderstorm events for the City and School District according to National Climatic Data Center (NCDC) data. Since January 2014, 20 thunderstorm(wind) events are known to have impacted Williamson County, based upon NCDC records. The table presents information on four of those historical events known to have specifically impacted the City of Round Rock. It is important to note that high wind events associated with other hazards, such as tornadoes, are not accounted for in this subsection.

DATE	TIME	MAGNITUDE
05/29/2015	00:00	61 knots
04/27/2016	01:40	52 knots
04/02/2017	08:50	61 knots
05/23/2017	16:16	65 knots

Table 5-4 - Historical Severe Thunderstorm Events (NCDC 2017)⁹

Probability of Future Events

Most thunderstorms occur during the spring months of March, April and May, and in the fall, during the month of September. The frequency of occurrence for a severe thunderstorm event is likely, meaning that an event is probable within the next three years for the City of Round Rock and Round Rock ISD.

Tornado

Tornadoes are among the most violent storms on the planet. A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. The most violent tornadoes are capable of tremendous destruction, with wind speeds of 250 miles per hour or more. Damage paths can be in excess of one mile wide and 50 miles long.

Location

As with thunderstorms, tornadoes do not have any specific geographic boundary and can occur throughout the City uniformly. It is assumed that the City and Round Rock ISD are uniformly exposed to tornado activity.

⁹ Source: NCDC

Extent

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes (particularly mobile homes). Two extent scales are presented as scale numbers differ depending on the year in which they were recorded. Tornado magnitudes are determined using the Enhanced Fujita Scale¹⁰ (Table 5-6).

EF-SCALE NO.	INTENSITY PHRASE	3 SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF0	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	SIGNIFICANT	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Table 5-6. The Enhanced Fujita Scale (Effective 2005 and Later)

The City of Round Rock has experienced a tornado on the scale of an F3 or severe tornado. Under the enhanced scale, this would be considered a devastating tornado or an EF4. In addition, Williamson County has experienced a tornado at an EF5. Although previous occurrences have reached this level, the majority of storms only rise to a level of EF1. Therefore, the range of intensity to be mitigated for a tornado event for the City of Round Rock and Round Rock ISD is from an EF0 to an EF4.

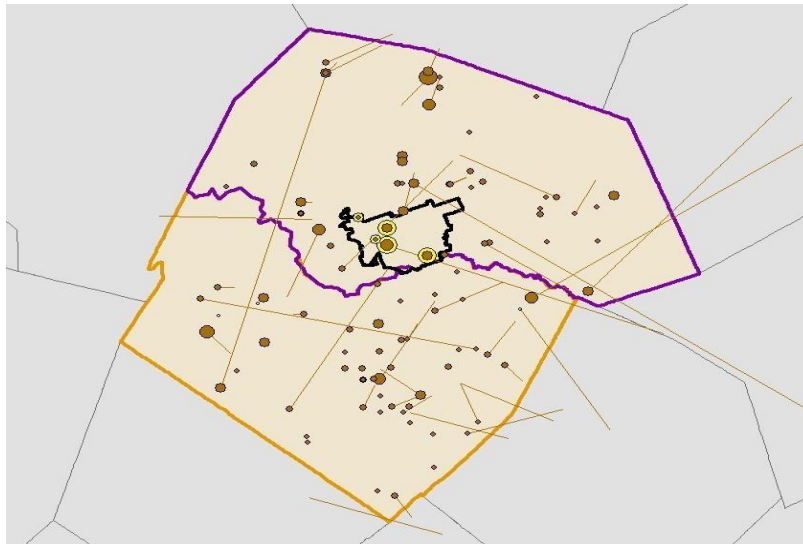
¹⁰ Source: National Weather Service

Previous Occurrences

It is important to note that only reported tornadoes were factored into the risk assessment. It is likely that a high number of occurrences have gone unreported over the past 58 years.

Figure 5-3 shows the locations of previous occurrences in Williamson and Travis Counties from 1950-2009. A total of 104 events have been recorded by the Storm Prediction Center (NOAA) for both counties. Five of the events occurred in the City of Round Rock; two events were categorized as gale tornados (F0), two were significant tornados (F2), and one was a severe tornado (F3).

Figure 5-3. Tornado Events in Williamson and Travis Counties (1950-2009) ¹¹



Probability of Future Events

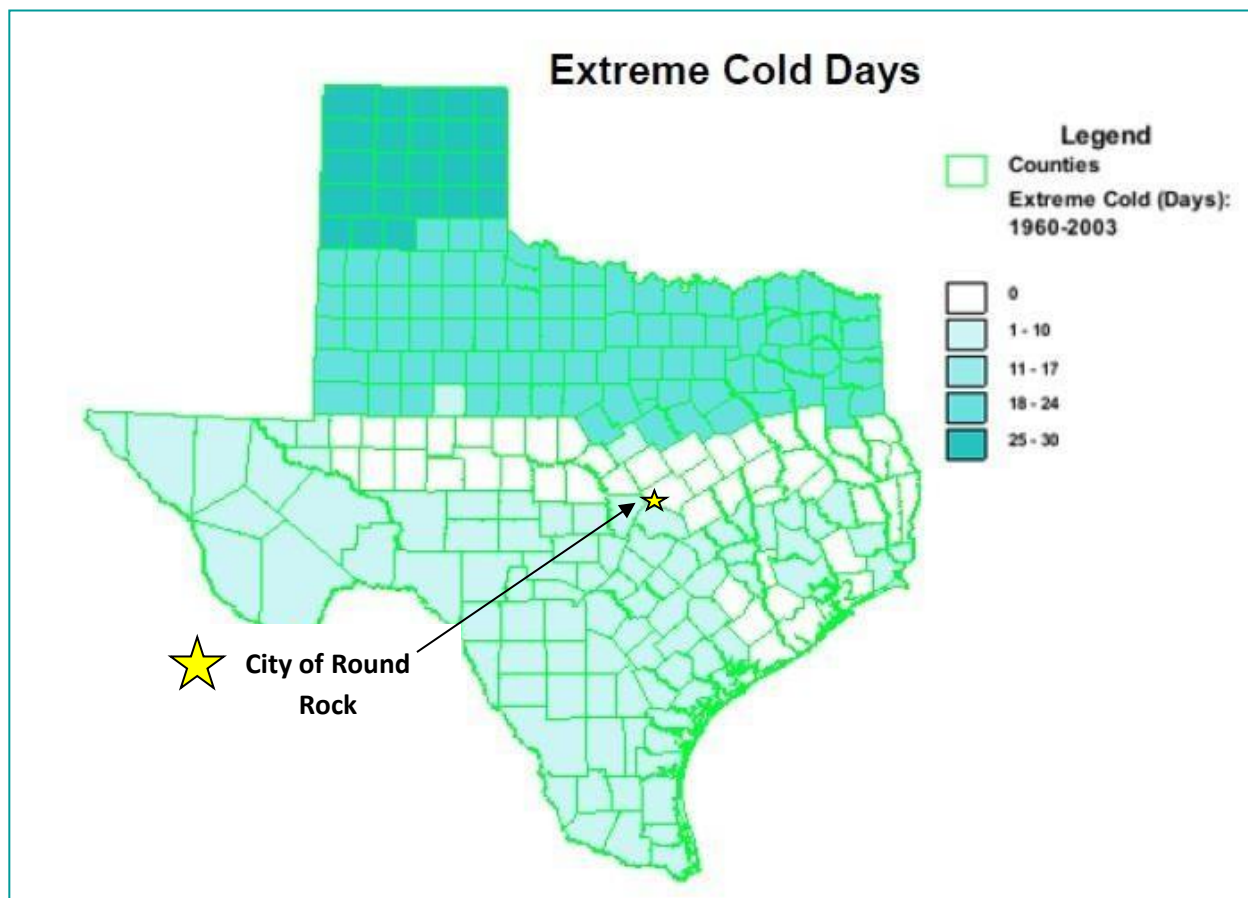
Tornadic storms can occur at any time of year and at any time of day, but they are typically more common in the spring months during the late afternoon and evening hours. A typically smaller, high frequency period can emerge in the fall during the brief transition between the warm and cold seasons. According to historical records, the City experiences a tornado touchdown every 10 or 12 years. Hence, the probability of future tornado occurrences affecting the City of Round Rock and Round Rock ISD is unlikely, meaning an event may occur in the next 10 years.

¹¹ Source: NOAA: Storm Prediction Center

Severe Winter Storm

Winter storms that threaten the City of Round Rock usually begin as powerful cold fronts that push south from central Canada. Although the City and School District are at risk to ice hazards and extremely cold temperatures, as well as snow, the effects and frequency of winter storm events are generally mild and short-lived. As indicated in Figure 5-4, on average, the area experiences less than 10 extreme cold days a year, meaning less than 10 days at or around freezing temperatures.

Figure 5-4. Extreme Cold Days 1960-2003 ¹²



¹² Source: NOAA: Storm Prediction Center

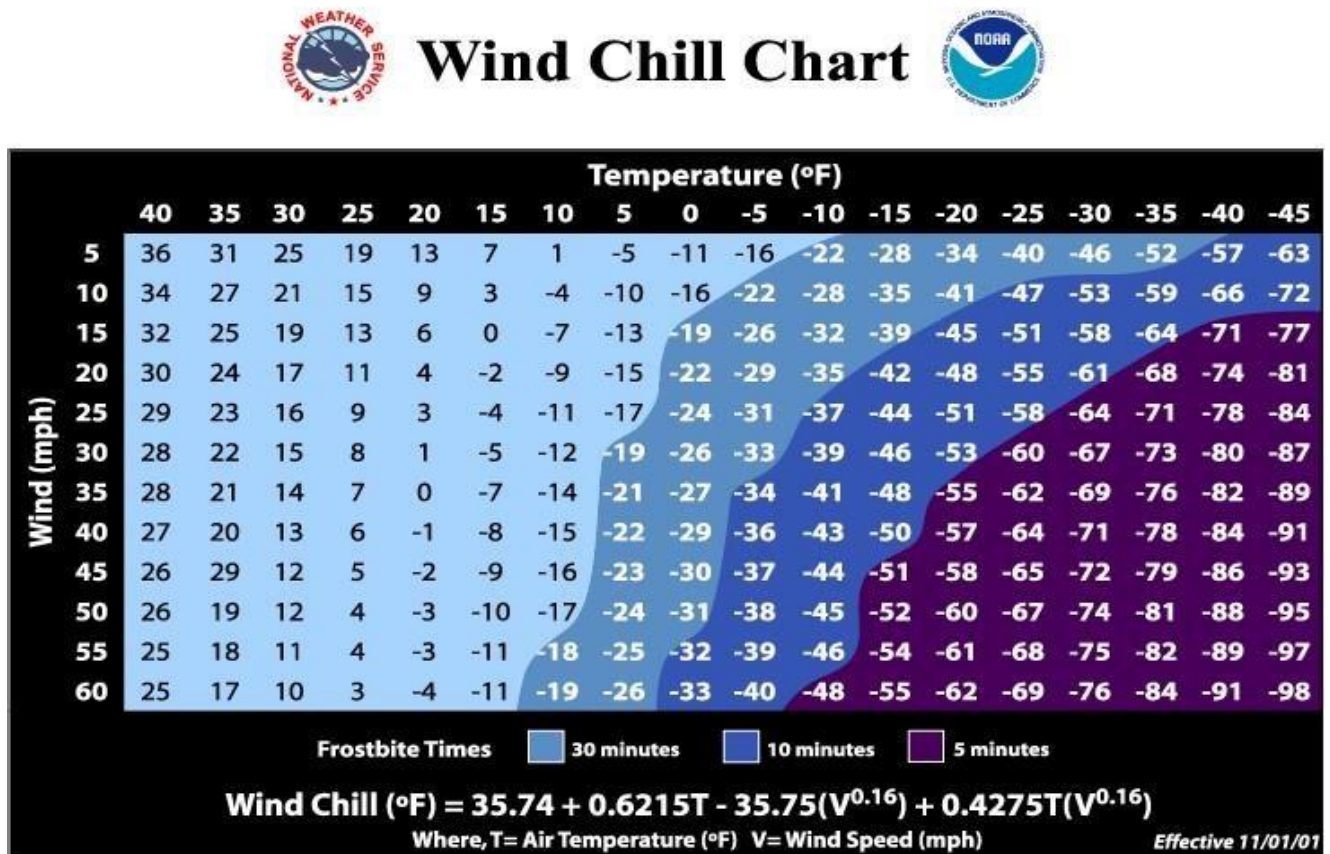
Location

Because winter storm events are not confined to specific geographic boundaries, all areas for the City of Round Rock and Round Rock ISD are considered uniformly exposed.

Extent

Extent for winter storm is measured by the intensity of the event coupled with the temperature. The wind chill factor effects temperature as described in Figure 5-5 and the magnitude overall is shown in Table 57. This is an index developed by the National Weather Service, although the chart is not applicable when temperatures are over 50° or winds are calm. Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. This is often referred to as “feels like” weather since the wind can accelerate the loss of heat from the body. Therefore, a temperature of 25° on a day where there are winds of at least 35 miles per hour could feel just as cold as a 15° day with calm winds due to the loss of heat from cold winds (See Figure 5-5). Both temperature and wind chill affect the degree of intensity of a winter storm event.

Figure 5-5. Wind Chill Chart ¹³



Winter months are generally mild for the City of Round Rock and Round Rock ISD due to their location in Central Texas. Nevertheless, the City and ISD have experienced freezes and more intense winter weather that sometimes result in sleet and snow. The most consistent month for this weather is February.

¹³ Source: National Weather Service

Table 5-7. Magnitude of Severe Winter Storms

Intensity	Temperature Range (Degree Fahrenheit)	Extent
Mild	40 – 50	Winds less than 10 mph and freezing rain or light snow falling for short durations with little or no accumulations
Moderate	30 – 40	Winds 10 – 15 mph and sleet and/or snow up to 4 inches
Significant	25 – 30	Intense snow showers accompanied with strong gust winds, between 15 and 20 mph with significant accumulation
Extreme	20 – 25	Wind driven snow that reduces visibility, heavy winds (between 20 to 30 mph), and sleet or ice up to 5 millimeters in diameter
Severe	Below 20	Winds of 35 mph or more and snow and sleet greater than 4 inches

Round Rock has never experienced a blizzard, but based on 16 previous occurrences recorded from 1950-2009, the area has been subject to winter storm watches, warnings, freezing rain, sleet, snow and wind chill.

Based on the data for previous occurrences and the area where the City and ISD are located, the average event to mitigate would be a mild to moderate winter storm. The City and School District can expect anywhere between 0.1 to 3.0 inches of ice and snow during a winter storm event and temperatures between 30 and 50 degrees with winds ranging from 0 to 15 mph. Reading this in concurrence with Figure 5-5 Wind Chill Chart means that it would take 30 minutes for frostbite to take place if one was exposed to a severe winter event. Infrastructure that is vulnerable to severe winter storms are overpasses, bridges, power lines and pipes for the city, school district and citizens. The elderly or medical/functional needs populations located at private homes may be vulnerable if loss of electricity occurs.

Previous Occurrences

Approximately 16 severe winter weather events were reported in the region over the past 60 years. We recently experienced a snow dusting in the Austin-Round Rock area over the holiday season 2017/2018. This is unusual for our region but shows there is always a slight chance of extreme weather.

Probability of Future Events

Based on the available data for previous occurrences of winter storms, the probability of a future event is occasional, with a winter storm (snow or ice) possible every five years.

Hail

Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere, and the subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals, until they fall as precipitation that is round or irregularly shaped masses of ice greater than 0.75 inches in diameter. The size of hailstones is a direct result of the size and severity of the storm.

High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a byproduct of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

Location

Hailstorms are a potentially damaging outgrowth of severe thunderstorms. As a result, they are not confined to any specific geographic location, and can vary greatly in terms of size, location, intensity and duration. Therefore, anywhere within the City of Round Rock and the Round Rock ISD can experience hail.

Extent

The National Weather Service classifies a storm as severe if hail of three-quarters of an inch in diameter (approximately the size of a penny) or greater is present, based on radar intensity or seen by observers. The intensity category of a hailstorm depends on its size and the potential damage it could cause, as depicted in the NCDC Intensity Scale in Table 5-8.

	Intensity Category	Typical Hail Diameter (in)¹⁴	Description	Probable Kinetic Energy, J-m²	Typical Damage Impacts
H0	Hard Hail	Up to 0.33	Pea	0-20	No damage
H1	Potentially Damaging	0.33 – 0.60	Marble	>20	Slight general damage to plants, crops
H2	Significant	0.60-0.80	Dime	>100	Significant damage to fruit, crops, vegetation

¹⁴ Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.

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	Intensity Category	Typical Hail Diameter (in) ¹⁴	Description	Probable Kinetic Energy, J-m ²	Typical Damage Impacts
H3	Severe	0.80-1.2	Nickel	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Quarter		Widespread glass and auto damage
H5	Destructive	1.6-2.0	Half Dollar	>800	Widespread destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4	Ping Pong Ball		Aircraft bodywork dented and brick walls pitted
H7	Very Destructive	2.4-3.0	Golf Ball		Severe roof damage and risk of serious injuries
H8	Very Destructive	3.0-3.5	Hen Egg		Severe damage to all structures
H9	Super Hailstorms	3.5-4.0	Tennis Ball		Extensive structural damage, could cause fatal injuries
H10	Super Hailstorms	4.0+	Baseball		Extensive structural damage, could cause fatal injuries

Table 5-8. Hailstorm Intensity Scale (H0 to H10)

Source: NCDC Intensity Scale, based on the TORRO Hailstorm Intensity Scale.

The scale in Table 5-8 extends from H0 to H10, with its increments of intensity or damage potential related to hail size (distribution and maximum), texture, fall speed, speed of storm translation, and strength of the accompanying wind. Based on available data regarding the previous occurrences for the area, the City of Round Rock and Round Rock ISD may experience hailstorms ranging from an H0 to an H7. Therefore,

Section 5 – Hazard Profile

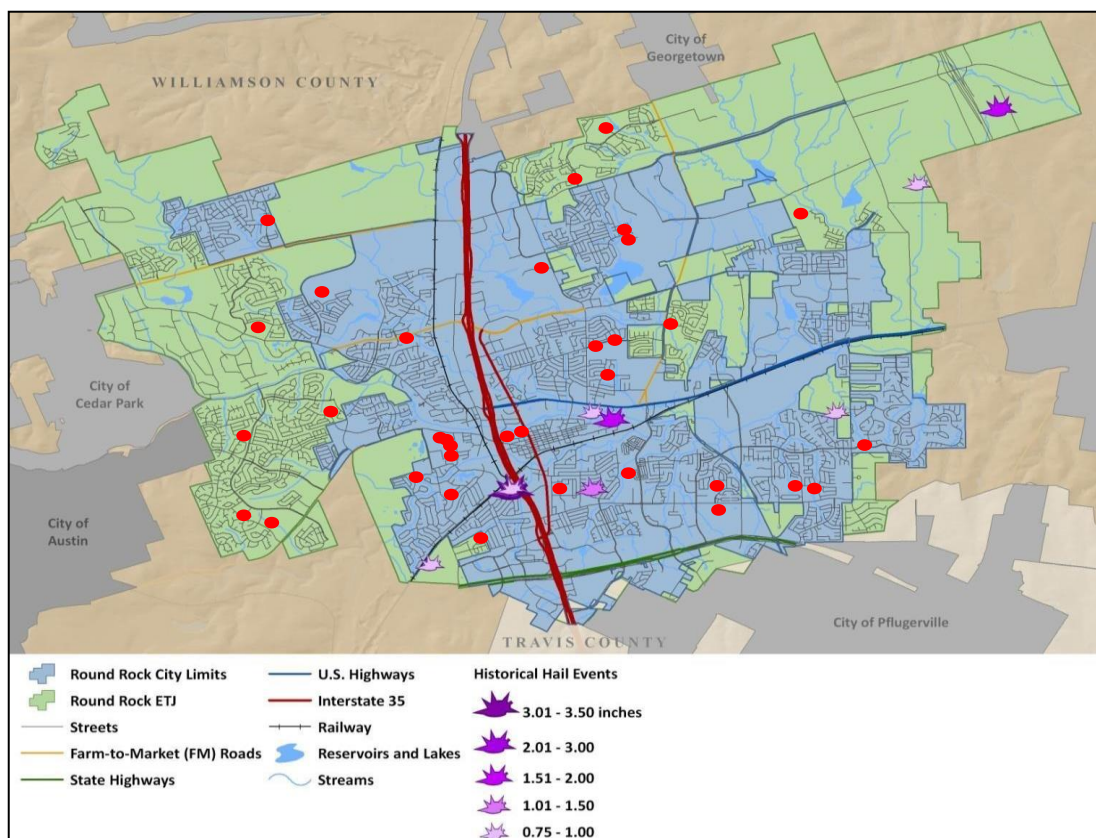
the City can mitigate a storm from low risk or hard hail to a more intense, destructive storm with golf-ball size hail that leads to severe roof damage and risks serious injuries.

Previous Occurrences

Historical evidence shown in Figure 5-6 shows that all the planning area is vulnerable to hail events overall, which typically result from severe thunderstorm activity. Indications are that 23 historical hail events are known to have impacted the City of Round Rock and outlying areas between January 1950 and August 2010. These events were reported to NCDC and may not represent all hail events to have occurred during the past 60 years. Only those events for Williamson and Travis counties with latitude and longitude available were factored into this analysis and plotted on the map (Figure 5-6).

According to Round Rock ISD records, there was hail damage from the late 1990's, as well as in 2009. There was a \$3,000,000 hail claim in March of 2009 that affected multiple of their schools.

Figure 5-6. Historical Hail Events¹⁵



¹⁵ Source: NCDC

Probability of Future Events

Based on 23 events over the last 50 years (1959 – 2009), a hail event is a likely occurrence happening approximately every other year. Most hailstorms occur during the spring (March, April and May) and in the fall during the month of September. Warning time for a hailstorm is generally minimal or there is no warning.

Hydrologic

Flood

Flooding is generally considered to be the most serious natural hazard for the region and constitutes a year-round threat. Flooding due to rainfall alone depends on basin topography, precipitation amounts, dominating weather patterns, soil moisture conditions, and the amount of permeable surface available to absorb the rain. Floods resulting from excessive precipitation can be classified under two categories: general floods, precipitation over a given river basin for an extended period of time combined with storm induced wave or tidal action; or flash floods, the product of heavy localized precipitation in a short time period.

The primary types of general flooding include riverine, coastal and urban flooding¹⁶. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff. Urban flooding occurs as land is converted from fields or woodlands to roads, buildings and parking lots and when the natural land loses its ability to absorb rainfall. Urbanization changes the natural hydrologic systems of a basin, increasing runoff two to six times over what would occur on natural terrain. During periods of urban flooding, streets can become swift-moving rivers, while highway underpasses and underground parking garages can become death traps as they fill with water.

Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. However, flash flooding events may also occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by a retention basin or other stormwater control facility. Although flash flooding occurs most often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces.

¹⁶ Coastal flooding will not be discussed herein as only riverine and urban flooding affect the Round Rock area.

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Inland and riverine flooding typically result from large-scale weather systems that generate prolonged rainfall over a wide geographic area. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

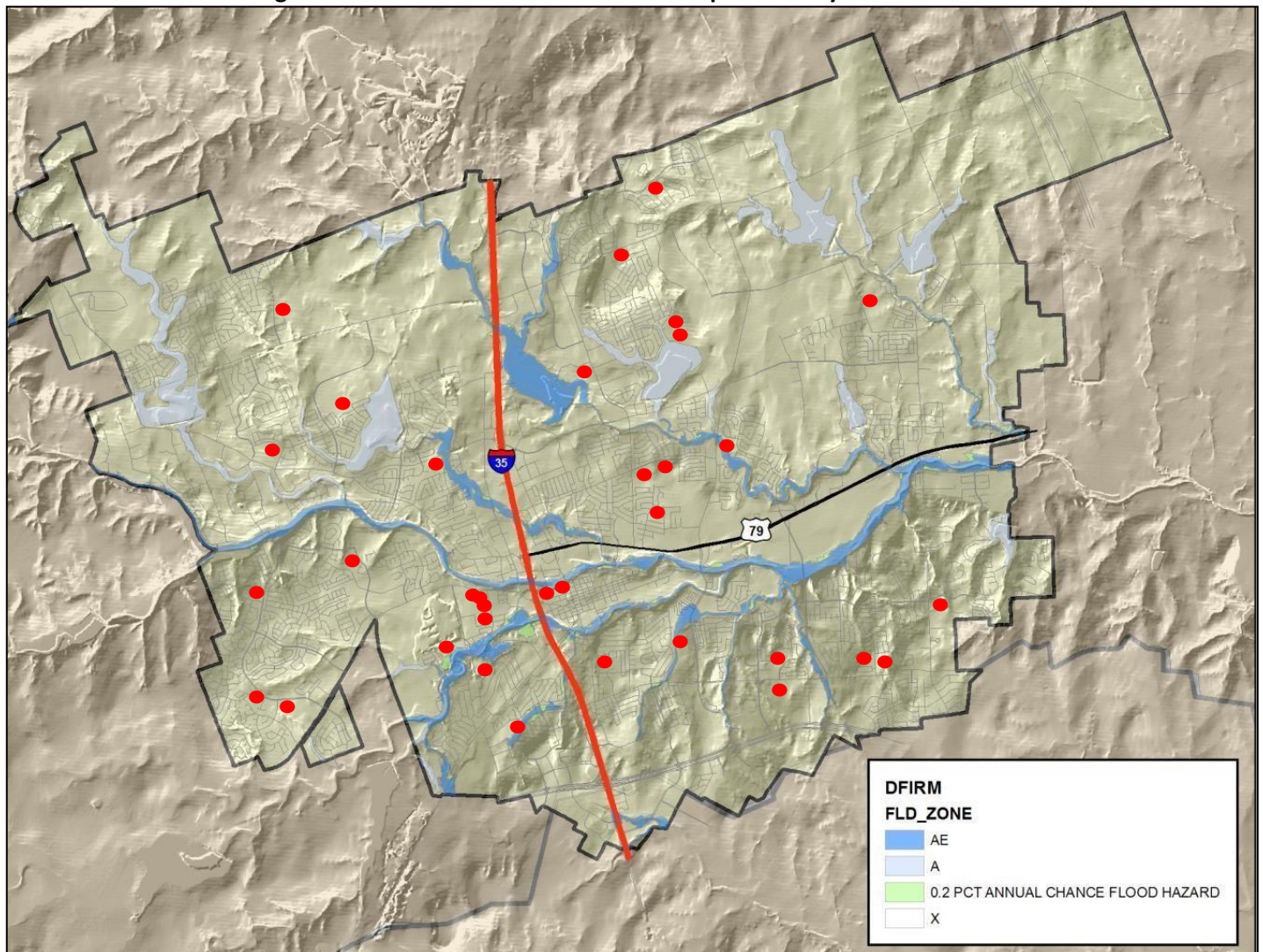
Location

For mapping purposes, Digital Q3 Flood Data is also shown for neighboring counties as well as the Round Rock area as a whole in Figure 5-7. The Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for Travis County shows the following flood hazard areas:

- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance requirements and floodplain management standards apply.
- Zone AO: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone X Protected by Levee: Areas protected from the 1-percent-annual-chance flood hazard by a levee system. These areas are now indicated on the Flood Insurance Rate Map (FIRM) and DFIRM panels as Zone X (shaded) and are typically considered to be at moderate risk of flooding.
- 0.2% Annual Chance Flood Hazard: This is the boundary of the flood that has a 0.2 percent chance of being equaled or exceeded in any given year.

The figure below shows the delineated flood plain. The area outlined is the City of Round Rock based on the digital Flood Insurance Rate Map (DFIRM) from FEMA. Round Rock ISD school locations are represented by the red dots.

Figure 5-7. FEMA Flood Insurance Rate Map of the City of Round Rock ¹⁷



Extent

The severity of a flooding event is typically determined by a combination of several factors including:

- Stream and river basin topography and physiography;
- Precipitation and weather patterns;
- Recent soil moisture conditions; and
- The degree of vegetative clearing and impervious surface.

¹⁷ Source: FEMA

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Floods resulting from excessive precipitation can be classified under one of two categories: (1) general floods, precipitation over a given river basin for an extended period of time combined with storm-induced wave or tidal action; or (2) flash floods, the product of heavy localized precipitation in a short time period. Determining the intensity and magnitude of a flood event is dependent upon the flood zone and location of the flood hazard area in addition to depths of flood waters. Extent of flood damages can be expected to be more damaging in the areas that will convey a base flood. FEMA categorizes areas on the terrain according to how the area will convey flood water. Flood zones are the categories that are mapped on Flood Insurance Rate Maps. Table 5-9 provides a description of flood zones as indicated below.

Table 5-9. Flood Zones ¹⁸

Flood Zones		
Zone A	The Base Floodplain. There are six types of A zones:	
	A	The base floodplain mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFE's are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection

¹⁸ Source: *Understanding Your Risks, identifying hazards and estimating losses, FEMA 386-2*

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Flood Zones		
Zone V & VE	V	The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B & Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the base flood and the 500-year floods. B zones are also used to designate base floodplains or lesser hazards, such as areas protected by levees from the base flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.	
Zone C & Zone X (unshaded)	Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

In addition to the flood zones, extent is provided in terms of depth of flood waters. Table 5-10 below describes the category of risk and potential magnitude of an event. The water depths depicted in Table 5-10 are an approximation based on elevation data (above sea level rather than above ground). Table 511 reflects extent associated with stream gauge data provided by the Upper Brushy Creek W.C.I.D. Flood Monitoring System depicting record rain levels for Tropical Storm Hermine in 2010.

Table 5-10. Extent Scale – Water Depth (Mean Sea Level, MSL)

SEVERITY	MSL (IN FEET)	DESCRIPTION
BELOW FLOOD STAGE	0 to 15	Water begins to exceed low sections of banks and the lowest sections of the floodplain.
ACTION STAGE	16 to 23	Flow is well into the floodplain, minor lowland flooding reaches low areas of the floodplain. Livestock should be moved from low lying areas.

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SEVERITY	MSL (IN FEET)	DESCRIPTION
FLOOD STAGE	24 to 28	Homes are threatened and properties downstream of river flows or in low lying areas begin to flood.
MODERATE FLOOD STAGE	29 to 32	At this stage the lowest homes downstream flood. Roads and bridges in the floodplain flood severely and are dangerous to motorists.
MAJOR FLOOD STAGE	33 and above	Major flooding approaches homes in the floodplain. Primary and secondary roads and bridges are severely flooded and very dangerous. Major flooding extends well into the floodplain, destroying property, equipment and livestock.

Table 5-11. Extent for Round Rock/Severe Flood Event

REPORTING ENTITY	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
Upper Brushy Creek W.C.I.D.	Record rain event for City of Round Rock in Sep. 2010 associated with Tropical Storm Hermine place the event as the statistical equivalent of a 100-year storm event in some areas; i.e., a rainfall which has a one percent chance of occurring in any given year.	Below Flood Stage – Avg. MSL 12'-15" Private property was impacted by the flood. One home received minor flooding and several homes were significantly flooded.

Based on reporting from the Upper Brushy Creek W.C.I.D., the flood event resulting from Tropical Storm Hermine places the City at the extent of “Below Flood Stage”. However, Williamson and Travis County have experienced flooding over 30 feet MSL. Therefore, reading Tables 5-10 and 5-11 together with previous occurrences for the area, the City and School District may experience a range of flooding events from below 15 upwards to 30 feet or from “Below Flood Stage” to almost a “Moderate Flood Stage.”

Previous Occurrences

The National Climatic Data Center has recorded 96 flood events in Williamson County from 1996 to April 2011. Four fatalities resulted from three of the events, ten people were injured, \$2.2 million in property damages was reported and \$80,000 in crop damages.

Flood on June 22, 1997:

Heavy rain fell from Friday night through Sunday leaving the soils saturated. Very heavy rains over the Texas Hill Country Saturday night and Sunday morning caused widespread flooding as well as flash flooding across numerous counties. Rainfall averaged four to six inches, with over 15 inches across many locations in the Texas Hill Country. The Guadalupe River first crested at 25.9 in the surrounding area of Comfort, Texas. No fatalities were reported, though \$500,000 in property damage and \$50,000 in crop damages were reported for several counties, including Williamson.

Flash flood on November 15, 2001:

Four to six inches of rain fell on Williamson County resulting in some of the worst flooding that Emergency Managers had seen 1957. Numerous rescues were required including pulling people from trees. At least three cars washed off of a Brushy Creek bridge. Hundreds of people were evacuated from their homes and a few homes were destroyed. Two fatalities were reported; both due to cars stalling on Brushy Creek low water crossings. Property damages totaled \$500,000.

Flash flood on March 13, 2007:

Thunderstorms developed over most of South Central Texas as an upper level low moved slowly across North Texas. High floodwater caused four area county roads to be closed. A husband and wife were driving in the area when their vehicle stalled in high water. The husband was tragically swept downstream and out of the grasp of rescuers. No damages were reported.

Flash flood on September 8, 2010:

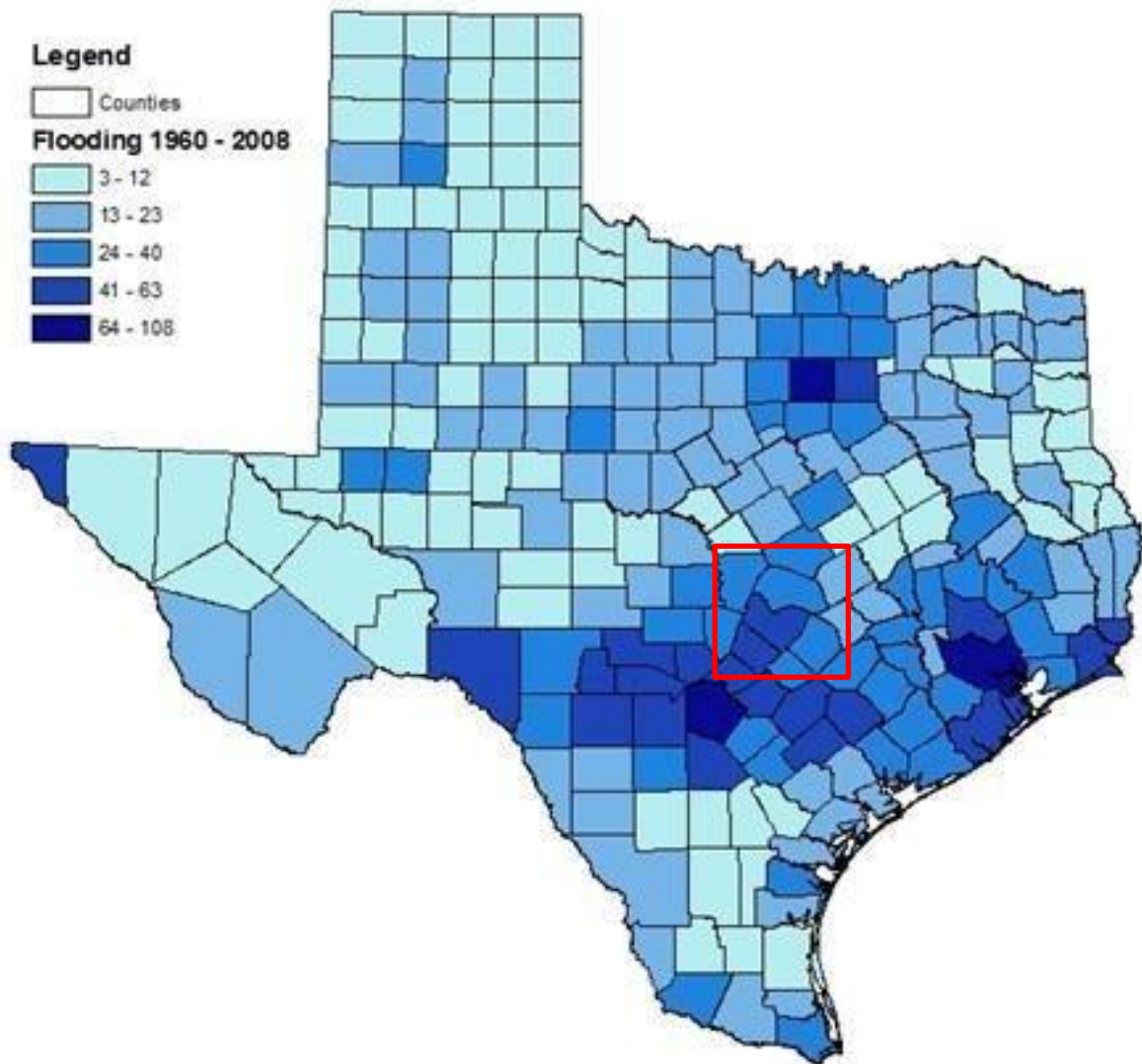
Heavy rain from Tropical Storm Hermine produced flash flooding which closed sections of Interstate 35. One man was found dead one week later in a drainage field. Williamson County reported 637 homes damaged by flood waters. Damage estimates are near \$8 million dollars for county infrastructure including roads, bridges, public buildings and parks.

Flash flood on Memorial Weekend 2015:

Thunderstorms persisted over the weekend causing major flooding throughout the region. Round Rock had six homes that were affected, five homes that had minor damage according to FEMA guidelines. One commercial structure was flooded and there was some road damage.

Flooding in the State of Texas has occurred at frequencies represented by the map in Figure 5-8. The Round Rock area has averaged 40-62 flood events over the past 50 years. The area can expect a flood event annually.

Figure 5-8. Frequency of flooding in the State of Texas ¹⁹



Probability of Future Events

Based on recorded historical occurrences and average flooding events, the City of Round Rock and Round Rock ISD is prone to inland flooding. Flooding in the area is highly likely, meaning it is probable that a flooding event will occur in the next year.

¹⁹ Source: SHEL DUS Database 1950-2008

Drought

Drought is a normal part of virtually all climatic regimes, including areas with high and low average rainfall and is considered a major threat to Texas agricultural industries and water supplies. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural and socioeconomic. Table 5-12 includes definitions for these different types of drought.

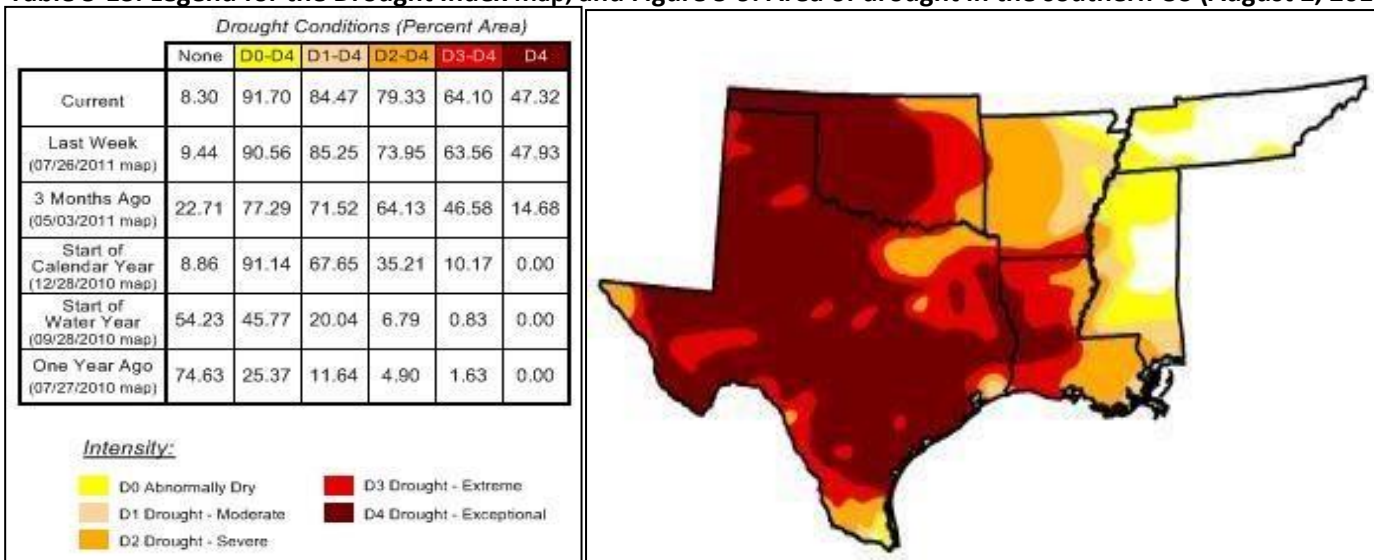
Table 5-12. Drought Classification Definitions²⁰

METEOROLOGICAL DROUGHT	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
HYDROLOGIC DROUGHT	The effects of precipitation shortfalls on stream flows and reservoir, lake and groundwater levels.
AGRICULTURAL DROUGHT	Soil moisture deficiencies relative to water demands of plant life, usually crops.
SOCIOECONOMIC DROUGHT	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Location

Drought can occur throughout the area and is not confined to any specific location. Areas of impact can be county wide and regional. A general and recent snapshot of the southern US shows current areas of intense drought.

Table 5-13. Legend for the Drought Index Map; and Figure 5-9. Area of drought in the southern US (August 2, 2011)



²⁰ Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Table 5-13 describes the drought conditions that are represented by each color on the map in Figure 5-9 above. The City of Round Rock is in an area of exceptional drought (D4) for the summer of 2011.

Extent

Droughts are slow-onset hazards, but over time can have very damaging affects to crops, municipal water supplies, recreational uses, and wildlife. If droughts extend over several years, the direct and indirect economic impact can be significant. Table 5-14 depicts the extent or magnitude of drought for the area.

Table 5-14. Extent Scale - Palmer Drought Index ²¹

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies	-5.0 or less

The Central Texas area has experienced periods of moderate, severe, extreme, and even exceptional drought, both agricultural and hydrological, according to Palmer Drought Index classifications and U.S. Drought Monitor. The real danger with drought of this magnitude is the amount of crop failure and the potential for wildfires to break out. This danger has become evident for much of Central Texas, including Travis and Williamson County including the City of Round Rock, as extreme and exceptional drought has resulted in crop losses and devastating wildfire outbreaks in 2011. Therefore, the range of intensity for

²¹ Source: National Drought Mitigation Center

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the area to mitigate is from a D0 in milder summers, to a D4 or exceptional drought, as the area has experienced thus far in 2011.

Previous Occurrences

Within NCDC records, two drought events occurred between 1996 and 2000 that are associated with Williamson County and the surrounding region. Property and crop damages accumulated from April to August 1996 and from July to October 2000²². Two other droughts have affected the area in recent years, but have not been reported to NCDC, the 2009 and 2011 drought, which are described below.

The 2011 drought, which has not subsided at the time of drafting of this Plan, is the worst drought for the State of Texas in the history of droughts for the state.

2000 Drought Conditions

In spite of rainfall east of Interstate 35 in June 2000, 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. Drought conditions abated with widespread rainfall which developed on October 17, 2000 across south-central Texas, with repeat heavy rainfall on October 22 through October 24. The drought, already weakened by the rainfall of the 17th, ended with the additional widespread heavy rain.

2009 Drought Conditions

Much of Central Texas experienced extreme and exceptional drought in 2009. Rainfall was 44 percent below normal, resulting in crop damages for farmers and the loss of cattle for ranchers due to stock ponds drying up.

2011 Drought Conditions

Lack of rainfall in the spring and summer months and record-breaking temperatures have created a period of extreme and exceptional drought for the State of Texas, including the City of Round Rock. Crop damages have not been totaled as the drought continues to affect already-stricken areas.

Probability of Future Events

Although instances of extreme drought have been frequent in the last few years looking back fifty years, this is a period of extreme or abnormal activity. Based on the previous occurrence data and location of the area, probability of a future drought event for the City and Round Rock ISD is occasional, meaning that a drought is probable within the next five years.

²² Crop damages are reported by region and results are averaged.

Other Natural Hazards

Wildfire

A wildfire can rapidly spread out of control and occurs most often in the summer, when the brush is dry and flames can move unchecked through a highly vegetative area. The fire often begins unnoticed and spreads quickly, lighting brush, trees and homes. It may be started by a campfire that was not doused properly, a tossed cigarette, burning debris, lightning or arson.

Wildfires can start as a slow burning along the forest floor, killing and damaging trees. They often spread more rapidly as they reach the tops of trees, with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a fire.

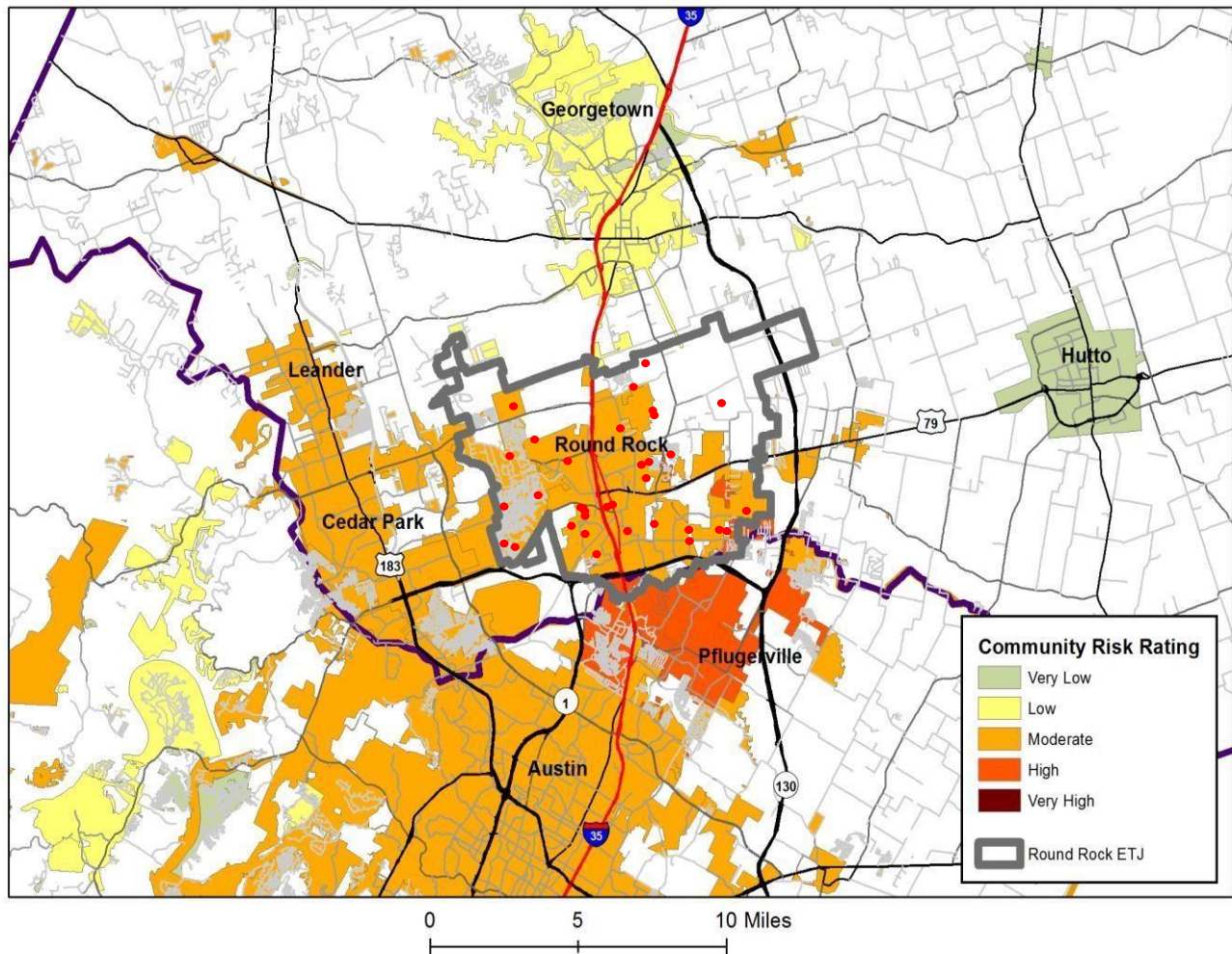
Texas has seen a significant increase in the number of wildfires in the past 30 years, which included wildland, interface or intermix fires. Wildland fires are fueled almost exclusively by natural vegetation while interface or intermix fires are urban/wildland fires in which vegetation and the built-environment provide the fuel.

Wildfire outbreaks have been uncommonly high in the summer of 2011. The President issued a Disaster Declaration (DR 1999) for wildfires that broke out in April and May of 2011 in the Hill Country and West Texas. The historically dry and hot conditions did not subside, which led to an outbreak of wildfires. Another Presidential Disaster Declaration was issued for Bastrop, Travis and Williamson counties. Numerous wildfires broke out in multiple areas across Central Texas, destroying homes and property, over Labor Day weekend in 2011.

Location

The Texas Forest Service provides location for the wildfire hazard per community based on their level of risk. Figure 5-10, on the following page, illustrates the location of the City of Round Rock, Round Rock ISD (red dots) and vicinity and the level of risk in terms of urban wildfire interface.

Figure 5-10. Communities at Risk: Round Rock and Vicinity ²³



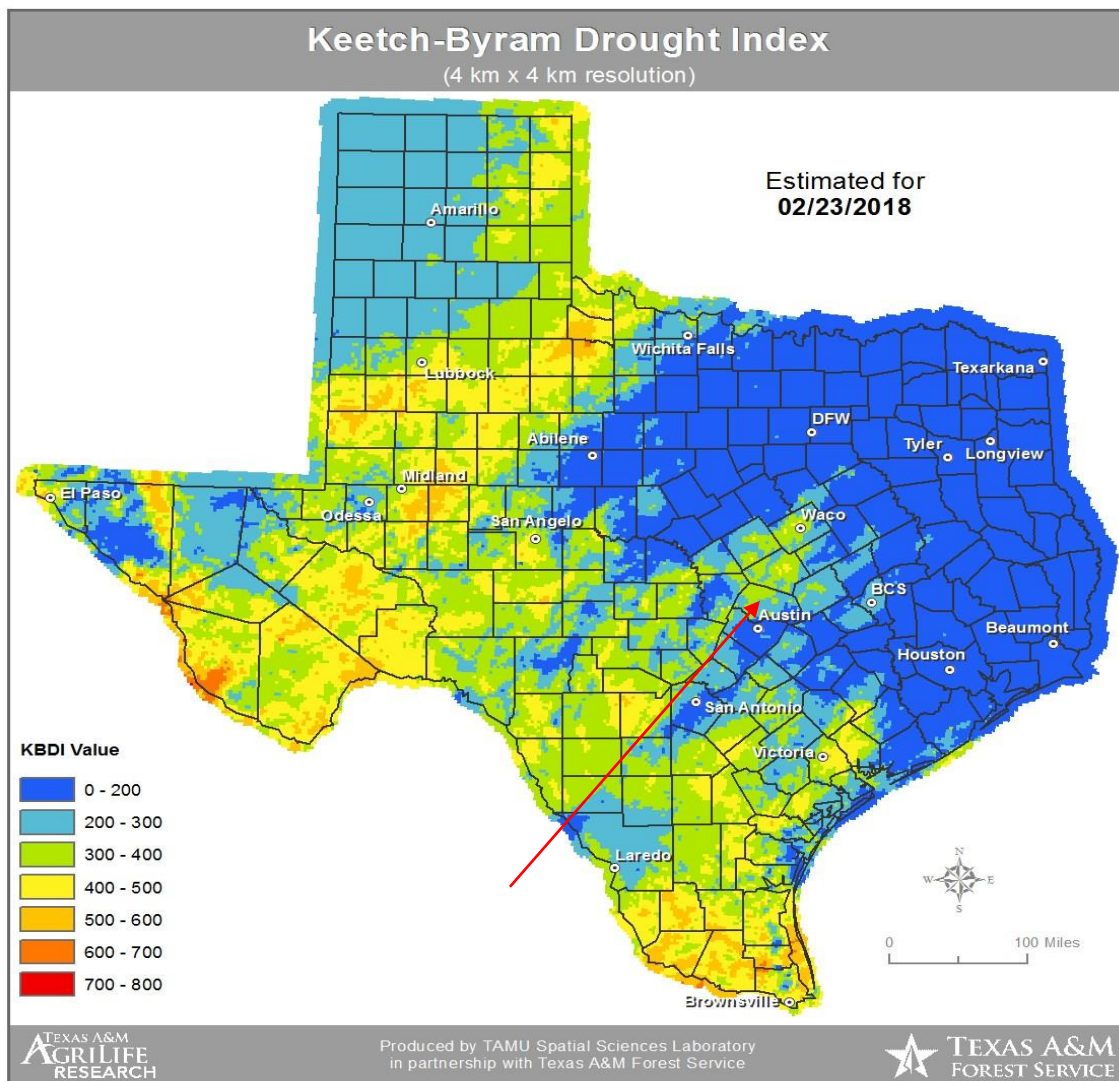
Extent

Fire risk is measured in terms of magnitude and intensity using the Keetch-Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential based on a daily water balance, where a drought factor is balanced with precipitation and soil moisture (assumed to have a maximum storage capacity of 8-inches), and is expressed in hundredths of an inch of soil moisture depletion.

Each color on the map represents the drought index at that location. The drought index ranges from 0 to 800, where a drought index of 0 represents no moisture depletion, and an index of 800 represents absolutely dry conditions.

²³ Source: Texas Forest Service

Figure 5-11. KBDI for the State of Texas, 2011 (Red arrow denotes Williamson County.)²⁴



Fire behavior can be categorized at four distinct levels:

- **0 - 200** Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.

²⁴ Source: Texas Forest Service

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- **200 - 400** Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and possibly through the night.
- **400 - 600** Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
- **600 - 800** Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Using the KBDI index is a good measure of the readiness of fuels for wildland fire. Caution should be exercised in dryer, hotter conditions, and the KBDI should be referenced as the area experiences changes in precipitation and soil moisture.

The range for intensity for the City of Round Rock is within 400 – 800. In a period of extreme heat or drought, the KBDI could be over 700 for the area. Table 5-15 provides information on the average, maximum, and minimum KBDI for Williamson County where the City of Round Rock is located. This table should be read in conjunction with the current KBDI index in determining the potential magnitude of a wildfire event. Because the KBDI is a measure of the current readiness of fuels for wildfire, caution should be exercised in dryer, hotter conditions, and the KBDI should be referenced as the area experiences changes in precipitation and soil moisture.

Table 5-15. Extent for Wildfire by County

COUNTY	AVERAGE KBDI	MAXIMUM KBDI	MINIMUM KBDI
Williamson County	633	735	612

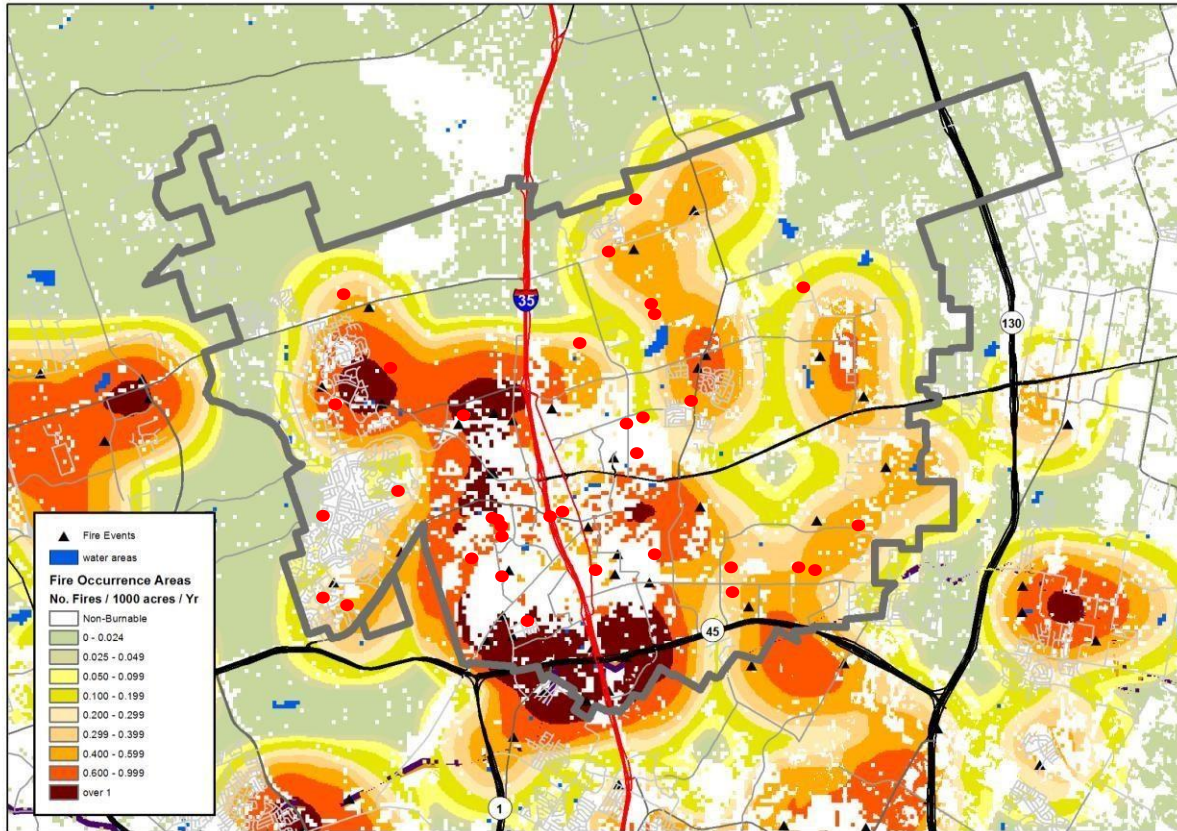
The average extent to be mitigated for the City of Round Rock is a KBDI index of 633. At this level fires will burn to mineral soils. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Round Rock ISD facilities are wholly located within the City of Round Rock. As such, the Round Rock ISD can expect a range for wildfire with a minimum KBDI of 612 and a maximum of 735. Round Rock ISD has not experienced a maximum of 735; therefore, the average extent to be mitigated for is the same for the City of 633.

Previous Occurrences

Except for one small grass fire, the City has not been directly affected by wildfires since 2011. Data has not been provided for any county wildfires since 2014 as reports were not complete at the time of drafting, but they also have the last recorded wildfires in 2011.

Figure 5-12. Previous Occurrences of Area Wildfires in Round Rock



Probability of Future Events

Wildfires can occur at any time of the year. As the city moves into wildland, the potential area of occurrence of wildfire increases. An event for the City of Round Rock is highly likely, with an event probable within the next 3 years. Due to the locations of schools for Round Rock ISD in areas with an increased risk, the probability for the School District is also highly likely.

Extreme Heat

The Round Rock area has a humid subtropical climate, characterized by humid summers, where temperatures average around 90 degrees Fahrenheit. The combination of high temperatures mixed with humidity leads to heat waves or periods of extreme heat. Although heat can damage buildings and facilities and strain on power grids, it presents a more significant threat to the safety and welfare of citizens and animals.



The major human risks associated with severe summer heat include: heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and even heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirm, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to care for their well-being.

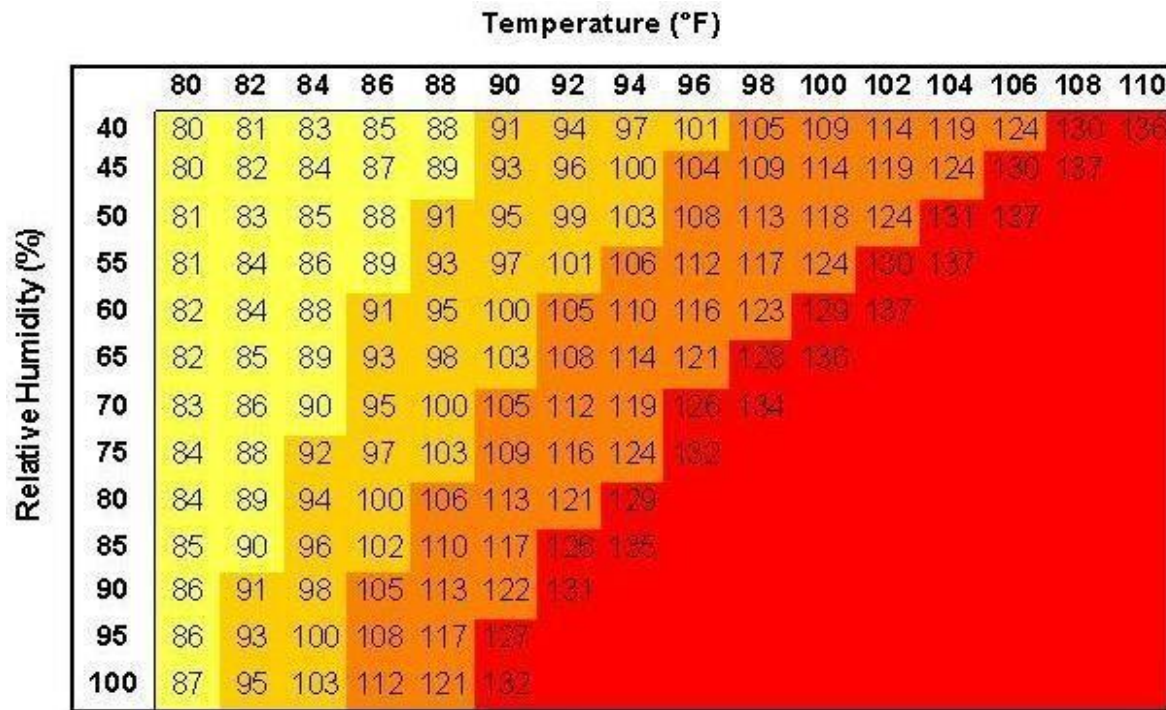
Location

Though injuries or deaths from extreme heat have been recorded at different locations throughout the City, there is no specific geographic scope to the extreme heat hazard. Extreme heat could occur at any area of the City including the Round Rock ISD properties.

Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the “Heat Index,” and is depicted in Figure 5-13. This index measures how hot it feels outside when humidity is combined with high temperatures.

Figure 5-13. Extent Scale for Extreme Summer Heat (National Weather Service)



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
Extreme Caution
Danger
Extreme Danger

The extent scale in Figure 5-13 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 90 degrees Fahrenheit or lower, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. “Caution” is the first level of intensity where fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps or heat exhaustion are possible, whereas a “Danger” level means that these symptoms are likely. “Extreme Danger” indicates that heat stroke is likely. The National Weather Service (NWS) initiates alerts based on the Heat Index as shown Table 5-16.

Table 5-16. Extreme Summer Heat Warnings

Warning	Detailed Description
Heat Advisory	Heat Index is expected to exceed 105 °F to 110 °F.
Excessive Heat Warning	Heat Index above 105 °F for 3 hours or more during the day and at or above 80 °F at night.

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Due to its location, and its urban makeup, the City of Round Rock and Round Rock ISD can expect an extreme heat event each summer, with a range of temperature intensities from “Extreme Caution” to “Extreme Danger” as excessive heat warnings are often issued in the summer months.

Citizens, especially children and the elderly should exercise caution by staying out of the heat for prolonged periods when a heat advisory or excessive heat warning is issued. Also at risk are those working or remaining outdoors for prolonged periods of time. Due to the abundance of concrete and metal infrastructure, the effects of an extreme heat event can be intensified. Concrete and metal absorb heat energy and emit that energy at night, thereby trapping heat, and causing the temperature to feel as much as 10 degrees higher than surrounding areas. This is known as the “heat island” effect.

Previous Occurrences

One event has been recorded by NCDC. It was on July 25, 2000 when temperatures rose to 105-120 °F. A victim was found in his home in front of an open refrigerator. The home had no air conditioning, only a window fan.

Probability of Future Events

Having only one previous occurrence recorded in a database having events recorded from 1950 to the present, it appears a heat event is not likely to occur again in the next 50 years. However, the lack of listed events is due to a lack of reporting, not a lack of occurrence. Temperatures will rise to upper 90’s and lower 100’s every year. Additionally, a bubble in senior citizen population numbers is expected within 10 years. Therefore, the probability of future occurrence of an extreme heat event is highly likely, with an event probable within the next year.

Technological

Dam Failure

Dams are water storage, control, or diversion barriers that impound water upstream in reservoirs. Dam failure is a collapse or breach in the structure. While most dams have storage volumes small enough that failures have little or no repercussions, dams with large storage amounts can cause significant flooding downstream.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment, piping or foundation leakage;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, or maintain gates, valves, and other operational components;
- Improper design, such as use of improper construction materials;
- Failure of upstream dams in the same drainage basin;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion

Location

Figure 5-14 illustrates the general location of 22 dams as recognized by the U.S. Army Corps of Engineers (USACE) in the National Inventory of Dams; the locations of the schools in the Round Rock ISD are represented with red dots. Of the 22 listed, all are considered a low risk dam for the City of Round Rock and Round Rock ISD. Significant and high hazard dams are not located within the planning area, as all 22 dams have a storage capacity of less than 10,000 acre-feet.

Figure 5.14 - General Location of Dams in the Round Rock Area and RRISD Schools²⁵

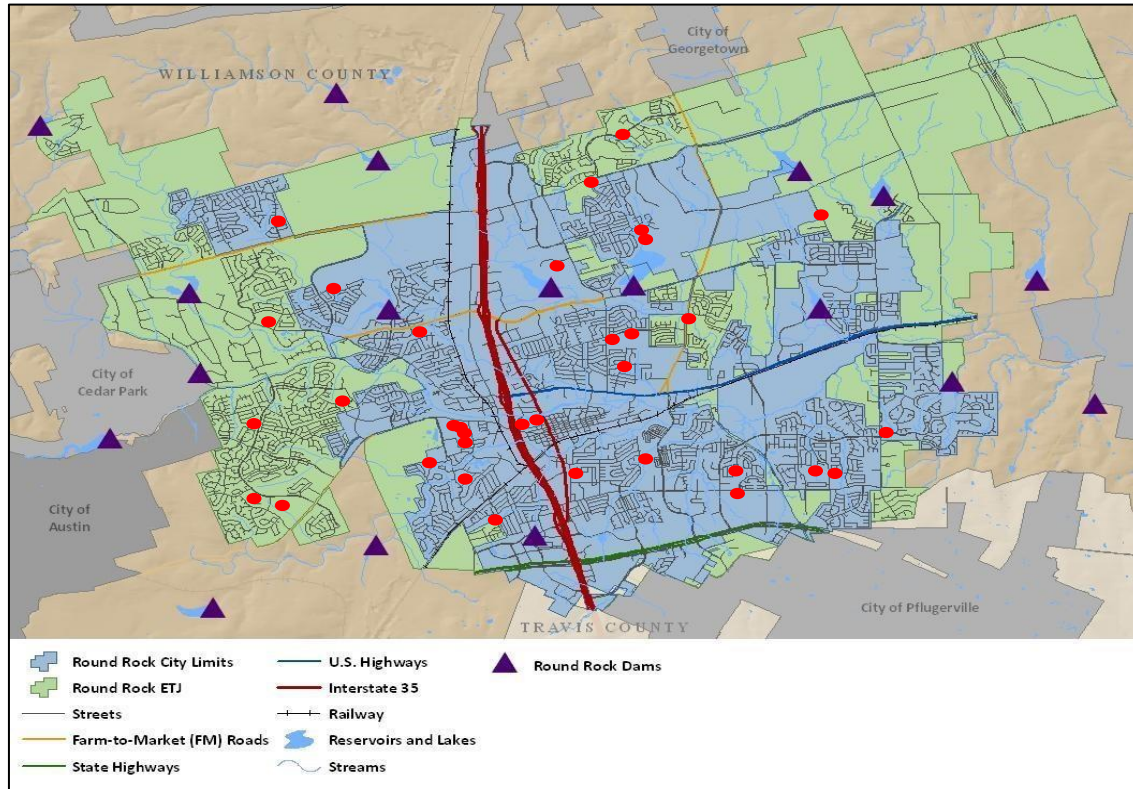


Table 5-17. Latitude/Longitude for Dams in the Round Rock Area

LATITUDE	LONGITUDE
30.487442	-97.809842
30.484172	-97.713573
30.584406	-97.721401
30.569442	-97.713219
30.541358	-97.678738
30.536535	-97.710947
30.541862	-97.662362

²⁵ Source: (USACE)

LATITUDE	LONGITUDE
30.561536	-97.612788
30.567170	-97.629383
30.536662	-97.625222
30.542941	-97.582330
30.520457	-97.599098
30.515645	-97.570711
30.522309	-97.748596
30.554288	-97.805767
30.534679	-97.791313
30.577267	-97.780334
30.507858	-97.766405
30.540025	-97.750604
30.470298	-97.745865
30.486466	-97.681984
30.493926	-97.806179

Figure 5.15 - General Location of Dams in the Round Rock Area

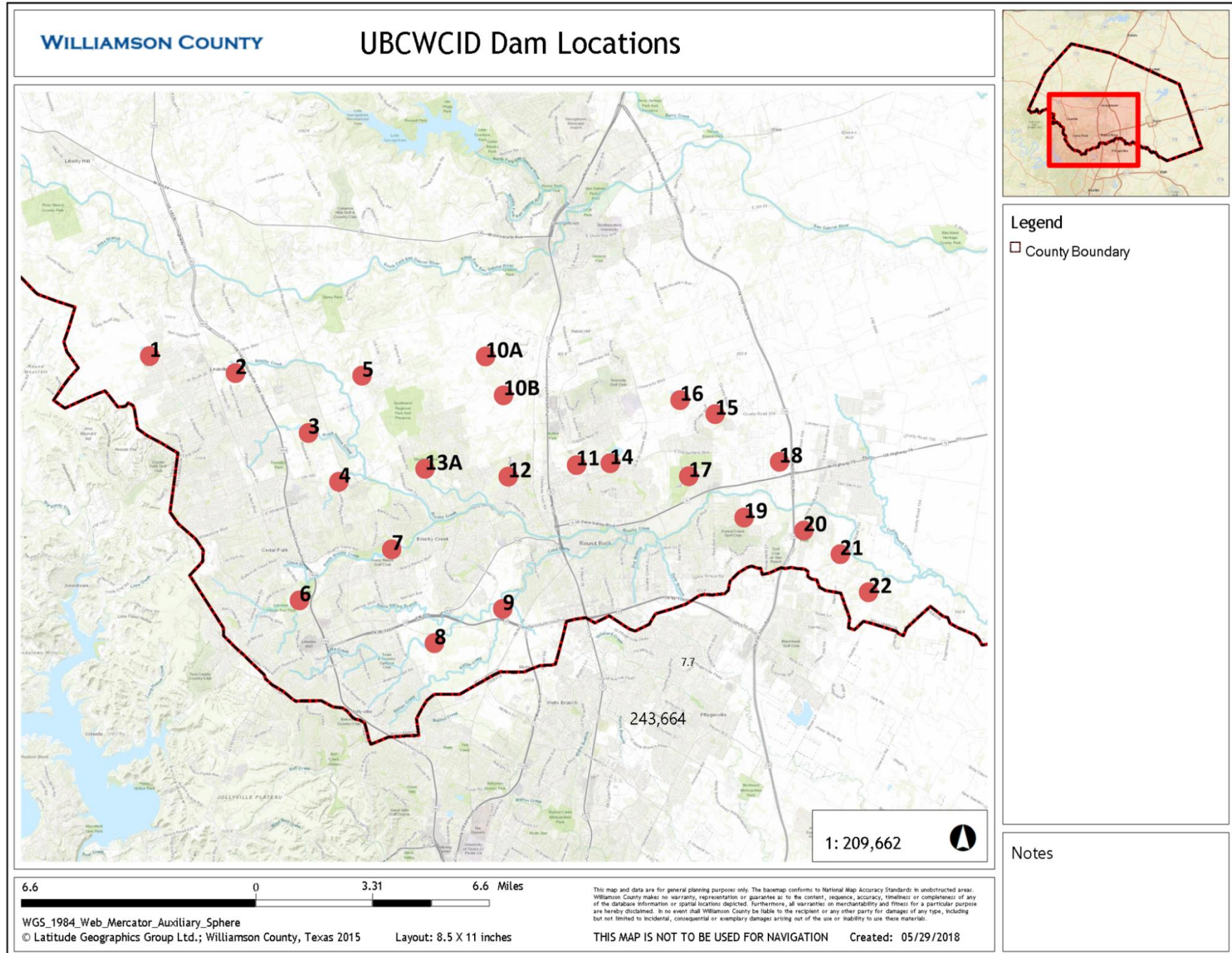


Figure 5.16 - General Location of Dams in the Round Rock Area with Municipal Boundaries Shown

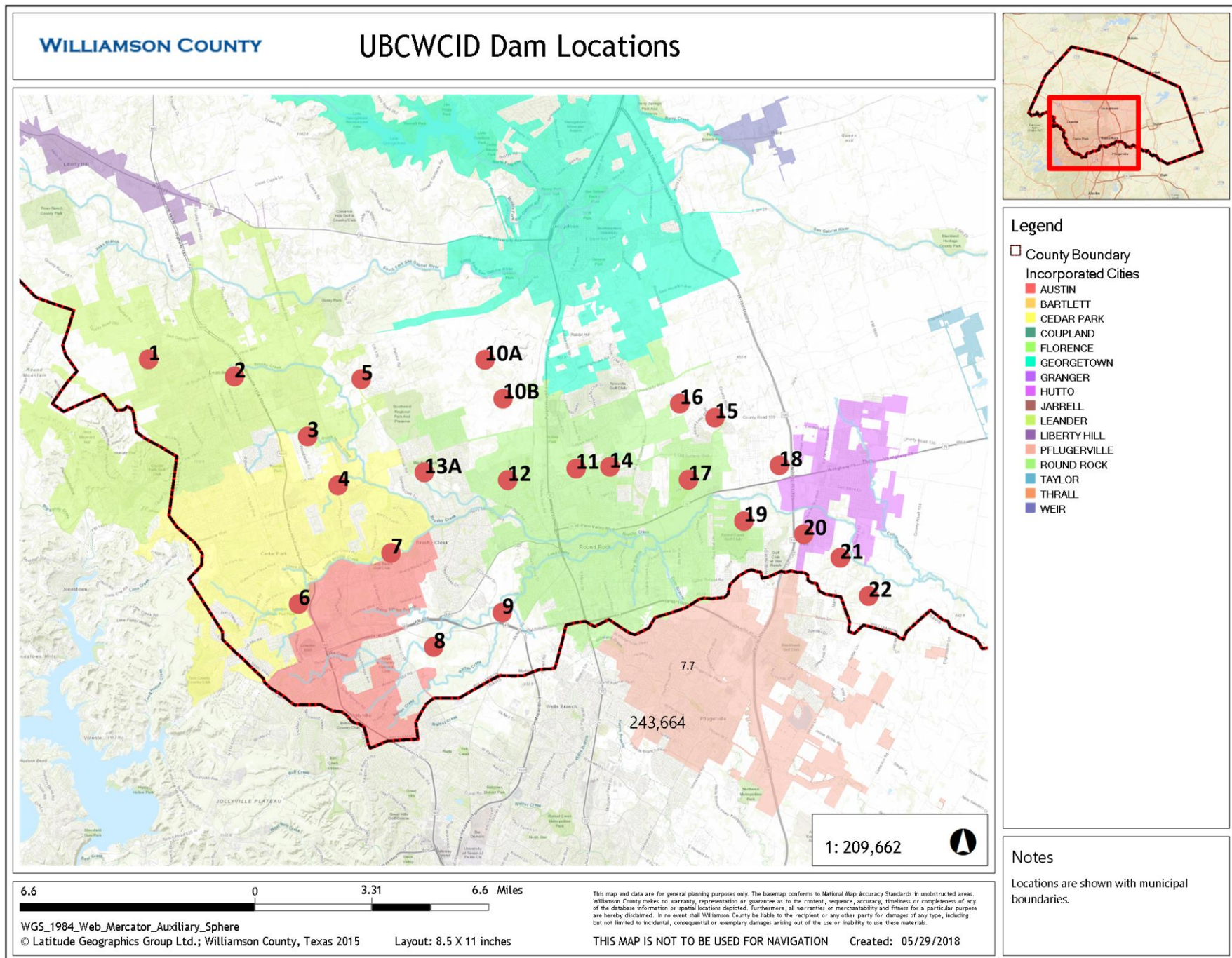


Figure 5.17 - General Location of Dams in the Round Rock Area with ISD Boundaries Shown

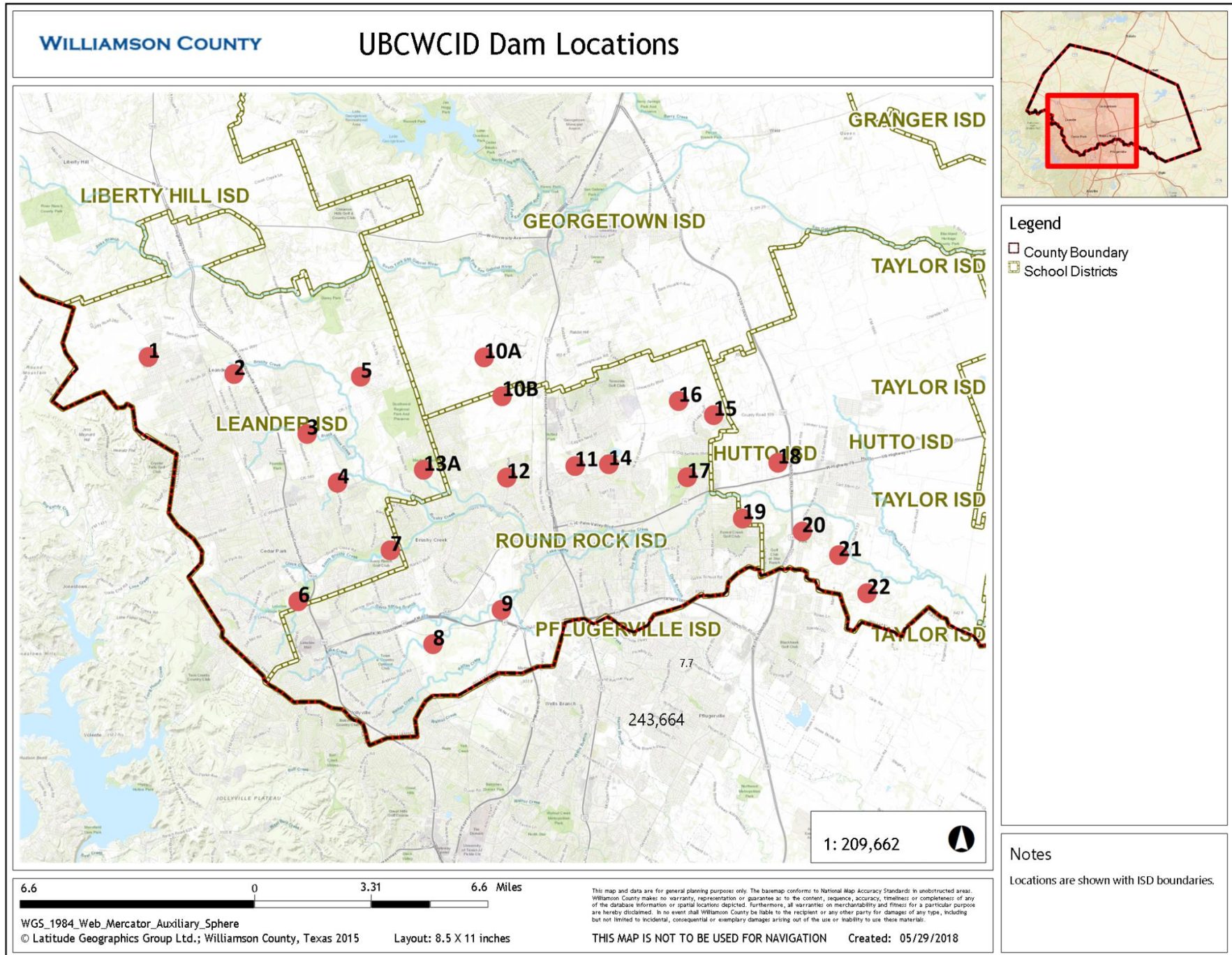
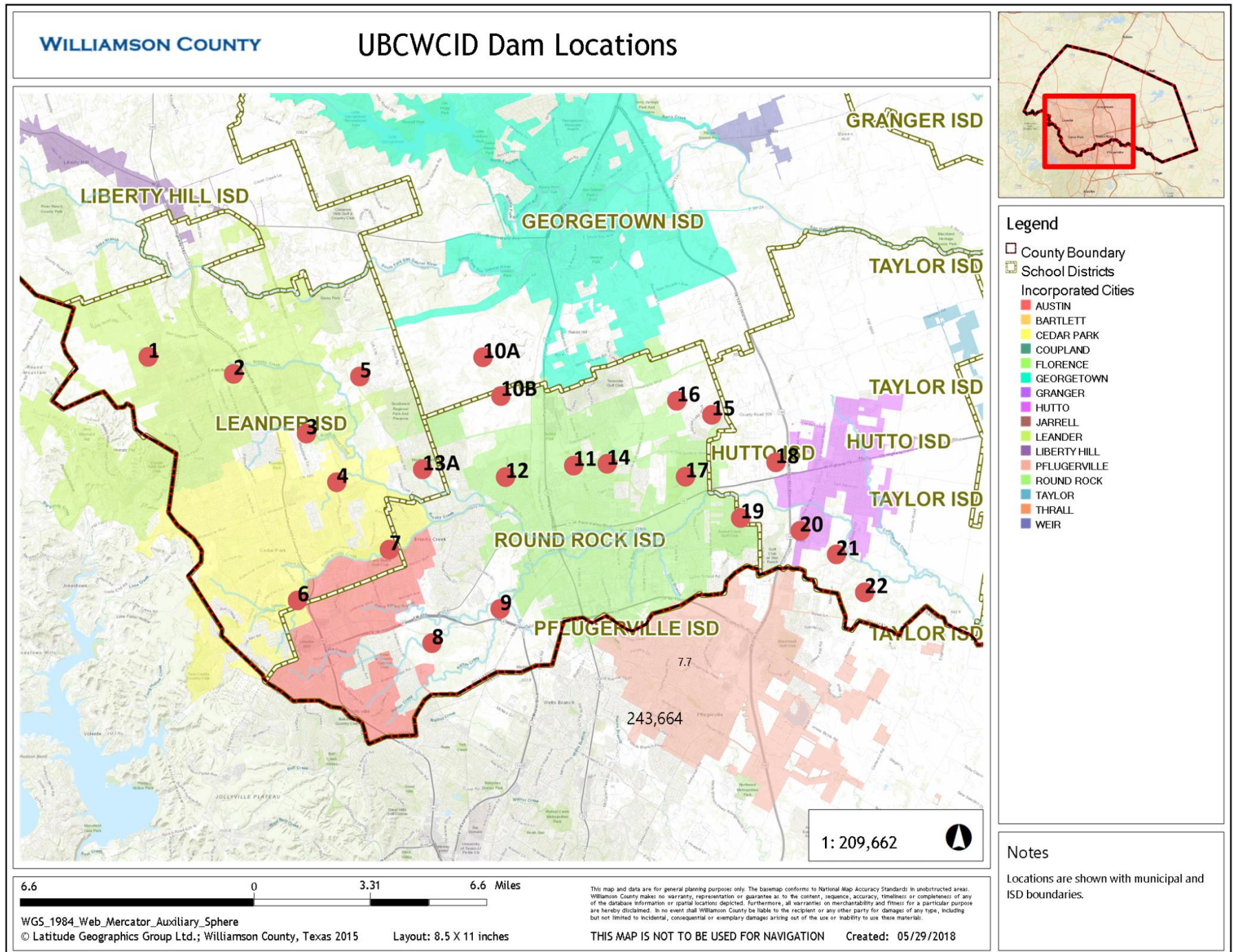


Figure 5.18 - General Location of Dams in the Round Rock Area with Municipal and ISD Boundaries Shown



Extent

The extent or magnitude of a dam failure event is described in terms of the classification of the damages that could result from a dam's failure; not the probability of failure. The National Interagency Committee on Dam Safety defines high hazard dams as those where failure or maloperation will cause loss of human life. Prior to 2009, high hazard dams were defined as those at which failure or maloperation would probably cause loss of human life. Dams classified as "significant" were those at which failure or maloperation probably would not result in loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or other significant damage. Low hazard potential dams are those at which failure or maloperation probably would not result in loss of human life but would cause limited economic and/or environmental losses. Losses would be limited mainly to the owner's property. Classifications for extent after 2009 are found in Table 5-18.

Table 5-18. Extent Classifications

HAZARD POTENTIAL CLASSIFICATION	LOSS OF HUMAN LIFE	DAM STORAGE CAPACITY
Low	None Expected	Less than 10,000 acre-feet
Significant	Probable (1 to 6)	Between 10,000 and 100,000 acre-feet
High	Loss of Life Expected (7 or More)	100,000 acre-feet or more

Total exposure was estimated by using 2010 Census population and local parcel data, in combination with the location and maximum storage capacity of each dam. GIS analysis was used to create a semicircle buffer in each anticipated inundation area. All 22 dams in the City of Round Rock planning area, which includes Round Rock ISD, have a capacity of less than 10,000 acre-feet. The potential classification is low and loss of human life is not expected in the event of a dam failure.

Previous Occurrence

There are about 80,000 dams in the United States today. Catastrophic dam failures have occurred frequently throughout the past century. Between 1918 and 1958, 33 major dam failures in the United States caused 1,680 deaths—an average of 42 deaths a year. From 1959 to 1965, nine major dams failed worldwide.

According to the TCEQ, there have been a total of 98 dam failures from 1970 to 2008 in the State of Texas. Of these, 13 were high hazard dams, 28 were significant, and 55 were low²⁶. One of the dams that failed is no longer classified and another has been removed from inventory.

There have been no previous occurrences of dam failure in the City of Round Rock, including Round Rock ISD.

²⁶ These dams total 96, as one of the dams that failed is no longer classified, while the other has been removed from inventory.

Probability of Future Events

No major dam failure has affected the City of Round Rock or Round Rock ISD. Therefore, failure of a major dam for the City or School District is an unlikely event, meaning that an occurrence is possible over the next ten years.

HAZARD VULNERABILITY

Overview

This section builds upon the information provided in Section 5 by providing a statement of vulnerability and assessing the potential impact and where available, losses, that can be expected to be caused by each identified hazard event.

This section focuses on the results of the vulnerability assessment, and is organized by hazard as listed below:

- Atmospheric
 - Hurricane Wind
 - Severe Thunderstorm
 - Tornado
 - Severe Winter Storm
 - Hail
- Hydrologic
 - Flood
 - Drought
- Other Natural Hazards
 - Wildfire
 - Extreme Heat
- Technological
 - Dam Failure

This risk assessment was conducted using two distinct methodologies: utilizing GIS-based analysis and statistical risk assessment methodology. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation, including historical occurrence information.

A GIS-based analysis was conducted for three hazards:

- Dam failure
- Hazardous materials release from fixed and mobile sites
- Oil and gas pipeline failure

A statistical risk assessment approach was used to analyze seven hazards:

Section 3 – Hazard Identification and Risk Assessment

- Drought
- Hail
- Severe thunderstorm

For each of the hazards profiled, a description of general vulnerability and impact statement are included. Impact statements are defined in Table 6-1.

Table 6-1. Impact Statements

Potential Severity	Description
Substantial	Multiple deaths Complete shutdown of facilities for 30 days or more. More than 50 percent of property destroyed or with major damage.
Major	Injuries and/or illnesses result in permanent disability. Complete shutdown of critical facilities for at least two weeks. More than 25 percent of property destroyed or with major damage.
Minor	Injuries and/or illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week.
Potential Severity	Description
	More than 10 percent of property destroyed or with major damage.
Limited	Injuries and/or illnesses are treatable with first aid. Minor quality of life lost. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property destroyed or with major damage.

Atmospheric Hazards

Hurricane Wind

Due to the City of Round Rock's Central Texas geographic location, this area of the State is less vulnerable to damage from hurricane winds and inland impact of coastal storms. The City of Round Rock is vulnerable to threats indirectly related to a hurricane or tropical storm event. Structures along the beachfront or in coastal areas face the primary impact of hurricane winds; however, hurricanes' secondary hazards can affect inland counties as well. The effects of a hurricane or tropical storm begin to diminish as it moves inland, although effects may be far-reaching. For example, winds alone from Hurricane Ike covered 120 miles, stretching well beyond the coastal area.



Hurricane-force winds can easily destroy poorly constructed buildings (none known) and portable school buildings (250). Debris such as signs, roofing materials, and small items left outside become extremely hazardous in hurricanes and. Extensive damage to trees, towers, and above-ground utility lines (from uprooted trees).

The impact from a hurricane on permanent structures in the City of Round Rock and Round Rock ISD is classified as "Minor". Portable buildings, radio towers, older water storage tanks have the potential for increased damage due to the extreme unlikelihood of a direct hit from hurricane winds.

Severe Thunderstorm

Vulnerability is difficult to evaluate since thunderstorms can occur at different strength levels, in random locations, and can create relatively narrow paths of destruction. Due to the randomness of this event, all existing and future structures, and facilities at the Round Rock ISD and in the City of Round Rock could potentially be impacted and remain vulnerable to possible injury and/or property loss from lightning and strong winds associated with severe thunderstorm.

Trees, power lines and poles, signage, portable school buildings (250), radio towers (1 located at Police Department and 1 located in Public Works), outdoor lighting, windows, garbage receptacles, and vehicles are vulnerable to severe winds associated with thunderstorm events. More severe damage involves windborne debris—in some instances, patio furniture and other lawn items have been reported to have been blown around by wind and, very commonly, debris from damaged structures in turn have caused damage to other buildings not directly impacted by the event.

A severe event can result in damage to personal property and public facilities from accompanying winds and lightning. Traffic disruptions, injuries and in rare cases, fatalities, can occur. Therefore, the impact of a thunderstorm event for the Round Rock ISD and the City of Round Rock is "Minor". The whole planning area is at risk for Thunderstorms and related damage.

Tornado

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities and populations in the City of Round Rock and Round Rock ISD are considered to be exposed to this hazard and could potentially be impacted.

The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Consequently, vulnerability of humans and property is difficult to evaluate since tornadoes form at different strengths, in random locations, and create relatively narrow paths of destruction. Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

- Portable School Buildings (250)
- Homes on crawlspaces (<50)
- Buildings with large spans, such as gymnasiums and factories (# unknown)



The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Most tornadoes are a few dozen yards wide and touchdown briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long. However, impact for tornado is “Minor” based on previous losses and potential risk.

Severe Winter Storm

During periods of extreme cold and freezing temperatures, water pipes can freeze and crack and ice can build up on power lines, causing them to break under the weight or causing tree limbs to fall on the lines. These events can disrupt electric service (Oncor, PEC, Georgetown Electric) for long periods.

Economic impact may be felt by increased consumption of heating fuel which can lead to energy shortages and higher prices. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

All populations are vulnerable to severe winter events. People and animals are subject to health risks from extended exposure to cold air. Elderly people are at greater risk of death from hypothermia during these events, icy roads (TXDOT controlled) may impede travel, and there are fewer neighbors to check in on the

Section 3 – Hazard Identification and Risk Assessment

elderly. According to the U.S. Center for Disease Control, every year hypothermia kills about 600 Americans, half of whom are 65 years of age or older. Buildings are vulnerable to power outages and internal water pipes bursting due to freezing both of which could Impact normal operations.

Despite the potential harm from a winter storm event, based on the level of risk and previous occurrences for winter storms in the City of Round Rock and Round Rock ISD, the impact for winter storm is “Minor”.

Hail

Damage from hail approaches \$1billion in the US each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles (except for the limited number of garaged Police and Fire vehicles), roofs of buildings and homes are most commonly damaged by hail.



Hail has been known to cause injury to humans, and occasionally has been fatal. Due to the lower level of risk for hail for the City of Round Rock and Round Rock ISD and previous damages, impact for hail is “Limited”.

Hydrologic Hazards

Flood



A property's vulnerability to a flood mostly depends on its location in, or in proximity, to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and can be repetitive loss structures.

Despite the growth the City of Round Rock experienced (US Census 2000), strict enforcement and ordinances have mitigated against greater flood losses due to extensive development. However, due to the unique terrain and storms in Central Texas, homes and businesses in the floodplain remain at risk of flash

flooding. During periods of heavy rainfall, homes and businesses located in some areas of the City are vulnerable to flooding.

Impact for flood for the City and ISD is "Substantial" as it could result in deaths due to cars and pedestrians entering flooded waterways. Risk to Critical Facilities is considered "minor" as only low-lying facilities such as the wastewater treatment plants are at risk during flooding due rainfall associated with an approximately 1% annual chance storms.

NFIP Participation

The City of Round Rock participates in the National Flood Insurance Program (NFIP). As part of continual compliance with the NFIP, the City has an Assigned Floodplain Administrator who ensures compliance with adopted ordinances regulating development in and around floodplains. The City of Round Rock regulates to a higher standard in both storm (1% ultimate) and freeboard than what is required by FEMA and NFIP.

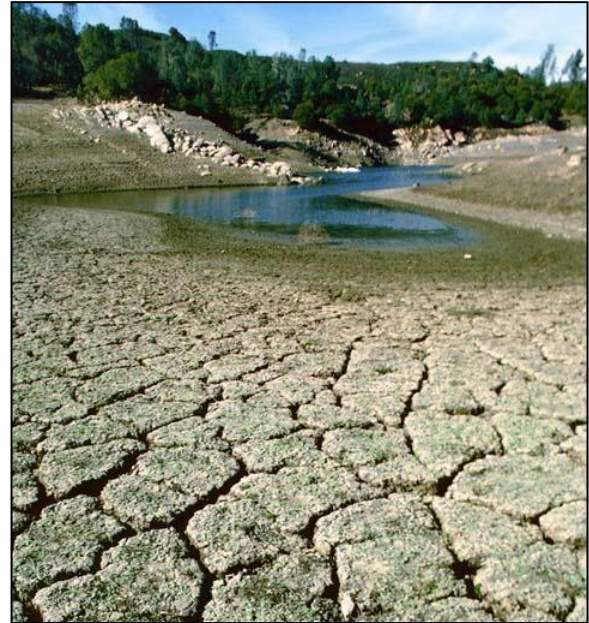
The City has been a leader to Floodplain Management for numerous decades. In 2014, the Texas Flood Management Association (TFMA) recognized the City of Round Rock's program with the City Floodplain Management Excellence Award. In 2016, the City's long-time Floodplain Administrator was acknowledged by TFMA as the Floodplain Administrator of the Year.

In Round Rock, 26 structures have been identified as repetitive loss properties, all of which are residential. Of those, 17 are insured under the NFIP. Almost all of these properties are located along Lake Creek, and most of them are in the western portion of the city.

Drought

Droughts are slow-onset hazards, but over time can have very damaging affects to crops, municipal water supplies, recreational uses, and wildlife. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Drought warnings are issued by the State Drought Preparedness Council, as directed by H.B. 2660, based upon input from NOAA, the Office of the State Climatologist, the U.S. Geological Service, the Texas Water Development Board, Texas Commission on Environmental Quality, and the Texas Agricultural Statistics Service. Warnings utilize five “levels of concern” and consider assessments of climatology, agriculture and water availability for each of 10 climatic regions of the state.



Although Round Rock is currently experiencing exceptional drought, on average, the impact for the City and Round Rock ISD is “Limited” as drought mainly affects crops and livestock (which minimally exist within the City) and not critical facilities.

Other Natural Hazards

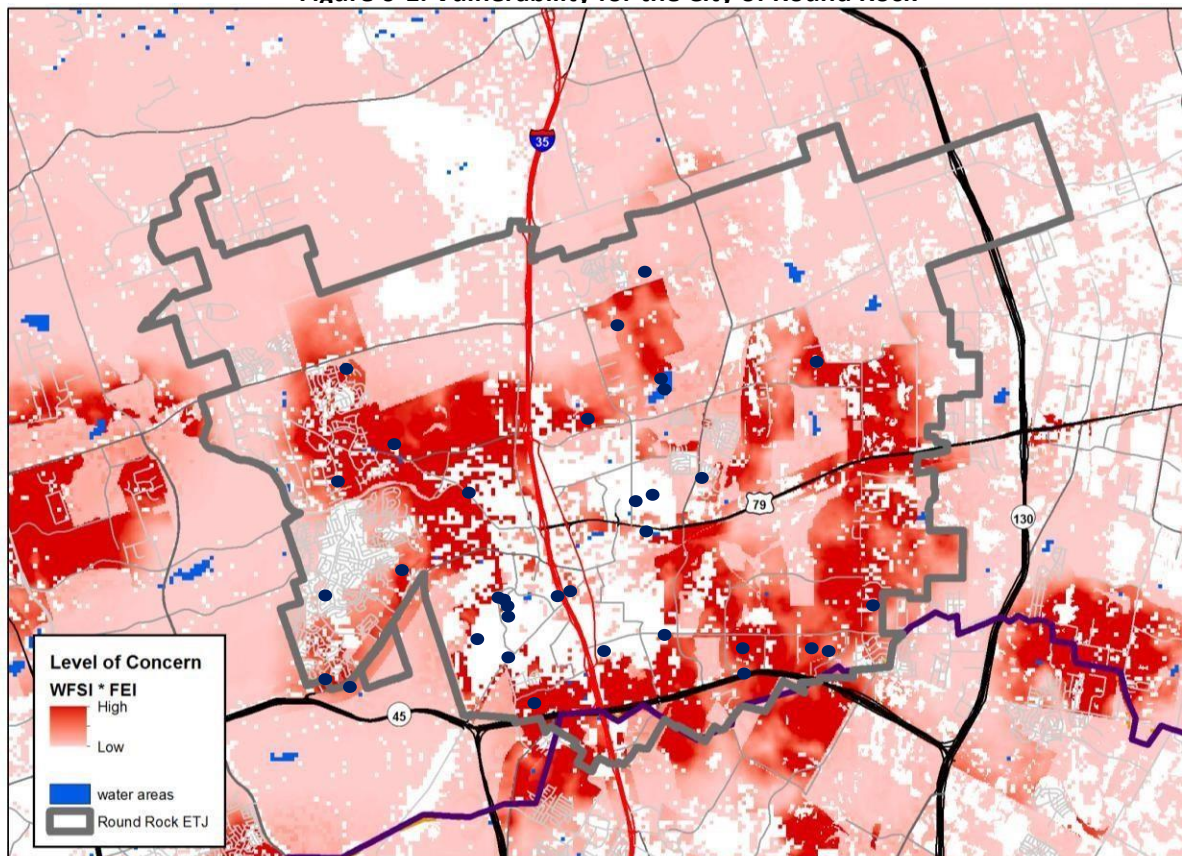
Wildfire

Periods of drought, dry conditions, high temperatures, and low humidity set the stage for wildfires.

Areas along railroads and people whose homes are in woodland settings in rural areas have an increased risk of wildfire.

The heavily populated, urban areas of the City of Round Rock are not prone to experiencing large, sweeping fires. Outside the City, in the unincorporated areas of the county, the greatest vulnerability is unoccupied buildings and open space that have not been maintained, as shown in Figure 6-1 below. Round Rock ISD school locations are identified on Figure 6-1 by dots, which some are located within areas with a high level of concern for wildfire.

Figure 6-1. Vulnerability for the City of Round Rock



Diminished air quality may be a result of wildfire. The smoke plumes from wildfires can contain potentially carcinogenic matter. Fine particles of invisible soot and ash that too small for the respiratory system to filter can cause immediate and possibly long term affects. The elderly or those individuals with

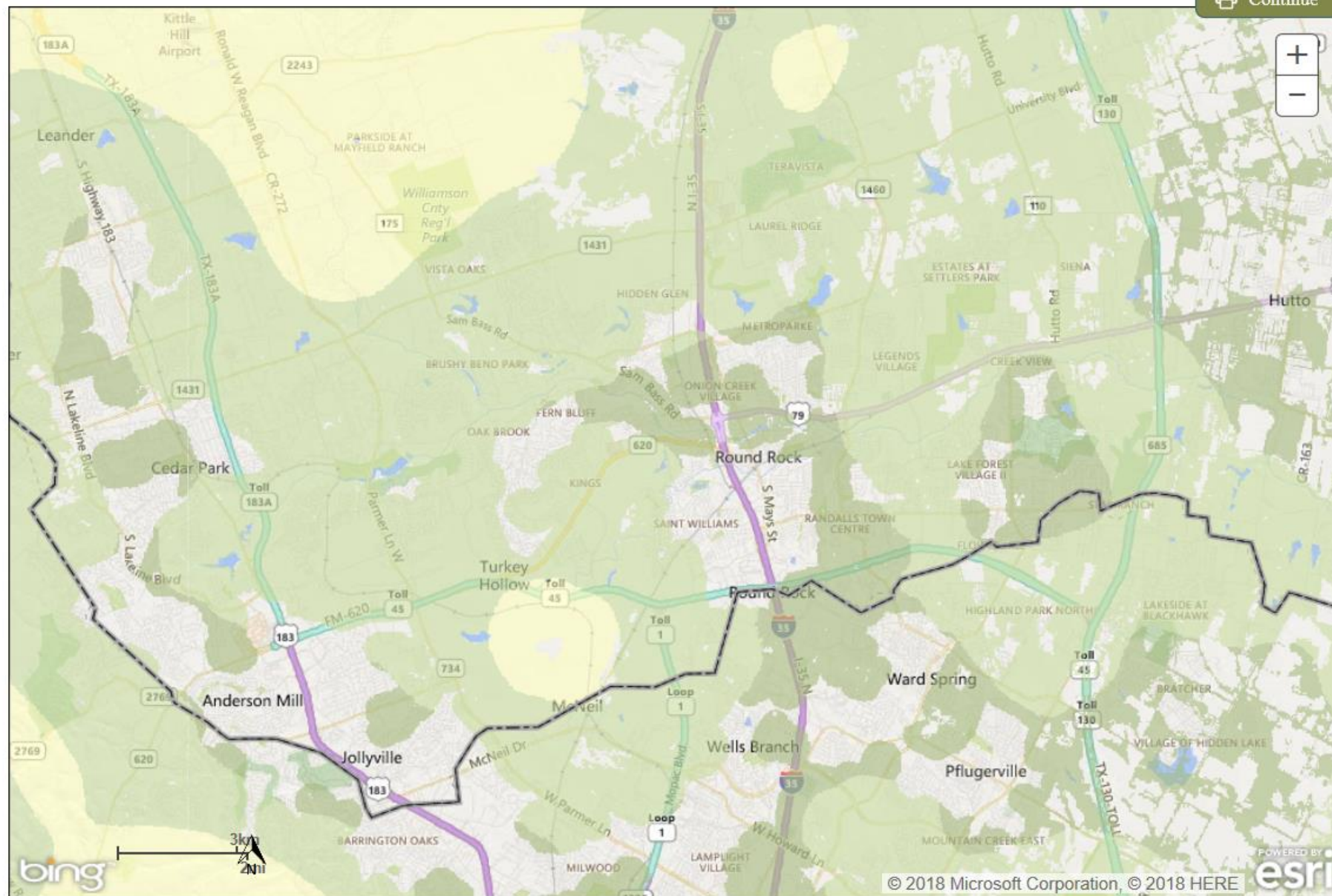
compromised respiratory systems may be more vulnerable to these effects.

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildfires since these conditions kill vegetation, creating a prime fuel source for these types of fires. The intensity of fires and the rate at which they spread are directly related to wind speed, temperature, and relative humidity.

Due to the potential for an occurrence and risk area, the impact for the City of Round Rock and Round Rock ISD is “Minor”.

Wildfire Threat for the Round Rock Area

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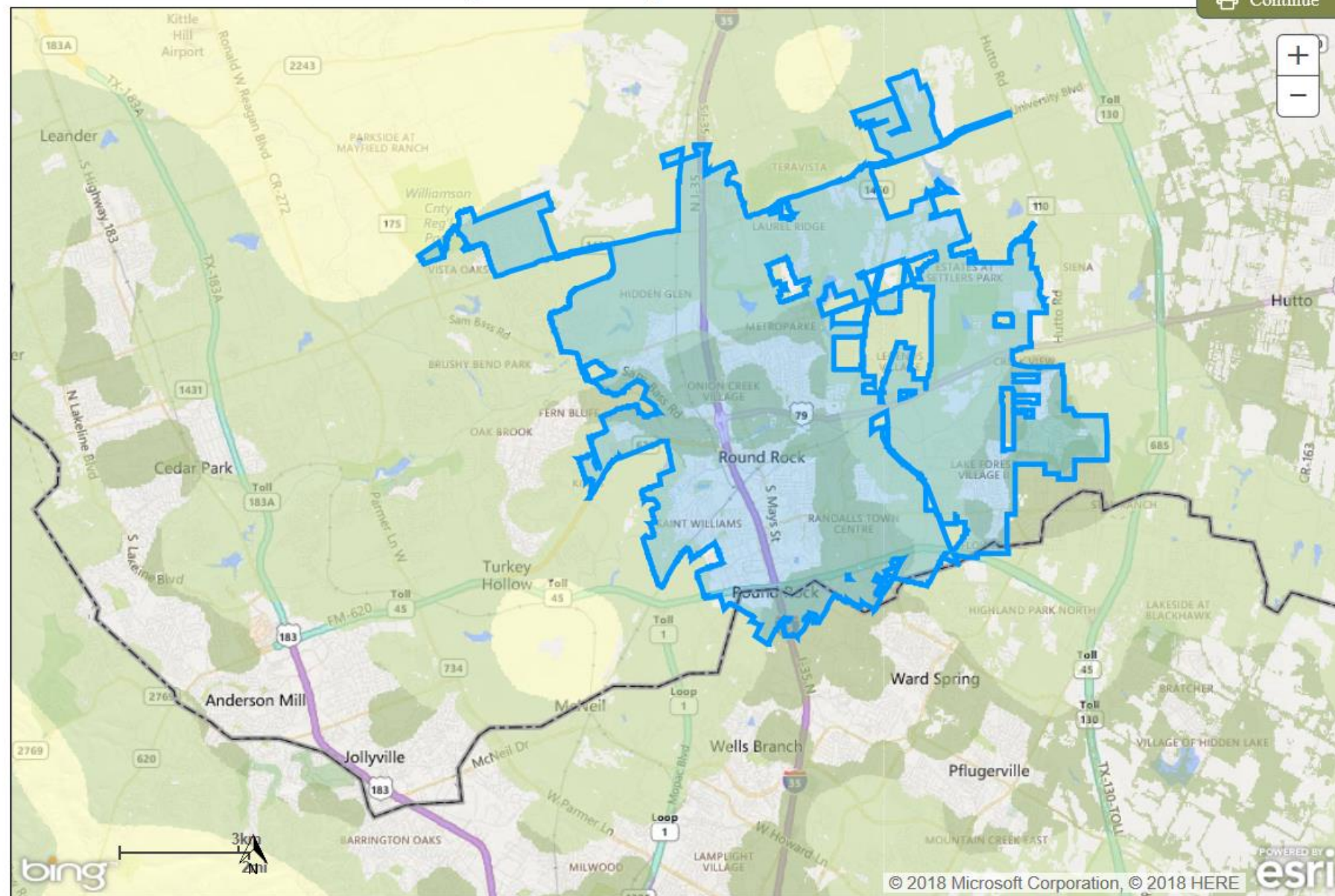
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<http://texaswildfirerisk.com>



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Wildfire Threat with Round Rock City Limit Overlay

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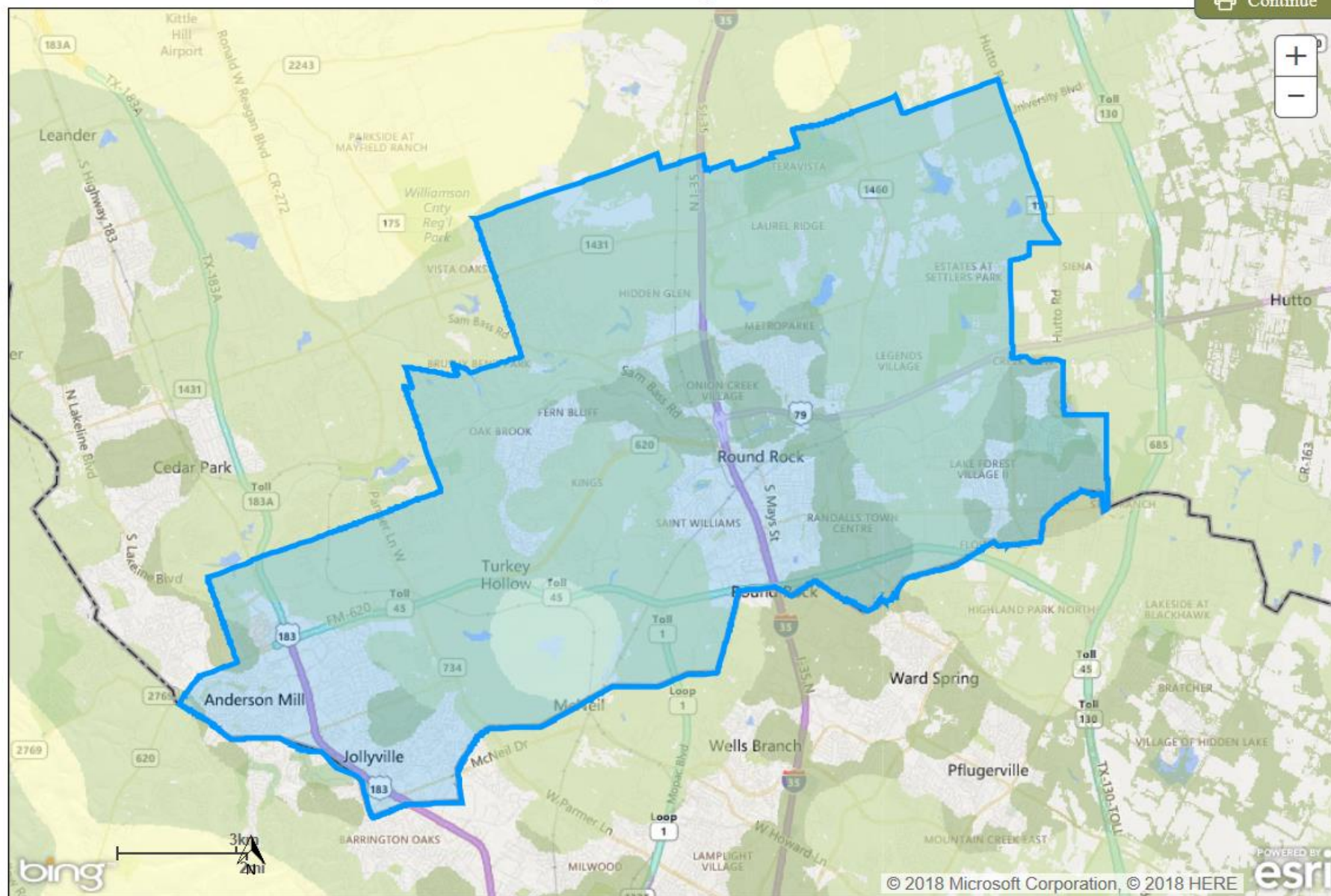
TEXAS WILDFIRE RISK ASSESSMENT PORTAL
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Wildfire Threat with Round Rock ISD Boundary Overlay

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Extreme Heat

Severe, excessive summer heat is characterized by a combination of exceptionally high temperatures and humidity. When these conditions persist over a period of time, it is called a heat wave.

Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens, particularly the elderly population or the infirmed that live within the City of Round Rock and cannot afford air conditioning or to run it on a regular basis. Students at Round Rock ISD are also susceptible as sporting events and practices are often held outside during early fall or late spring when temperatures are at the highest. The major human risks associated with severe summer heat include: heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and even heat stroke.

Because students (48,500) are exposed due to the timing of the school year, Round Rock ISD has developed a four-part Heat Plan. Each part is important to ensure that athletes in the Round Rock ISD are protected from the problems that can arise as coaches and athletes begin workouts during the hot summer months of August and September. The four parts are Education, Acclimation, Hydration, and Monitoring of Athletes for heat related problems.

The impact to the City of Round Rock and Round Rock ISD would be minor when an event occurs. Injuries or illnesses could result because of extremely high temperatures, but permanent disability and fatalities would not be expected.



Technological Hazard

Dam Failure

The following contains excerpts from the UBCWCID Emergency Action Plan (EAP)

Dam failure is a collapse or breach in a dam. While most dams have storage volumes small enough that failures have little or no repercussions, dams with large storage amounts can cause significant downstream flooding.

Dam failures in the United States typically occur from any one or combination of the following:

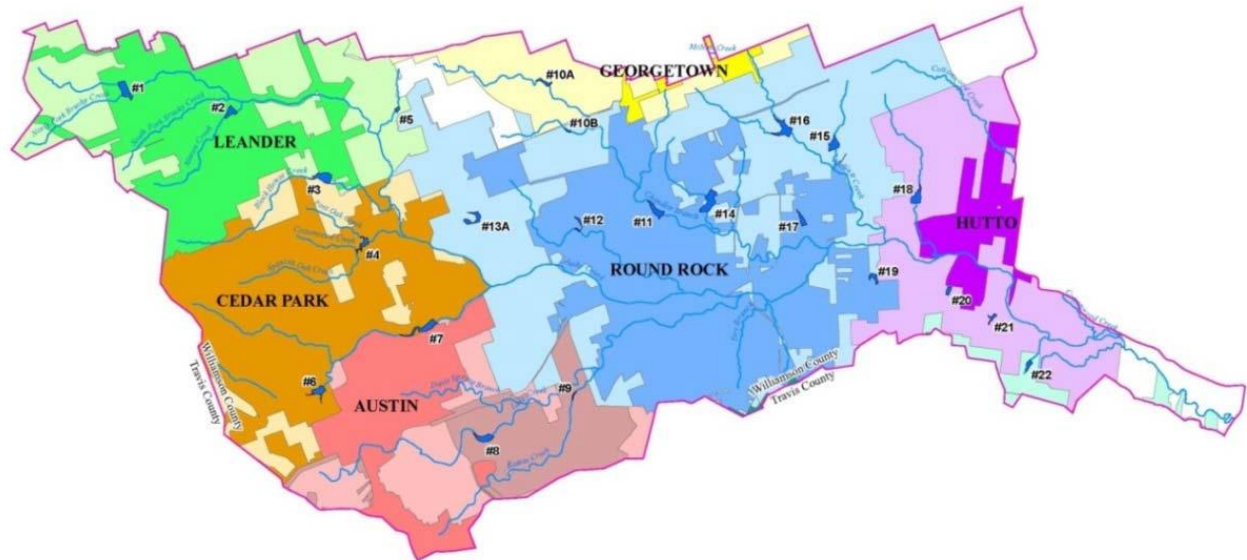
- Overtopping of the primary dam structure is often a precursor of dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of dam crest account for 34% of all dam failures.
- Foundation defects due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30% of all dam failures.
- Failure due to piping and seepage accounts for 20% of all failures according to the Association of State Dam Safety Officials (ASDSO). These are caused by internal erosion due to piping and seepage, erosion along hydraulic structures, such as spillways, erosion due to animal burrows, and cracks in the dam structure.
- Other causes of dam failure, approximately 16%, include deterioration and erosion, settlement and particularly relevant to the District: Auxiliary spillway headcutting.

Auxiliary Spillway Headcutting is visible by a noticeable discontinuity in flow surface within the auxiliary spillway. There are three phases:

1. Vegetal cover failure,
2. Concentrated flow erosion, and
3. Headcut advancement.

Historically, hundreds of dam failures have occurred throughout the U.S. according to ASDSO. These failures have caused immense property and environmental damages. As the nation's dams age and population increases, the potential for deadly dam failures grows.

It is unknown how many dam failures have occurred in the U.S., but they have been documented in every state. From January 1, 2005 through June 2013, State dam safety programs reported 173 dam failures and 587 "incidents" that, without intervention, would likely have resulted in dam failure.



The District is responsible for operation and maintenance of 23 Natural Resources Conversation Service (NRCS)-designed flood control structures within the UBC watershed in the Brazos River Basin of Williamson County, Texas. Most of the dams are located around the cities of Round Rock, Leander, Cedar Park, and Hutto. All 23 structures are classified as high-hazard dams by TCEQ and were constructed between 1958 and 1966 for the purpose of flood control.

2.7.2.1 TCEQ Dam Safety Program

The TCEQ Dam Safety Program (defined in the Texas Administrative Code Chapter 299) regulates both private and public dams in Texas. TCEQ staff periodically inspect dams that pose a high or significant hazard and makes recommendations and reports to dam owners to help them maintain safe facilities. TCEQ requires that dam owners of high hazard structures maintain, regularly inspect, and develop an EAP for each structure. There are specific requirements for performance of an exercise of EAP procedures every 5 years. TCEQ maintains guidelines for dam design, dam maintenance, dam hydrologic/hydraulic study, dam inspection, and EAP preparation.

2.7.3 Dam Failure Extent Location

The District has developed dam breach inundation maps for all 23 of the District's dams that estimate the flood extent associated with dam failure for scenarios defined by TCEQ guidelines. TCEQ is in the process of revising the State Design Flood for dams, a change that would potentially change definition of dam failure flood extents.

The following text serves to explain the extent as well as location of the dam failure associated with each Dam within the District. The information was pulled from the figures included in the EAP. The listed overtopped road is assumed to be the furthest downstream and is to show the extent of the resultant flooding, caused by the dam inundation. (i.e., if a Dam Breach causes a road east of Hutto to overtop, it is assumed that there is flooding and road closures from the point of the breach to the listed road overtopped. The Probable Max Flood Breach scenario is the breach associated with the largest probable flood that could occur in a given location. A Sunny Day scenario is a breach that occurs without flood conditions, and with only the breach only comprised of the Normal Pool behind each Dam.

- Dam 8 - PMF Breach inundation flood flows downstream, and at peak time of 50 minutes, overtops A.W. Grimes Blvd, by 9.7 feet. The Cap metro rail line, about 3200 feet downstream is overtopped prior to the breach. The Sunny Day Breach flood - No roads are overtopped in this scenario, and the breach is contained in the existing floodplain extents.
- Dam 9 - PMF Breach inundation flood flows downstream, and at peak time of 55 minutes, overtops A.W. Grimes Blvd, by 5.5 feet. Oak Ridge Drive, about 6000 feet downstream is overtopped prior to the breach. Sunny Day Breach - No roads are overtopped in this scenario, and the breach is contained in the existing floodplain extents.
- Dam 10A - PMF Breach inundation flood flows downstream, and at peak time of 195 minutes, overtops Old Settlers Blvd Downstream of Dam 11 by 1.9 feet. The railroad, located about 5000 feet downstream is overtopped prior to the breach. Sunny Day Breach - No roads are overtopped in this scenario, and the breach is contained in the existing floodplain extents.
- Dam 10B - PMF Breach inundation flood flows downstream, and at peak time of 45 minutes, overtops E Palm Valley Blvd by 4.3 feet. Sunny Day Breach – overtops IH-35 service road South by 0.3 feet, at peak flood time: 30 minutes, and is later contained within Dam 11. The flood first overtops the railroad 14 minutes after the breach.
- Dam 11 - PMF Breach inundation flood flows downstream, following Brushy Creek through Hutto, and at peak time of 167 minutes, overtops CR 129 east of Hutto by 5.2 feet. Old Settlers Blvd, about 2000 feet downstream is overtopped prior to the breach. The Sunny Day Breach flood overtops Harrell Road by 4.3 feet, at peak flood time: 205 minutes; and overtops Old Settlers Blvd at 32minutes.
- Dam 12 - PMF Breach inundation flood flows downstream, following Brushy Creek through Hutto, and at peak time of 110 minutes, overtops CR 129 east of Hutto by 7.7 feet. Old Settlers Blvd, about 1200 feet downstream is overtopped prior to the breach. The Sunny Day Breach flood is first overtopped at 9 minutes, then overtops by 1.3 feet, at peak flood time: 14 minutes.
- Dam 13A - PMF Breach inundation flood flows downstream, and at peak time of 50 minutes, overtops Tonkawa Trail, by 8.7 feet. No roads downstream of this crossing are overtopped. The Sunny Day Breach flood overtops Tonkawa Trail by 0.5 feet, at peak flood time: 90 minutes. This road first overtops at 85 minutes after breach.
- Dam 14 - PMF Breach inundation flood flows downstream, following Brushy Creek through Hutto, and at peak time of 73 minutes, overtops CR 129 east of Hutto by 5.2 feet. Old Settlers Blvd located 800 feet downstream overtops prior to the breach. The Sunny Day Breach flood overtops Harrell Road by 4.2 feet, at peak flood time: 132 minutes. The flood first overtops Old Settlers Blvd 10 minutes after the breach.
- Dam 15 - PMF Breach inundation flood flows downstream, following Brushy Creek through Hutto, and at peak time of 53 minutes, overtops CR 129 east of Hutto by 9.6 feet. Red Bud Lane located 2200 feet downstream overtops prior to the breach. The Sunny Day Breach flood overtops CR 110 by 1.2 feet, at peak flood time: 75 minutes. The flood first overtops Red Bud Lane within 28 minutes after the breach.
- Dam 16 - PMF Breach inundation flood flows downstream, following Brushy Creek through Hutto, and at peak time of 155 minutes, overtops CR 129 east of Hutto by 9.5 feet. CR 112 located 1500 feet

downstream overtops prior to the breach. The Sunny Day Breach flood overtops CR 110 by 2.6 feet, at Peak Flood time of 61 minutes. The flood first overtops CR 112 within 4 minutes after the breach.

- Dam 17 - PMF Breach inundation flood flows downstream, and at peak time of 21 minutes, overtops Red Bud Lane, by 15 feet. US 79 located 3000 feet downstream overtops prior to the breach. Sunny Day Breach – No roads are overtopped in this scenario, and the breach is contained in the existing floodplain extents.
- Dam 19 - PMF Breach inundation area flows downstream, following Brushy Creek through Hutto, and at peak time of 111 minutes, overtops CR 129 east of Hutto by 5.2 feet. CR 137 located over 3 miles downstream overtops prior to the breach. Sunny Day Breach – No roads are overtopped in this scenario, and the breach is contained in the existing floodplain extents along Brushy Creek.

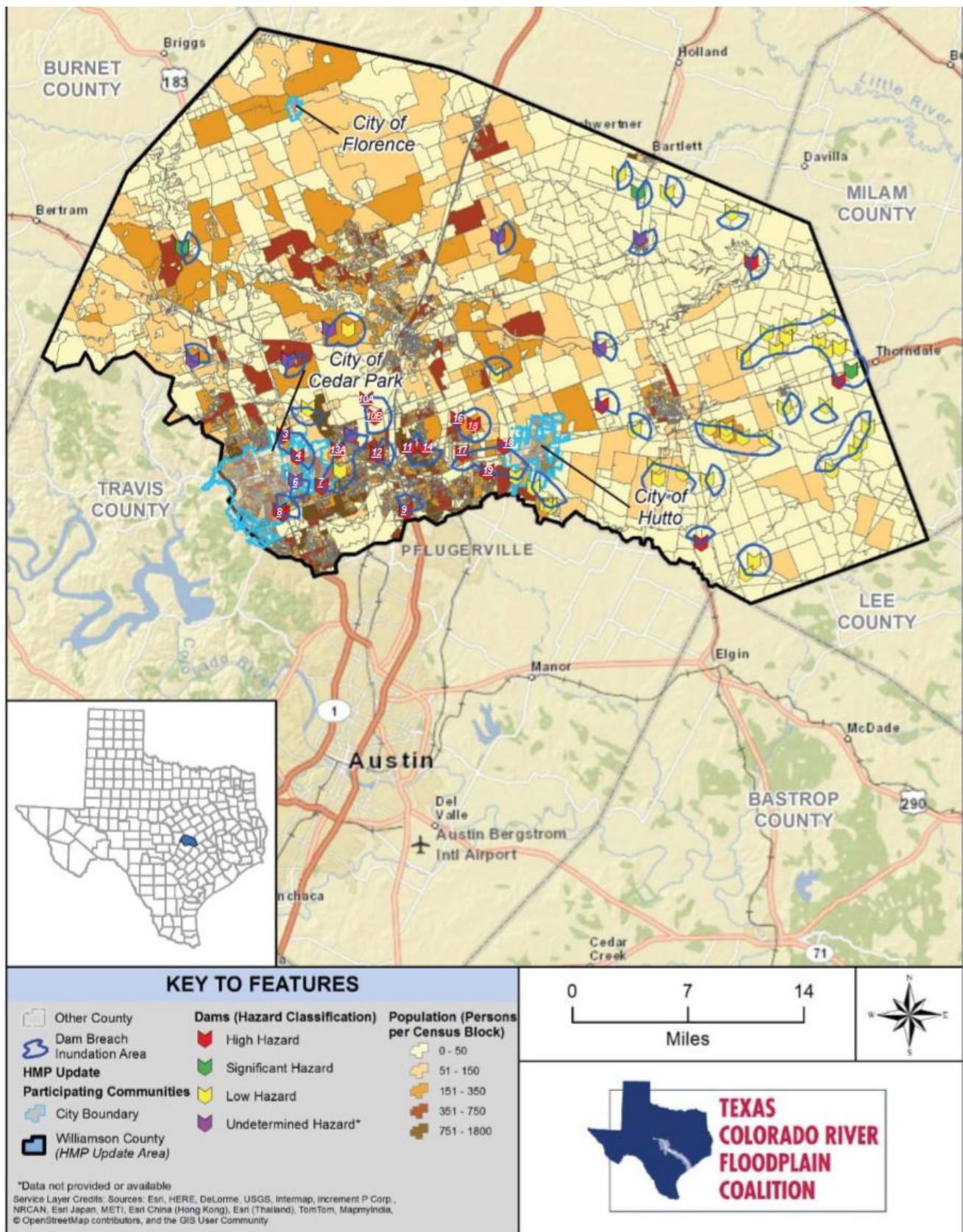


Figure depicting inundation areas for dams in the Round Rock area.

MITIGATION STRATEGY

Capability Assessment

The planning team reviewed existing regulatory capabilities and opportunities for establishing new capabilities and enhancing existing ones. Round Rock can improve its capabilities by: budgeting for mitigation actions and support, adopting ordinances and procedures to implement mitigation actions, adopting and implementing stricter building standards, approving the hiring and training of staff for mitigation activities, and approving mitigation action updates and additions to existing plans as new needs are recognized.

City of Round Rock and Round Rock ISD
Administrative, Financial, Regulatory, and Technical Abilities
Building Code Enforcement
Comprehensive Planning
Developing and Implementing Ordinances
Drought Contingency Planning
Emergency Management/Risk Management
Floodplain Management
General Budgeting
Grant Funding
LEPC Participation
Levying/Collecting Tax
Nuisance Abatement
Public Education
Subdivision
Zoning

Mitigation Goals

Previously the Planning team developed the mitigation strategy based on the results of the risk and capability assessments. At the Risk Assessment Workshop held in May 2016, and the Mitigation Workshop held in August 2016, Planning Team members refined the mitigation strategy for the Plan, changing the order of the mitigation goals. However, Team members chose to maintain the overall goal of reducing and eliminating the long-term risk of loss of life and property damage from the full range of disasters.

Goal 1 Protect public health and safety.

Objective 1. Maximize the utilization of the latest technology and best practices to provide adequate warning and communication during hazardous events.

Objective 1.2 Reduce the danger to, and enhance protection of, high risk areas during hazard events.

Objective 1.3 Maximize the utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

Goal 2 Protect new and existing properties.

Objective 2.1 Reduce repetitive losses to the National Flood Insurance Program (NFIP).

Objective 2.2 Use the most cost-effective approach to protect existing buildings and public infrastructure from hazards.

Objective 2.3 Enact and enforce regulatory measures to ensure that development will not put people in harm's way or increase threats to existing properties.

Goal 3 Build and support partnerships to enhance mitigation to continuously become less vulnerable to hazards.

Objective 3.1 Build and support local partnerships to continuously become less vulnerable to hazards.

Objective 3.2 Leverage existing community resources and explore additional opportunities to engage community members/volunteers to safeguard the community before, during and after a disaster.

Objective 3.3 Incorporate hazard mitigation concerns into City planning and budgeting processes.

Goal 4 Leverage outside funds for investment in local hazard mitigation.

Objective 4.1 Maximize the use of outside sources of funding for mitigation projects and programs.

Objective 4.2 Maximize participation of property and business owners in maintaining and

protecting their properties before, during and after hazardous events.

Objective 4.3 Maximize insurance coverage to provide financial protection against hazardous events.

Objective 4.4 Prioritize mitigation projects based on cost-effectiveness, and starting with those sites facing the greatest threat to life, health and property.

Goal 5 **Educate the whole community on the importance of mitigation, and the mitigation planning process.**

Objective 5.1 Heighten public awareness of natural and man-made hazards that threaten the Round Rock community.

Objective 5.2 Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards.

Objective 5.3 Advocate for and encourage the identification and adoption of appropriate hazard mitigation measures.

MITIGATION ACTIONS

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Mitigation actions presented in this plan update are activities designed to reduce or eliminate losses resulting from natural hazards. The 58 mitigation actions in the 2013-2018 HMP were reviewed to determine any additions, modifications or deletions that were needed. Additionally, the original mitigation actions were evaluated per FEMA’s direction to determine where consolidated goals may be appropriate. The update process resulted in the identification of 11 mitigation actions targeted for implementation by individual planning partners as listed in following Table MA1. A summary of disposition of the previous 58 mitigation actions is shown in Table MA2.

Revised mitigation action worksheets are being developed to represent the newly consolidated mitigation actions. The worksheets will provide more information for each recommended mitigation action, including the specific problem being mitigated, alternative actions considered, whether the action applies to existing or future development, the benefits or losses avoided, the department, position, office or agency responsible for implementing the action, the local planning mechanism, and potential funding sources. These worksheets will provide a tool for the planning partners to apply for grants or general funds to complete the mitigation action. An example worksheet the City of Round Rock is shown in Figure MA1. These worksheets will be kept on file with the City and RRISD as a valuable resource for annual progress updates and reports.

TABLE MA1												
MITIGATION ACTIONS DEVELOPED TO ADDRESS HAZARDS												
Action No.	Title	Dam/Levee Failure	Drought	Extreme Heat	Flood	Hail	Hurricane/Tropical Storms	Lightning	Tornado	Wildfire	Wind	Winter Weather
CITY OF ROUND ROCK & Round Rock ISD												
1	Education - All Hazards Mitigation	X	X	X	X	X	X	X	X	X	X	X
2	Purchase NOAA All Hazard Radios	X	X	X	X	X	X	X	X	X	X	X
3	Flood Mitigation - Detention (New/Modified)	X			X		X					
4	Flood Mitigation - Channel/Culvert Capacity	X			X		X					
5	Flood Mitigation - Protection and Removal	X			X		X					
6	Flood Mitigation - Modeling, Gauges & Data	X			X		X					
7	Flood Mitigation - Capital Equipment Purchase	X			X		X					
8	Drought Mitigation - Reuse and Alternative Sources		X							X		
9	Alternative Power - Generators & System Changes	X			X	X	X	X	X	X	X	X
10	Hail Protection - retrofit a/c units with hail guards					X						
11	Alternative Power - Generators & System Changes	X			X	X	X	X	X	X	X	X

TABLE MA1

MITIGATION ACTIONS DEVELOPED TO ADDRESS HAZARDS

Action No.	Title	Description	Mitigation Action Ranking	Action Type	Applicable Goals	Responsible Department	Estimated Cost	Potential Funding Sources	Timeline in Months	Benefit
CITY OF ROUND ROCK & ROUND ROCK ISD										
1	Education - All Hazards Mitigation	Educate residents and RRISD on how to mitigate their homes and facilities from these hazards via websites, public forums, blogs, etc.	3	EAP	3.1,3.2,4.2, 5.1,5.2,5.3	Emergency Mgmt & RRISD	< \$10,000	Budget	48	Medium
2	All Hazard Radios	Purchase NOAA All Hazard radios and disperse to residents and RRISD and target businesses for use for hazard events.	8	SIP	1.2, 3.1,3.2, 5.1,5.2,5.3	Emergency Mgmt & RRISD	< \$10,000	Budget, Donations/ Sponsors	36	Medium
3	Flood Mitigation - Detention (New/Modified)	Implement new or enlarge existing detention structures to reduce flooding.	1	SIP	1.3,2.1,2.2, 3.1,3.3,4.1, 4.4	Stormwater Engineering	>\$100,000	Budget, HMA, Partners	60	High
4	Flood Mitigation - Channel/Culvert Capacity	Enlarge channels and/or culverts to reduce flooding of roadways and properties.	2	SIP	1.1,1.3,1.4, 2.1,2.2, 4.4	Stormwater Engineering	>\$100,000	Budget, HMA, Partners	60	Medium
5	Flood Mitigation - Protection and Removal	Armor channel banks, flood-proof structures and/or remove infrastructure or structures to reduce flooding impacts.	4	SIP NSP LPR	1.1, 1.3, 1.4 2.1, 2.2, 3.3, 4.1, 4.3, 4.4	Stormwater Engineering	>\$100,000	Budget, HMA,	60	High
6	Flood Mitigation - Modeling, gauging and Data	New and updated models and a network of gauges and/or cameras will be used for real-time and predictive mapping.	5	SIP LPR	1.2, 1.3, 3.1, 3.1, 4.1, 4.4 5.1,5.2,5.3	Stormwater Engineering	>\$100,000	Budget, HMA, Partners	48	High
7	Flood Mitigation - Capital Equipment Purchase	A variety of large equipment can help minimize flooding by keeping drainage ways and culverts free of debris and limbs.	9	SIP NSP	1.1,1.3,1.4, 2.1,2.2, 4.4	Stormwater Operations	>\$100,000	Budget, HMA,	24	Medium
8	Drought Mitigation - Reuse and Alternative Sources	Evaluate and implement expansion of the City reuse water system and alternative water sources to ease drought impacts.	6	SIP	1.2, 4.1, 4.2, 4.4, 5.1, 5.2, 5.3	Utilities & Environmental Services	>\$100,000	Budget, HMA, TWDB	60	Medium
9	Alternative Power - Generators and System Changes	Adjust wiring to equipment as needed to allow for newly purchased generators as temporary or permanent installations.	7	SIP	1.1, 1.3, 1.4	General Svc, Parks RRISD facilities	<\$100,000	Budget, HMA,	60	High

TABLE MA1

MITIGATION ACTIONS DEVELOPED TO ADDRESS HAZARDS

Action No.	Title	Description	Mitigation Action Ranking	Action Type	Applicable Goals	Responsible Department	Estimated Cost	Potential Funding Sources	Timeline in Months	Benefit
10	Hail Protection - retrofit A/Cs with hail guards	Add hail guards to existing A/C to minimize damage and downtime due to storms.	2	SIP	1.1, 1.3, 1.4	Facilities	>\$100,000	Budget, HMA,	60	Medium
CERT	Community Emergency Response Team		HUD	U.S. Department of Housing and Urban Development						
CFPP	Community Flood Protection Plan		LPR	Local Plans and Regulations						
CIKR	Critical Infrastructure and Key Resources		N/A	Not Applicable						
COOP	Continuity of Operations		NFIP	National Flood Insurance Program						
CRS	Community Rating System		NSP	Natural Systems Protection						
CWPP	Community Wildfire Protection Plan		NWS	National Weather Service						
EAP	Education and Awareness Programs		SIP	Structure and Infrastructure Project						
EOC	Emergency Operations Center		THIRA	Threat Hazard Identification Risk Analysis						
FEMA	Federal Emergency Management Agency		TWDB	Texas Water Development Board						
FIRM	Flood Insurance Rate Maps		USACE	U.S. Army Corps of Engineers						
GIS	Geographic Information System		USDA	U.S. Department of Agriculture						
HMA	Hazard Mitigation Assistance		WHP	Wildfire Hazard Potential						

TABLE MA2
Disposition of Previous Mitigation Actions

Item No.	Action Item	Keep	Remove	Amend/ Update	Owner	Comments
1	Acquire warning system for high-hazard dams.		X		n/a	UBWCID is dam owner
2	Develop public awareness program for notifying residents in inundation zone downstream of high-hazard dams to seek safe shelter in the event of dam failure.		X		SW	Consolidated under 'Education - All Hazards Mitigation'
3	Acquire inflatable Zumro structure (860 square feet) and 4 HVAC units to provide cooling/heating shelters for weather related events to house first responders/public as needed.		X		OEM	Project Complete
4	Increase measures in place for tree trimming program to protect critical infrastructure from overhanging and dead limbs that pose a threat when downed during severe thunderstorm events.		X		PW	City no longer pursuing project
5	Install bullet-resistant material on entry doors; reinforce bench with fiberglass composite bulletproof panels; extend bench shelving to create added distance between judge and defendant; consider reinforcing walls of courtroom.		X		Muni Court	Project Complete
6	Install bullet resistant materials in pertinent areas of Municipal Court lobby.		X		Court	Project Complete
7	Install outdoor warning system to alert residents, park visitors to seek shelter in the event of severe weather and in the event of other disasters or need for public alert.		X		PARD	City no longer pursuing project
8	Retrofit Emergency Operation Center and 911-Emergency Communications supporting areas of building to provide additional electrical backup and backup generator in the event of severe weather or disaster events.		X		OEM	Consolidated under ' Alternative Power - Generators & System Changes'
9	Purchase point of distribution (POD) 2 inflatable Zumro structures (860 square feet, and may be zipped together) and 8 HVAC units as needed for distribution of pandemic-like and S&S Strategic national stockpile.		X		OEM	Project Complete
10	Construct safe shelter as part of Capital Area Shelter HUB plan shelter in proposed Sports Complex to house residents in the event of local disasters and house evacuees from coastal communities during hurricane events.		X		OEM, CM	City no longer pursuing project
11	Purchase and install Flood early warning system and modeling stream gauge system for area waterways.		X		OEM, SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
12	Upgrade existing program to notify residents within the community in the event of train derailment and/or transportation disaster involving chemical spills or chemical/radiological release.		X		OEM	Consolidated under 'Education - All Hazards Mitigation'
13	Purchase equipment and install gates and video surveillance equipment for area low-water crossings.		X		OEM, SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
14	Work with area businesses through the local Chamber to develop disaster preparedness and public awareness plans related to pandemic outbreak.		X		OEM	Consolidated under 'Education - All Hazards Mitigation'
15	Work with area businesses through the local Chamber to develop disaster preparedness and public awareness plans related to Fuel Pipeline Breach.		X		OEM	Consolidated under 'Education - All Hazards Mitigation'
16	Promote the use of rain barrels and pressurized rainwater harvesting to conserve water usage during extreme heat and drought conditions.		X		U&ES	Consolidated under 'Drought Mitigation - Reuse and Alternative Sources'
17	Work with area businesses through the local Chamber to develop disaster preparedness and public awareness plans for area wildfires during extreme heat and drought.		X		OEM, CM	Consolidated under 'Education - All Hazards Mitigation'

TABLE MA2
Disposition of Previous Mitigation Actions

Item No.	Action Item	Keep	Remove	Amend/ Update	Owner	Comments
18	Enhance security for Emergency Operations Center Facility. Funding will enable enhancement of security for the City's Emergency Operations Center and the Police Department building in which it is housed, including state-of-the-art intrusion detection and video surveillance equipment to secure and protect this critical facility.		X		OEM	Project Complete
19	Construct new bridge to pass the 1% storm, bridge approximately 10-feet high by 450-feet long would be required.		X		n/a	City no longer pursuing project
20	Install an early warning system consisting of water level gauge(s), flashing signage, and new barricades to warn drivers of road overtopping before they enter Memorial Park.		X		SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
21	Implement stream bank stabilization for the segment of Brushy Creek immediately downstream of Georgetown Street to just upstream of the west water treatment plant.		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
22	Improve culverts under Old Settlers Boulevard at Chandler Branch and the associated channel improvements.		X		SW	Consolidated under 'Flood Mitigation - Channel/Culvert Capacity'
23	Improve channel associated with tributary of Chandler Branch that runs through from Eagles Nest St. to Settlement Dr. Approximately 3400 feet will be improved.		X		SW	Consolidated under 'Flood Mitigation - Channel/Culvert Capacity'
24	Develop updated hydrologic and hydraulic models of the Chandler Branch Tributary 16C Watershed and evaluating alternate methods for providing flood protection to the inundated structures.		X		SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
25	Buy out multiple properties within the Chandler Branch Watershed to significantly reduce the flood hazard risk in the area. Area will be converted to permanent green space and land use planning initiative.		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
26	Construct second access way to the Rhodes Subdivision portions of which are at risk for flooding.		X		SW	Problem resolved - project not necessary
27	Develop updated hydrologic and hydraulic models of the Chandler Branch Watershed and evaluating alternate methods and provide flood protection to the potentially inundated structures.		X		SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
28	Develop a comprehensive citywide remediation plan related to discharge incidents into the drainage system or waterways.		X		SW	City no longer pursuing project
29	Stabilize stream bank and associated hydraulic modeling for the segment of Dry Branch Tributary 1 from Dell Way downstream to Greenlawn Boulevard.		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
30	Install multiple box culverts in Dry Branch Tributary 5 under Gattis School Road and associated channel improvements. The project consists of installing four (4) 10' x 4' box culverts.		X		SW	Consolidated under 'Flood Mitigation - Channel/Culvert Capacity'
31	Reduce risk and stabilize stream bank for the segment of Dry Branch Tributary 5 from the existing stock pond to the confluence of the Dry Branch main stem (approximately 500 LF).		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
32	Develop Public Awareness and Education Campaign-Turn Around Don't Drown.		X		SW	Consolidated under 'Education - All Hazards Mitigation'
33	Strengthen local NFIP Program and implement Floodplain Education Campaign regarding risk of building in/near floodplain areas and availability and promotion of NFIP flood insurance policies.		X		SW	Consolidated under 'Education - All Hazards Mitigation'
34	Replace six culverts with a bridge to prevent roadway overtopping. Gilleland Creek flows under Greenlawn Blvd and will require associated channel improvements.		X		SW	Consolidated under 'Flood Mitigation - Channel/Culvert Capacity'
35	Develop updated hydrologic and hydraulic models of the Lake Creek Tributary 2 Watershed and evaluate and implement alternate methods for providing flood protection to the inundated structures.		X		SW	Project Complete

TABLE MA2
Disposition of Previous Mitigation Actions

Item No.	Action Item	Keep	Remove	Amend/ Update	Owner	Comments
36	Modify WCID SCS Dam #9 for increased flood control of the Lake Creek Watershed and improving protection levels for downstream structures.		X		SW	Consolidated under 'Flood Mitigation - Detention (New/ Modified)'
37	Elevate and/or flood-proof structures to reduce costs from flood hazards. Assist owners with increased cost of compliance associated with elevating and flood-proofing structures currently located within the Lake Creek Watershed.		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
38	Purchase multiple repetitive loss structures within the Lake Creek Watershed to significantly reduce the flood hazard risk in the area.		X		SW	Consolidated under 'Flood Mitigation - Protection and Removal'
39	Update hydrologic and hydraulic models of the Lake Creek Watershed and evaluating and implement alternate methods for providing flood protection to the inundated structures.		X		SW	Consolidated under 'Flood Mitigation - Detention (New/ Modified)'. In progress.
40	Develop updated hydrologic and hydraulic models of the Onion Branch Watershed and evaluating and implement alternate methods for providing flood protection to the inundated structures.		X		SW	Models Complete. Project consolidated under 'Flood Mitigation - Channel/Culvert Capacity'.
41	Assimilate Williamson County stakeholder's stream and rain gauge data for historical and real-time event analysis within a centralized interface.		X		SW	Consolidated under 'Flood Mitigation - Modeling, gauges & Data'
42	Purchase a vacuum truck to remove debris, materials from inlets, drains, and culverts.		X		n/a	Truck purchased this year.
43	Generate appropriate updates to the Flood Insurance Rate Map to formalize Base Flood Elevations for Zone A areas within the City of Round Rock.		X		SW	Project Complete
44	Relocate approx. 100-200 feet of 6" high-pressure gas line. Remove 280 feet of 54" CMP pipe and replace with pre-cast Box Culvert and all the associated street repairs.		X		SW	Conflict resolved with box culvert project
45	Redevelop and improve Ground Water Capacity.		X		U&ES	Consolidated under 'Drought Mitigation - Reuse and Alternative Sources'
46	Reduce risk to infrastructure and Waste Water Lift Station Enhancement		X		U&ES	Project Complete
47	Develop new water reuse irrigation systems and/or expand upon existing water reuse system.			X	U&ES	Consolidated under 'Drought Mitigation - Reuse and Alternative Sources'
48	Develop and maintain education program for residents on increasing defensible space around structures to reduce potential wildfire.		X		Fire	Consolidated under 'Education - All Hazards Mitigation'
49	Identify vacant land in areas at high risk to wildfire and develop trails or preserve space from development.		X		Fire, PW, OEM	covered in the CWPP
50	Implement and expand StormReady program to increase public awareness of extreme weather events to reduce property damage and save lives.		X		OEM	Consolidated under 'Education - All Hazards Mitigation'
51	Through the NOAA StormReady program, work with schools, nursing homes, and businesses to purchase weather radios with stand-alone receivers in order to receive weather alerts and warnings.			X	OEM	renamed Purchase NOAA All Hazard Radios (consistent w/WilCo) also covered in 'Education - All Hazards Mitigation'
52	Purchase emergency generator and back-up equipment for major intersections to provide power to traffic lights and controls in the event of severe weather.		X		PWs	Consolidated under 'Alternative Power - Generators & System Changes'
53	Identify suitable shelter locations and develop procedures for notifying citizens of available shelters in the event hurricane winds threaten the area.		X		OEM	Project Complete
54	Procure and distribute Excessive Heat Events Guidebooks and 'Beat the Heat' pamphlets from NWS to provide best practices for saving lives during heat waves in urban areas.		X		OEM	Consolidated under 'Education - All Hazards Mitigation'
55	Purchase generators to supply back-up power to HVAC systems in the event of power failure in cooling and heating emergencies.		X		OEM	Consolidated under 'Alternative Power - Generators & System Changes'

TABLE MA2
Disposition of Previous Mitigation Actions

Item No.	Action Item	Keep	Remove	Amend/ Update	Owner	Comments
56	Acquire cell phone software/apps. enabling instructors/ISD employees' to access real-time weather alerts during outside sports activities, during / after school and weekend school activities.		X		ISD	Project Complete
57	Retrofit A/C units with hail guards as infrastructure protection.	X			ISD	Partially Complete.
58	Purchase generators for emergency back-up for light and HVAC systems in the event of power failure in heating and cooling emergencies.	X			ISD	

Mitigation Action Worksheet

Please complete one worksheet per action with as much detail as possible, using the instructions beginning on page 3 and examples provided by FEMA.

Name of Jurisdiction: City of Round Rock Mitigation Action #: 3

Mitigation Action Title: Flood Mitigation – Detention (New/Modified)

Assessing the Risk	
Hazard(s) addressed: (check all that apply)	<input type="checkbox"/> All Hazards <input type="checkbox"/> Coastal Erosion <input type="checkbox"/> Dam/Levee Failure <input type="checkbox"/> Drought <input type="checkbox"/> Earthquake <input type="checkbox"/> Expansive Soils <input type="checkbox"/> Extreme Heat <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Hail <input checked="" type="checkbox"/> Hurricanes/Tropical Storms <input type="checkbox"/> Land Subsidence <input type="checkbox"/> Lightning <input checked="" type="checkbox"/> Thunderstorm <input type="checkbox"/> Tornado <input type="checkbox"/> Wildfire <input type="checkbox"/> Wind <input type="checkbox"/> Winter Weather
Specific problem being Mitigated (describe why action is needed)	The Upper Brushy Creek WCID (UBCWCID) 2016 regional Flood Protection Plan (FPP) identified the Lake Creek Area as the high combination of stakeholder-defined risk factors: resource value (e.g. 60-80 for residences, 100 for public facility), and depth of flooding in the 2%, 1%, and 0.2 % Annual Chance floods.
Evaluation of Potential Alternatives	
Alternatives Considered (name of project and reason for not selecting)	1. Take no action (unacceptable risk persists)
	2. Expand associated stream channels (tight easements, environmental damage)
	3. Expand flood pools of existing dams (ineffective, dams fully control relevant floods)
Action/Project Intended for Implementation	
Describe how action will be implemented (main steps involved)	Construct series of projects from the FPP to provide added detention, and to control uncontrolled flows. Action includes additional planning for project optimization, and for public education and awareness programs. Projects B-1 (Dam 102) and A-17 (Dam 101) are new flood control structures on mapped tributaries. Project A-19 provides controls to uncontrolled flows from a quarry area.
Action/Project Type	<input checked="" type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure Project <input type="checkbox"/> Natural Systems Protection <input checked="" type="checkbox"/> Education and Awareness Programs
Applicable Goals/Objectives (refer to list of goals/objectives)	<input type="checkbox"/> Goal #1 <input type="checkbox"/> Goal #2 <input type="checkbox"/> Goal #3 <input checked="" type="checkbox"/> Goal #4 <input checked="" type="checkbox"/> Goal #5 <input type="checkbox"/> Goal #6 Objective: 1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 4.5, 5.1, 5.4
Applies to existing or future development	<input type="checkbox"/> Existing Development <input type="checkbox"/> Future Development <input checked="" type="checkbox"/> Both Existing and Future Development <input type="checkbox"/> Not Applicable
Describe benefits (losses avoided)	<input checked="" type="checkbox"/> Life Safety <input checked="" type="checkbox"/> Damage Reduction <input type="checkbox"/> Other Describe
Estimated Cost	<input type="checkbox"/> < \$10,000; <input type="checkbox"/> \$10,000 to \$100,000; <input checked="" type="checkbox"/> > \$100,000 Other Amount: Dam 102 ~\$10M; Dam 101 ~\$30M
Plan for Implementation	
Responsible Department	Utilities and Environmental Services - Stormwater
Local Planning Mechanism (check all that apply)	<input checked="" type="checkbox"/> Capital Improvement Plan <input checked="" type="checkbox"/> Comprehensive Plan <input type="checkbox"/> Building Code <input type="checkbox"/> Ordinance <input type="checkbox"/> Other:
Potential Funding Sources	FEMA Hazard Mitigation Funding, City funding, UBCWCID funding
Timeline for Completion	<input checked="" type="checkbox"/> Short Term (1-5 yrs.) <input type="checkbox"/> Long Term (>5 yrs.) <input checked="" type="checkbox"/> Ongoing
Reporting on Progress	
Status/Comment	<input type="checkbox"/> Not Started <input checked="" type="checkbox"/> In-progress <input type="checkbox"/> Delayed <input type="checkbox"/> Completed <input type="checkbox"/> No Longer Required Comment:
Completed by: (name, title, phone #)	Alysha Girard, PE Stormwater Programs Manager 512-218-6646

PLAN MAINTENANCE

Plan Maintenance Procedures

The following is an explanation of how the City of Round Rock and Round Rock ISD will implement the plan, and continue to evaluate and enhance it over time. Continual public involvement is also addressed. The sustained hazard mitigation planning process consists of three main parts:

- Incorporation
- Monitoring and Evaluation
- Continued Public Involvement

Incorporation

The City and Round Rock ISD will be responsible for further development and implementation of mitigation action plans. Each action has been assigned to a specific department within the City and District. The following describes the process by which Round Rock will incorporate elements of the mitigation plan into other planning mechanisms as well.

Process of Incorporation

Once the Plan is adopted, the City and District will implement actions based on priority and the availability of funding. The City already implements policies and programs to reduce loss to life and property from hazards. The mitigation actions developed for this Plan build upon that effort and will be implemented through other program mechanisms where possible.

The potential funding sources listed for each identified action may be used when the jurisdiction begins to seek funds to implement actions. An implementation time-period or a specific implementation date has been assigned to each action as an incentive for completing each task and gauging whether actions are implemented in a timely manner.

Since the last implementation for the hazard mitigation plan, the City of Round Rock has added more public education training, PSA's (which won an award), placed bright yellow signs at all parks that say "When Thunder Roars Go Indoors" with the NWS information below; transportation has enhanced their planning coordination to manage storm drain/creek debris before and during storms to mitigate flooding.

Round Rock will continue to integrate the implementation of their mitigation actions with other plans and policies such as construction standards and emergency management plans and ensure that these actions, or proposed projects, are reflected in other planning efforts.

The Round Rock ISD has used the mitigation plan to determine best allocations for generator purchases for the facilities and for public education purposes.

The School District's Safety and Risk Management Division will continue to integrate implementation of their mitigation actions through a comprehensive District-wide safety, crisis response and risk management program by utilizing expertise and incorporating plans and policies of related departments.

Upon formal adoption of the Plan, Team Members will work to integrate hazard mitigation strategies into existing plans as indicated in Table 9-1 below.

Table 9.1 - Process of Incorporation by Planning Mechanism

Planning Mechanism	Incorporation of Plan
Grant Applications	The Plan will be consulted by Planning Team Members whenever grant funding is sought for mitigation projects. If a project is not in the Plan, an amendment may be necessary to include the action in the Plan.
Annual Budget Review	Various departments and key personnel that participated in the planning process will review the Plan and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought or mitigation actions that will be undertaken according to the implementation schedule of the specific action
Regulatory Plans	Currently Round Rock has regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, Disaster Recovery Plans, Economic Development or Evacuation Plans. The Plan will be consulted when city departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place.
Capital Improvement Plans	Round Rock has a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.

Planning Mechanism	Incorporation of Plan
Comprehensive Plans	Round Rock and the Round Rock ISD have comprehensive Plans in place. Since comprehensive plans involve developing a unified vision for a community, the mitigation vision and goals of the Plan will be reviewed and added as appropriate (and approval from the Comprehensive Plan Committee) in the development or revision of a Comprehensive Plan.
Floodplain Management Plans	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 5 of this plan discussing the people and property at risk to flood, will be reviewed and revised when Round Rock updates their management plans or develop new plans.

Incorporating the Adopted Resolution by Quasi-Jurisdictional Team Members

Since Round Rock ISD is a quasi-jurisdictional entity, upon FEMA approval, the ISD will post the item on the agenda for a regular board meeting, at least 72 hours in advance. A presentation and discussion regarding ISD's participation in the Plan will take place. Following discussion, a board member would move to approve or adopt, there would be a second, and the recommendation to adopt the Plan would be approved by majority vote, and reflected in the minutes. The approved Plan will then be posted on the ISD's website.

Monitoring and Evaluation

Periodic revisions of the Plan are required to ensure that the goals, objectives, and mitigation action plans are kept current. More important, revisions may be necessary to ensure that the Plan is in full compliance with federal regulations and state statutes. This portion outlines the procedures for completing such revisions and future updates for the City and District.

Monitoring

Designated Hazard Mitigation Plan Team Members are responsible for yearly monitoring of components of the hazard mitigation plan that pertain to their jurisdiction. The City of Round Rock will oversee the monitoring and evaluation process. The City will organize annual meetings to discuss the implementation of the mitigation actions and to provide feedback on the progress of the Plan. The office responsible for each jurisdiction is included in Table 9-2.

Round Rock ISD will also monitor the Plan on an annual basis. The Director of Safety/Risk Management will oversee the monitoring and evaluation process that coincides with meetings of the School Board. At these meetings, the Round Rock ISD team will discuss which actions included in the Plan may be implemented through federal, state or local funding sources. The District will also discuss whether new actions should be included in the Plan.

Evaluation

At the beginning of each fiscal year, Team Members for the City and District will meet once to evaluate the hazard mitigation plan. As part of the evaluation process, the jurisdictions will assess any changes in risk, determine whether implementation of mitigation actions is on schedule or if there are any implementation problems (such as technical, political, legal or coordination issues), and reflect changes in development. The District will look at changes in student population and potential growth, including the need for new facilities. The City will evaluate land development or programs that affect mitigation priorities in their respective departments. On an annual basis, Team Members for the District and City will identify any needed changes in the Plan based upon their evaluation activities. This yearly evaluation process will help determine if any further updates are necessary.



Table 9.2 – Chair Person/Office Responsible for Evaluation and Monitoring of the Plan

Jurisdiction	Office Responsible
The City of Round Rock	Emergency Management
Round Rock Independent School District	Hazard and Risk Management

Plan Amendments

At any time, minor technical changes may be made to the Plan to keep it updated. However, any material changes to the mitigation actions or major changes in the overall direction of the Plan or the policies contained within it will be subject to formal adoption by the governing bodies of participating jurisdictions (Round Rock ISD and the City of Round Rock).

At the end of the comment period, the proposed amendment and any comments will be forwarded to the governing bodies of the City of Round Rock and Round Rock ISD. If no comments are received from the reviewing parties within the specified review period, this will also be noted. Planning Team Members will then review the proposed amendment and comments received and vote to accept, reject, or amend the proposed change. Upon ratification, the amendment will be transmitted to TDEM.

In determining whether to recommend approval or denial of a plan amendment request, the following factors will be considered:

- Errors or omissions made in the identification of issues or needs during the preparation of the Plan;
- New issues or needs that were not adequately addressed in the Plan; and
- Changes in information, data, or assumptions from those on which the Plan was based.

Five (5) Year Review

The Plan will be thoroughly reviewed by the Planning Team every five years to determine whether there have been any significant changes in the area that may necessitate changes in the types of mitigation actions proposed.

As with the development of this Plan, the Homeland Security and Emergency Management Division for The City of Round Rock and the Safety and Risk Management Office for Round Rock ISD will oversee the review process. Each year, Team Members will meet by conference call or presentation, to discuss the implementation of the mitigation actions and provide updates.

New developments in identified hazard areas, an increased exposure to hazards, disaster declarations, the increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the content of the plan.

Following the five-year review, any revisions deemed necessary will be summarized and utilized according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the revised plan will be submitted to TDEM for final review and approval in coordination with FEMA.


Continued Public Involvement

Input from the public was an integral part of the preparation of this Plan and will continue to be essential as the Plan grows and changes. Changes or suggestions to this Plan will require opportunities for the public to make its views known.

This plan will be available on the City of Round Rock Web Site (<http://www.roundrocktexas.gov>) where officials and the public are invited to provide ongoing feedback. Copies of the plan also will be kept for public review in the offices of the City and ISD.

Further, if necessary, the City can designate voluntary citizens or willing members of the private sectors as members of the Planning Team as well as utilize local media to notify the public of any maintenance or periodic review activities taking place.

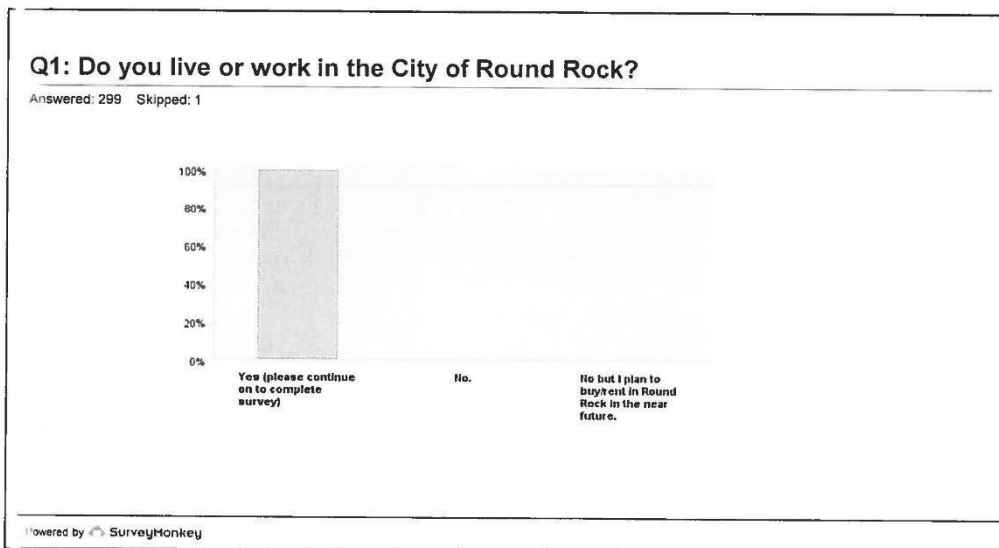
5/3/2017



Community Preparedness and Hazards Survey 2017

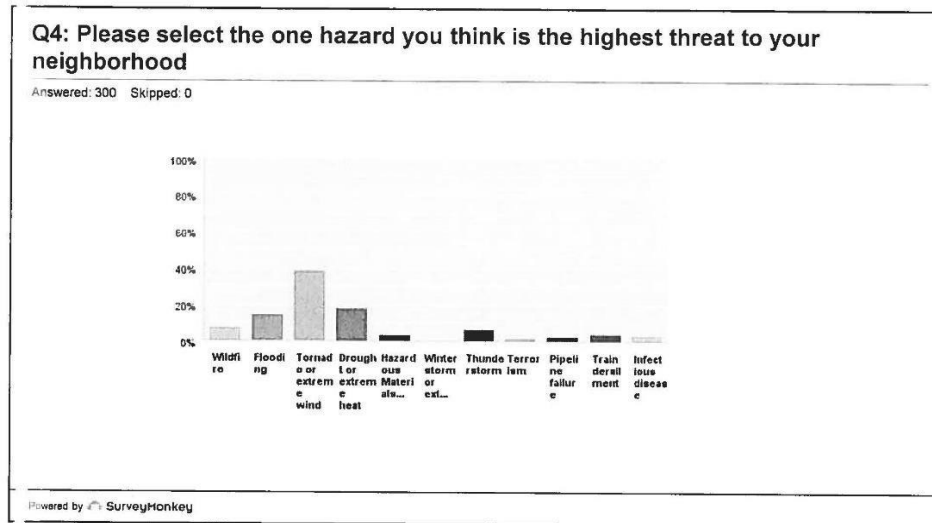
Monday, March 13, 2017

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APPENDIX A: Hazard Mitigation Survey Results 2017

5/3/2017



Q4: Please select the one hazard you think is the highest threat to your neighborhood

Answered: 300 Skipped: 0

Answer Choices	Responses	
Wildfire	7.33%	22
Flooding	14.67%	44
Tornado or extreme wind	38.33%	115
Drought or extreme heat	18.00%	54
Hazardous Materials release	3.33%	10
Winter storm or extreme cold	0.33%	1
Thunderstorm	6.67%	20
Terrorism	1.33%	4
Pipeline failure	2.33%	7
Train derailment	4.00%	12
Infectious disease	3.67%	11
Total		300

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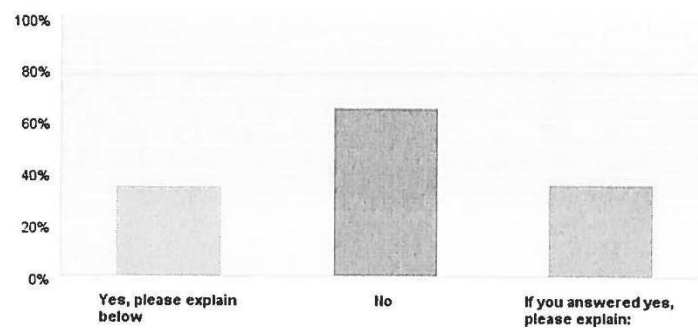
Q5: Please select the one hazard you think is the second highest threat to your neighborhood


Answer Choices	Responses	
Wildfire	11.74%	35
Flooding	13.09%	39
→ Tornado or extreme wind	19.80%	59
Drought or extreme heat	15.44%	← 45
Hazardous Materials release	5.37%	16
Winter storm or extreme cold	1.01%	3
Thunderstorm	15.10%	← 45
Terrorism	4.70%	14
Pipeline failure	2.35%	7
Train derailment	7.38%	22
Infectious disease	4.03%	12
Total		299

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Q6: Have you ever experienced or been impacted by a disaster?

Answered: 299 Skipped: 1

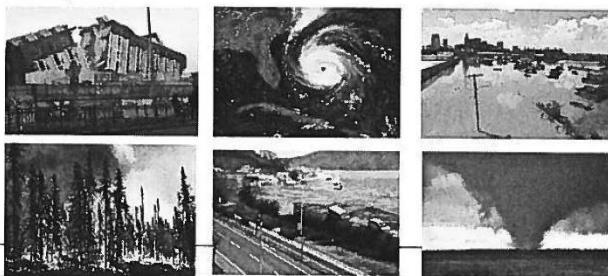


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Question 6 Responses

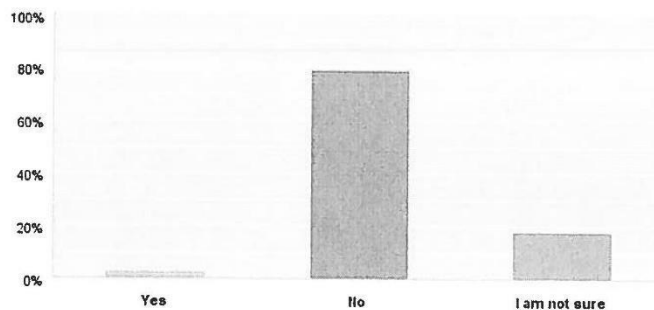
1993 Des Moines Iowa flooding
Tornado (while I was a kid)
Survivor of the 1979 "Terrible Tuesday" tornadoes
Flooding in Albany
Bastrop fires
Louisiana hurricanes
Hurricane Hugo, NC
Flooding in 1992 and 2008 Iowa
Hailstorm the size of baseballs broke out all car windows
Tornadoes Kansas City, lack of warning system here is my concern
Coastal hurricanes
Loss of electricity for several days in Canada
Jarrell tornado and 1988 train derailment
9 hurricanes, 3 floods and 10 earthquakes
Earthquake in CA and tornado in KS
Tornadoes in northern Indiana
Hurricane Celia in Corpus
TS Hermine flooding 2010
Fire and hail
Mudslide with homes and lives lost in CA
Hurricanes in Florida
Train derailment
Tornado in Illinois

Blizzards in Colorado
Tornado, Tsunami and earthquake
War torn country (Vietnam) had to escape by boat
Texas floods, hurricanes and wildfires
Earthquake, fire and structural collapses in CA
Hurricane Sandy in NY
Flooding and hurricanes in Houston
Hail, tornado and straight-line winds in the Midwest
Hurricanes in Katy, TX and Youngsville, LA

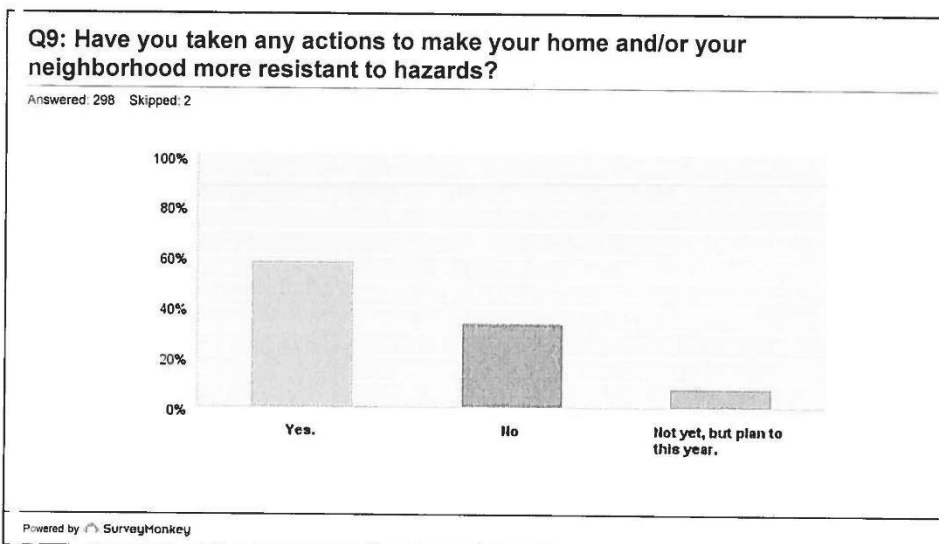
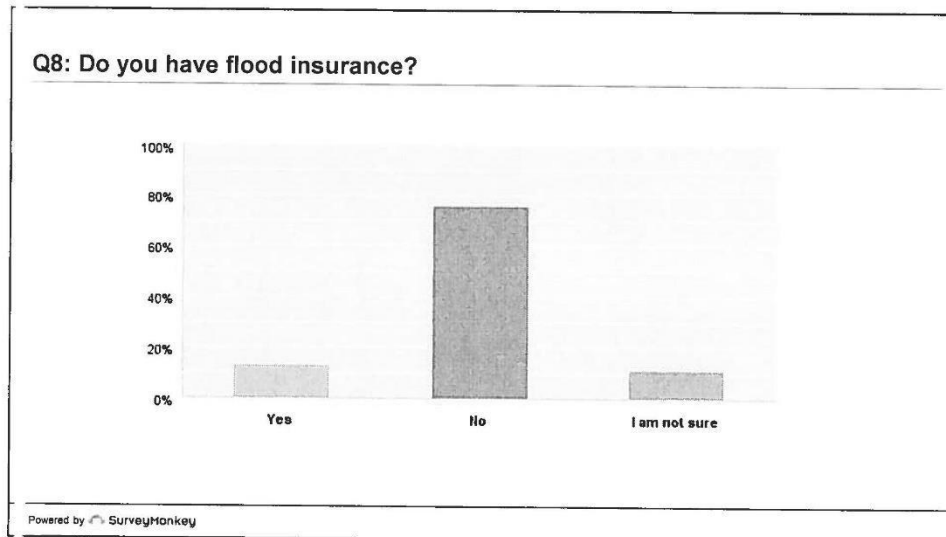


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Q7: Is your home located in a floodplain?

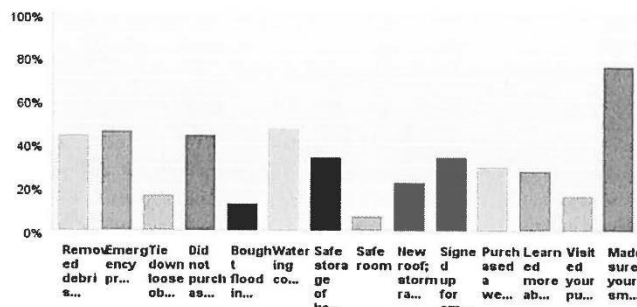


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Q10: If you answered "yes" or "plan to" to question 9, what actions have you/will you take to make your home and/or neighborhood more resistant to hazards?

Answered: 233 Skipped: 87



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Q10: If you answered "yes" or "plan to" to question 9, what actions have you/will you take to make your home and/or neighborhood more resistant to hazards?


Answer Choices	Responses
Removed debris (gutters and land) for wildfire resistance	44.21% 103
Emergency preparedness kit and/or plan	45.92% 107
Tie down loose objects	16.74% 39
Did not purchase in flood plain	44.21% 103
Bought flood insurance	12.45% 29
Watering control or drought resistant vegetation	46.78% 109
Safe storage of hazardous materials	33.91% 79
Safe room	6.87% 16
New roof, storm rated shingles	22.32% 52
Signed up for emergency notification system	33.91% 79
Purchased a weather radio	30.04% 70
Learned more about hazards that could occur in Central Texas	27.99% 65
Visited your public health website for current information on flu, mosquitoes and/or infectious disease information to protect your family and community	16.74% 39
Made sure your smoke alarms, carbon dioxide monitors are working properly	75.97% 177
Total Respondents: 233	

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Q11: If you answered "no" to question 8, are you interested in making your home or neighborhood more resistant to hazards?

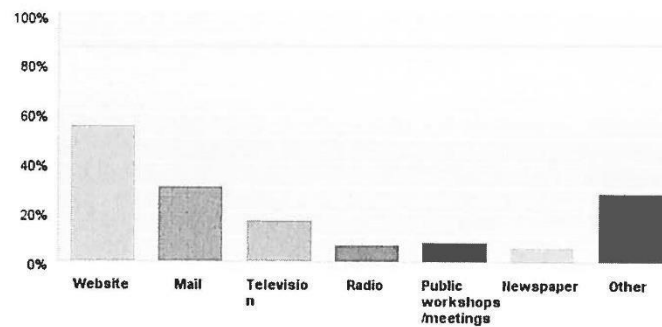
Answered: 265 Skipped: 35


Answer Choices	Responses	
Yes	42.64%	113
No	7.92%	21
N/A I answered yes to question 8	49.43%	131
Total		265

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Q12: What is the most effective way for you to receive hazard mitigation information for your home or community?

Answered: 295 Skipped: 5




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Q12: What is the most effective way for you to receive hazard mitigation information for your home or community?

Answered: 295 Skipped: 5

Answer Choices	Responses	
Website	54.92%	162
Mail	30.51%	90
Television	16.61%	49
Radio	6.44%	19
Public workshops/meetings	8.47%	25
Newspaper	6.44%	19
Other	27.80%	82
Total Respondents: 295		

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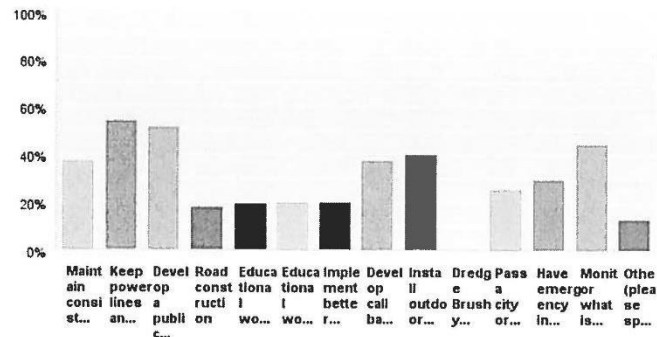
Question 12 "other" responses

Text messages
 Flyers on doors
 Large informative signs at entries of neighborhoods
 Next door App
 Reverse 911-Lack of tornado sirens-why?
 City Website
 Easily accessible website
 Text message directing to site
 Email
 Facebook or Twitter
 Dispersing information via HOA board and/or meetings
 Mobile App

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Q13: In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazards in your community?

Answered: 297 Skipped: 3



Powered by SurveyMonkey

Q13: In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazards in your community?

Answer Choices	Responses
Maintain consistent source of water during fires	37.04% 110
Keep power lines and bridges/low water crossings clear of debris	54.21% 161
Develop a public awareness campaign for possible hazards and home mitigation actions	51.52% 153
Road construction	17.85% 53
Educational workshops on water conservation	19.53% 58
Educational workshops/programs for home fire prevention and preparedness	20.20% 60
Implement better building codes that improve structures from damage	19.87% 59
Develop call back procedures on emergency telephone calls	37.71% 112
Install outdoor warning systems in parks	40.07% 119
Dredge Brushy Creek	0.00% 0
Pass a city ordinance requiring land owners to mow their fields when not in use	25.25% 75
Have emergency information available at churches, recreation centers, etc	29.29% 87
Monitor what is being transported via train through Round Rock	44.44% 132
Other (please specify)	13.13% 39

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Total Respondents: 297

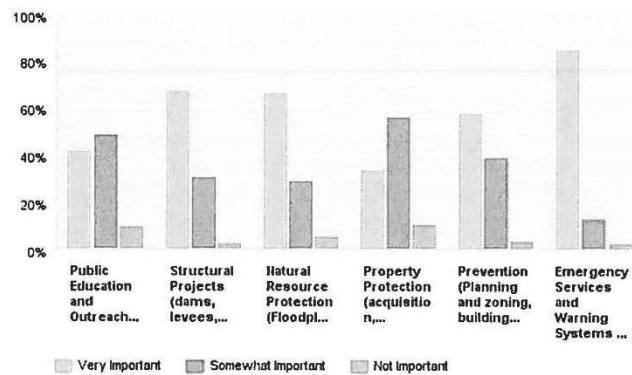
Q13: In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazards in your community? Other responses:

- Install tornado sirens (lill)
- RRISD needs to take better water conservation measures
- Have a volunteer CERT group for RR
- Help home owners make structural improvements
- Natural resource protection (floodplain protection, habitat preservation, forest mgmt.) and structural projects (dams, levees, retention basins, storm sewers, etc.)
- Promote water conservation/capture and solar power
- We need a drought plan that includes use of back up water resources
- Some of these suggestions are far too reaching creating larger government intrusion
- Help us identify whether or not we are in a flood plain via the website
- We don't monitor the trains already? That should be expected. My concerns are environmental.
- Many "boxed" storage facilities could contain hazardous or flammables-who monitors those?
- Public/private disaster shelters
- Traffic-racing causing death, aggressive driving
- Increase police patrol to help reduce drug trafficking in Stoney Brook
- All of the above in proper proportion
- Upgrade the Brushy and Lake Creek dam system
- Address flood issues in neighborhoods
- Enforce vehemently fireworks rules that citizens flaunt and get FEMA to fix and revise floodplain maps
- Not allow fireworks "huts" to sell them within the city, new residents don't know they are illegal!
- Phone app
- Spray city at least during high mosquito season to reduce potential infections like Zika

Powered by SurveyMonkey

Q14: Community-wide activities can help to reduce our risk from hazards. How important are the following community-wide activities to you in reducing risks for your community?

Answered: 298 Skipped: 2



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Q14: Community-wide activities can help to reduce our risk from hazards. How important are the following community-wide activities to you in reducing risks for your community?

	Very Important	Somewhat Important	Not Important	Total	Weighted Average
Public Education and Outreach (School education or outreach projects, demonstration events, brochures)	41.72% 121	48.62% 141	9.66% 28	290	1.68
Structural Projects (dams, levees, retention basins, storm sewers, etc.)	67.01% 195	30.58% 89	2.41% 7	291	1.35
Natural Resource Protection (Floodplain protection, habitat preservation, forest mgmt., etc.)	65.75% 192	28.77% 84	5.48% 16	292	1.40
Property Protection (acquisition, relocation or elevation of buildings, storm shutters, etc.)	33.33% 96	56.25% 162	10.42% 30	268	1.77
Prevention (Planning and zoning, building codes, open space preservation, etc.)	57.39% 167	39.18% 114	3.44% 10	291	1.46
Emergency Services and Warning Systems (Emergency response training, warning systems, evacuation planning, etc.)	84.46% 250	13.18% 39	2.36% 7	296	1.18


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Questions-Suggestions?

Next:

Hazard Mitigation project updates (handout)

Moving forward-strategies, concerns, deadlines, FEMA, public input

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APPENDIX B: Hazard Mitigation Plan Input and Meetings



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City updating Hazard Mitigation Plan, requests public input

Update: The survey will be available through end of March

The City of Round Rock is revising the 2012 Hazard Mitigation Plan, "Hazard Mitigation Planning in the Round Rock Community."

The goal of the Hazard Mitigation Plan is to minimize or eliminate long term risk to human life and property from known hazards by identifying and implementing cost-effective mitigation actions. Mitigation is defined by FEMA as "sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects."

Please take a moment to fill out the Hazard Mitigation Survey (<https://www.surveymonkey.com/r/H38FJ8V>), which is available below or online at this link: <https://www.surveymonkey.com/r/H38FJ8V> (<https://www.surveymonkey.com/r/H38FJ8V>)

This survey provides an opportunity to our community to share opinions, concerns and participate in the hazard mitigation planning process. The survey will be available until March 31 to allow ample time for citizens to provide input.

For more information, please contact Dorothy Miller, City of Round Rock EMC, dmiller@roundrocktexas.gov (<mailto:dmiller@roundrocktexas.gov>).

Posted: February 6, 2017

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Council Members (/council)

[Craig Morgan \(/about/city-council/city-council-members/#Mayor\)](/about/city-council/city-council-members/#Mayor) - Mayor
[Tammy Young \(/about/city-council/city-council-members/#Place1\)](/about/city-council/city-council-members/#Place1) - Place 1

[Rene Flores \(/about/city-council/city-council-members/#Place2\)](/about/city-council/city-council-members/#Place2) - Place 2

[Frank Leffingwell \(/about/city-council/city-council-members/#Place3\)](/about/city-council/city-council-members/#Place3) - Place 3

Services (/services/)

[🔧 Service Request \(/services/servicerequest\)](/services/servicerequest)

[📖 Search library catalog \(https://catalog.roundrocktexas.gov\)](https://catalog.roundrocktexas.gov)

[🏊 Register for rec programs \(https://www.roundrockrecreation.org\)](https://www.roundrockrecreation.org)

[📄 Open records request \(/departments/administration/city-clerk/open-records-center/\)](/departments/administration/city-clerk/open-records-center/)

[💳 Pay utility bill or court fine \(https://www.municipalonlinepayments.com/roundrocktx\)](https://www.municipalonlinepayments.com/roundrocktx)

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City updating Hazard Mitigation Plan, requests public input

Digital Communications Coordinator Austin Ellington from City of Round Rock · 21 Feb 17



Please take a moment to fill out the Hazard Mitigation Survey, which will help our staff minimize or eliminate long term risk to human life and property from known hazards.

SURVEY: <http://bit.ly/HazardSurveyRRTX>

21 Feb 17 · Subscribers of City of Round Rock in Crime & Safety

Thank ·5 Reply ·6

Recurrence: (none): 15 item(s)				
	Hazard Mitigation Follow-Up	WILCO ESOC, 911 Tracy...	Tue 1/30/2018 3:00 PM	Tue 1/30/2018 4:00 PM
	Meet regarding Hazard Mitigation coordin...	Starbucks on Universit...	Wed 12/20/2017 3:00 PM	Wed 12/20/2017 5:00 PM
	EMC Meeting	Round Rock	Wed 11/8/2017 10:00 AM	Wed 11/8/2017 12:00 PM
	THIRA/SPR Gap Analysis workshop schedul...	Capital Area Council of...	Tue 9/26/2017 9:30 AM	Tue 9/26/2017 11:30 AM
	hazard mitigation plan reviewing and revis...	HSEM, Utilities, Transp...	Wed 8/2/2017 1:00 PM	Wed 8/2/2017 4:00 PM
	Regional Preparedness Education Coopera...	CAPCOG 6800 Burleso...	Fri 6/23/2017 10:00 AM	Fri 6/23/2017 12:00 PM
	Hazard Mitigation Plan Development	2701 N Mays Street, Ro...	Wed 3/22/2017 10:30 AM	Wed 3/22/2017 11:30 AM
	Hazard mitigation plan review	HSEM/FD	Fri 2/10/2017 11:30 AM	Fri 2/10/2017 12:00 PM
	HMAP survey to residents	HSEM, City hall	Tue 2/7/2017 1:00 PM	Tue 2/7/2017 3:30 PM
	Hazard Mitigation planning	HSEM	Fri 1/27/2017 9:30 AM	Fri 1/27/2017 12:00 PM
	GoToWebinar - HIRA, Consequence Analysi...	GoToWebinar - See co...	Tue 1/10/2017 1:30 PM	Tue 1/10/2017 2:30 PM
	September CAIMT Meeting	2701 North Mays Stree...	Wed 9/14/2016 1:30 PM	Wed 9/14/2016 3:00 PM
	August CAIMT Meeting	Lakeway Regional Med...	Wed 8/10/2016 1:30 PM	Wed 8/10/2016 3:00 PM
	CAIMT July Meeting	2105 Kramer Lane, Aust...	Wed 7/13/2016 1:30 PM	Wed 7/13/2016 3:00 PM
	May CAIMT Mtg (NOTE: TIME CHANGE)	2201 Robert Dedman ...	Wed 5/11/2016 1:30 PM	Wed 5/11/2016 3:30 PM
Recurrence: (none): 16 item(s)				
	Hazard Mitigation plan finalization	TBD	Mon 2/26/2018 8:00 AM	Mon 2/26/2018 2:00 PM
	hazard mitigation plan with Alysha	TBD	Fri 2/23/2018 8:30 AM	Fri 2/23/2018 11:30 AM
	Hazard Mitigation Project Meeting	Central Conference Ro...	Tue 12/5/2017 2:30 PM	Tue 12/5/2017 3:30 PM
	FEMA Hazard Mitigation plan meeting wit...	WILCO ESOC	Thu 10/26/2017 9:00 AM	Thu 10/26/2017 10:30 AM
	Hazard mitigation plan	HSEM, EOC	Tue 9/19/2017 8:30 AM	Tue 9/19/2017 4:30 PM
	Hazard mitigation planning	TBD	Fri 9/8/2017 12:00 AM	Sat 9/9/2017 12:00 AM
	Hazard mitigation plan	HSEM	Thu 7/27/2017 8:30 AM	Thu 7/27/2017 11:30 AM
	Hazard Mitigation Planning Meeting	RREOC	Wed 5/3/2017 9:00 AM	Wed 5/3/2017 11:00 AM
	HSEM Priorities Meeting	Wherever	Tue 2/21/2017 2:00 PM	Tue 2/21/2017 4:00 PM
	Wildfire Protection planning	Wilco ESOC	Fri 2/3/2017 11:00 AM	Fri 2/3/2017 4:00 PM
	hazard mitigation plan guide	HSEM	Tue 1/31/2017 2:00 PM	Tue 1/31/2017 3:30 PM
	Hazard mitigation plan revisions	HSEM	Fri 1/20/2017 2:00 PM	Fri 1/20/2017 3:00 PM
	reviewed and revised hazard mitigation go...	HSEM	Wed 11/2/2016 9:00 AM	Wed 11/2/2016 9:30 AM
	Haz Mit Strategy Session/Etc.	Wherever	Tue 11/1/2016 9:00 AM	Tue 11/1/2016 10:30 AM
	Hazard Mitigation Planning	Wilco/Cedar Park	Thu 9/22/2016 10:30 AM	Thu 9/22/2016 1:30 PM
	Hazard Mitigation Planning meeting update	RR PD CID Conference ...	Tue 8/2/2016 10:00 AM	Tue 8/2/2016 11:30 AM



Round Rock Hazard Mitigation Planning Meeting 3 May 2017

Agenda

- Welcome & Introductions
- Community Preparedness Survey results
- Hazard mitigation project review and revisions
- Open discussion, questions, concerns
- Adjourn



Hazard Mitigation Action Plan Revision Meeting

August 2, 2016

Agenda:

- Review/revise mitigation goals and objectives
- Community profile update-Briefly review and identify POC for revisions.
- Review/identify critical facilities
- Next steps, meeting date

Hazard Mitigation Action Plan Revision Meeting

3 May 2017



SIGN IN SHEET

Name	Agency/Department	Email	Phone Number
Marc Barbone	HSEM	mbarbone@roundrock.texas.gov	(214) 391-3100
Dorothy Miller	HSEM / Fire	dmiller@roundrock.texas.gov	512-218-3259
Sherri Crane	FINANCE - CORR	scrane@roundrock.texas.gov	512-218-5443
Pic Banders	CONTRACTS, FINANCE	pbanders@roundrock.texas.gov	512-218-5459
Chad McDowell	B-S	cmcdow11@rr	512-341-3191
Ruth Haddad	UBENCLIO	ruth.haddad@roundrock.texas.gov	512-799-5002
George Scherer	RRISO	George - Scherer@roundrock.texas.gov	512-464-5454
Charles Dittman	RRFD	cdittman@roundrock.texas.gov	512-718-5590
Robert Isbell	RRFD	risbell@roundrock.texas.gov	512-218-5590
CLIFF SAYLOR	RR POLICE / SUPP SERV	csaylor@rr	512-202-7796
RILEY ATKINS	RR PARKS	rleak@roundrock.texas.gov	512-341-3344
Ryan Bradner	RR Strong Water	rbradner@roundrock.texas.gov	512-271-2752
Randy Gordon	Z.P. PARKS & RE	rgordon@roundrock.texas.gov	512-801-4529
JOHNNIE KEITH	PARKS	jkeith@roundrock.texas.gov	512-801-4536