

CITY OF SAN MARCOS HAZARD MITIGATION ACTION PLAN



UPDATE 2024

Draft

Maintaining a Safe, Secure,
and Sustainable Community



For more information, visit our website at:

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SECTION 1 – INTRODUCTION

Background.....	1-1
Scope	1-2
Purpose	1-2
Authority.....	1-3
Summary of Sections	1-3

SECTION 2 – PLANNING PROCESS

Plan Preparation and Development.....	2-1
Review and Incorporation of Existing Plans	2-8
Timeline for Implementing Mitigation Actions	2-11
Public and Stakeholder Involvement	2-12

SECTION 3 – CITY PROFILE

Overview.....	3-1
Population and Demographics	3-3
Population Growth	3-4
Natural, Cultural, and Historic Resources.....	3-4
Economic Impact	3-7
Existing Land Use and Development Trends	3-9
Future Growth and Development	3-11

SECTION 4 – RISK OVERVIEW

Hazard Description	4-1
Disaster Declaration History	4-4
Natural Hazards and Climate Change	4-5
Overview of Hazard Analysis	4-7
Hazard Ranking	4-9

SECTION 5 – DAM FAILURE

Hazard Description	5-1
Location	5-2
Extent	5-5
Historical Occurrences	5-7
Probability of Future Events	5-8

Vulnerability and Impact	5-8
Climate Change Considerations	5-10

SECTION 6 – DROUGHT

Hazard Description	6-1
Location	6-2
Extent	6-3
Historical Occurrences	6-5
Probability of Future Events	6-9
Vulnerability and Impact	6-10
Climate Change Considerations	6-14

SECTION 7 – EARTHQUAKE

Hazard Description	7-1
Location	7-2
Extent	7-4
Historical Occurrences	7-7
Probability of Future Events	7-7
Vulnerability and Impact	7-7
Climate Change Consideration	7-9

SECTION 8 – EXPANSIVE SOILS

Hazard Description	8-1
Location	8-1
Extent	8-2
Historical Occurrences	8-3
Probability of Future Events	8-3
Vulnerability and Impact	8-4
Climate Change Considerations	8-6

SECTION 9 – EXTREME HEAT

Hazard Description	9-1
Location	9-1
Extent	9-2
Historical Occurrences	9-4

Probability of Future Events	9-5
Vulnerability and Impact.....	9-6
Climate Change Considerations	9-8

SECTION 10 – FLOOD

Hazard Description	10-1
Location	10-1
Extent	10-4
Historical Occurrences	10-6
Probability of Future Events	10-11
Vulnerability and Impact	10-11
Climate Change Considerations	10-15
NFIP Participation	10-15
Community Rating System	10-16
NFIP Compliance and Maintenance	10-17
Repetitive Loss	10-17

SECTION 11 – HAIL

Hazard Description	11-1
Location	11-1
Extent	11-2
Historical Occurrences	11-3
Probability of Future Events	11-5
Vulnerability and Impact	11-5
Climate Change Considerations	11-9

SECTION 12 – HURRICANE/TROPICAL STORM

Hazard Description	12-1
Location	12-1
Extent	12-2
Historical Occurrences	12-2
Probability of Future Events	12-4
Vulnerability and Impact	12-4
Climate Change Considerations	12-8

SECTION 13 – LIGHTNING

Hazard Description	13-1
Location	13-1
Extent	13-1
Historical Occurrences	13-3
Probability of Future Events	13-4
Vulnerability and Impact	13-4
Climate Change Considerations	13-7

SECTION 14 – THUNDERSTORM WIND

Hazard Description	14-1
Location	14-1
Extent	14-2
Historical Occurrences	14-3
Probability of Future Events	14-7
Vulnerability and Impact	14-7
Climate Change Considerations	14-11

SECTION 15 – TORNADO

Hazard Description	15-1
Location	15-1
Extent	15-3
Historical Occurrences	15-5
Probability of Future Events	15-6
Vulnerability and Impact	15-6
Climate Change Considerations	15-10

SECTION 16 – WILDFIRE

Hazard Description	16-1
Location	16-1
Extent	16-3
Historical Occurrences	16-7
Probability of Future Events	16-10
Vulnerability and Impact	16-10

Climate Change Considerations	16-16
-------------------------------------	-------

SECTION 17 – WINTER STORM

Hazard Description	17-1
Location	17-3
Extent	17-3
Historical Occurrences	17-4
Probability of Future Events	17-7
Vulnerability and Impact	17-7
Climate Change Considerations	17-11

SECTION 18 – MITIGATION STRATEGY

Mitigation Goals	18-1
Goal 1	18-1
Goal 2	18-1
Goal 3	18-2
Goal 4	18-2
Goal 5	18-2
Goal 6	18-3

SECTION 19 – PREVIOUS ACTIONS

Summary	19-1
City of San Marcos	19-2

SECTION 20 – MITIGATION ACTIONS

Summary	20-1
City of San Marcos.....	20-3
City of San Marcos Green Initiative Projects	20-43

SECTION 21 – PLAN MAINTENANCE

Plan Maintenance Procedures	21-1
Incorporation	21-1
Monitoring and Evaluation	21-3
Updating	21-5
Continued Public Involvement	21-5

APPENDIX A – PLANNING TEAM
APPENDIX B – PUBLIC SURVEY RESULTS
APPENDIX C – CRITICAL FACILITIES
APPENDIX D – DAM LOCATIONS
APPENDIX E – MEETING DOCUMENTATION
APPENDIX F – CAPABILITY ASSESSMENT
APPENDIX G – STATE AND FEDERAL FUNDING OPPORTUNITIES
APPENDIX H – CAPITAL IMPROVEMENT PROJECTS
APPENDIX I – GREEN INITIATIVES AND RESILIENCY TOOLKIT



SECTION 1 INTRODUCTION

SECTION 1: INTRODUCTION

Background.....	1
Scope	2
Purpose	2
Authority.....	3
Summary of Sections	3

BACKGROUND

The City of San Marcos is the county seat of Hays County, one of the fastest growing counties in the United States. Part of the Greater Austin Metropolitan Area, the city is located on the Interstate 35 corridor 30 miles southwest of Austin and 51 miles northeast of San Antonio. It is situated on the Balcones Fault, the boundary between the hill country to the west and coastal plains to the east. Many springs emerge along the fault, including San Marcos Springs, which is the source of the San Marcos River and Spring Lake.

Texas is prone to extremely heavy rains and flooding with half of the world record rainfall rates (48 hours or less).¹ While flooding is a well-known risk, the City of San Marcos is susceptible to a wide range of natural hazards, including but not limited to extreme heat, tornadoes, hail, and wildfires. These life-threatening hazards can destroy property, disrupt the economy, and lower the overall quality of life for individuals.

While it is impossible to prevent an event from occurring, the impacts from many hazards to people and property can be lessened through mitigation. The Federal Emergency Management Agency (FEMA) defines mitigation as *sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects*.² Communities participate in hazard mitigation by developing hazard mitigation plans. The Texas Division of Emergency Management (TDEM) is required to review the plan and FEMA has the authority to review and approve hazard mitigation plans through the Disaster Mitigation Act of 2000 (DMA).

In 2003-2006, Hays County originally developed their multi-jurisdictional Hazard Mitigation Plan (HMP), which included annexes for the county's individual jurisdictions, including the City of San Marcos. The County's plan and annexes were updated in 2011 and again in 2016-2018 per DMA requirements. The previous Plan was approved by FEMA in 2018.

The Disaster Mitigation Act requires that hazard mitigation plans be reviewed and revised every five years to maintain eligibility for Hazard Mitigation Assistance (HMA) grant funding. Since FEMA approved the City of San Marcos Hays County HMP Update in 2018, the City began the process of developing their own 2024 Hazard Mitigation Action Plan Update in order to maintain eligibility for grant funding within the five-year window. The HMAP Update planning process provided an opportunity for the City of San Marcos to evaluate successful mitigation actions and explore opportunities to avoid future disaster loss. The 2018 HMAP expired in 2023, therefore the City of San Marcos selected H2O Partners, Inc. to write and develop the 2024 HMAP Update, hereinafter titled: "The City of San Marcos Hazard Mitigation Plan Update 2024: Maintaining a Safe, Secure, and Sustainable Community" (Plan or Plan Update). The HMAP Update planning

¹ <http://www.floodsafety.com/texas/regional-info/san-antonio-flooding/>

² <http://www.fema.gov/hazard-mitigation-planning-resources>

SECTION 1: INTRODUCTION

process provided an opportunity for the City of San Marcos to evaluate successful mitigation actions and explore opportunities to avoid future disaster loss.

Hazard mitigation activities are an investment in a community's safety and sustainability. It is widely accepted that the most effective hazard mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive review of a hazard mitigation plan addresses vulnerabilities to hazards that exist today and in the foreseeable future. Therefore, it is essential that a plan identify projected patterns of how future development will increase or decrease a community's overall hazard vulnerability.

SCOPE

The focus of the Plan Update is to identify activities to mitigate hazards classified as "high" or "moderate" risk, as determined through a detailed hazard risk assessment conducted for the City of San Marcos. The hazard classification enables the City to prioritize mitigation actions based on hazards which can present the greatest risk to lives and property in the geographic scope.

PURPOSE

The Plan Update was prepared by the City of San Marcos and H2O Partners, Inc. The purpose of the Plan Update is to protect people and structures and to minimize the costs of disaster response and recovery. The goal of the Plan Update is to minimize or eliminate long-term risks to human life, property, operations, and the environment from known hazards by identifying risks and implementing cost-effective hazard mitigation actions. The planning process is an opportunity for the City of San Marcos, stakeholders, and the general public to evaluate and develop successful hazard mitigation actions to reduce future risk of loss of life and damage to property resulting from a disaster in the City of San Marcos.

The Mission Statement of the Plan Update is, *"Maintaining a secure and sustainable future through the revision and development of targeted hazard mitigation actions to protect life and property."*

The City of San Marcos Planning Team identified 13 natural hazards to be addressed by the Plan Update. The specific goals of the Plan Update are to:

- Provide a comprehensive update to the 2018 HMAP;
- Minimize disruption to the City of San Marcos following a disaster;
- Streamline disaster recovery by articulating actions to be taken before a disaster strikes to reduce or eliminate future damage;
- Demonstrate a firm local commitment to hazard mitigation principles;
- Serve as a basis for future funding that may become available through grant and technical assistance programs offered by the State or Federal government. The Plan will enable the City of San Marcos to take advantage of rapidly developing mitigation grant opportunities as they arise; and
- Ensure that the City of San Marcos maintains eligibility for the full range of future federal disaster relief.

SECTION 1: INTRODUCTION

AUTHORITY



The Plan is tailored specifically for the City of San Marcos and plan participants including Planning Team members, stakeholders, and the general public who participated in the Plan Update development process. The Plan complies 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). Additionally, the Plan complies with the Interim Final Rules for the Hazard Mitigation Planning and Hazard Mitigation Grant Program (44 CFR, Part 201), which specify the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA’s “Local Mitigation Policy Guide” (Effective April 19, 2023), and the “Local Mitigation Planning Handbook” (March 2013).

SUMMARY OF SECTIONS

Sections 1 and 2 of the Plan Update outline the Plan’s purpose and development, including how Planning Team members, stakeholders, and members of the general public were involved in the planning process. Section 3 profiles the City of San Marcos’ population and economy.

Sections 4 through 17 present a hazard overview and information on individual natural hazards in the planning area. For each hazard, the Plan Update presents a description of the hazard, a list of historical hazard events, and the results of the vulnerability and risk assessment process.

Section 18 presents hazard mitigation goals and objectives. Section 19 gives an analysis for the previous actions and Section 20 presents hazard mitigation actions for the City of San Marcos. Section 21 identifies Plan maintenance mechanisms.

The list of planning team members and stakeholders is located in Appendix A. Public survey results are analyzed and presented in Appendix B. Appendix C contains a detailed list of critical facilities for the area. Appendix D contains information regarding Dam locations within the City of San Marcos. Appendix E contains information regarding workshops and meeting documentation. Capability Assessment results are located in Appendix F. Appendix G includes state and federal funding opportunities. Appendix H includes City of San Marcos Capital Improvement Projects and Appendix I contains the Green Initiatives and Resiliency Toolkit.³

³ Information contained in some of these appendices are exempt from public release under the Freedom of Information Act (FOIA).



SECTION 2

PLANNING PROCESS

SECTION 2: PLANNING PROCESS

Plan Preparation and Development	1
Overview of the Plan	1
Planning Team	2
Planning Process	5
Kickoff Workshop	6
Hazard Identification.....	6
Risk Assessment	6
Mitigation Review and Development	7
Green Initiatives in Mitigation Strategy	7
Review and Incorporation of Existing Plans.....	8
Review.....	8
Incorporation of Existing Plans into the HMAP Process.....	8
Incorporation of the HMAP into Other Planning Mechanisms	9
Plan Review and Plan Update.....	11
Timeline for Implementing Mitigation Actions	11
Public and Stakeholder Involvement.....	12
Stakeholder Involvement.....	12
Public Meetings	15
Public Participation Survey	15

PLAN PREPARATION AND DEVELOPMENT

Hazard mitigation planning involves coordination with various constituents and stakeholders to develop a more disaster-resistant community. Section 2 provides an overview of the planning process including the identification of key steps and a detailed description of how stakeholders and the public were involved.

OVERVIEW OF THE PLAN

The City of San Marcos hired H2O Partners, Inc., to provide technical support and oversee the development of the City of San Marcos Hazard Mitigation Action Plan Update 2024. The Consultant Team used the FEMA “Local Mitigation Planning Policy Guide” (effective April 19, 2023), and the “Local Mitigation Planning Handbook” (March 2013) to develop the Plan Update. The overall planning process is shown in Figure 2-1 below.

SECTION 2: PLANNING PROCESS

Figure 2-1. Mitigation Planning Process



The City of San Marcos and the Consultant Team met in February 2023, to begin organizing resources, identify Planning Team members, and conduct a Capability Assessment.

PLANNING TEAM

Key members of H2O Partners, Inc. developed the Plan Update in conjunction with the Planning Team. The Planning Team was established using a direct representation model. Some of the responsibilities of the Planning Team included: completing Capability Assessment surveys, providing input regarding the identification of hazards, identifying mitigation goals, and developing mitigation strategies. An Executive Planning Team consisting of key personnel from the Office of Emergency Management involved in hazard mitigation activities, shown in Table 2-1, was formed to coordinate planning efforts and request input and participation in the planning process. Participation in this planning process is defined as being engaged in the process through attending meetings, providing data and related information, providing updates on previous actions, and reviewing and commenting on draft versions of the plan. Table 2-2 reflects the Advisory Planning Team, consisting of additional representatives from city departments that participated throughout the planning process. All Executive and Advisory Planning Team members are involved in hazard mitigation activities; those with the authority to regulate development are identified with an asterisk next to their title.

Table 2-1. Executive Planning Team

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos Office of Emergency Management	Assistant Emergency Management Coordinator
City of San Marcos Office of Emergency Management	Emergency Management Coordinator
City of San Marcos Office of Emergency Management	Emergency Management Specialist

SECTION 2: PLANNING PROCESS

Table 2-2. Advisory Planning Team¹

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos	Administrative Service Manager for City Directors
City of San Marcos	Assistant City Manager I*
City of San Marcos	Assistant City Manager II*
City of San Marcos	Assistant Chief of Police
City of San Marcos	Assistant Chief of Operations
City of San Marcos	Assistant Director of Planning and Development Services*
City of San Marcos	Assistant Director of Engineering*
City of San Marcos	Assistant Director of Finance
City of San Marcos	Assistant Director of Human Resources
City of San Marcos	Assistant Director of I.T.
City of San Marcos	Assistant Director of Neighborhood Enhancement*
City of San Marcos	Assistant Director of Planning and Development Services*
City of San Marcos	Assistant Director of Parks and Recreation
City of San Marcos	Assistant Director of Public Works*
City of San Marcos	Assistant Director of Water / Wastewater
City of San Marcos	Assistant City Manager*
City of San Marcos	City Attorney
City of San Marcos	City Manager*
City of San Marcos	Code Compliance Officer I*
City of San Marcos	Code Compliance Officer II*
City of San Marcos	Community Enhancement Initiatives Manager
City of San Marcos	Community Urban Forester

¹ *Authority to regulate development

SECTION 2: PLANNING PROCESS

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos	Conservation Coordinator
City of San Marcos	Director of Destination Services
City of San Marcos	Director of Engineering*
City of San Marcos	Director of Human Resources / Civil Service
City of San Marcos	Director of I.T.
City of San Marcos	Director of Neighborhood Enhancement
City of San Marcos	Director of Parks and Recreation
City of San Marcos	Director of Planning and Development*
City of San Marcos	Director of Public Works*
City of San Marcos	Director of Utilities*
City of San Marcos	Diversity, Equity, & Inclusion Coordinator
City of San Marcos	Environmental Health & Safety Manager
City of San Marcos	Fire Chief
City of San Marcos	Fire Department Representative
City of San Marcos	Fire Department Engineer I
City of San Marcos	Fire Department Engineer II
City of San Marcos	Floodplain Administrator*
City of San Marcos	Grants Coordinator
City of San Marcos	I.T. Security Manager
City of San Marcos	Library Director
City of San Marcos	SMTX / TXST Intern
City of San Marcos	Stormwater Systems Manager*

Additionally, a Stakeholder Group was invited via email to participate in the planning process by attending meetings, commenting on draft versions of the plan, and/or by providing data to inform the planning process. The Consultant Team, Planning Teams, and Stakeholder Group coordinated to identify mitigation goals, and develop mitigation strategies and actions for the Plan Update. Appendix A provides a complete listing of all participating Planning Team members and stakeholders by organization and title. Stakeholder involvement is discussed further below.

SECTION 2: PLANNING PROCESS

Based on results of the completed Capability Assessment survey, the City of San Marcos described methods for achieving future hazard mitigation measures by expanding existing capabilities. For example, the City of San Marcos has an opportunity to establish Planning Team members with the authority to monitor the Plan and identify grant funding opportunities for expanding staff. Other options for improving capabilities include the following:

- Integrate risk information into future updates of the Vision SMTX Comprehensive Plan.
- Integrate risk information into the City of San Marcos' Capital Improvement Plan.
- Adopt the Wildfire Urban Interface Code.
- Identify opportunities for cross-training or increase the technical expertise of staff by attending free training available through FEMA and the Texas Division of Emergency Management (TDEM), and monitoring classes and availability through [preparingtexas.org](https://www.preparingtexas.org).
- Review current floodplain ordinances for opportunities to increase resiliency, (above current standards) such as modifying permitting or building codes.
- Develop ordinances that will require all new developments to conform to the higher mitigation standards, exceeding current requirements.

Sample hazard mitigation actions developed with similar hazard risk were shared at the meetings. These important discussions resulted in the development of multiple mitigation actions that are included in the Plan Update to further mitigate risk from natural hazards in the future.

The Planning Team developed hazard mitigation actions for mitigating risk from all the identified hazards within this Plan Update; these actions include acquiring land to prevent future development in floodplain areas and preserve these areas as open space and raising electrical components of lift stations above the Base Flood Elevation. An action is also included to acquire and install quick connects for back-up generators at all critical facilities to ensure continuity of operations after a hazard event.

The Planning Team also developed a number of hazard mitigation actions related to the City of San Marcos' Green Initiative, which focus on incorporating goals of resilience, carbon reduction, and sustainability into the City's mitigation strategy. Among these actions are diversifying water and energy supplies, implementing an Urban and Community Forestry Strategic Management Plan, and creating incentives for planning more than the minimum number of trees on new developments.

PLANNING PROCESS

The process used to prepare the Plan Update followed the four major steps included at Figure 2-1. After the Planning Team was organized, a capability assessment was developed and distributed at the Kick-Off Workshop. Hazards were identified and assessed, and results associated with each of the hazards were provided at the Risk Assessment Workshop. Based on the City of San Marcos' identified vulnerabilities, specific mitigation strategies were discussed and developed at the Mitigation Strategy Workshop. Finally, Plan maintenance and implementation procedures were developed and are included in Section 21. Participation of Planning Team members, stakeholders, and the public at each of the workshops is documented in Appendix E.

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

- The nature and magnitude of risks currently affecting the city;
- Hazard mitigation goals to address current and expected conditions;

SECTION 2: PLANNING PROCESS

- Whether current resources will be sufficient for implementing the Plan Update;
- Implementation problems, such as technical, political, legal, and coordination issues that may hinder development;
- Anticipated outcomes; and
- How the City of San Marcos, agencies, and partners will participate in implementing the Plan Update.

KICKOFF WORKSHOP

The Kickoff Workshop was held on March 9, 2023 at San Marcos City Hall. The initial workshop informed participating officials and key department personnel about how the planning process pertained to their distinct roles and responsibilities and engaged stakeholder groups including, but not limited to non-profit organizations including the American Red Cross, Blanco River Regional Recovery Team, San Marcos Greenbelt Alliance, local food banks, neighboring jurisdictions such as Hays County Office of Emergency Services, local medical partners, San Marcos CISD and Texas State University. In addition to the kickoff presentation, participants received the following information:

- Project overview regarding the planning process;
- Public survey access information;
- Hazard Ranking form; and
- Capability Assessment survey for completion.

A risk ranking exercise was conducted at the Kickoff Workshop to get input from the Planning Team and stakeholders pertaining to various risks from a list of natural hazards affecting the planning area. Participants ranked hazards high to low in terms of perceived level of risk, frequency of occurrence, and potential impact.

HAZARD IDENTIFICATION

At the Kickoff Workshop, and through email and phone correspondence, the Planning Team conducted preliminary hazard identification. The Planning Team in coordination with the Consultant Team reviewed and considered a full range of natural hazards. Once identified, the teams narrowed the list to significant hazards by reviewing hazards affecting the area as a whole, the 2018 State of Texas Hazard Mitigation Plan, and initial study results from reputable sources such as federal and state agencies. Based on this initial analysis, the teams identified a total of 13 natural hazards which pose a significant threat to the planning area.

RISK ASSESSMENT

An initial risk assessment for the City of San Marcos was completed in April 2023 and results were presented to Planning Team members at the Risk Assessment Workshop held on May 10, 2023, at the City of San Marcos Public Services Complex with a virtual attendance option available through Microsoft Teams. At the workshop, the characteristics and consequences of each hazard were evaluated to determine the extent to which the planning area would be affected in terms of potential danger to property and residents.

Property and crop damages were estimated by gathering data from the National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA). The assessment also examined the impact of various hazards on the built environment, including general building stock, critical facilities, lifelines, and infrastructure. The resulting risk assessment profiled hazard events provided information on previous occurrences, estimated

SECTION 2: PLANNING PROCESS

probability of future events, and detailed the spatial extent and magnitude of impact on people and property. A hazard profile and vulnerability analysis for each of the hazards can be found in Sections 4 through 17.

MITIGATION REVIEW AND DEVELOPMENT

Developing the Mitigation Strategy for the Plan involved identifying mitigation goals and new mitigation actions. A Mitigation Workshop was held on July 12, 2023, at the City of San Marcos Public Services Complex with a virtual attendance option available through Microsoft Teams. In addition to the Planning Team, stakeholder groups were invited to attend the workshop. The City was proactive in identifying mitigation actions to lessen the risk of all the identified hazards included in the Plan Update.

An inclusive and structured process was used to develop and prioritize new hazard mitigation actions for the Plan Update. The prioritization method was based on FEMA's STAPLE+E criteria and included social, technical, administrative, political, legal, economic, and environmental considerations. As a result, each Planning Team member assigned an overall priority to each hazard mitigation action. The overall priority of each action is reflected in the hazard mitigation actions found in Section 20.

Planning Team members then 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.

Specifically, the process involved:

- Listing optional hazard mitigation actions based on information collected from previous plan reviews, studies, and interviews with federal, state, and local officials. Workshop participants reviewed the optional mitigation actions and selected actions that were most applicable to their area of responsibility, cost-effective in reducing risk, easily implemented, and likely to receive institutional and community support.
- Workshop participants inventoried federal and state funding sources that could assist in implementing the proposed hazard mitigation actions. Information was collected, including the program name, authority, purpose of the program, types of assistance and eligible projects, conditions on funding, types of hazards covered, matching requirements, application deadlines, and a point of contact.
- Planning Team members considered the benefits that would result from implementing the hazard mitigation actions compared to the cost of those projects. Although detailed cost-benefit analyses were beyond the scope of the Plan Update, Planning Team members utilized economic evaluation as a determining factor between hazard mitigation actions.
- Planning Team members then selected and prioritized mitigation actions.

Hazard mitigation actions identified in the process were made available to the Planning Team for review. The draft Plan Update was maintained on file by the City of San Marcos Office of Emergency Management and was made available to the general public for review.

GREEN INITIATIVES IN MITIGATION STRATEGY

Alongside the City of San Marcos' primary Mitigation Strategy development process, a concerted effort was made to incorporate Green Initiatives that support the City's commitment to identifying feasible green solutions and increasing its resilience. To discuss potential sustainable actions and nature-based solutions to include in the city's mitigation strategy, a Green Initiative Goals Meeting

SECTION 2: PLANNING PROCESS

was held on September 6, 2023, at San Marcos City Hall with a virtual attendance option available through Microsoft Teams. In this meeting, which was in coordination with Halff, the Planning Team discussed adopting and implementing long-term, nature-based mitigation solutions that will assist the City of San Marcos in meeting its mitigation goals, while also reducing the carbon footprint of the city where possible.

Among the City of San Marcos' key Green Initiatives to incorporate into the development of mitigation strategy were improving energy resilience and carbon reduction; transportation infrastructure and fleet improvements; the development of land and structures; and policies and practices to enhance infrastructure resiliency. Through the planning process, a total of 28 Green Initiative mitigation projects were identified and incorporated into the plan. These identified projects were made available to the Planning Team for review and can be found in the Mitigation Actions section of the Plan (Section 20). A Green Initiatives and Resiliency Toolkit can be found in Appendix I.

REVIEW AND INCORPORATION OF EXISTING PLANS

REVIEW

Background information utilized during the planning process included various studies, plans, reports, and technical information from sources such as 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 Texas State Data Center, Texas Forest Service, the Texas Division of Emergency Management (TDEM), and the 2018 Texas State Hazard Mitigation Plan. Section 4 and the hazard-specific sections of the Plan (Sections 5-17) summarize the relevant background information.

Specific background documents, including those from FEMA, provided information on hazard risk, hazard mitigation actions currently being implemented, and potential mitigation actions. Previous hazard events, occurrences, and descriptions were identified through NOAA's National Centers for Environmental Information (NCEI). Results of past hazard events were found through searching the NCEI Storm Event Database. The USACE studies were reviewed for their assessment of risk and potential projects in the region. Information from the State Demographer was reviewed for population and other projections and included in 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. Materials from FEMA and TDEM were reviewed for guidance on Plan Update development requirements.

INCORPORATION OF EXISTING PLANS INTO THE HMAP PROCESS

A Capability Assessment was completed by key departments from the City of San Marcos which provided information pertaining to existing plans, policies, ordinances, and regulations to be integrated into the goals and objectives of the Plan Update. The relevant information was included in a master Capability Assessment, Appendix F.

Existing projects and studies were utilized as a starting point for discussing hazard mitigation actions among Planning and Consultant Team members. For example, mitigation projects completed by the City of San Marcos include promoting Flood Insurance through community outreach, creating a Dam Safety Table-top Exercise Program, as well as developing and

SECTION 2: PLANNING PROCESS

implementing a Cooling Plan that evaluates the risks of excessive heat and pursues strategies to implement cooling stations.

Finally, the 2018 State of Texas Hazard 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 2018 State Plan was also used as a guidance document, along with FEMA materials, in the development of the City of San Marcos Hazard Mitigation Action Plan Update 2024.

INCORPORATION OF THE HMAP INTO OTHER PLANNING MECHANISMS

Planning Team members will integrate implementation of the Plan Update with other planning mechanisms for the City of San Marcos, such as the Emergency Operation Plan and future updates to the Vision SMTX Comprehensive Plan. This section discusses how the Plan will be implemented by the City of San Marcos. It also addresses how the Plan will be evaluated and improved over time, and how the public will continue to be involved in the hazard mitigation planning process.

The City of San Marcos will be responsible for implementing hazard mitigation actions contained in Section 20. Each hazard mitigation action has been assigned to a specific City department that is responsible for tracking and implementing the action.

A funding source has been listed for each identified hazard mitigation action and may be utilized to implement the action. An implementation time period has also been assigned to each hazard mitigation action as an incentive and to determine whether actions are implemented on a timely basis.

The City of San Marcos will integrate hazard mitigation actions contained in the Plan Update with existing planning mechanisms such as floodplain ordinances, Emergency Operation Plans, Evacuation Plans, and other local and area planning efforts. The City of San Marcos will work closely with area organizations to coordinate implementation of hazard mitigation actions that benefit the planning area financially and economically.

Upon formal adoption of the Plan Update, Planning Team members will review existing plans along with building codes to guide development and ensure that hazard mitigation actions are implemented. Each of the City departments will be responsible for coordinating periodic review of the Plan Update with members of the Advisory Planning Team to ensure integration of hazard mitigation strategies into these planning mechanisms and codes. The Planning Team will also conduct periodic reviews of various existing planning mechanisms and analyze the need for any revisions or updates in light of the approved Plan Update. The City of San Marcos will ensure that future long-term planning objectives will contribute to the goals of the Plan to reduce the long-term risk to life and property from moderate and high-risk hazards. Within one year of formal adoption of the Plan, existing planning mechanisms will be reviewed and analyzed as they pertain to the Plan Update.

Planning Team members will review and revise, as necessary, the long-range goals and objectives in its strategic plan and budgets to ensure that they are consistent with the Plan Update.

SECTION 2: PLANNING PROCESS

Furthermore, the City of San Marcos will work with neighboring jurisdictions to advance the goals of the Plan Update as it applies to ongoing, long-range planning goals and actions for mitigating risk to natural hazards throughout the planning area.

Table 2-3 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts.

Table 2-3. Examples of Methods of Incorporation

PLANNING MECHANISM	INCORPORATION OF PLAN
Annual Budget Review	Various departments and key personnel that participated in the planning process will review this Plan Update and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action.
Capital Improvement Plans	Prior to any revisions to the Capital Improvement Plan (CIP), City departments will review the risk assessment and mitigation strategy sections of this Plan Update, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
General Plan	The City of San Marcos adopted The Vision SMTX Comprehensive Plan, the City's General Plan, in 2023. In future revisions and updates to the General Plan, the mitigation vision and goals of this Plan Update will be reviewed.
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 10 of this Plan Update discussing the people and property at risk of flooding will be reviewed and revised when updating the flood management plans or developing new plans.
Grant Applications	This Plan Update will be evaluated when grant funding is sought for mitigation projects. If a project is not in the Plan Update, a Plan Revision may be necessary to include the action in the Plan.
Regulatory Plans	Currently, the City of San Marcos has regulatory plans in place, such as Emergency Operations Plans, Continuity of Operations Plans, Land Use Plans, and Evacuation Plans. This Plan Update will be consulted when City departments review or revise their current regulatory planning mechanisms or in

SECTION 2: PLANNING PROCESS

PLANNING MECHANISM	INCORPORATION OF PLAN
	the development of regulatory plans that are not currently in place.

Appendix F Capability Assessment provides an overview of the City's existing planning and regulatory capabilities. These existing capabilities provide the mechanisms to implement the City's mitigation strategy. For example, the adoption of building codes and implementation of land use regulations have been demonstrated to help communities avoid losses from natural hazard events. In 2023, the City of San Marcos adopted the 2021 versions of the International Building Code, International Residential Code, International Energy Code, and the International Fire Code. The ordinance through which these codes were adopted also states the City will update and make changes, if necessary, to these codes to meet the unique needs of the community. This ordinance went into effect on April 1, 2023.

It should be noted for the purposes of the Plan Update that the 2018 HMAP has been used as a reference when reviewing and updating all plans and ordinances for the entire planning area. The Emergency Management Plan developed for the City of San Marcos is updated every five years and incorporates goals, objectives, and actions identified in the mitigation plan.

PLAN REVIEW AND PLAN UPDATE

As with the development of Plan Update, the City of San Marcos will oversee the review and update process for relevance and if necessary, make adjustments. At the beginning of each fiscal year, Planning Team Members will meet to evaluate the Plan and review other planning mechanisms to ensure consistency with long-range planning efforts. In addition, planning participants will also meet once a year, by conference call or presentation, to re-evaluate prioritization of the hazard mitigation actions.

TIMELINE FOR IMPLEMENTING MITIGATION ACTIONS

Both the Executive Planning Team (Table A-1, Appendix A) and the Advisory Planning Team (Table A-2, Appendix A) will engage in discussions regarding a timeframe for how and when to implement each hazard mitigation action. Considerations include when the action will be started, how existing planning mechanisms' timelines affect implementation, and when the action should be fully implemented. Timeframes may be general, and there will be short-, medium-, and long-term goals for implementation based on prioritization of each action, as identified on individual Hazard Mitigation Action worksheets included in the Plan Update for the City of San Marcos.

Both the Executive and Advisory Planning Team will evaluate and prioritize the most suitable hazard mitigation actions for the community to implement. The timeline for implementation of actions will partially be directed by the City's comprehensive planning process, budgetary constraints, and community needs. The City of San Marcos is committed to addressing and implementing hazard mitigation actions that may be aligned with and integrated into the Plan Update.

Overall, the Planning Team is in agreement that goals and actions of the Plan Update shall be aligned with the timeframe for implementation of hazard mitigation actions with respect to annual review and updates of existing plans and policies.

SECTION 2: PLANNING PROCESS

PUBLIC AND STAKEHOLDER INVOLVEMENT

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

The public was involved in the development of the City of San Marcos Hazard Mitigation Action Plan Update 2024 at different stages prior to official Plan approval and adoption. Public input was sought using three methods: (1) open public meetings; (2) survey instruments; and (3) making the draft Plan Update available for public review on the City of San Marcos's Facebook City Hall page along with the Office of Emergency Management website.

The planning team worked to identify local agencies, organizations and community leaders that focus on reaching vulnerable populations and underserved communities. These organizations were included in the planning process as stakeholders and were invited to participate in the planning process via email (Table 2-4) including the American Red Cross, COAD SMTX, Feeding America - Central Texas Food Bank, Meals on Wheels, Texas Health and Human Services Commission, Greater San Marcos Youth Council Inc., Blanco River Regional Recovery Team, Hays County Food Bank, Salvation Army, San Marcos Area Chamber of Commerce, San Marcos Housing Authority, and San Marcos CISD. In addition, public notices were posted on bulletin boards in public facilities including at the City of San Marcos City Hall.

The draft Plan Update was made available to the general public for review and comment on the City of San Marcos' Facebook and OEM website. The public was notified at the public meetings that the draft Plan Update would be available for review.

No feedback was received on the draft Plan Update, although it was given on the public survey, and all relevant information was incorporated into the Plan Update. Public input was utilized to assist in identifying hazards that were of most concern to residents of the city and what actions they felt should be included and prioritized.

The Plan Update will be advertised and posted on City of San Marcos' Office of Emergency Management website upon approval from FEMA and a copy will be kept in the Office of Emergency Management.

STAKEHOLDER INVOLVEMENT

Stakeholder involvement is essential to hazard mitigation planning since a wide range of stakeholders can provide input on specific topics and from various points of view. Throughout the planning process, members of community groups, local businesses, neighboring jurisdictions, schools, universities, and hospitals were invited to participate in development of the Plan Update. The Stakeholder Working Group (Table A-3 in Appendix A, and Table 2-4, below), included a broad range of representatives from both the public and private sector and served as a key component in the City's outreach efforts for development of the Plan Update. Documentation of stakeholder meetings is found in Appendix E. A list of organizations invited to attend via email is found in Table 2-4.

SECTION 2: PLANNING PROCESS

Table 2-4. Stakeholder Working Group

AGENCY	TITLE	PARTICIPATED
American Red Cross	Regional Manager of Communications	
Bastrop County	Assistant Emergency Management Coordinator	
Blanco River Regional Recovery Team	Executive Director	
Caldwell County	Emergency Management Coordinator	
Capital Area Council of Governments	Executive Director	
Central Texas Food Bank	Media Representative	
COAD - SMTX	Chair Board Member	X
Comal County	Emergency Management Coordinator	
Environmental Protection Agency	Regional Administrator	
Greater San Marcos Youth Council Inc.	Executive Director	
Greater Spring Project	Chief Executive	
Hays County	Director of Emergency Management	
Hays County Food Bank	Community Relations Coordinator	
Lower Colorado River Authority	Public Information Officer	
Lower Colorado River Authority	San Marcos Representative	
Meals on Wheels	Chief Development Officer	
NOAA	Regional Representative	
Salvation Army	Center Manager	
San Marcos Area Chamber of Commerce	Operations & Membership Manager	
San Marcos CISD	Superintendent	
San Marcos Greenbelt Alliance	Representative	
San Marcos Housing Authority	Executive Director	

SECTION 2: PLANNING PROCESS

AGENCY	TITLE	PARTICIPATED
San Marcos Regional Animal Shelter	Rescue Response	
ServPro	General Manager	X
ServPro	Sale Representative	X
State Legislature	District 45	
State Legislature	District 73	
State Senate	District 21	
State Senate	District 25	
Texas A&M Agrilife Extension	District 10 Representative	
Texas Commission on Environmental Quality	Regional Representative	
Texas Department of Emergency Management	Region 6, District 12 Coordinator	X
Texas Department of Transportation	District Engineer	
Texas Development Water Board	Region K Planner	
Texas Development Water Board	Region L Planner	
Texas Floodplain Management Association	Hays County Engineer	
Texas Forest Service	Mitigation and Prevention Specialist	
Texas Health and Human Services Commission	Adults and People with Disabilities Office	
Texas Parks and Wildlife	Hill Country Wildlife District - District Leader	
Texas State University	Emergency Management Coordinator	X
Texas Windstorm Insurance Association	Media Representative	
Travis County	Chief Deputy Emergency Management Coordinator	
U.S. Army Corps of Engineers	Southwest Regional Representative	
U.S. Fish & Wildlife	Southwest Regional Representative	

SECTION 2: PLANNING PROCESS

Stakeholders and participants from neighboring communities that attended the Planning Team and public meetings played a key role in the planning process. For example, codes and development restrictions as well as infrastructure improvements were two of the biggest concerns to stakeholders. The City of San Marcos included actions in the Plan to address these concerns, including incorporating green initiatives into the City's local codes and ordinances, retrofitting public buildings and critical facilities, and improving drainage near roadways and neighborhoods.

PUBLIC MEETINGS

A series of public meetings were held throughout the planning area to collect public and stakeholder input. Topics of discussion included the purpose of hazard mitigation, discussion of the planning process, and types of natural hazards. The City of San Marcos released information regarding the public meetings in their area to increase public participation in the Plan Update development process, through posting on their website, on social media sources including Facebook and Twitter, through the local media, and/or posting the information on bulletin boards in public facilities. A sampling of these notices can be found in Appendix E, along with the documentation on the public meetings. Representatives from area neighborhood associations and area residents were invited to participate.

Public meetings were held on the following dates and locations:

- March 9, 2023, San Marcos Activity Center
- May 10, 2023, San Marcos Activity Center
- July 12, 2023, San Marcos Activity Center

PUBLIC PARTICIPATION SURVEY

In addition to public meetings, the Planning and Consultant Teams developed a public survey, in both English, designed to solicit public input during the planning process from residents and stakeholders and to obtain data regarding the identification of any potential hazard mitigation actions or problem areas. The survey was promoted by local officials and a link to the survey was posted on the City of San Marcos' Office of Emergency Management website. Paper versions of the survey were also provided at each of the public meetings. A total of 39 surveys were completed online. The survey results are analyzed in Appendix B. The Planning Team reviewed the input from the surveys and decided which information to incorporate into the Plan as hazard mitigation actions. For example, many residents were concerned with retrofitting existing structures, ordinances and codes guiding new development, and water conservation along eddying sections of the Blanco River. Survey responses also showed the public has an interest in the City implementing mitigation projects related to improving emergency preparedness, enhancing disaster response, and building green infrastructure. As a result of the public survey, many of these suggested actions have been included in the mitigation strategy.



SECTION 3

CITY PROFILE

SECTION 3: CITY PROFILE

Overview	1
Population and Demographics	3
Population Growth	4
Natural, Cultural, and Historic Resources.....	4
Economic Impact	7
Existing Land Use and Development Trends	9
Future Growth and Development	11

OVERVIEW

The banks of the San Marcos River are among the oldest continuously inhabited sites in the Americas, originally populated by ancient Native Americans – the Clovis people – more than 10,000 years ago. Multiple Spanish attempts at colonization were made in the area, beginning with the establishment of the San Xavier missions in 1755. However, these were short-lived, as it wasn't until the area became the center of Anglo-American settlement in the 1840s that the City of San Marcos we know today began to take shape. On March 1, 1848, the Texas Legislature organized Hays County and designated the City of San Marcos as the county seat.

Over the latter half of the 19th century, cattle and cotton production in the area sustained the growth of San Marcos. The city slowly grew as it became linked to stagecoach routes between Austin and San Antonio, becoming a commercial center for trade between local farmers and coastal commission merchants. The Civil War stunted the growth of San Marcos; by 1870, it only held a population of 742. However, after the arrival of the International Great Northern Railroad in 1880, the City of San Marcos population grew past 2,300 before the end of the century.

The Southwest Texas State Normal School (now known as Texas State University) was founded in 1899, establishing education as a prominent local industry that continues to this day. The wartime demand of World War II initiated development of industrial and manufacturing sectors in San Marcos, greatly increasing the city's financial resources post-war. In the 1960s, Aquarena Springs and Wonder World emerged as important attractions, bolstering the tourism industry to be a reliable and growing source of income. This proliferation of industries in the 20th century, San Marcos' accessibility thanks to Interstate 35, and Austin's growth explosion fueled the exponential growth that built San Marcos to where it is today.

The City of San Marcos has a total area of 35.71 square miles, of which 35.59 square miles is land and 0.12 square miles is covered by water. San Marcos sits on the Balcones Fault, the boundary separating the area into two distinct regions. The eastern part is Blackland Prairie, while the western region consists of forested or grassy rolling hills. Many springs emerge along the Balcones fault, including San Marcos Springs, which forms Spring Lake and is the source of the San Marcos River.

The San Marcos River and Blanco River, part of the Guadalupe watershed, flow through the City of San Marcos, as well as the following: Cottonwood Creek, Purgatory Creek, Sink Creek, and Willow Springs Creek.

Figure 3-1 shows the general location of the City of San Marcos relative to other area communities within and adjacent to Hays County.

SECTION 3: CITY PROFILE

Figure 3-1. Location of the City of San Marcos

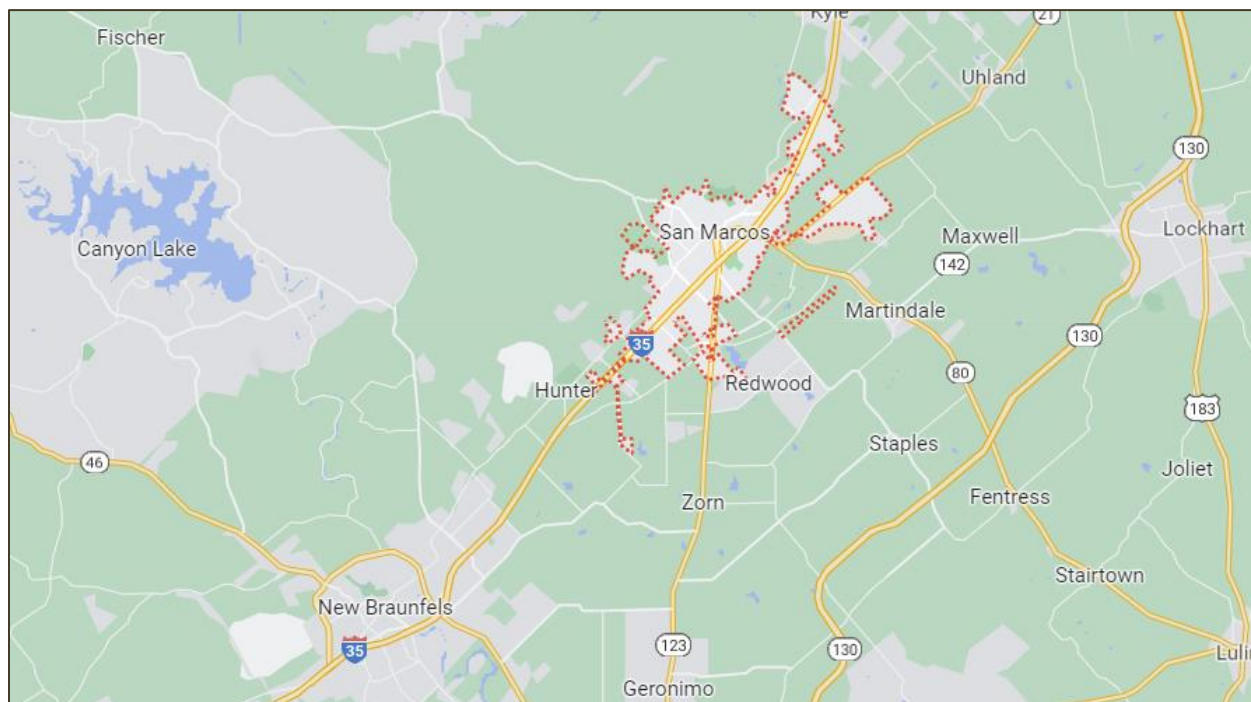
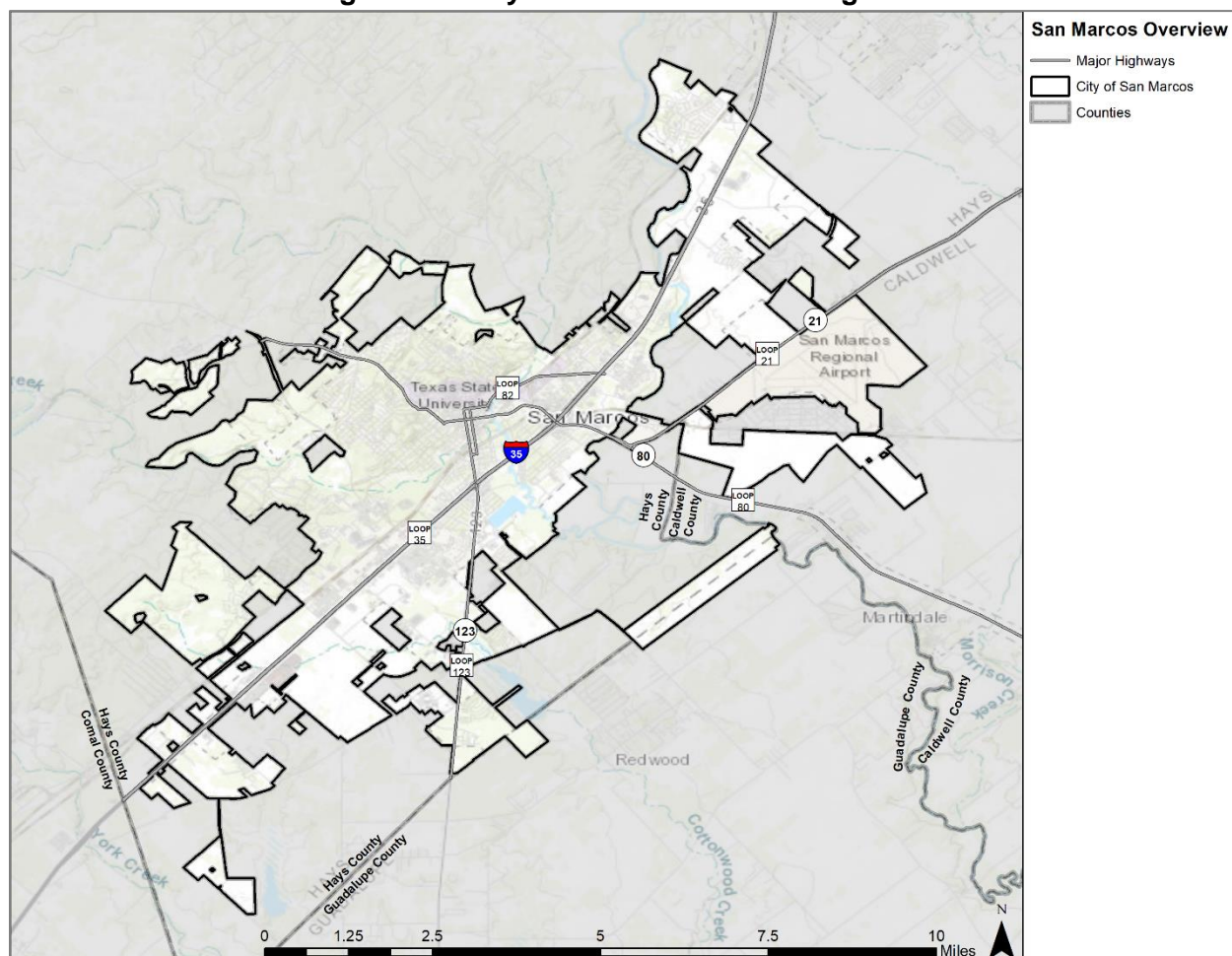


Figure 3-2 shows the city limits of the City of San Marcos, which makes up the planning area. All areas of the city's corporate limits are covered in the risk assessment analysis of the Plan.

SECTION 3: CITY PROFILE

Figure 3-2. City of San Marcos Planning Area



POPULATION AND DEMOGRAPHICS

According to the 2020 Census population count, the City of San Marcos has an official population of 67,553 residents, a 50 percent increase since the 2010 census.¹ Table 3-1 summarizes select characteristics of vulnerable or sensitive populations in the City of San Marcos using data from the U.S. Census Bureau 2021 American Community Survey (ACS) five-year estimates. Note that, in some cases the 2021 ACS estimates may differ from the 2020 Census counts; the ACS estimates are used throughout this section for consistency.

¹ Source: <https://demographics.texas.gov/Data/Decennial/2010/>, <https://www.census.gov/en.html> and <https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2020/>

SECTION 3: CITY PROFILE

Table 3-1. City of San Marcos Vulnerable and Sensitive Populations, 2021

TOTAL 2021 POPULATION	ESTIMATED VULNERABLE OR SENSITIVE POPULATIONS ²					
	Youth (Under 5)	% of Total Population	Elderly (Over 65)	% of Total Population	% Below Poverty Level	% Language other than English spoken at home
64,812	2,408	3.7%	6,034	9.3%	30.6%	28.3%

POPULATION GROWTH

The official 2020 City of San Marcos population is 67,553. Overall, the City of San Marcos experienced an increase in population between 1980 and 2020 of 188 percent, or an increase of 44,133 residents. The city continued to have population growth between 2010 and 2020 by 50 percent, or 22,659 residents. Table 3-2 provides historic growth rates in the City of San Marcos. Population growth since the last plan was considered when updating this plan. A larger population means an increase in vulnerability as well as a growth in vulnerable populations.

Table 3-2. Population for City of San Marcos, 1980-2020

1980	1990	2000	2010	2020	POP CHANGE 1980- 2020	PERCENT OF CHANGE	POP CHANGE 2010- 2020	PERCENT OF CHANGE
23,420	28,738	34,733	44,894	67,553	44,133	188%	22,659	50%

NATURAL, CULTURAL, AND HISTORIC RESOURCES

Natural resources are crucial for a functioning environment as well as providing many benefits in the overall reduction of the impacts of natural hazards. Protection of these natural resources is important to consider when identifying mitigation projects and may be used to leverage additional funding for projects that not only contribute to this plan's goals, but also provide for protection of sensitive natural resources. For instance, protecting wetland areas protects sensitive habitat as well as attenuates and stores floodwaters, increasing tree canopy coverage helps reduce the impacts of extreme heat and pollution, and protecting and planting native vegetation over invasive species helps reduce water usage and the impacts of drought.

Throughout the planning area, the City of San Marcos maintains many natural environments and assets. The city has 28 parks consisting of over 450 acres of parkland, as well as 17 designated natural areas. These natural areas contain over 2,100 acres of greenspace, over 28 miles of trails, and are home to many species of wildlife and vegetation.

² The Estimated Vulnerable or Sensitive Populations are based off the 2021 American Community Survey 5-Year Estimates Data Profiles.

SECTION 3: CITY PROFILE

In addition to the habitats and greenspaces on land, the San Marcos and Blanco rivers are central natural resources to the City of San Marcos. Recreation on the rivers such as swimming, canoeing, and tubing are a huge draw for locals and tourists alike. These rivers flow through hundreds of acres of parkland, and the San Marcos River is home to several endangered or threatened aquatic species. Through the Edwards Aquifer Habitat Conservation Plan, the City of San Marcos works to protect the endangered species and enhance the water quality in the San Marcos River. Components to this conservation effort include bank stabilization, constructing river access areas, planting native trees and shrubs along the river, and invasive species removal.³

The City of San Marcos has numerous programs and departments dedicated to the preservation and protection of the natural resources in the area. In addition, the City of San Marcos is a participant in the Community Rating System (CRS). CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP, which provides an additional level of risk reduction to community assets and resources. Please see Section 10 for additional information on CRS and higher floodplain development standards.

The Meadows Center for Water and the Environment, a research center at Texas State University, conducts research on the natural environment, focusing on water's relationship with the environment, land and habitat conservation, sustainable energy, and environmental awareness. The Meadows Center manages the habitat of Spring Lake, where the center is located, as well as developing educational programs related to habitat conservation and supporting responsible water policy in Texas.⁴

The Urban Forester for the City of San Marcos maintains, restores, and develops urban forest ecosystems for more than 2,004 acres of San Marcos. "The Community Forestry Program strives to conserve, protect and enhance existing trees and natural landscapes that are healthy and contribute to a safe and livable community, as well as to establish and maintain new trees."⁵

The City of San Marcos has also worked to incorporate environmental sustainability into the construction of both new and renovated city facilities. In 2021, an expansion to the San Marcos Public Library and the construction of a new Public Services Complex were both completed. Five rainwater harvesting tanks were installed between these two projects, which are able to collect a combined 137,000 gallons of water for landscape irrigation uses. Additionally, the library expansion project planted 30 new trees, while only removing two pre-existing trees.⁶

Sustainable San Marcos, one of a number of environmentally focused nonprofit organizations the City of San Marcos works with, hosts the Sustainable Infrastructure mapping effort in San Marcos. The mapping effort serves as a guide to the sustainable infrastructure that currently exists in San Marcos. This public resource builds awareness of organized initiatives and informal, distributed efforts being undertaken in San Marcos to make the community more sustainable.⁷

The City of San Marcos participates in the Edwards Aquifer Habitat Conservation Plan (HCP) in coordination with the Edwards Aquifer Authority, Texas Parks and Wildlife and the U.S. Fish and

³ Source: <https://www.sanmarcostx.gov/931/Rivers>

⁴ Source: <https://www.meadowscenter.txst.edu/about.html>

⁵ Source: <http://www.sanmarcostx.gov/211/Community-Forestry-Program>

⁶ Source: <http://www.sanmarcostx.gov/3519/Sustainable-Facilities>

⁷ Source: <https://ssmtx.org/sustainability-in-smtx>

SECTION 3: CITY PROFILE

Wildlife Service to best protect the endangered species of the San Marcos and Comal rivers and springs. The plan has many projects in and along the San Marcos River that work together to protect and enhance the river's water quality and habitat.⁸

To further understand natural resources that may be vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the planning area. An endangered species is any species of fish, plant life, or wildlife that is in danger of extinction throughout all or most of its range. A threatened species is a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Both endangered and threatened species are protected by law and any future hazard mitigation projects are subject to these laws. Candidate species are plants and animals that have been proposed as endangered or threatened but are not currently listed.

According to the U.S. Fish and Wildlife Service, as of August 2023, there are 12 federally endangered or threatened species in Hays County, with four additional species listed either as candidate endangered species or proposed to be added to the endangered / threatened list. These species are listed in Table 3-3. Two species found in Hays County, the bald eagle and the black-capped vireo, are currently listed as being in recovery from endangerment.

Table 3-3. Endangered Species in Hays County⁹

TYPE of SPECIES	COMMON NAME	SCIENTIFIC NAME	SPECIES STATUS
Amphibians	San Marcos Salamander	Eurycea nana	Threatened
Amphibians	Texas Blind Salamander	Eurycea rathbuni	Endangered
Amphibians	Barton Springs Salamander	Eurycea sosorum	Endangered
Birds	Whooping Crane	Grus americana	Endangered
Birds	Red Knot	Calidris canutus rufa	Threatened
Birds	Golden-cheeked Warbler	Setophaga chrysoparia	Endangered
Clams	Guadalupe Orb	Cyclonaias necki	Proposed Endangered
Clams	Texas Fatmucket	Lampsilis bracteata	Proposed Endangered
Crustaceans	Peck's Cave Amphipod	Stygobromus (Stygonectes) pecki	Endangered
Fishes	Fountain Darter	Etheostoma fonticola	Endangered
Flowering Plants	Bracted Twistflower	Streptanthus bracteatus	Threatened
Flowering Plants	Texas Wild-rice	Zizania texana	Endangered

⁸ Source: <https://www.sanmarcostx.gov/942/Habitat-Conservation-Plan>

⁹ U.S. Fish and Wildlife Service, Environmental Conservation Online System <https://ecos.fws.gov/ecp/report/species-listings-by-current-range-county?fips=48209>

SECTION 3: CITY PROFILE

TYPE of SPECIES	COMMON NAME	SCIENTIFIC NAME	SPECIES STATUS
Insects	Monarch Butterfly	Danaus plexippus	Candidate
Insects	Comal Springs Dryopid Beetle	Stygoparnus comalensis	Endangered
Insects	Comal Springs Riffle Beetle	Heterelmis comalensis	Endangered
Mammals	Tricolored Bat	Perimyotis subflavus	Proposed Endangered

The City of San Marcos has a rich history that is preserved through its designated historic districts and landmarks. Throughout the city there are seven Historic Districts and nine Historic Landmarks designated by the City of San Marcos. The City is home to famous landmark trees including the Kissing Oak, and the Log Cabin Oaks¹⁰. In 1993, San Marcos' Downtown District was listed on the National Register of Historic Places. There are also 40 buildings and sites listed on the National Register of Historic Places. Historic buildings are vulnerable to natural hazards as their construction pre-dates modern building codes. There are also historic preservation considerations and requirements for historic structures when they are included in mitigation or recovery projects.

ECONOMIC IMPACT

Building and maintaining infrastructure depends on the economy, and therefore, protecting infrastructure from risk due to natural hazards in the planning area is important to the City of San Marcos.

The City of San Marcos is a central economy of Hays County – the fastest growing county in Texas and the fastest growing county with over 100,000 residents in the United States. The region has been called “The Next Great Metropolis” by Forbes.¹¹ Much of this growth is due to San Marcos' location on the IH-35 corridor, 15 miles south of Austin and 30 miles north of San Antonio, as both of those cities are among the fastest growing Metropolitan Statistical Areas (MSA) in the country.

The area's high quality of life, proximity to major highways and international airports, and diverse and talented workforce make it an ideal place for industry. In 2021, Amazon employed 5,000 people in the City of San Marcos, making it the top employer in the city. That same year, Amazon announced an additional investment in the City of San Marcos, creating hundreds of part-time and full-time jobs with an industrial facility of over 1 million square feet.¹²

Tourism is also a key generator of jobs and growth within the San Marcos community. Over 14 million people visit the city annually to see attractions like the San Marcos River and one of the nation's largest outdoor outlet shopping centers. As a major component of travel and tourism, San Marcos' hotel and hospitality industry is also closely tied to the economic development in the area.

¹⁰ Source: https://www.waymarking.com/waymarks/WMZFKH_Log_Cabin_Oaks_San_Marcos_TX

¹¹ Source: <https://www.forbes.com/sites/joelkotkin/2016/10/13/the-next-great-american-metropolis-is-taking-shape-in-texas/?sh=9ebc6471e2fb>

¹² Source: <https://www.sanmarcostx.gov/ArchiveCenter/ViewFile/Item/544>

SECTION 3: CITY PROFILE

The City of San Marcos offers a richly diverse pool of highly skilled, multilingual, multicultural workers. Of adults 25 years and older, 34 percent have a bachelor's degree or higher. Texas State University stimulates the San Marcos economy as both one of its top employers and a business incentive drawing innovative companies to the area to collaborate with its programs in disciplines like engineering and commercialization.

Based on the American Community Survey 2021 estimates, 65 percent of the population 16 years and over is employed in the labor force. The per capita income is \$22,001, and the median household income in the city is \$42,500. It is estimated that 30 percent of people in the City of San Marcos are below the poverty level.

Table 3-4 and Table 3-5 show the various occupations and industries within the City of San Marcos, according to the 2021 estimates by the American Community Survey.

Table 3-4. Occupations of Employed Population in the City of San Marcos¹³

OCCUPATION	ESTIMATE	PERCENT
Civilian employed population 16 years and over	38,536	-
Management, business, science, and arts occupations	12,640	32.8%
Service occupations	9,750	25.3%
Sales and office occupations	8,979	23.3%
Production, transportation, and material moving occupations	4,586	11.9%
Natural resources, construction, and maintenance occupations	2,582	6.7%

Table 3-5. Industries of Employed Population in Hays County¹⁴

INDUSTRY	ESTIMATE	PERCENT
Civilian employed population 16 years and over	38,536	-
Educational services, and health care and social assistance	9,249	24.0%
Arts, entertainment, and recreation, and accommodation and food services	7,206	18.7%
Retail trade	5,357	13.9%
Professional, scientific, and management, and administrative and waste management services	3,468	9.0%
Transportation and warehousing, and utilities	2,698	7.0%

¹³ 2021 American Community Survey 5-Year Estimates Data Profiles.

¹⁴ 2021 American Community Survey 5-Year Estimates Data Profiles.

SECTION 3: CITY PROFILE

INDUSTRY	ESTIMATE	PERCENT
Construction	2,582	6.7%
Manufacturing	2,004	5.2%
Finance and insurance, and real estate and rental and leasing	1,850	4.8%
Other services, (except public administration)	1,580	4.1%
Public administration	1,117	2.9%
Information	732	1.9%
Wholesale trade	462	1.2%
Agriculture, forestry, fishing and hunting, and mining	270	0.7%

EXISTING LAND USE AND DEVELOPMENT TRENDS

Development trends in the City of San Marcos have been largely shaped by the increase in things like population, land area, and the number of students at Texas State University over the past 10 years. Additionally, advances in technology and social consciousness surrounding sustainability, resiliency, and equity have provided a new context for planning.

The Vision SMTX Comprehensive plan for the City of San Marcos recognizes the city as a community of diverse and inclusive neighborhoods that protects and celebrates the river and other rich natural, historical, and cultural assets; embraces its small-town feel, charm and quality of life; and leverages strategic development to continue building a sustainable community with enhanced access and opportunities for people and businesses.¹⁵ This plan takes into consideration guiding principles from the community, and uses them to establish goals through 2050. These include things like incentivizing conservation land use policies or providing better access to goods and services for those living and working east of IH-35.

According to the 2021 American Community Survey five-year estimates, there are a total of 28,249 housing units in the City of San Marcos, of which 25,707 are occupied units (91 percent of total units) and 2,542 are vacant units. Of the occupied housing units, 26 percent are owner-occupied and 74 percent are renter-occupied, nearly double the estimated rate of renter-occupied units for the state of Texas.¹⁶ Homeownership can reflect an individual's connection to a community, place attachment, and ownership of their community. Homeownership can also be used as a measure of a community's economic strength. Low levels of homeownership can be an indication of a fluctuating local economy and may indicate a population with less than long-term commitment to the local community, "which could hamper [implementation of] both individual and community mitigation actions" before a disaster as well as during recovery periods.¹⁷

¹⁵ Source: www.visionsmtx.com ; at time of drafting, this plan was still in process of adoption

¹⁶ U.S. Census Bureau American Community Survey Five-Year Estimates, 2017-2021

¹⁷ FEMA Community Resilience Indicator Analysis, September 2021, https://www.fema.gov/sites/default/files/documents/fema_community-resilience-indicator-analysis_2022.pdf

SECTION 3: CITY PROFILE

A review of building permits gives a picture of the built environment and the number of buildings that are being constructed in the city. Table 3-6 lists the number of residential buildings and total units authorized through a permit from the City of San Marcos between 2000 and 2021. The data includes total buildings, total units and the total value of construction costs to show the potential increase in vulnerability of structures to the various hazards assessed in the HMAP risk assessment. The increase in vulnerability can be attributed to the higher construction costs that would be factored into repairing or replacing a structure using current market values. Permits are reported annually in September and the data includes that from 2000 through 2021 to demonstrate growth. Of the residential building permits issued in this period, 59 percent were for multi-family residential units and 41 percent for single family units. Housing type can also be an indication of an individual's ability to recover from a disaster.¹⁸

Table 3-6. City of San Marcos Residential Building Permits Issued, 2000-2021¹⁹

YEAR	TOTAL BUILDINGS	TOTAL UNITS	TOTAL VALUE
2000	197	1,079	\$52,803,405
2001	147	602	\$31,449,804
2002	188	560	\$83,118,889
2003	182	499	\$42,979,899
2004	181	745	\$55,487,740
2005	181	664	\$51,166,568
2006	158	638	\$48,138,858
2007	112	527	\$38,261,708
2008	67	388	\$27,144,249
2009	53	178	\$13,674,819
2010	366	1,294	\$97,687,951
2011	274	1,229	\$90,920,201
2012	384	1,999	\$145,192,007
2013	402	1,958	\$144,890,833
2014	243	243	\$39,493,164
2015	277	277	\$37,699,709
2016	352	352	\$51,824,715

¹⁸ Evidence from Hurricane Ike, International Journal of Disaster Risk Reduction, Volume 57, 2021,102149, ISSN 2212-4209, <https://doi.org/10.1016/j.ijdr.2021.102149>.
(<https://www.sciencedirect.com/science/article/pii/S2212420921001151>)

¹⁹ U.S. Census Bureau, Building Permit Survey, 1992-2021, <https://www.census.gov/construction/bps/>

SECTION 3: CITY PROFILE

YEAR	TOTAL BUILDINGS	TOTAL UNITS	TOTAL VALUE
2017	419	419	\$69,986,491
2018	557	557	\$86,468,277
2019	577	577	\$105,399,917
2020	625	625	\$117,547,676
2021	721	721	\$134,559,361
Total	6,663	16,131	\$1,565,896,241

FUTURE GROWTH AND DEVELOPMENT

To better understand how future growth and development in the city might affect hazard vulnerability, it is useful to consider population growth, vacant land, the potential for future development in hazard areas, and current planning and growth management efforts.

Population projections for Hays County from 2020 to 2050 are listed in Table 3-7, as provided by the Office of the State Demographer, Texas State Data Center, and the Institute for Demographic and Socioeconomic Research. Population projections are based on a 0.5 scenario growth rate, which is 50 percent of the population growth rate that occurred during 2010-2020. This information is only available at the county level; however the City of San Marcos is a major driver of growth in Hays County. San Marcos accounts for approximately 30 percent of the total Hays County population and has captured nearly 27 percent of the population growth in the county since 2000.²⁰

Table 3-7. Hays County Population Projections²¹

LAND AREA (SQ MI)	2010		2020		2030		2040		2050	
	Population									
	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)
676.85	157,107	232.11	234,896	347.04	347,120	512.85	509,975	753.45	746,149	1,102.4

The estimated increase in population and continued growth will result in challenges to the City of San Marcos infrastructure and development. To accommodate projected growth rates, it is estimated that between 42,000 and 54,000 additional housing units will be needed by 2050.²²

²⁰ Source: www.visionsmtx.com/wp-content/uploads/2023/02/VisionSMTX_FinalDraft_02.16.23_.pdf

²¹ Office of the State Demographer, Texas State Data Center, and the Institute for Demographic and Socioeconomic Research

²² Source: <https://ktswblog.net/2022/12/22/san-marcos-continues-to-adapt-to-growing-population/>

SECTION 3: CITY PROFILE

Comprehensive Plans are guiding documents in a community that sets forth a vision, goals, policies, and guidelines to direct future physical, social, and economic development that will occur within a jurisdiction. Comprehensive Plans are part of a continuous process to provide an environment for the community and to consider the general desire of the community to conserve, preserve, and protect the natural environment of their jurisdiction. These plans are used to guide city staff, decision-makers, and the community in making decisions which affect the community with the understanding of the long-term effects. The Vision SMTX Comprehensive plan for the City of San Marcos notes a major goal of development over the next 30 years to make all areas of San Marcos into complete places, meaning residents have readily accessible community spaces and amenities near where they live. Many residents in newer neighborhoods currently need to drive for nearly all of their trips. In particular, the community's most noted area needing improvement is east of IH-35, as residents who live and work in that area would benefit from better access to goods and services.²³

²³ Source: www.visionsmtx.com/wp-content/uploads/2023/02/VisionSMTX_FinalDraft_02.16.23_.pdf



SECTION 4

RISK OVERVIEW

SECTION 4: RISK OVERVIEW

Hazard Description	1
Disaster Declaration History	4
Natural Hazards and Climate Change	5
Overview of Hazard Analysis	7
Hazard Ranking	9

HAZARD DESCRIPTION

Section 4 is the first phase of the Risk Assessment, providing background information for the hazard identification process and descriptions for the hazards identified. The Risk Assessment continues with Sections 5 through 17, which include hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the City of San Marcos identified 13 natural hazards that are addressed in the 2024 Hazard Mitigation Plan Update and were identified as significant, as shown in Table 4-1. The hazards were identified through input from Planning Team members and a review of the current 2018 State of Texas Hazard Mitigation Plan (State Plan). Readily available online information from reputable sources such as federal and state agencies were also evaluated and utilized to supplement information as needed.

In general, there are three main categories of natural hazards: atmospheric, hydrologic, and technological. Atmospheric hazards are events or incidents associated with weather generated phenomenon. The atmospheric hazards that have been identified as significant for the planning area include extreme heat, hail, hurricane/tropical storm, lightning, thunderstorm wind, tornado, and winter storm (Table 4-1).

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. Hydrologic hazards identified as significant for the planning area include flood and drought.

Technological hazards refer to the origins of incidents that can arise from human activities, such as the construction and maintenance of dams. They are distinct from natural hazards primarily because they originate from human activity. The risks presented by natural hazards may be increased or decreased as a result of human activity, however they are not inherently human-induced. Therefore, dam failure is classified as a quasi-technological hazard and referred to as “technological” in Table 4-1 for purposes of description.

For the Risk Assessment, the wildfire, earthquake, and expansive soils hazards are considered “other,” since the hazards are not considered atmospheric, hydrologic, nor technological.

SECTION 4: RISK OVERVIEW

Table 4-1. Hazard Descriptions

HAZARD	DESCRIPTION
ATMOSPHERIC	
Extreme Heat	Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period of time.
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 subsequent cooling of the air mass.
Hurricane/Tropical Storm	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.
Lightning	Lightning is a sudden electrostatic discharge that occurs during an electrical storm. This discharge occurs between electrically charged regions of a cloud, between two clouds, or between a cloud and the ground.
Thunderstorm Wind	A thunderstorm occurs when an observer hears thunder. Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms. Lightning detection networks routinely track cloud-to-ground flashes, and therefore thunderstorms.
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. The destruction caused by tornadoes ranges from light to catastrophic, depending on the location, intensity, size, and duration of the storm.
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. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.
HYDROLOGIC	
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality.

SECTION 4: RISK OVERVIEW

HAZARD	DESCRIPTION
Flood	The accumulation of water within a body of water, 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, and shallow flooding.
OTHER	
Expansive Soils	Expansive soils are soils and soft rock that tend to swell or shrink due to changes in moisture content. Changes in soil volume present a hazard primarily to structures built on top of expansive soils.
Wildfire	A wildfire is 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. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors.
Earthquake	An earthquake is the sudden, rapid, shaking of the earth, caused by the breaking and shifting of subterranean rock as it releases strain that has accumulated over a long time. Initial mild shaking may strengthen and become extremely violent within seconds.
TECHNOLOGICAL	
Dam Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam.

Hazards that weren't considered significant and were not included in the Plan Update are located in Table 4-2, along with the evaluation process used for determining the significance of each of these hazards. Hazards not identified for inclusion at this time may be addressed during future evaluations and updates.

Table 4-2. Other Hazards Deferred

HAZARD CONSIDERED	REASON FOR DETERMINATION
Coastal Erosion	The planning area is not located on the coast, therefore coastal erosion does not pose a risk.

SECTION 4: RISK OVERVIEW

HAZARD CONSIDERED	REASON FOR DETERMINATION
Land Subsidence	There are no historical occurrences of land subsidence for the planning area and it is located in an area where occurrences are considered rare. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of land subsidence and none is expected in the future.

DISASTER DECLARATION HISTORY

One method of understanding hazards that pose a risk to City of San Marcos is to identify past hazards events that triggered federal or state disaster declarations. Federal and state declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. Table 4-3 lists state and federal disaster declarations received by Hays County. Many of the disaster events were regional or statewide.

Between 1953 and October 2023, Hays County received 26 Federal disaster declarations. Out of the 26 federally declared disasters, a majority (7) were related to wildfire, followed by declarations for flood (5), severe storms (4), hurricanes (3), winter weather (3), biological (2), tornado (1), and drought (1).

In addition to the 26 federally declared disasters, there have been 27 U.S. Department of Agriculture (USDA) Secretarial disaster designations between 2013 and 2023. The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county.¹ Of the USDA designations, a majority were for drought (9), followed by those for wind (4), wildfire (4), excessive heat (4), and insects (4).

Table 4-3. Disaster Declaration History in Hays County, 1953-2023

YEAR	DECLARATION TITLE	HAZARD	DECLARATION TYPE	DISASTER No.
1970	Tornadoes, Windstorms & Flooding	Tornado	DR	DR-286
1972	Severe Storms & Flooding	Flood	DR	DR-333
1991	Severe Thunderstorms	Flood	DR	DR-930
1993	Extreme Fire Hazard	Drought	EM	EM-3113
1997	Severe Storms & Flooding	Flood	DR	DR-1179
1998	Tropical Storm Charley	Severe Storm	DR	DR-1239
1998	TX-Flooding 10/18/98	Flood	DR	Dr-1257

¹ United States Department of Agriculture https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/emergency_disaster_designation_declaration_process-factsheet.pdf

SECTION 4: RISK OVERVIEW

YEAR	DECLARATION TITLE	HAZARD	DECLARATION TYPE	DISASTER No.
1999	Extreme Fire Hazard	Fire	EM	EM-3142
2001	TX Amherst Street Fire	Fire	FSA	FSA-2352
2002	Severe Storms & Flooding	Flood	DR	DR-1425
2005	Hurricane Katrina	Hurricane	EM	EM-3216
2005	Hurricane Rita	Hurricane	EM	EM-3261
2005	Hurricane Rita	Hurricane	DR	DR-1606
2006	Niederwald Fire	Fire	FM	FM-2617
2006	Extreme Wildfire Threat	Fire	DR	DR-1624
2006	Rim Rock Fire	Fire	FM	FM-2680
2008	Wildfires	Fire	EM	EM-3284
2008	Old Bastrop Highway Fire Complex	Fire	FM	FM-2751
2013	Severe Storms & Flooding	Severe Storm	DR	DR-4159
2015	Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Severe Storm	DR	DR-4223
2015	Severe Storms, Tornadoes, Straight-line Winds, & Flooding	Severe Storm	DR	DR-4245
2020	Covid-19	Biological	EM	EM-3458
2020	Covid-19 Pandemic	Biological	DR	DR-4485
2021	Severe Winter Storm	Severe Ice Storm	EM	EM-3554
2021	Severe Winter Storms	Severe Ice Storm	DR	DR-4586
2023	Severe Winter Storm	Winter Storm	DR	DR-4705

NATURAL HAZARDS AND CLIMATE CHANGE

Climate change is defined as a long-term shift in temperature and weather patterns. These shifts can increase or decrease the risk of natural hazards. Global climate change is expected to exacerbate the risks of certain types of natural hazards impacted through rising sea levels, warmer ocean temperatures, higher humidity, the possibility of stronger storms, and an increase in wind and flood damages due to storm surges. Texas is considered one of the more vulnerable states in the U.S. to both abrupt climate changes and to the impact of gradual climate changes to the natural and built environments.

SECTION 4: RISK OVERVIEW

Climate change is expected to lead to an increase in average temperatures as well as an increase in frequency, duration, and intensity of extreme heat events. With no reductions in emissions worldwide, Texas is projected to experience an additional 30 to 60 days per year above 100°F than what is experienced now.²

The State Climatologist's *Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036* identifies ongoing and likely future trends out to the year 2036 based on analysis of historic observations of temperatures, precipitation, and extreme weather. Table 4-4 highlights future trends in extreme weather from the report.

Table 4-4. Future Trends in Extreme Weather in Texas³

HAZARDS	EXPECTED TRENDS
Extreme Temperatures	<ul style="list-style-type: none">○ The average annual surface temperature in 2036 is expected to be 3.0°F warmer than the 1950-1999 average and 1.8°F warmer than the 1991-2020 average.○ Nearly double the number of 100°F days by 2036 compared to 2001-2020.○ Higher frequency of 100°F days in urban areas.○ Extreme monthly summertime temperature trends imply an increase of about 1°F compared to the 1950-1999 average.○ Extreme monthly wintertime temperatures are expected to continue to increase at an even faster rate.○ The coolest days of the summer are expected to continue becoming warmer.
Precipitation	<ul style="list-style-type: none">○ Precipitation has increased by 10 percent or more in eastern Texas, but little trend is present in western Texas.○ Precipitation trends to 2036 are likely to be dominated by natural variability.○ Extreme precipitation is expected to increase in intensity on average statewide by 6-10 percent compared to the 1950-1999 averages and 2-3 percent relative to the 2001-2020 averages.○ This translates to an increase in the frequency of extreme rain of 30-50 percent relative to the climatological expected frequency in 1950-1999 and 10-15 percent relative to 2001-2020.
Drought	<ul style="list-style-type: none">○ Increasing temperatures, rainfall variability, and other factors will on balance decrease water availability, but impact changes will vary strongly across applications.○ Impact trends to be highly sector-specific, with the impacts possibly smaller for agriculture than for surface water supply.

² U.S. Global Change Research Program, Washington, DC, USA, pp. 987–1035. doi: 10.7930/NCA4.2018.CH23. <https://nca2018.globalchange.gov/chapter/23/>

³ Gammon-Nielsen, John, Holman, Sara, Buley, Austin and Jorgensen, Savannah. *Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, 2021 Update*. Texas A&M University Office of the Texas State Climatologist. October 7, 2021. <https://climatexas.tamu.edu/files/ClimateReport-1900to2036-2021Update>

SECTION 4: RISK OVERVIEW

HAZARDS	EXPECTED TRENDS
Flood	<ul style="list-style-type: none">○ No long-term river flooding trend has been identified in the observations, nor is such a trend projected at this point, except perhaps for the most extreme floods and areas with normally high rainfall.○ Urban flooding is projected to increase, both as a simple matter of urban population increase and because of the projected increase of precipitation intensity, which drives flooding in fast-response drainages like those usually found in urban areas.○ The climate-driven trend in urban flood frequency should be similar to the climate-driven trend in extreme precipitation frequency: 30-50 percent in 2036 relative to 1950-1999 and 10-15 percent relative to 2001-2020.
Winter Weather	<ul style="list-style-type: none">○ As the climate warms, the likelihood of winter weather decreases.○ Both extreme cold and snowfall either become less frequent or are expected to do so.○ Widespread snowfall events in Texas such as the one that took place in February 2021 are extremely rare.
Thunderstorms (Wind, Hail, Lightning)	<ul style="list-style-type: none">○ Historical trend data is unreliable.○ Indirect evidence supports an increase in the number of days capable of producing severe thunderstorms and an increase in the frequency of very large hail in early springtime, but these possible trends are too uncertain to quantify.
Wildfire	<ul style="list-style-type: none">○ Weather and climate drivers of wildfire risk are projected to increase the risk of wildfires throughout the state, primarily due to increased rates of drying and increased fuel load.

OVERVIEW OF HAZARD ANALYSIS

The methodologies utilized to develop the Risk Assessment are a historical analysis and a statistical approach. Both methodologies provide an estimate of potential impact by using a common systematic framework for evaluation.

Records retrieved from National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA) were reported for the City of San Marcos. Remaining records identifying the occurrence of hazard events in the planning area and the maximum recorded magnitude of each event were also evaluated.

The use of geographic information system (GIS) technology to identify and assess risks for the City of San Marcos and evaluate community assets and their vulnerability to the hazards.

The four general parameters that are described for each hazard in the Risk Assessment include frequency of return, approximate annualized losses, a description of general vulnerability, and a statement of the hazard's impact.

Frequency of return was calculated by dividing the number of events in the recorded time period for each hazard by the overall time period that the resource database recorded events. Frequency

SECTION 4: RISK OVERVIEW

of return statements are defined in Table 4-5, and impact statements are defined in Table 4-6 below.

Table 4-5. Frequency of Return Statements

PROBABILITY	DESCRIPTION
Highly Likely	Event is probable in the next year.
Likely	Event is probable in the next three years.
Occasional	Event is probable in the next five years.
Unlikely	Event is probable in the next ten years.

Table 4-6. 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 illnesses resulting 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 illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week. More than 10 percent of property destroyed or with major damage.
Limited	Injuries and illnesses are treatable with first aid. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property destroyed or with major damage.

Each of the hazard profiles includes a description of a general Vulnerability Assessment. Vulnerability is the total of assets that are subject to damages from a hazard, based on historic recorded damages. Assets in the region were inventoried and defined in hazard zones where appropriate. The total amount of damages, including property and crop damages, for each hazard is divided by the total number of assets (building value totals) in that community to determine the percentage of damage that each hazard can cause to the community. Risk and consequences will be addressed and covered within each hazard profile under the Vulnerability and Impact section as well as under the Assessment of Impact sections, where applicable.

To better understand how future growth and development in the City of San Marcos might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts. The city's vulnerability to hazards was considered based on recent development changes that occurred throughout the planning area. The population of the City of San Marcos has grown

SECTION 4: RISK OVERVIEW

by 50 percent between 2010 and 2020 according to the U.S. Census Bureau, therefore the vulnerability to the population, infrastructure, and buildings has increased for hazards that do not have a geographical boundary.

Once loss estimates and vulnerability were identified, an impact statement was applied to relate the potential impact of the hazard on the assets within the area of impact.

HAZARD RANKING

During the 2023 planning process, the Planning Team conducted a risk rating exercise to get input from the Planning Team and stakeholders. Table 4-7 portrays the results of the risk assessment analysis including the frequency of occurrence and potential severity. The definitions for frequency of occurrence and potential severity can be found in Table 4-5 and Table 4-6.

Table 4-7. Hazard Risk Ranking

HAZARD	FREQUENCY OF OCCURENCE	POTENTIAL SEVERITY
Dam Failure	Unlikely	Limited
Drought	Likely	Limited
Earthquake	Unlikely	Limited
Expansive Soils	Unlikely	Limited
Extreme Heat	Highly Likely	Limited
Flood	Highly Likely	Substantial
Hail	Highly Likely	Limited
Hurricane/Tropical Storm	Likely	Limited
Lightning	Highly Likely	Limited
Thunderstorm Wind	Likely	Limited
Tornado	Unlikely	Minor
Wildfire	Highly Likely	Limited
Winter Storm	Highly Likely	Limited



SECTION 5

DAM FAILURE

SECTION 5: DAM FAILURE

Hazard Description	1
Location	2
Extent	5
Historical Occurrences	7
Probability of Future Events	8
Vulnerability and Impact.....	8
Assessment of Impacts.....	9
Climate Change Considerations.....	10

HAZARD DESCRIPTION

Dams are water storage, control, or diversion structures that impound water upstream in reservoirs. Dam failure can take several forms, including a collapse of or breach in the structure. While most dams have storage volumes small enough that failures have few or no repercussions, dams storing large 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 of the embankment;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, or maintain gates, valves, and other operational components;
- Improper design or use of improper construction materials;
- Failure of upstream dams in the same drainage basin;
- High winds, which can cause significant wave action and result in substantial erosion;
- Destructive acts of terrorism; and,
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, leading to structural failure.

Benefits provided by dams include water supplies for drinking; irrigation and industrial uses; flood control; hydroelectric power; recreation; and navigation. Dams in Texas serve many purposes, some of which include recreation, flood mitigation, irrigation, water supply, and fire protection. About 1 in 3 of the state's dams are for flood risk mitigation and 1 in 7 dams are for irrigation or water supply.¹

While dams serve a role in helping communities' function, dams also represent a risk to public safety. Dams require ongoing maintenance, monitoring, safety inspections, and sometimes even rehabilitation to continue safe service.

In the event of a dam failure, the energy of the water stored behind the dam is capable of causing rapid and unexpected flooding downstream, resulting in loss of life and substantial property damage. A devastating effect on water supply and power generation could be expected as well.

¹ American Society of Civil Engineers. "2021 Report Card for America's Infrastructure: Infrastructure Texas Report Card." 2021. <https://infrastructurereportcard.org/state-item/texas/>

SECTION 5: DAM FAILURE

The terrorist attacks of September 11, 2001 generated increased focus on protecting the country's infrastructure, including ensuring the safety of dams.

One major issue with the safety of dams is their age. The average age of America's more than 90,000 dams is 57 years.² According to estimates released in 2022 by the Association of State Dam Safety Officials, the total cost of rehabilitating non-federal dams is \$75.69 billion. Of non-federal dams, the high-hazard potential dams are estimated at a total of \$24.04 billion for rehabilitation.³ In addition to the continual aging of dams, there have not been significant increases in the number of safety inspectors resulting in haphazard maintenance and inspection. Within Texas there are over 3,200 dams exempt from dam safety requirements by State legislation.⁴

The current maintenance budget does not match the scale of the United States' long-term modifications of its watersheds. Worse still, more people are moving into risky areas. As the population grows, dams that once could have failed without major repercussions are now upstream of cities and development. Dams once classified as low hazard have the potential to be reclassified as high hazard potential dams as development and populations increase downstream.



LOCATION

The State of Texas has 7,413 dams, all regulated by the Texas Commission on Environmental Quality (TCEQ). The National Dam Safety Review Board (in coordination with FEMA) and the National Inventory of Dams (NID) lists a total of ten dams that are owned by or located in the City

² American Society of Civil Engineers. "2021 Report Card for America's Infrastructure." 2021. <https://infrastructurereportcard.org/>

³ Association of State Dam Safety Officials, "The Cost of Rehabilitating Our Nation's Dams". March 2022. https://damsafety-stag.s3.amazonaws.com/s3fs-public/files/Cost%20of%20Rehab%20Report-2022%20FINAL_0.pdf

⁴ American Society of Civil Engineers. "2021 Report Card for America's Infrastructure: Infrastructure Texas Report Card." 2021. <https://infrastructurereportcard.org/state-item/texas/>

SECTION 5: DAM FAILURE

of San Marcos (Appendix D). Each of these dams were analyzed individually by location, volume, elevation, and condition (where available) when determining the risk, if any, for each dam. Each dam site was further analyzed for potential risks utilizing FEMA's National Flood Hazard Layer (where available) to map locations and fully understand development near the dam and topographical variations that may increase risk for the City of San Marcos planning area.

Most of the dams listed were embankments for typically dry detention drainage areas or shored up stream embankments. These types of structures are utilized for flood control and do not pose a dam failure risk. Other dams in the planning area feature such limited storage capacity that they pose no risk to structures, infrastructure, or residents. Dams that were deemed to pose no past, current, or future risk to the planning area are not profiled in the plan as no loss of life or impact to critical facilities or infrastructure is expected in the event of a breach. Based on this analysis, the planning team was able to determine that only 5 of the 10 dams identified pose a risk to the planning area (refer to Table 5-1). Figure 5-1 illustrates general locations for each dam posing a potential risk to the planning area.

The dam inundation maps were provided for the five dams profiled in this section (Appendix D). The number and types of structures in the inundation areas was not available. The dam failure extent section below includes the estimated number of structures most at risk in the immediate area within a one- or three-mile radius, depending on the capacity of the dam, for all five profiled dams. These structures are considered to be at greatest risk in the event of a breach. For dams with a maximum storage capacity of 100,000 acre-feet or more, all structures within five miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity between 10,000 and 100,000 acre-feet, all structures within three miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity of less than 10,000 acre-feet, all structures within one mile are considered to be at risk to potential dam failure hazards. The inundation area maps extend beyond this radius to show the breach overflow areas subject to minimal flooding. However, the risk in these extended areas is considered minimal due to the limited capacity of the dams.

The estimated inundation radius has been included on the location map for each profiled dam (indicated by the red circle).

SECTION 5: DAM FAILURE

Figure 5-1. Dams with Potential Risk to City of San Marcos

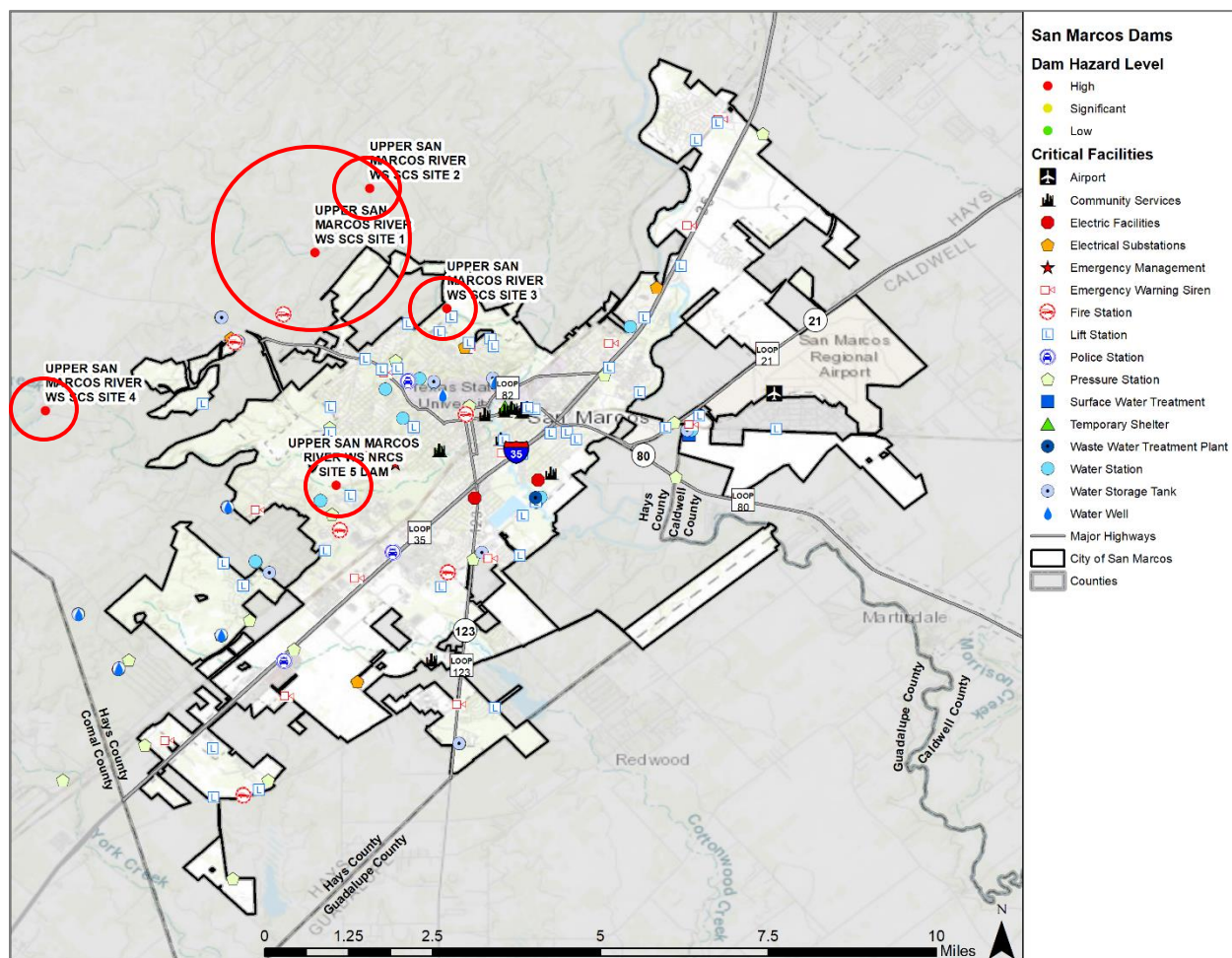


Table 5-1. City of San Marcos Dam Survey⁵

LOCATION	DAM NAME	CLASSIFICATION	HEIGHT (feet)	MAX STORAGE (acre feet)	OWNER
		CONDITION			
City of San Marcos	Upper San Marcos River WS SCS Site 1	High	80	18,399	City of San Marcos/ Hays Co SWCD
		Satisfactory			
City of San Marcos	Upper San Marcos River WS SCS Site 3	High	60	4,323	City of San Marcos/ Hays Co SWCD
		Satisfactory			
City of San Marcos	Upper San Marcos River WS SCS Site 4	High	101	8,421	City of San Marcos/ Hays Co SWCD
		Satisfactory			

⁵ National Inventory of Dams

SECTION 5: DAM FAILURE

LOCATION	DAM NAME	CLASSIFICATION	HEIGHT (feet)	MAX STORAGE (acre feet)	OWNER
		CONDITION			
City of San Marcos	Upper San Marcos River WS NRCS Site 5 Dam	High	73.5	7,329	City of San Marcos/ Hays Co SWCD
		Satisfactory			
Hays County	Upper San Marcos River WS SCS Site 2	High	51	3,034	City of San Marcos/ Hays Co SWCD
		Satisfactory			

EXTENT

The extent or magnitude of a dam failure event is described in terms of the classification of damages that could result from a dam's failure, not the probability of failure. For dams with a maximum storage capacity of 100,000 acre-feet or more, all census blocks within five miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity between 10,000 and 100,000 acre-feet, all census blocks within three miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity of less than 10,000 acre-feet, all census blocks within one mile are considered to be at risk to potential dam or levee failure hazards. Each profiled dam describes the structures or infrastructure considered to be at risk in the event of a breach based on each estimated inundation zone. An estimated depth for dam breach is indicated for each profiled dam.⁶

Upper San Marcos River WS SCS Site 1 Dam:

Upper San Marcos River WS SCS Site 1 Dam is located in the City of San Marcos on the Sink Creek and is used for flood control purposes. The earthen dam is owned by the City of San Marcos, along with Hays County, Hays County SWCD, and Upper San Marcos WS Reclamation. It was constructed in 1983 and has not been modified since construction was completed. The area located near the dam is semi-rural, with limited development in the immediate area near the dam. In the event of a breach, approximately 200 residential structures and 10 commercial structures within a three mile radius from the dam could be impacted. In addition, a dam failure could cause limited infrastructure damage, minor power outages and could disrupt utility systems.

In the event of a breach, it is estimated that the average breach width would be 330.9 feet with a maximum breach flow of 2,562 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of up to 25 feet, with the highest depth in the immediate area of the dam.

Upper San Marcos River WS SCS Site 3 Dam:

Upper San Marcos River WS SCS Site 3 Dam is located in the City of San Marcos on the Sink Creek and is used for flood control purposes. The earthen dam is owned by the City of San Marcos, along with Hays County, Hays County SWCD, Upper San Marcos WS Reclamation, and FCD. It was constructed in 1991 and has not been modified since construction was completed. The area located near the dam is semi-rural with limited development in the immediate area

⁶ Dam breach depth is an estimate based on best available data, not statistical data.

SECTION 5: DAM FAILURE

around the dam. In the event of a breach, approximately 75-100 residential structures within a one mile radius from the dam could be impacted. In addition, a dam failure could cause limited infrastructure damage, minor power outages and could disrupt utility systems. Extensive damage is not anticipated in the event of a breach due to the limited storage capacity of the dam.

In the event of a breach, it is estimated that the average breach width would be 214.4 feet with a maximum breach flow of 6,733 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of up to 20 feet, with the highest depth in the immediate area of the dam.

Upper San Marcos River WS SCS Site 4 Dam:

Upper San Marcos River WS SCS Site 4 Dam is located in the City of San Marcos on the Purgatory Creek and is used for flood control purposes. The earthen dam is owned by the City of San Marcos, along with Hays County, Hays County SWCD, Upper San Marcos WS Reclamation, and FCD. It was constructed in 1991 and was modified in 2018. The area located near the dam is rural with very limited development within a one mile radius of the dam. It is estimated that a breach could impact approximately 10 residential structures. In addition, a dam failure could cause limited infrastructure damage, minor power outages and could disrupt utility systems. Extensive damage is not anticipated in the event of a breach due to the limited storage capacity of the dam.

In the event of a breach, it is estimated that the average breach width would be 288.5 feet with a maximum breach flow of 7,099 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of up to 25 feet, with the highest depth in the immediate area of the dam.

Upper San Marcos River WS NRCS Site 5 Dam:

Upper San Marcos River WS NRCS Site 5 Dam is located in the City of San Marcos on the Purgatory Creek and is used for flood control purposes. The earthen dam is owned by the City of San Marcos, along with Hays County, Hays County SWCD, Upper San Marcos WS Reclamation and FCD. It was constructed in 1989 and was modified in 2017. The area located near the dam is densely populated with several hundred residential and commercial structures located within one mile of the dam. In addition, a dam failure could cause limited infrastructure damage, minor power outages and could disrupt utility systems. Development is limited in the immediate area around the dam where flood depths and velocity would be the greatest. Extensive damage is not anticipated in the event of a breach due to the limited storage capacity of the dam.

In the event of a breach, it is estimated that the average breach width would be 257.4 feet with a maximum breach flow of 6,904 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of up to 25 feet, with the highest depth in the immediate area of the dam.

Upper San Marcos River WS SCS Site 2 Dam:

Upper San Marcos River WS SCS Site 2 Dam is located in Hays County on the Sink Creek and is used for flood risk reduction purposes. The earthen dam is owned by the City of San Marcos, along with Hays County, Hays County SWCD, Upper San Marcos WS Reclamation and FCD. It was constructed in 1985 and has not been modified since construction was completed. The area located near the dam is semi-rural with limited development in the immediate area around the dam. In the event of a breach, approximately 25-50 residential structures within a one mile radius from the dam could be impacted. In addition, a dam failure could cause limited infrastructure

SECTION 5: DAM FAILURE

damage, minor power outages and could disrupt utility systems. Extensive damage is not anticipated in the event of a breach due to the limited storage capacity of the dam.

In the event of a breach, it is estimated that the average breach width would be 188.4 feet with a maximum breach flow of 5,346 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of up to 20 feet, with the highest depth in the immediate area of the dam.

Table 5-3 represents the extent or magnitude of a dam failure event that could be expected for the City of San Marcos planning area, per profiled dam.

Table 5-3. Extent Summaries Per Profiled Dam

PROFILED DAM	EXTENT (Flow Depth)	LEVEL OF INTENSITY TO MITIGATE
Upper San Marcos River WS SCS Site 1	0-25 Feet	While extensive damages and impacts to critical facilities or infrastructure are not anticipated in the event of a failure, as a High Hazard classified dam the consequences of a potential failure will likely cause loss of life as a result of a failure event.
Upper San Marcos River WS SCS Site 3	0-20 Feet	While extensive damages and impacts to critical facilities or infrastructure are not anticipated in the event of a failure, as a High Hazard classified dam the consequences of a potential failure will likely cause loss of life as a result of a failure event.
Upper San Marcos River WS SCS Site 4	0-25 Feet	While extensive damages and impacts to critical facilities or infrastructure are not anticipated in the event of a failure, as a High Hazard classified dam the consequences of a potential failure will likely cause loss of life as a result of a failure event.
Upper San Marcos River WS NRCS Site 5 Dam	0-25 Feet	While extensive damages and impacts to critical facilities or infrastructure are not anticipated in the event of a failure, as a High Hazard classified dam the consequences of a potential failure will likely cause loss of life as a result of a failure event.
Upper San Marcos River WS SCS Site 2	0-20 Feet	While extensive damages and impacts to critical facilities or infrastructure are not anticipated in the event of a failure, as a High Hazard classified dam the consequences of a potential failure will likely cause loss of life as a result of a failure event.

HISTORICAL OCCURRENCES

The State of Texas has not experienced loss of life or extensive economic damage due to a dam failure since the first half of the twentieth century. However, there may be many incidents that are not reported and, therefore, the actual number of incidents is likely to be greater. There has not been a recorded dam failure event reported for the City of San Marcos planning area (not including controlled releases).

SECTION 5: DAM FAILURE

PROBABILITY OF FUTURE EVENTS

Due to the lack of historical occurrences, the probability of a future event is “Unlikely” for the City of San Marcos, meaning an event is possible in the next ten years.

VULNERABILITY AND IMPACT

There are 10 dams in the City of San Marcos planning area. All dams were evaluated in-depth to determine the risk, if any, associated with each dam. This analysis indicated 5 of the dams identified present a risk to structures or infrastructure in the planning area. These dams will be reevaluated in the next planning process to confirm if risk has changed. As development increases in the city there is the potential for dams classified as low hazard to be reclassified as development and populations near these dams increase. The City of San Marcos, in conjunction with Hays County, has developed individual Emergency Action Plans for each of the dams profiled which defines protocols to identify unusually and unlikely conditions that may endanger the integrity of the dam and emergency protocols to warn downstream residents of its impending or actual failure. Each plan provides a systematic means to expedite effective response to prevent a dam failure and prevent or reduce loss of life and property should a dam failure occur.

Flooding is the most prominent effect of dam failure. If the dam failure is extensive, a large amount of water would enter the downstream waterways forcing them out of their banks. There may be significant environmental effects, resulting in flooding that could disperse debris and hazardous materials downstream that can damage local ecosystems. If the event is severe, debris carried downstream can block traffic flow, cause power outages, and disrupt local utilities, such as water and wastewater, which could result in school closures. For specific vulnerabilities, please refer to the narrative for each dam under the Extent section of this profile.

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area located in estimated inundation zones and are susceptible to a range of impacts caused by dam failure events.

Table 5-4. Critical Facilities Vulnerable to Dam Failure Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 Fire Station	<ul style="list-style-type: none">Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.Emergency vehicles can be damaged by rising flood waters and floating debris.Power outages could disrupt communications, delaying emergency response times.Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.Debris can impede emergency response vehicle access to areas.Washed out roads and bridges can impede emergency response vehicle access to areas.Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm’s way.

SECTION 5: DAM FAILURE

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none">○ Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.○ Increased number of structure fires due to gas line ruptures and downed power lines, further straining the capacity and resources of emergency personnel.○ First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.○ Extended power outages and evacuations may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
4 Lift Stations, 2 Water Facilities or infrastructure	<ul style="list-style-type: none">○ Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks.○ Disruptions and outages impact public welfare as safe drinking water is critical.○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease.○ Exposure to untreated wastewater is harmful to people and the environment.○ Any service disruptions can negatively impact or delay emergency management operations.

Annualized loss-estimates for dam failure are not available; neither is there a breakdown of potential dollar losses for critical facilities, infrastructure and lifelines, or hazardous-materials facilities. Historically, the overall severity of impact from a dam breach would be considered “Limited,” meaning it could result in injuries that can be treated with first-aid, critical facilities being shut down for 24-hours or less and less than 10 percent of the property in the estimated breach inundation area destroyed or with major damage.

ASSESSMENT OF IMPACTS

Any individual dam has a very specific area that will be impacted by a catastrophic failure. Dams identified as high or significant hazard can directly threaten the lives of individuals living or working in the inundation zone below the dam. The impact from any catastrophic failure would be similar to that of a flash flood. The impact of climate change could produce greater risk of dam failure due to larger more frequent floods, exacerbating the current dam failure impacts. Dam failure threats can be associated with a variety of impacts, including:

- Upper San Marcos River WS SCS Site 1, 2, 3, and 4 Dams and Upper San Marcos River NRCS Site 5 Dam are classified as high hazard dams.
- Future development downstream of dams has the potential to increase dam classification to significant or high hazard potential.
- Injuries from debris carried by the floodwaters are possible.
- Swift-water rescue of individuals trapped by the water puts the immediate responders at risk for their own lives.
- Individuals involved in the cleanup may be at risk from the debris left behind.

SECTION 5: DAM FAILURE

- Continuity of operations for any jurisdiction outside the direct impact area could be very limited.
- Roads and bridges downstream of a dam failure could be destroyed.
- Homes and businesses downstream of a dam could be damaged or destroyed.
- Emergency services may be temporarily unavailable.
- Disruption of operations and the delivery of services in the impacted area.
- A large dam with a high head of water could effectively scour the terrain below it for miles, taking out all buildings and other infrastructure.
- Scouring force could erode soil and any buried pipelines.
- Scouring action of a large dam will destroy all vegetation in its path.
- Wildlife and wildlife habitats caught in the flow will likely be destroyed.
- Fish habitat will likely be destroyed.
- Topsoil will erode, slowing the return of natural vegetation.
- The destructive high velocity water flow may include substantial debris and hazardous materials, significantly increasing the risks to life and property in its path.
- Debris and hazardous material deposited downstream may cause further pollution of areas far greater than the inundation zone.
- Destroyed businesses and homes may not be rebuilt, reducing the tax base and impacting long term economic recovery.
- Historical or cultural resources may be damaged or destroyed. There are 40 buildings and sites in the city that are listed on the National Register of Historic Places.
- Recreational activities and tourism may be temporarily unavailable or unappealing, slowing economic recovery.

The economic and financial impacts of dam failure on the area will depend entirely on the location of the dam, scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the community, local businesses, and the community will also contribute to the overall economic and financial conditions in the aftermath of any dam failure event.

CLIMATE CHANGE CONSIDERATIONS

A direct connection between climate change and dam failure events is unclear. As air temperatures increase, so does the amount of moisture the atmosphere can hold leading to more frequent and intense rain and flooding. The increased potential volume of rainfall will likely lead to an increase in pressure placed on dam systems during future flood events. Additionally, the aging dams increase the possibility of dam failure and the risk of catastrophic flooding inside estimated dam inundation zones.

Safety features, known as spillways, are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events can result in increased discharges downstream and increased flooding potential. Climate change is likely to increase the probability of spillway overflows.



SECTION 6 DROUGHT

SECTION 6: DROUGHT

Hazard Description	1
Location	2
Extent	3
Historical Occurrences	5
Significant Events	8
Probability of Future Events	9
Vulnerability and Impact	10
Assessment of Impacts	12
Climate Change Considerations	14

HAZARD DESCRIPTION

Drought is a period of time without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 6-1 presents definitions for these different types of droughts.



Droughts are one of the most complex of all natural hazards as it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants, and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 6-1. Drought Classification Definitions¹

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.

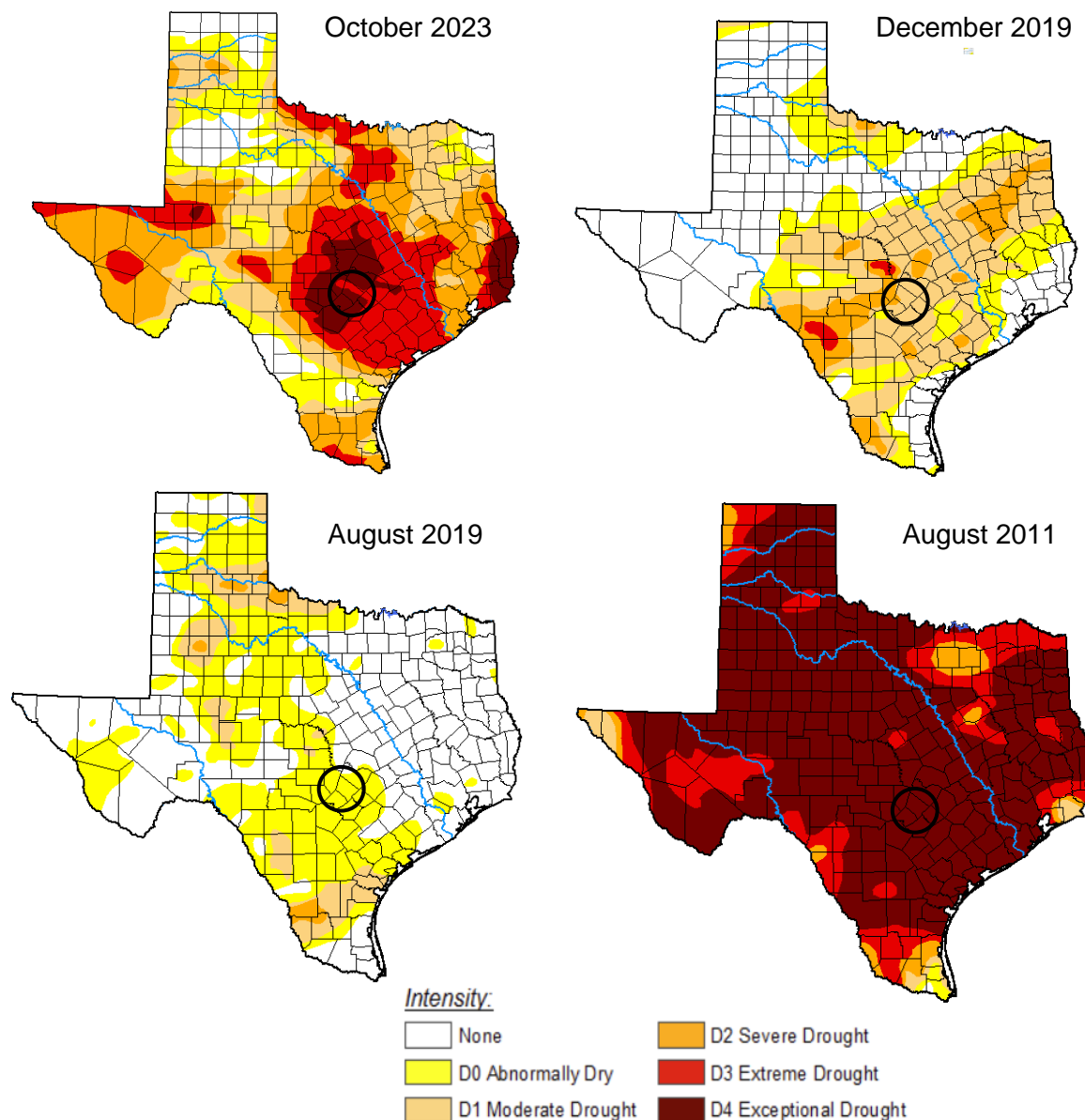
¹ Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

SECTION 6: DROUGHT

LOCATION

Droughts occur regularly throughout Texas and the City of San Marcos and are considered a normal condition. However, they can vary greatly in their intensity and duration. The U.S. Drought Monitor, produced through a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration, shows as of October 2023, the planning area is experiencing exceptional drought conditions. Historically the planning area has experienced a range of conditions from abnormally dry to exceptional drought conditions over the last decade. There is no distinct geographic boundary to drought; therefore, it can occur throughout the City of San Marcos planning area equally.

Figure 6-1. U.S. Drought Monitor, October 2023, December 2019, August 2019, August 2011



SECTION 6: DROUGHT

EXTENT

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop. Table 6-2 depicts magnitude of drought, while Table 6-3 describes the classification descriptions.

Table 6-2. Palmer Drought Index

DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.99	+3.00 to +3.99	+4.00 and above

Table 6-3. Palmer Drought Category Descriptions²

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

² Source: National Drought Mitigation Center

SECTION 6: DROUGHT

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. and correspond to the intensity of drought.

Based on the historical occurrences for drought and the location of the City of San Marcos can anticipate a range of drought from abnormally dry to exceptional, or D0 to D4, based on the Palmer Drought Category. The entire planning area has experienced exceptional drought conditions. These are the most extreme drought conditions the City can anticipate in the future.

The San Marcos Utilities Conservation Department monitors drought conditions and implements drought response stages during periods of higher-than-normal temperatures and lower than normal rainfall. The San Marcos City Code Chapter 86, Article 2 Division 2, Water Conservation lists the five drought response stages list and the conditions that occur to determine each stage. Each stage ends when conditions to implement are no longer applicable or when determined by the Director of Utilities Conservation Department.

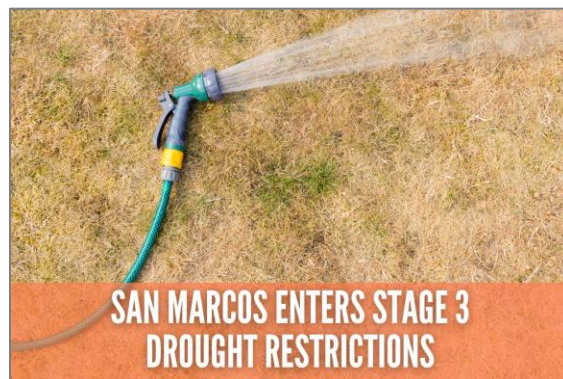


Table 6-4. City of San Marcos Drought Response Conditions³

STAGE	Conditions for Implementation
1	Stage 1 shall be implemented when any one of the following conditions occur, or as otherwise determined by the director: <ol style="list-style-type: none">1. The ten-day average aquifer level is less than 660 feet above mean sea level as measured at the J-17 index well; or2. The ten-day average discharge rate of San Marcos Springs is below 96 CFS as measured at the San Marcos gauging station; or3. The ten-day average discharge rate of Comal Springs is below 225 CFS as measured at the Comal gauging station.
2	Stage 2 shall be implemented when any one of the following conditions occur, or as otherwise determined by the director: <ol style="list-style-type: none">1. The ten-day average aquifer level is less than 650 feet above mean sea level as measured at the J-17 index well; or2. The ten-day average discharge rate of San Marcos Springs is below 80 CFS as measured at the San Marcos gauging station; or3. The ten-day average discharge rate of Comal Springs is below 200 CFS as measured at the Comal gauging station.
3	Stage 3 shall be implemented when any one of the following conditions occur, or as otherwise determined by the director: <ol style="list-style-type: none">1. The ten-day average aquifer level is less than 640 feet above mean sea level as measured at the J-17 index well; or

³ Conservation & Drought | City of San Marcos, TX. (n.d.). <https://www.sanmarcostx.gov/3704/Conservation-Drought>

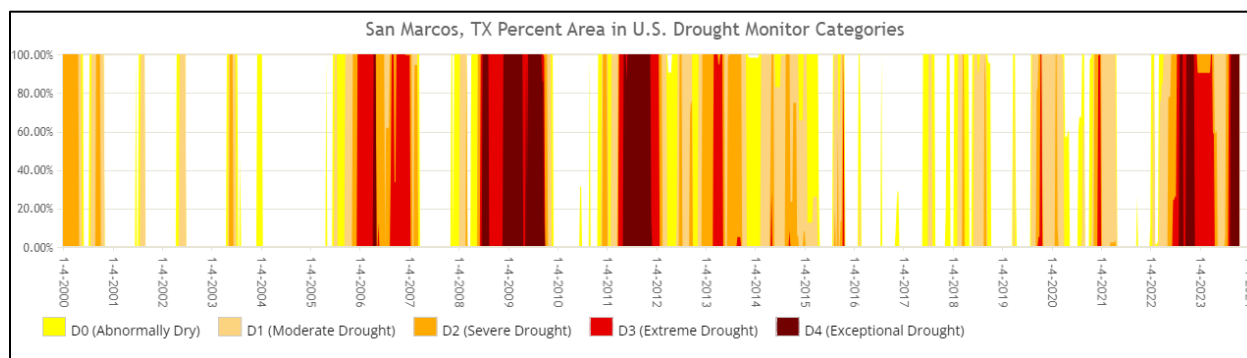
SECTION 6: DROUGHT

STAGE	Conditions for Implementation
	<ol style="list-style-type: none"> The ten-day average discharge rate of San Marcos Springs is below 65 CFS as measured at the San Marcos gauging station; or The ten-day average discharge rate of Comal Springs is below 150 CFS as measured at the Comal gauging station.
4	<p>Stage 4 shall be implemented when any one of the following conditions occur, or as otherwise determined by the director:</p> <ol style="list-style-type: none"> The ten-day average aquifer level is less than 630 feet above mean sea level as measured at the J-17 index well; or The ten-day average discharge rate of San Marcos Springs is below 55 CFS as measured at the San Marcos gauging station; or The ten-day average discharge rate of Comal Springs is below 100 CFS as measured at the Comal gauging station.
5	<p>Stage 5 shall be implemented when any one of the following conditions occur, or as otherwise determined by the director:</p> <ol style="list-style-type: none"> The ten-day average aquifer level is less than 625 feet above mean sea level as measured at the J-17 index well; or The ten-day average discharge rate of San Marcos Springs is below 50 CFS as measured at the San Marcos gauging station; or The ten-day average discharge rate of Comal Springs is below 45 CFS, or the three-day average discharge is below 40 CFS as measured at the Comal gauging station.

HISTORICAL OCCURRENCES

The City of San Marcos may experience a severe drought in any given year. According to the U.S. Drought Monitor, in the 1,200 weeks between January 1, 2000, and October 17, 2023, the City of San Marcos spent 758 weeks (61 percent of the time) in some level of drought as defined as Abnormally Dry (D0) or worse conditions.

Figure 6-2. City of San Marcos Drought Intensity, January 2000-October 2023⁴



Historical drought information shows drought activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire

⁴ U.S. Drought Monitor

SECTION 6: DROUGHT

forecast area has been allocated to each county impacted by the event. Historical drought data is provided on a county-wide basis per the NCEI Storm Events database.

Table 6-5 lists historical events that have occurred in Hays County as reported in the National Centers for Environmental Information Storm Events Database (NCEI). There are a total of 52 reported historical drought events, with 10 unique drought periods that have impacted Hays County between January 1996 and July 2023. Significant events are described below. Historical drought events reported in the NCEI database for Hays County and the City of San Marcos, over the 27.5 year reporting period has resulted in negligible property and crop damages.

Table 6-5. Historical Drought Years⁵

DROUGHT YEAR
1996
2000
2011-2012 ⁶
2012
2012-2013
2014
2018
2019-2020
2020-2021
2022-2023
10 unique events

Table 6-6. Historical Drought Events, 1996-2023

DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
4/1/1996	0	0	\$0	\$0
5/1/1996	0	0	\$0	\$0
6/1/1996	0	0	\$0	\$0
7/1/1996	0	0	\$0	\$0
8/1/1996	0	0	\$0	\$0
7/1/2000	0	0	\$0	\$0

⁵ Historical data is reported from January 1996 through July 2023.

⁶ Three unique drought periods reported in 2012.

SECTION 6: DROUGHT

DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
8/1/2000	0	0	\$0	\$0
9/1/2000	0	0	\$0	\$0
10/1/2000	0	0	\$0	\$0
5/1/2011	0	0	\$0	\$0
6/1/2011	0	0	\$0	\$0
7/1/2011	0	0	\$0	\$0
8/1/2011	0	0	\$0	\$0
9/1/2011	0	0	\$0	\$0
10/1/2011	0	0	\$0	\$0
11/1/2011	0	0	\$0	\$0
12/1/2011	0	0	\$0	\$0
1/1/2012	0	0	\$0	\$0
6/1/2012	0	0	\$0	\$0
12/1/2012	0	0	\$0	\$0
2/1/2013	0	0	\$0	\$0
3/1/2013	0	0	\$0	\$0
4/1/2013	0	0	\$0	\$0
6/1/2013	0	0	\$0	\$0
7/1/2013	0	0	\$0	\$0
8/1/2013	0	0	\$0	\$0
8/1/2014	0	0	\$0	\$0
8/1/2018	0	0	\$0	\$0
9/1/2018	0	0	\$0	\$0
9/1/2019	0	0	\$0	\$0
10/1/2019	0	0	\$0	\$0
11/1/2019	0	0	\$0	\$0
1/1/2020	0	0	\$0	\$0
2/1/2020	0	0	\$0	\$0

SECTION 6: DROUGHT

DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
11/1/2020	0	0	\$0	\$0
12/1/2020	0	0	\$0	\$0
1/1/2021	0	0	\$0	\$0
5/1/2022	0	0	\$0	\$0
6/1/2022	0	0	\$0	\$0
7/1/2022	0	0	\$0	\$0
8/1/2022	0	0	\$0	\$0
9/1/2022	0	0	\$0	\$0
10/1/2022	0	0	\$0	\$0
1/1/2023	0	0	\$0	\$0
2/1/2023	0	0	\$0	\$0
3/1/2023	0	0	\$0	\$0
4/1/2023	0	0	\$0	\$0
5/1/2023	0	0	\$0	\$0
6/1/2023	0	0	\$0	\$0
7/1/2023	0	0	\$0	\$0
Total	0	0	\$0	\$0

Table 6-7. Historical Drought Events Summary, 1996-2023

JURISDICTION	NUMBER OF EVENTS	DEATH	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	52	0	0	\$0	\$0

SIGNIFICANT EVENTS

May 2022 – December 2022

May was a dry month across most of South Central Texas, exacerbating an ongoing drought. Hays and Williamson counties moved into severe (D2) drought. All public water systems encouraged at least voluntary water restrictions, and many had mandatory restrictions in effect, with reports noting the San Marcos water system at Stage 2. The Edwards Aquifer was 26.4 feet below normal. Area reservoirs were below normal conservation pool level. Rivers across the region were below or much below normal seven-day streamflow at the end of the month. All the counties in D2 or worse drought had outdoor burn bans in effect at the end of the month while drought conditions continued. December was another dry month across South Central Texas, but

SECTION 6: DROUGHT

there was enough rain in a few spots to produce some drought improvement. Hays County moved from Exceptional (D4) drought to Extreme (D3) drought. The 7-day average streamflow at the end of the month was much below normal (under 10%) on the Medina River, below normal (10%-24%) to normal (25%-75%) on the San Antonio River and much below normal on the Guadalupe River. The Edwards Aquifer dropped 1.0 foot during the month and was 31.9 feet below average. Area reservoirs were below normal conservation pool elevation. Most public water systems encouraged at least voluntary water restrictions, and many had mandatory restrictions in effect.

May 2011 – April 2012

Existing drought conditions over South Central Texas continued and worsened in some counties. Most of the area, including Hays County, was in exceptional drought conditions (Stage D4) due to lack of rain. Fire danger in South Central Texas remained moderate to high, and burn bans were in effect for all counties. The Texas A&M agricultural program reports indicated the agricultural situation was rapidly deteriorating with forage availability remaining below average. Many stock tanks remained extremely low, with some in danger of drying up. At the end of the month the seven-day stream flow average remained in the below or much below normal range for basins across South Central Texas. The City of San Marcos moved to drought response Stage 2. The weak

to moderate La Nina event continued during December according to the Climate Prediction Center. The drought continued over South Central Texas, but there was some improvement. There were several significant rainfall events during the month. While some counties improved, numerous counties, including Hays, remained in Stage 3 (extreme drought category). Due to recent rain and cooler temperatures, fire danger was low by the end of December and only 14 counties still had burn bans in effect. The Texas A&M Crop and Weather report stated soil-moisture levels improved slightly but remained very low in the deep soil profile. At the end of the month the seven-day stream flow average remained in the below or much below normal range for basins across South Central Texas and the Rio Grande Plains. The City of San Marcos improved to drought response Stage 1.



PROBABILITY OF FUTURE EVENTS

Based on available records of historic events, there have been 10 extended time periods of drought within a 27.5-year reporting period in Hays County, including the City of San Marcos planning area. The probability of future events is considered "Likely", or an event probable in the next three years. See additional information on climate change at the end of this section as it relates to the frequency of future events.

SECTION 6: DROUGHT

VULNERABILITY AND IMPACT

Loss estimates were based on 27.5 years of statistical data from the NCEI. A drought event frequency-impact analysis was then developed to determine an impact profile on agriculture products and estimate potential losses due to drought in the area. All existing and future buildings, facilities, and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages, breaks in water lines, or crop and livestock losses on agricultural lands and typically have minimal impact on buildings. Table 6-8 shows annualized exposure.

Table 6-8. Potential Annualized Losses Due to Drought

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
City of San Marcos	\$0	\$0

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by drought events.

Table 6-9. Critical Facilities Vulnerable to Drought Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 6 Fire Stations, 3 Police Stations	<ul style="list-style-type: none">○ Increased law enforcement activities may be required to enforce water restrictions.○ Firefighters may have limited water resources to aid in firefighting and suppression activities, increasing risk to lives and property.○ Potential for increased number of emergency calls as drought events can lead to cascading hazard events such as wildfires and flash flooding.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none">○ Strain on staff as drought may cause health problems related to low water flows and poor water quality.○ Water main breaks due to soil shrinking and swelling cycles could lead to facility closures.○ Building foundations may crack due to soil shrinking and swelling cycles.
1 Airport	<ul style="list-style-type: none">○ Operations dependent on water supply may be adversely impacted.○ Economic disruptions due to cracked foundations and damaged infrastructure as a result of soil shrinking and swelling cycles.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure (water stations, pressure	<ul style="list-style-type: none">○ Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks.○ Disruptions and outages impact public welfare as safe drinking water is critical.○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease.○ Exposure to untreated wastewater is harmful to people and the environment.

SECTION 6: DROUGHT

CRITICAL FACILITIES	POTENTIAL IMPACTS
stations, storage tanks, and wells)	<ul style="list-style-type: none">Any service disruptions can negatively impact or delay emergency management operations.

The average person will survive only a few days without potable water, and this timeframe can be drastically shortened for those with more fragile health – typically children, the elderly, and the ill. The population over 65 in the City of San Marcos planning area is estimated at 9.3 percent of the total population and children under the age of 5 are estimated at 3.7 percent, or an estimated total of 8,442 potentially vulnerable residents in the planning area based on age. In addition, an estimated 30.6 percent of the planning area population live below the poverty level, which may contribute to overall health impacts of a drought.

Table 6-10. Populations at Greater Risk⁷

JURISDICTION	YOUTH (UNDER 5)	ELDERLY (OVER 65)	POPULATION BELOW POVERTY LEVEL
City of San Marcos	2,408	6,034	15,858

This population is also vulnerable to food shortages when drought conditions exist, and potable water is in short supply. Potable water is used for drinking, sanitation, patient care, sterilization, equipment, heating and cooling systems, and many other essential functions in medical facilities. All residents in the City of San Marcos planning area could be adversely affected by drought conditions, which could limit water supplies and present health threats. During summer drought, or hot and dry conditions, elderly persons, small children, infants and the chronically ill who do not have adequate cooling units in their homes may become more vulnerable to injury and/or death.

The economic impact of droughts can be significant as they produce a complex web of impacts that spans many sectors of the economy and reach well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Crop production can also suffer greatly during extreme drought conditions, limiting fresh local food supplies, driving up costs, and negatively impacting the local economy. The City of San Marcos has embraced community food production, from rooftop gardens to urban schoolyards. Drought conditions could adversely affect urban farming projects throughout the city.

Habitat damage is a vulnerability of the environment during periods of drought for both aquatic and terrestrial species. The environment also becomes vulnerable during periods of extreme or prolonged drought due to severe erosion and land degradation.

Severe droughts can cause widespread tree mortality across many forest biomes with profound effects on the function of ecosystems and carbon balance. Climate change is expected to intensify

⁷ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 6: DROUGHT

regional-scale droughts, significantly contributing to high tree mortality and increasing the risk of sweeping wildfires.

Impact of droughts experienced in the City of San Marcos planning area, have not resulted injuries or fatalities supporting a “Limited” severity of impact meaning injuries and/or illnesses can be treated with first aide, shutdown of facilities and services for less than 24 hours, and less than 10 percent of property is destroyed or with major damage. Annualized estimated loss over the 27.5-year reporting period in the City of San Marcos is considered negligible.

ASSESSMENT OF IMPACTS

The Drought Impact Reporter was developed in 2005 by the University of Nebraska-Lincoln to provide a national database of drought impacts. Droughts can have an impact on agriculture, business and industry; energy; fire; plants and wildlife; relief, response, and restrictions; society and public health; tourism and recreation; and water supply and quality. The reports are submitted from individuals from federal, state, and local agencies, as well as the general public. Table 6-11 lists the drought impacts to the City of San Marcos from 2005 to 2022 based on reports received by the Drought Impact Reporter.

Table 6-11. Drought Impacts, 2005-2022⁸

DROUGHT IMPACTS 2005-2022	
Agriculture	0
Business & Industry	0
Energy	0
Fire	0
Plants & Wildlife	4
Relief, Response & Restrictions	36
Society & Public Health	3
Tourism & Recreation	0
Water Supply & Quality	38

Drought has the potential to impact people in the City of San Marcos planning area. While it is rare that drought, in and of itself, leads to a direct risk to the health and safety of people in the U.S., severe water shortages could result in inadequate supply for human needs. The impact of climate change could produce longer, more severe droughts, exacerbating the current drought impacts. Severe drought conditions can be frequently associated with a variety of impacts, including:

- Dry clay soil can lead to water main lines shifting and breaking. Often repair to water lines includes shutting off water to multiple homes at one time.

⁸ Drought Impact Reporter

SECTION 6: DROUGHT

- The number of health-related low-flow issues (e.g., diminished sewage flows, increased pollution concentrations, reduced firefighting capacity, and cross-connection contamination) will increase as the drought intensifies.
- Public safety from forest / range / wildfires will increase as water availability and/or pressure decreases.
- Respiratory ailments may increase as the air quality decreases.
- There may be an increase in disease due to wildlife concentrations (e.g., rabies, Rocky Mountain spotted fever, Lyme disease).
- Political conflicts may increase between municipalities, counties, states, and regions.
- Water management conflicts may arise between competing interests.
- Severe water shortages could result in inadequate supply for human needs as well as lower quality of water for consumption.
- During drought there is an increased risk for wildfires and dust storms.
- The community may need increased operational costs to enforce water restriction or rationing.
- Prolonged drought can lead to increases in illness and disease related to drought.
- Utility providers can see decreases in revenue as water supplies diminish.
- Utilities providers may cut back energy generation and service to their customers to prioritize critical service needs.
- Hydroelectric power generation facilities and infrastructure would have significantly diminished generation capability. Dams simply cannot produce as much electricity from low water levels as they can from high water levels.
- Fish and wildlife food and habitat will be reduced or degraded over time during a drought and disease will increase, especially for aquatic life.
- Wildlife will move to more sustainable locations creating higher concentrations of wildlife in smaller areas, increasing vulnerability, and further depleting limited natural resources.
- Severe and prolonged drought can result in the reduction of a species or cause the extinction of a species altogether.
- Plant life will suffer from long-term drought. Wind and erosion will also pose a threat to plant life as soil quality will decline. The urban tree canopy, including city parks, are vulnerable to the impacts of prolonged drought.
- Dry and dead vegetation will increase the risk of wildfire.
- Drought poses a significant risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Drought-related declines in production may lead to an increase in unemployment.
- Negatively impacted water suppliers may face increased costs resulting from the transport water or develop supplemental water resources.
- Long-term drought may negatively impact future economic development.
- Unlikely to have an impact on continuity of operations until prolonged severe or extreme levels are reached.
- Government functionality may be questioned and challenged if planning, response, and recovery are not timely and effective, impacting public confidence.

The overall extent of damages caused by periods of drought is dependent on its extent and duration. The level of preparedness and pre-event planning done by government, businesses, and the community will contribute to the overall economic and financial conditions in the aftermath of a drought event.

SECTION 6: DROUGHT

CLIMATE CHANGE CONSIDERATIONS

With the range of factors influencing drought conditions, it is impossible to make quantitative statewide projections of drought trends; however, many factors point toward increased drought severity. Drought will continue to be driven largely by precipitation variability over multiple decades, with long-term precipitation trends expected to be relatively small. Other factors affecting drought impacts, such as increased temperatures and improved plant water use efficiency, decrease water availability but will cause drought impact trends to be highly sector-specific, with the impacts possibly smaller for agriculture than for surface water supply.⁹

⁹ Cleaveland, M. K., T. H. Votteler, D. K. Stahle, R. C. Casteel, and J. L. Banner, 2011: Extended Chronology of Drought in South Central, Southeastern and West Texas. Texas Water Journal, 2, 54-96, as cited in Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 7 EARTHQUAKE

SECTION 7: EARTHQUAKE

Hazard Description	1
Location	2
Extent	4
Historical Occurrences	7
Probability of Future Events	7
Vulnerability and Impact.....	7
Climate Change Considerations.....	9

HAZARD DESCRIPTION

An earthquake is the sudden movement of the Earth's surface caused by the release of stress accumulated within or along the edge of the Earth's tectonic plates, volcanic eruption, or by a manmade explosion. The majority of earthquakes occur along faults; however, earthquakes can occur within plate interiors. Over geologic time, plates move and plate boundaries change, pushing weakened boundary regions to the interior part of the plates. These areas of weakness within the continents can cause earthquakes in response to stresses that originate at the edges of the plate or in the deeper crust.

Earthquake locations are described by the focal depth and geographic position of the epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter is the point on the Earth's surface directly above the hypocenter. Earthquakes usually occur without warning, with their effects impacting great distances away from the epicenter.

According to the U.S. Geological Society (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may influence an individual's normal activities. Table 7-1 describes definitions of examples.

Table 7-1. Definitions of Earthquake Hazards¹

HAZARD	DESCRIPTION
Surface Faulting	Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes, those with an epicenter less than 20 kilometers.
Ground Motion (shaking)	The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.
Landslide	A movement of surface material down a slope.

¹ Source: USGS, 2012

SECTION 7: EARTHQUAKE

HAZARD	DESCRIPTION
Liquefaction	A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like when you wiggle your toes in the wet sand near the water at the beach. This effect can be caused by earthquake shaking.
Tectonic Deformation	A change in the original shape of a material due to stress and strain.
Tsunami	A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands.
Seiche	The sloshing of a closed body of water from earthquake shaking.

LOCATION

Earthquake hazard areas are mapped by the USGS from lowest hazard to highest hazard areas. Figure 7-1 shows major earthquake hazard areas. An Earthquake Hazard Map, also known as a Percent Peak Ground Accelerations (%PGA) Map. The map shows the %PGA values with a 2% chance of being exceeded over 50 years. %PGA is an earthquake measurement that displays three things: the geographic area affected (all colored areas on the map), the probability of an earthquake of each given level of severity (2% chance in 50 years), and the strength of ground movement (severity) shown as percent of the acceleration force of gravity (%g) (the PGA is indicated by color). The City of San Marcos planning area, as identified in Figure 7-1, is located in a low hazard area of 0-4%g peak ground acceleration.

SECTION 7: EARTHQUAKE

Figure 7-1. U.S. Map of Peak Ground Acceleration

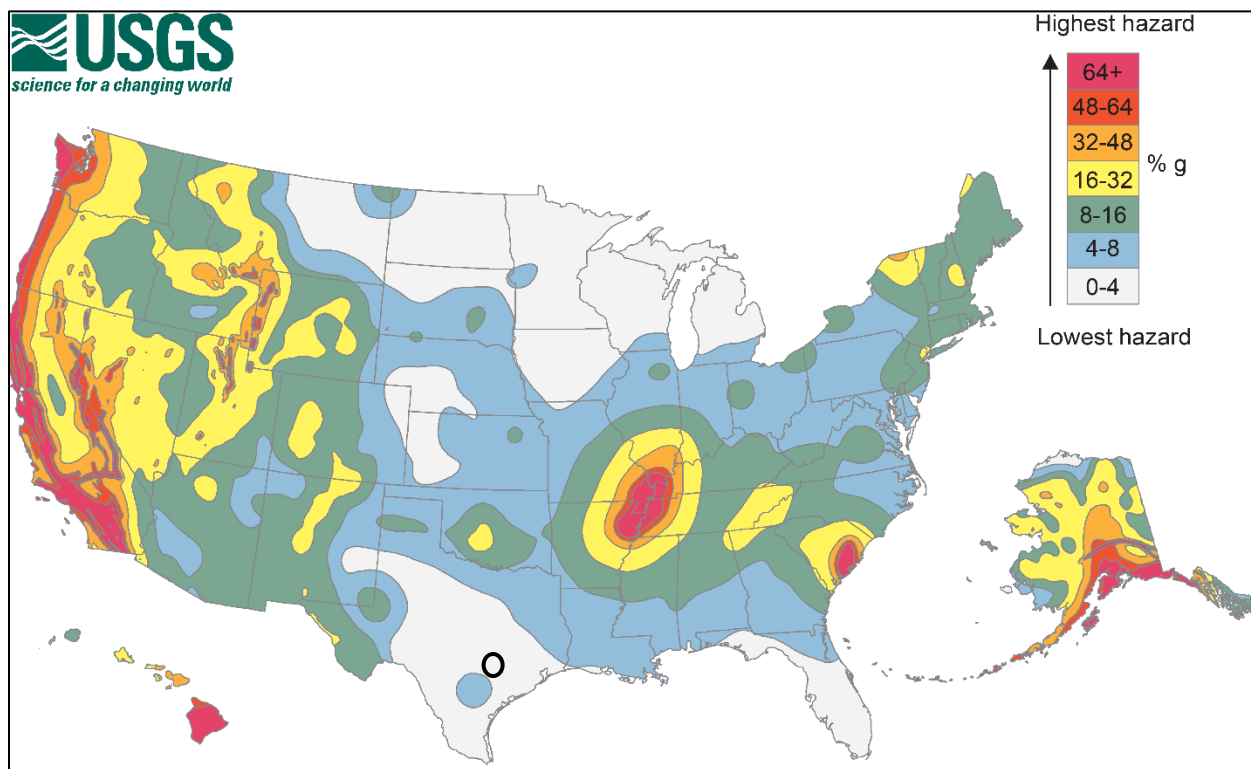
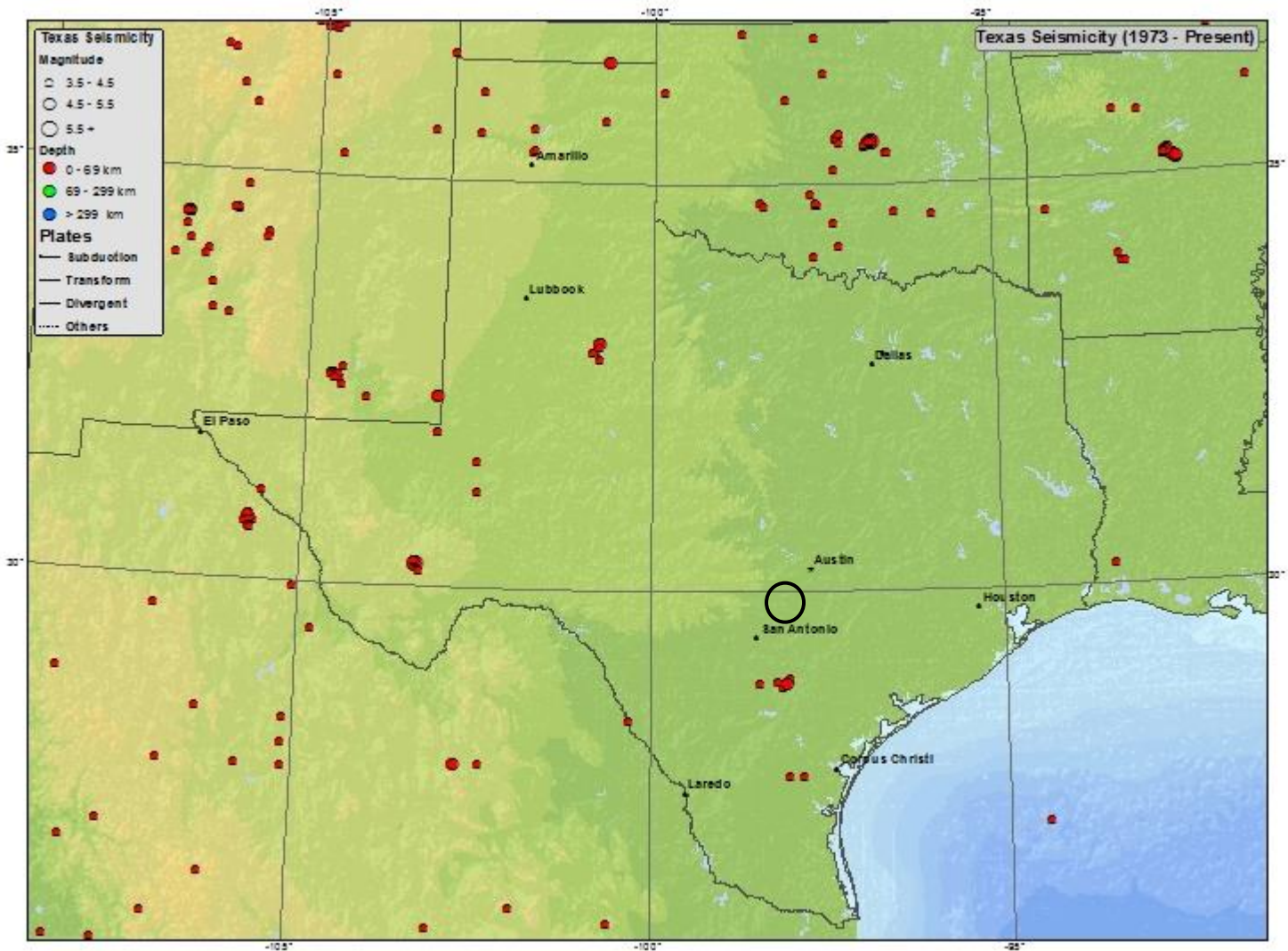


Figure 7-2 maps historic earthquake epicenters across Texas between 1973 and 2012.

SECTION 7: EARTHQUAKE

Figure 7-2. Historic Earthquake Epicenters in Texas, 1973-2012



EXTENT

The magnitude, or intensity of an earthquake, is a recorded value of the amplitude of seismic waves. The Richter scale is the most commonly used scale that measures the magnitude of earthquakes. It has no upper limit and is not used to describe damage (Table 7-2).

Table 7-2. Richter Scale

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
2.5 or LESS	Usually not felt, but can be recorded by seismograph
2.5-5.4	Often felt, but only causes minor damage
5.5-6.0	Slight damage to buildings and other structures
6.1 TO 6.9	May cause a lot of damage in very populated areas

SECTION 7: EARTHQUAKE

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
7.0 TO 7.9	Major earthquake; serious damage
8 OR GREATER	Great earthquake; can totally destroy communities near the epicenter

The intensity of an earthquake is expressed by the Modified Mercalli Scale, based on the effects of ground shaking on people, buildings, and natural features, and is location dependent. The Modified Mercalli Scale gives the intensity of the earthquake in values ranging from I to XII. Table 7-3 summarizes earthquake intensity as described by the Modified Mercalli Scale and provides a comparison between the Richter and Modified Mercalli Intensity Scales.

Table 7-3. Modified Mercalli Intensity (MMI) Scale

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER MAGNITUDE
I	INSTRUMENTAL	Not felt except by a very few under especially favorable conditions	
II	FEEBLE	Felt only by a few persons at rest, especially on upper floors of buildings.	< 4.2
III	SLIGHT	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	MODERATE	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors, disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	
V	SLIGHTLY STRONG	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	< 4.8
VI	STRONG	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	< 5.4

SECTION 7: EARTHQUAKE

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER MAGNITUDE
VII	VERY STRONG	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	< 6.1
VIII	DESTRUCTIVE	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	
IX	RUINOUS	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	< 6.9
X	DISASTROUS	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	< 7.3
XI	VERY DISASTROUS	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	< 8.1
XII	CATASTROPHIC	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	> 8.1

Table 7-4 lists the Modified Mercalli Intensity (MMI) with the corresponding acceleration (%g) (PGA), as well as the perceived shaking and potential damage expected.

Table 7-4. Modified Mercalli Intensity (MMI) and PGA Equivalents

MMI	ACCELERATION (%g) (PGA)	PERCEIVED SHAKING	POTENTIAL DAMAGE
I	<.17	Not Felt	None
II	.17-1.4	Weak	None
III	.17-1.4	Weak	None

SECTION 7: EARTHQUAKE

MMI	ACCELERATION (%g) (PGA)	PERCEIVED SHAKING	POTENTIAL DAMAGE
IV	1.4-3.9	Light	None
V	3.9-9.2	Moderate	Very Light
VI	9.2-18	Strong	Light
VII	18-34	Very Strong	Moderate

Taking into consideration the possible extent of an earthquake for the area, by reviewing Tables 7-2 through 7-4 in conjunction with previous occurrences as depicted in Figure 7-2, the City of San Marcos planning area experiences on average less than 2.5 Richter Scale or Level IV or instrumental impact based on the Modified Mercalli intensity scale. This is the greatest extent the entire planning area can anticipate in the future.

HISTORICAL OCCURRENCES

According to USGS, and the National Geophysical Data Center (NGDC), there are no “significant” earthquakes on record for the State of Texas and the entire City of San Marcos planning area from 2150 B.C. to present. A significant earthquake, as defined by NGDC, is one that has caused at least moderate damage (approximately \$1 million or more), has resulted in 10 or more deaths, has registered as a magnitude 7.5 or greater, has registered as Modified Mercalli Intensity (MMI) Scale X or greater, or generated a tsunami. None of these criteria have been met by any seismic activity known to have impacted the planning area.

PROBABILITY OF FUTURE EVENTS

Earthquake Hazard Maps show the distribution of earthquake shaking levels that have a certain probability of occurring over a given period. According to the USGS, the entire City of San Marcos planning area has a PGA of 0-4%g for earthquakes with a 4 percent probability of occurring within 50 years. Based on historical records, the probability of an earthquake affecting the planning area is “Unlikely”, meaning that an event is probable in the next 10 years.

VULNERABILITY AND IMPACT

Little warning is usually associated with earthquakes and can impact areas a great distance away from the epicenter. The amount of damage depends on the density of population and buildings, and infrastructure construction in the affected area. Some places may be more vulnerable than others based on soil type, building age, and building codes in the City of San Marcos planning area.

The City of San Marcos Planning Team identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by earthquake events.

SECTION 7: EARTHQUAKE

Table 7-5. Critical Facilities Vulnerable to an Earthquake

CRITICAL FACILITIES	POTENTIAL IMPACTS
Emergency Response Departments, Hospitals Including: 1 EOC, 6 Fire Stations, 3 Police Stations	<ul style="list-style-type: none"> Emergency operations and services may be significantly impacted due to power outages, damaged facilities, fires and/or loss of communications. Impact can impede emergency response vehicle access to areas. Power outages could disrupt communications, delaying emergency response times. Extended power outages may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
Airport, Academic Institutions, Animal Shelter, Evacuation Centers & Shelters, Governmental Facilities, Residential/ Assisted Living Facilities Including: 1 Airport, 9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Power outages could disrupt critical care. Backup power sources could be damaged. Evacuations may be necessary due to extended power outages or other associated damages to facilities.
Utility Services and Infrastructure Including: 1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> Emergency operations and critical services may be significantly impacted due to power outages, damaged facilities, and/or loss of communications. Impact can impede emergency service vehicle access to areas. Power outages could disrupt communications, delaying emergency response times further straining the capacity and resources of emergency service personnel.

With no historical events recorded, neither annualized loss-estimates or a breakdown of potential dollar losses of critical facilities and infrastructure from earthquakes are available. The potential severity of impact from an earthquake for the entire City of San Marcos planning area is classified as “Limited”, meaning that less than 10 percent of infrastructure would be damaged with critical facilities being shut down for less than 24 hours.

SECTION 7: EARTHQUAKE

CLIMATE CHANGE CONSIDERATIONS

Damaging earthquakes are rare within the State of Texas, including the City of San Marcos planning area. Changing conditions of weather patterns and climate change has not been established as having a direct impact on earthquake intensity or frequency.

According to the USGS, statistically there is an approximately equal distribution of earthquakes in all cold weather, hot weather, rainy weather, etc. Very large low-pressure changes associated with major storm systems, like typhoons and hurricanes, are known to trigger episodes of fault slip or slow earthquakes in the Earth's crust and may also play a role in triggering some damaging earthquakes. However, the numbers are small and are not statistically significant.²

The City of San Marcos planning area is located outside of any known earthquake hazard areas and is not located on or near any fault lines. Climate change is assumed to have no impact on the probability or intensity of potential earthquakes in the planning area.

² (n.d.). *Natural Hazards*. United States Geological Survey. <https://www.usgs.gov/faqs/there-earthquake-weather>



SECTION 8

EXPANSIVE SOILS

SECTION 8: EXPANSIVE SOILS

Hazard Description	1
Location	1
Extent	2
Historical Occurrences	3
Probability of Future Events	3
Vulnerability and Impact.....	4
Assessment of Impacts.....	5
Climate Change Considerations.....	6

HAZARD DESCRIPTION

Expansive soils are soils and soft rocks with a relatively high percentage of clay minerals that are subject to changes in volume as they swell and shrink with changing moisture conditions. Expansive soils contain minerals such as smectite clays that are capable of absorbing water. When these clays absorb water, they increase in volume and expand. The change in soil volume and resulting expansion can exert enough force on a building or other structure to cause damage.



Expansive soils will also lose volume and shrink when they dry. Drought conditions can cause soils to contract in response to a loss of soil moisture. A reduction in soil volume can affect the support to buildings or other structures and result in damage. Fissures in the soil can also develop and facilitate the deep penetration of water when moist conditions or runoff occurs. This produces a cycle of shrinkage and swelling that place repetitive stress on structures. The effect of expansive soil is most prevalent in regions prone to prolonged periods of drought followed by periods of moderate to high precipitation. Expansions in soil of 10 percent or more are not uncommon in the City of San Marcos planning area.

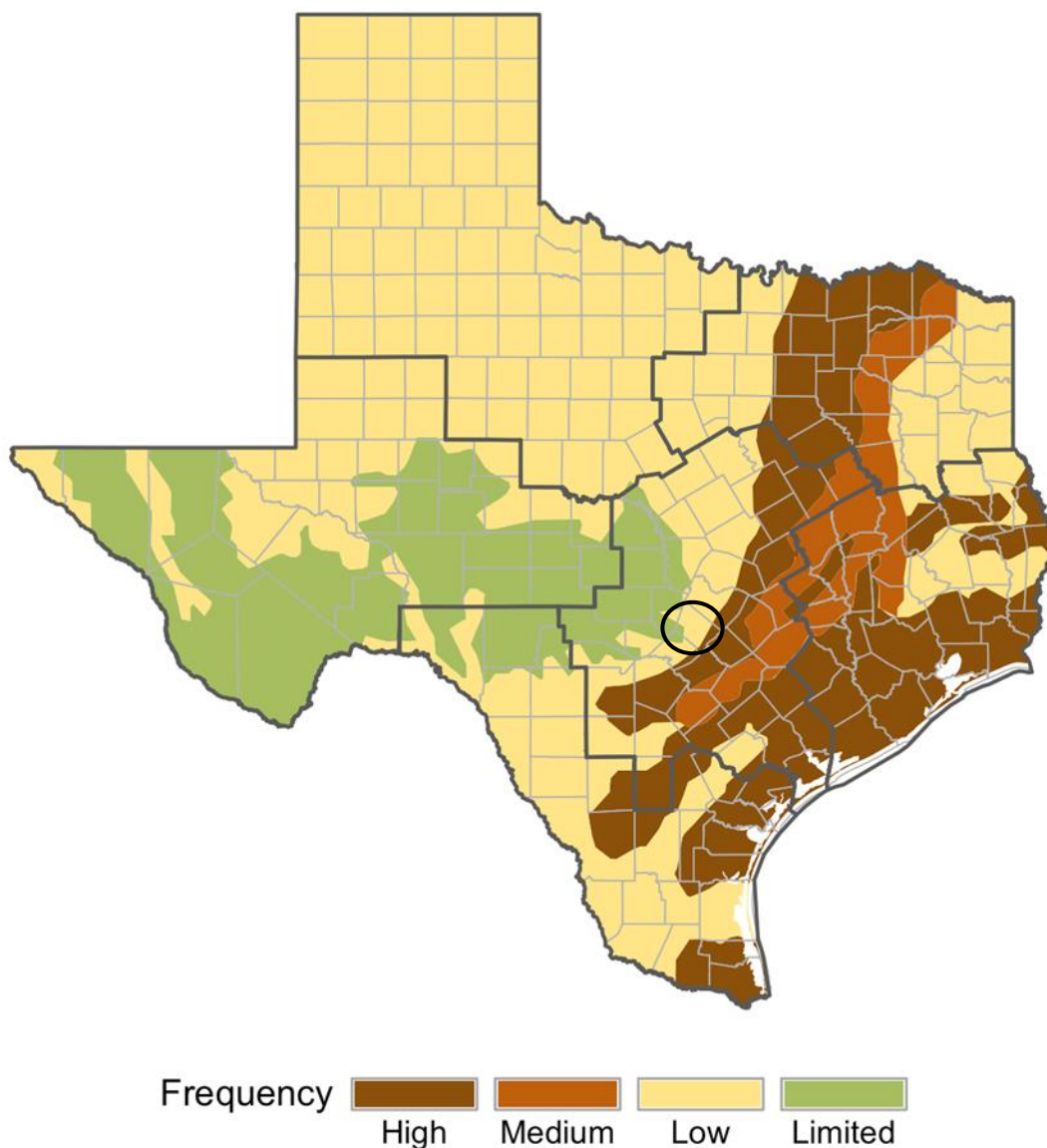
LOCATION

In Texas, the most expansive soils are in a band 200 miles west from the coastline, stretching approximately from Beaumont down to Brownsville. These areas receive the most moisture and are also vulnerable to droughts, which can cause the soil to contract. In the City of San Marcos planning area, the problems associated with expansive soil typically occur during drought periods. Expansive soils (bentonite, smectite, or other reactive clays) expand when the soil particles attract water and can shrink when the clay dries.

Figure 8-1 shows areas of expansive soil in Texas. The majority of Hays County falls within the low-risk area, indicated in yellow, with a small southeastern portion of the county residing in the high-risk area (brown). The City of San Marcos planning area is located primarily in a low-risk area with the south east portion of the city located in the high-risk area.

SECTION 8: EXPANSIVE SOILS

Figure 8-1. Location of Expansive Soils in Texas¹



Source: Tavakoli, E. (2016). *Laboratory Evaluation of TX-PROCHEM as an Ionic Liquid Soil Stabilizer*. [Master's Thesis].

EXTENT

Expansive soils risk is measured by the degree to which soils may shrink or swell. Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent, moderate if 3 to 6 percent, high if 6 to 9 percent, and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures.² The City of

¹ Tavakoli, E. (2016). *Laboratory Evaluation of TX-PROCHEM as an Ionic Liquid Soil Stabilizer*. [Master's Thesis].

² (2009). *Soil Reports*. Natural Resources Conservation Service.

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_016186.pdf

SECTION 8: EXPANSIVE SOILS

San Marcos planning area is primarily subject to moderate (3-6%) linear extensibility and low frequency of expansive soils (Figure 8-1), with a small southeast portion of the planning area subject to very high (>9%) linear extensibility and high frequency of expansive soils.

Figure 8-2. NRCS Soil Linear Extensibility Risk Categories

Potential Category	Linear Extensibility %	Clay %
Low	< 3%	< 25%
Moderate	3% - 6%	25% - 35%
High	6% - 9%	35% - 45%
Very High	> 9%	> 45%

HISTORICAL OCCURRENCES

Expansive soil is a condition that is native to Texas soil characteristics and cannot be documented as a time-specific event, except when it leads to structural and infrastructure damage. Extreme conditions can damage roads, structures, and infrastructure, including projects still under construction. Damages from expansive soils are typically associated with droughts, previous occurrences for expansive soils can be correlated with previous occurrences of drought, which are typically negligible. The City of San Marcos has no known recorded events of damaging expansive soils. Refer to the Drought profile (Section 6) of this plan for more information on the impacts of past drought events.

PROBABILITY OF FUTURE EVENTS

The Texas Department of Licensing and Regulation requires structures built after 2005 to include soil tests to be conducted for the likelihood of soil expansion, compression, or shifting. In such cases, top or subsoils are required to be removed and remaining soils stabilized. Builders must ensure that water drains away from the structure on all sides and building owners notified of the potential for damage if changes in drainage flow occur. These measures significantly reduce the probability of expansive soil impacts on newer and future development. It is considered “Unlikely” that the high-risk areas in the City of San Marcos will experience some expansive soil impacts such as problems with foundations, roadways, sidewalks and other structures and infrastructure in the future, especially during times of drought. Older structures will be impacted with greater frequency due to the soil testing and stabilization requirements for newer structures. See additional information on climate change at the end of this section.

SECTION 8: EXPANSIVE SOILS

VULNERABILITY AND IMPACT

The effects of expansive soils are most prevalent when periods of moderate to high precipitation are followed by drought and then again by periods of rainfall. Other cases of damage result from increases in moisture volume from such sources as broken or leaking water and sewer lines. Dry clays are capable of absorbing water and will increase in volume in an amount proportional to the amount of water absorbed. Soils capable of changes in volume present a hazard to structures built over them and to the pipelines buried in them. Houses and one-story commercial buildings are more apt to be damaged by the expansion of swelling clays than are multi-story buildings, which are usually heavy enough to counter swelling pressures. However, if constructed on wet clay, multi-story buildings may also be damaged by clay shrinkage when moisture levels are substantially reduced.



Cracked foundations and floors, jammed windows and doors, and ruptured pipelines are typical types of damage resulting from swelling soils. Damage to the upper floors of larger buildings can occur when motion in the structure is significant. While all infrastructure within the City of San Marcos planning area is minimally vulnerable, slabs on grade structures are more likely to suffer damage from expansive soils. In addition, older structures built to less stringent building codes may also be more susceptible to damage than new construction.

While the number of slabs on grade structures is not available, the U.S. Census data indicates approximately 6,772 of the housing units (24 percent of all housing units) in the planning area were built before 1980 and may be more susceptible to damages.

Table 8-1. Residential Structures at Greatest Risk³

JURISDICTION	SFR STRUCTURES BUILT BEFORE 1980
City of San Marcos	6,772

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by expansive soils.

Table 8-2. Critical Facilities Vulnerable to Expansive Soils

CRITICAL FACILITIES	POTENTIAL IMPACTS
6 Fire Stations 3 Police Stations	○ Uneven settling and shifting cause cracks in building foundations impacting the integrity of critical facility structures and lead to doors being unable to open or close properly.

³ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 8: EXPANSIVE SOILS

CRITICAL FACILITIES	POTENTIAL IMPACTS
9 Government Buildings 2 Recreation Centers 1 EOC 1 Airport	<ul style="list-style-type: none"> ○ Damages and cracks in streets and highway infrastructure may lead to emergency vehicles being unable to access areas, increasing the need for airport operations. ○ Ruptured sewer lines can create additional public health emergencies. ○ Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> ○ Disruptions and outages impact public welfare as safe drinking water is critical. ○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. ○ Exposure to untreated wastewater is harmful to people and the environment.

ASSESSMENT OF IMPACTS

Expansive soils are generally influenced by how wet or dry reactive clay types of soils become, so the climate of an area, and more specifically the seasonal precipitation-drought cycle associated with arid or semi-arid regions, influences the occurrence and severity of these hazards. Problems associated with expansive soils in the City of San Marcos typically occur during extended periods of drought.

Expansive soils present a hazard to lightweight buildings and other infrastructure. Uneven settling and shifting in such structures may occur, causing cracks in foundations, walls, streets, driveways, and sidewalks; ruptured pipes; and windows and doors that do not open and close properly. Special provisions are necessary in the construction of footings and slabs resting on expansive soils to minimize damages due to the expansiveness. Homeowners and public agencies that assume they cannot afford preventative measures such as more costly foundations and floor systems, often incur the largest percentage of damage and costly repairs from expanding soil. No figures are available for the total damage to homes in the planning area from expansive clays. The greatest damage occurs when structures are constructed when clays are dry (such as during a drought) and then subsequent soaking rains swell the clay.

Infrastructure such as pipelines can be damaged, causing increased maintenance and repairs, replacement, or damage to the point of failure. Sewer and water lines are also affected by shrinking and swelling soils. The movement of the soil can snap water and sewer lines, producing a minimum of temporary discomfort, and a maximum of serious health and welfare risk. Field monitoring and testing should be conducted on a regular basis, especially during extended drought periods, to avoid loss of function or water pressure, which could impact drinking water and firefighting capabilities. In addition, highways (IH-10, IH-35,) and mass transit (Capital Area Rural Transportation System and Amtrak's Texas Eagle) can be affected by expansive soils and could hinder evacuations if deemed not usable during disasters.

Unlike many other environmental hazards, the effects of expansive soil are deceptive in that they are not revealed suddenly or caused by a single event, but rather become increasingly evident

SECTION 8: EXPANSIVE SOILS

and destructive over time. As such, the vast majority of expansive soil impacts are relatively benign in terms of emergency management and emergency response.

Expansive soil can directly impact infrastructure and, as a result, indirectly create impacts on residents. The impact of climate change could produce more severe expansive soils events, exacerbating the current expansive soils impacts. The following are a summary of impacts frequently associated with expansive soils:

- Expansive soils are influenced by the seasonal precipitation-drought cycle. Most impacts on the City of San Marcos typically occur during extended periods of drought.
- Impacts to lightweight buildings and other infrastructure are most likely to occur. Impacts include uneven settling and shifting in structures; cracks in foundations, walls, streets, driveways, and sidewalks; ruptured pipes; and windows and doors that do not open and close properly.
- 24 percent of homes in the City of San Marcos were built before 1980 leading them to more susceptible to damages from expansive soils. 40 buildings and sites in the city are on the National Register of Historic Places, many of which pre-date modern building codes.
- Highways (IH-10, IH-35,) and mass transit (Capital Area Rural Transportation System and Amtrak's Texas Eagle) can be affected by expansive soils.
- Economic impacts are limited to uninsured damages.
- Impacts on people are indirect, with impacts related to disruption in city services such as water and sewer.
- As population grows and development increases in the city, the potential risk to expansive soils will also increase.
- Limited impact is anticipated to the natural environment other than changes in soil characteristics.

The impact of expansive soils experienced in the City of San Marcos has resulted in no injuries and fatalities, supporting a "Limited" severity of impact meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10 percent of property is destroyed or with major damage.

CLIMATE CHANGE CONSIDERATIONS

Expansive soils are directly connected to drought and flood conditions as they literally swell and shrink with changing moisture conditions. Impacts of climate change on drought and flood events indicate similar changes to expansive soil frequency and impacts. Refer to Probability of Future Events section in Section 10: Flood and Section 6: Drought for more information on those hazards.



SECTION 9

EXTREME HEAT

SECTION 9: EXTREME HEAT

Hazard Description	1
Location	1
Extent	2
Historical Occurrences	4
Significant Events	5
Probability of Future Events	5
Vulnerability and Impact	6
Assessment of Impacts	8
Climate Change Considerations	8

HAZARD DESCRIPTION

Extreme heat is a prolonged period of excessively high temperatures and exceptionally humid conditions. Extreme heat during the summer months is a common occurrence throughout the State of Texas, and the City of San Marcos is no exception. The city typically experiences extended heat waves or extended periods of extreme heat that are often accompanied by high humidity. In addition, the city also has urban heat islands or areas where there is a concentration of structures such as buildings and pavement and a limited amount of greenery causing higher temperatures relative to outlying areas. The urban heat island effect results in daytime temperatures that are 1-7°F higher than temperatures in outlying areas and nighttime temperatures that are 2-5°F higher.¹



Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of the community. The major human risks associated with extreme heat include heat cramps, sunburn, dehydration, fatigue, heat exhaustion, and even heat stroke. The most vulnerable populations to heat casualties are children and the elderly or infirmed 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 look out for their well-being.

LOCATION

While extreme heat events can occur throughout the entire City of San Marcos, the areas where heat stays throughout the day is largely dependent on the type of land use and ground cover. Areas with large amounts of impervious and dark surfaces such as roads and roofs, heat up quickly and remain hot throughout the day. These areas, which tend to be urban and industrial, are not able to cool down overnight and start the day with higher morning temperatures in comparison to less dense areas that have more trees and vegetation.

¹ Environmental Protection Agency, <https://www.epa.gov/heatislands/learn-about-heat-islands>

SECTION 9: EXTREME HEAT

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 9-1. This index measures how hot it feels outside when humidity is combined with high temperatures.

Figure 9-1. Extent Scale for Extreme Summer Heat²

Temperatures (°F)		Temperatures (°F)		Temperatures (°F)		Temperatures (°F)	
40	80 - 88: CAUTION	40	90 - 96: EXTREME CAUTION	40	98 - 106: DANGER	40	108 - 110: EXTREME DANGER
45	80 - 88: CAUTION	45	90 - 94: EXTREME CAUTION	45	96 - 104: DANGER	45	106 - 110: EXTREME DANGER
50	80 - 86: CAUTION	50	88 - 94: EXTREME CAUTION	50	96 - 102: DANGER	50	104 - 110: EXTREME DANGER
55	80 - 86: CAUTION	55	88 - 92: EXTREME CAUTION	55	94 - 100: DANGER	55	102 - 110: EXTREME DANGER
60	80 - 84: CAUTION	60	86 - 90: EXTREME CAUTION	60	92 - 98: DANGER	60	100 - 110: EXTREME DANGER
65	80 - 84: CAUTION	65	86 - 90: EXTREME CAUTION	65	92 - 96: DANGER	65	98 - 110: EXTREME DANGER
70	80 - 84: CAUTION	70	86 - 88: EXTREME CAUTION	70	90 - 94: DANGER	70	96 - 110: EXTREME DANGER
75	80 - 82: CAUTION	75	84 - 88: EXTREME CAUTION	75	90 - 94: DANGER	75	96 - 110: EXTREME DANGER
80	80 - 82: CAUTION	80	84 - 86: EXTREME CAUTION	80	88 - 92: DANGER	80	94 - 110: EXTREME DANGER
85	80 - 82: CAUTION	85	84 - 86: EXTREME CAUTION	85	88 - 90: DANGER	85	92 - 110: EXTREME DANGER
90	80: CAUTION	90	82 - 84: EXTREME CAUTION	90	86 - 90: DANGER	90	92 - 110: EXTREME DANGER
95	80: CAUTION	95	82 - 84: EXTREME CAUTION	95	86 - 88: DANGER	95	90 - 110: EXTREME DANGER
100	80: CAUTION	100	82 - 84: EXTREME CAUTION	100	86 - 88: DANGER	100	90 - 110: EXTREME DANGER

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

The Extent Scale in Figure 9-1 displays varying categories of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 90 degrees Fahrenheit (°F) 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 category of intensity, and it indicates when fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps, or heat exhaustion are possible, and 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 in Table 9-1.

Table 9-1. Heat Index and Warnings

CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Extreme Danger	125°F and higher	Heat stroke or sun stroke likely.	An Excessive Heat Warning is issued if the Heat Index

² Source: NOAA

SECTION 9: EXTREME HEAT

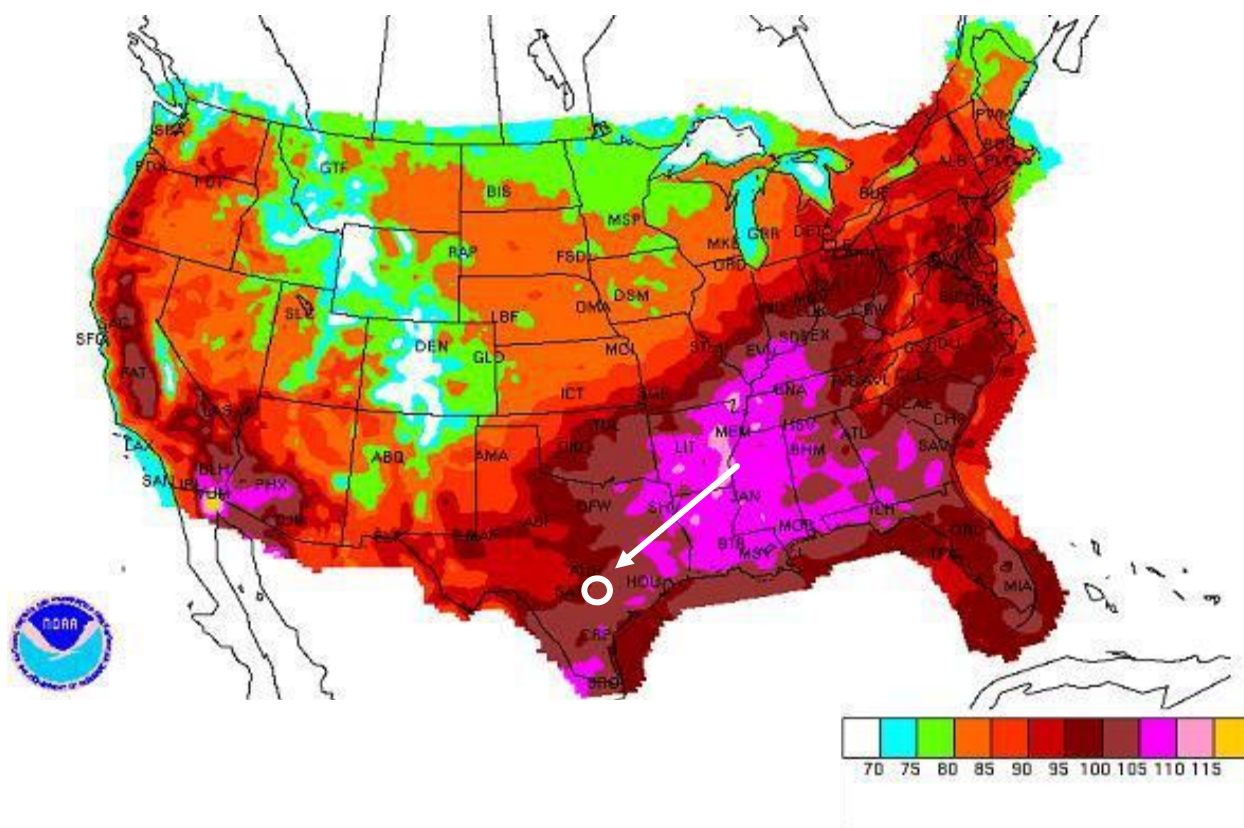
CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Danger	103 – 124°F	Sunstroke, muscle cramps, and/or heat exhaustion are likely. Heatstroke possible with prolonged exposure and/or physical activity.	rises above 105°F at least 3 hours during the day or above 80°F at night.
Extreme Caution	90 – 103°F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.	A heat advisory will be issued to warn that the Heat Index may exceed 105°F.
Caution	80 – 90°F	Fatigue is possible with prolonged exposure and/or physical activity.	

The City of San Marcos lies in South Central Texas with two distinct regions, the Blackland Prairie in the east, while the western region consists of forested or grassy rolling hills. Typically, elevation rises approximately 600 to over 1,400 feet within Hays County. Due to its geography and its warm, sunny, and humid subtropical climate, the City of San Marcos planning area can expect an extreme heat event each summer. The community, 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. In addition, those working or remaining outdoors for extended periods of time are at greater risk.

Figure 9-2 displays the daily maximum heat index as derived from NOAA based on data compiled from 1838 to 2015. The white circle shows the City of San Marcos planning area, which is represented primarily in brown, indicating an average daily heat index of 100°F to 105°F. Therefore, the City of San Marcos could experience dangerous heat from 100°F to 105°F, and should mitigate to the extent of “Danger,” which can include sunstroke, muscle cramps, heat exhaustion and potential heat stroke. This is the highest temperature (extreme caution category) the planning area can anticipate based on historical events.

SECTION 9: EXTREME HEAT

Figure 9-2. Average Daily Maximum Heat Index Days³



HISTORICAL OCCURRENCES

Previous occurrences for extreme heat are derived from the NCEI database, which identifies extreme heat events on a county-wide level for each event. According to heat related incidents located solely within Hays County, there have been five extreme heat events on record for the county which includes the City of San Marcos (Table 9-2). Historical extreme heat information, as provided by the NCEI, shows extreme heat activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event.

Historical extreme heat data for the City of San Marcos are provided on a county-wide basis per the NCEI database from 1996 through July 2023. Only extreme heat events that have been reported have been factored into this risk assessment. It is highly likely additional extreme heat occurrences have gone unreported before and during the recording period. Due to the limited number of reported events, average high temperatures have been analyzed in order to determine the probability of future events.

³ The white circle indicates the City of San Marcos planning area.

SECTION 9: EXTREME HEAT

Table 9-2. Historical Extreme Heat Events, 1996-2023⁴

DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
7/22/2018	0	0	\$0	\$0
7/13/2020	0	0	\$0	\$0
6/15/2023	0	0	\$0	\$0
6/25/2023	0	0	\$0	\$0
7/10/2023	0	0	\$0	\$0
Total	0	0	\$0	\$0

Based on the list of historical extreme heat events for the City of San Marcos planning area, all five events were reported to the NCEI since the 2018 Plan.

SIGNIFICANT EVENTS

June 15 – 21, 2023 – Hays County

Strong high pressure settled over South Central Texas, and temperatures and heat indices soared. The excessive heat expanded over the next several days until it reached its peak on the 21st when all counties reached excessive heat criteria. A number of record highs were set during this period. Peak heat index values included 120 at San Marcos on the 21st.

July 13, 2020 – Hays County

Temperatures exceeded 105°F across 17 counties, including Hays County. The temperature reached 110°F in Luling and 109°F in New Braunfels. There were no reported damages or fatalities as a result of the extreme temperatures in the City of San Marcos.

July 22, 2018 – Hays County

Strong high pressure developed over South Central Texas with record high temperatures. The heat wave started on the 19th with high temperatures reaching 105°F and higher. The hot temperatures spread across the region reaching their greatest extent on the 23rd with reports indicating temperatures at 109°F and 110°F. The extreme heat broke on the 24th when highs dropped down closer to 100°F. There were no reported damages or fatalities as a result of the extreme temperatures in the City of San Marcos.

PROBABILITY OF FUTURE EVENTS

According to historical records the City of San Marcos planning area has experienced five events in a 27.5-year reporting period. Due to the average daily temperature throughout the summer, it is assumed that Hays County and the City of San Marcos planning area can anticipate multiple events each year. This frequency supports a “Highly Likely” probability of future events. See additional information on the impacts of climate change at the end of this section.

⁴ NOAA, NCEI Storm Events Database events reported from January 1996 through July 2023.

SECTION 9: EXTREME HEAT

VULNERABILITY AND IMPACT

There is no defined geographic boundary for extreme heat events. While the entirety of the City of San Marcos is exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not likely to sustain significant damage from extreme heat events. Therefore, any estimated property losses associated with the extreme heat hazard are anticipated to be minimal across the area.

Every summer, the hazard of heat-related illness becomes a significant public health issue throughout much of the United States. Mortality from all causes increases during heat waves, and excessive heat is an important contributing factor to deaths from other causes, particularly among the elderly. Extreme temperatures present a significant threat to life and safety for the population of the city as a whole. Heat casualties, for example, are typically caused by a lack of adequate air-conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed 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 look out for their well-being. Children may also be more vulnerable if left unattended in vehicles. Students are also susceptible at sporting events and practices which are often held outside during early fall or late spring when temperatures are at the highest. In addition, populations living below the poverty level are unable to run air-conditioning on a regular basis and are limited in their ability to seek medical treatment. Another segment of the population at risk are those whose jobs consist of strenuous labor outdoors.

The population over 65 in the City of San Marcos is estimated at 9.3 percent of the total population and children under the age of 5 are estimated at 3.7 percent, or an estimated total of 8,442 potentially vulnerable residents in the planning area based on age. In addition, an estimated 30.6 percent of the planning area population live below the poverty level. Underprivileged populations are disproportionately impacted by extreme heat events as they are less likely to be able to afford air conditioning during the hot summer months as well as less likely to have access to medical care.

Table 9-3. Populations at Greater Risk⁵

JURISDICTION	YOUTH (UNDER 5)	ELDERLY (OVER 65)	POPULATION BELOW POVERTY LEVEL
City of San Marcos	2,408	6,034	15,858

Extreme high temperatures can have significant secondary impacts, leading to droughts, water shortages, increased fire danger, and prompt excessive demands for energy. The possibility of rolling blackouts increases with unseasonably high temperatures in what is a normally mild month with low power demands. Typically, more than 12 hours of warning time would be given before the onset of an extreme heat event. In addition, while damages to structures are not expected during extreme heat events, vulnerable populations, as well as the population in general, may be subject to significant injury or illness during periods of extreme heat, potentially resulting in death.

In terms of vulnerability to structures, the impact from extreme heat would be negligible. It is possible that critical facilities and infrastructure could be shut down for 24 hours if cooling units

⁵ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 9: EXTREME HEAT

are running constantly, leading to a temporary power outage. Less than 10 percent of residential and commercial property could be damaged if extreme heat events lead to structure fires. Based on historical records over a 27.5-year period, annualized property and crop losses for the City of San Marcos planning area are negligible. With no damages, injuries, or fatalities, the overall potential severity of impact to the planning area from extreme heat is considered “Limited”.

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by extreme heat events.

Table 9-4. Critical Facilities Vulnerable to Extreme Heat Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 6 Fire Stations, 3 Police Stations	<ul style="list-style-type: none">○ Emergency operations, services and response times may be significantly impacted due to power outages, and/or loss of communications.○ Exposure to heat can cause heat illnesses in first responders, especially for those in heavy equipment.○ Roads may become impassable due to excessive heat causing asphalt roads to soften and concrete roads to shift or buckle impacting response times by emergency services.○ Extended power outages due to increased usage may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none">○ Power outages due to increased usage could disrupt critical care.○ Backup power sources could be damaged.○ Evacuations may be necessary due to extended power outages, breaks in water main lines or other associated damages to facilities.
1 Airport	<ul style="list-style-type: none">○ Facilities, infrastructure, or critical equipment including communications may be damaged, destroyed or otherwise inoperable.○ Essential supplies like medicines, water, food, and equipment deliveries may be delayed.○ Economic disruption due to power outages negatively impact airport services as well as area businesses reliant on airport operations.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure (water stations, pressure stations, storage tanks, and wells)	<ul style="list-style-type: none">○ Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks.○ Disruptions and outages impact public welfare as safe drinking water is critical.○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease.○ Exposure to untreated wastewater is harmful to people and the environment.○ Any service disruptions can negatively impact or delay emergency management operations.

SECTION 9: EXTREME HEAT

ASSESSMENT OF IMPACTS

The greatest risk from extreme heat is to public health and safety. The impact of climate change could produce longer, more severe heat waves, exacerbating the current impacts. Extreme heat conditions can be frequently associated with a variety of impacts, including:

- Vulnerable populations, particularly the elderly (9.3 percent of total population) and children under 5 (3.7 percent of total population), can face serious or life-threatening health problems from exposure to extreme heat including hyperthermia, heat cramps, heat exhaustion, and heat stroke (or sunstroke).
- Response personnel, including utility workers, public works personnel, and any other professions where individuals are required to work outside, are more subject to extreme heat related illnesses since their exposure would typically be greater.
- High energy demand periods can outpace the supply of energy, potentially creating the need for rolling brownouts which would elevate the risk of illness to vulnerable residents.
- Highways and roads may be damaged by excessive heat causing asphalt roads to soften and concrete roads to shift or buckle.
- Vehicle engines and cooling systems typically run harder during extreme heat events resulting in increases in mechanical failures.
- Extreme heat events during times of drought can exacerbate the environmental impacts associated with drought, decreasing water and air quality and further degrading wildlife habitat.
- Extreme heat increases ground-level ozone (smog), increasing the risk of respiratory illnesses.
- Negatively impacted water suppliers may face increased costs resulting from the transport of water resources or development of supplemental water resources.
- Tourism and recreational activities predominant in the City of San Marcos may be negatively impacted during extreme heat events, reducing seasonal revenue.
- Outdoor activities may see an increase in school injury or illness during extreme heat events.
- Food suppliers can anticipate an increase in food costs due to increases in production costs and crop and livestock losses.
- Fisheries may be negatively impacted by extreme heat, suffering damage to fish habitats (either natural or man-made) and a loss of fish and/or other aquatic organisms due to decreased water flows or availability.

The economic and financial impacts of extreme heat on the community will depend on the duration of the event, demand for energy, drought associated with extreme heat, and many other factors. The level of preparedness and the amount of planning done by the jurisdiction, local businesses, and the community will impact the overall economic and financial conditions before, during, and after an extreme heat event.

CLIMATE CHANGE CONSIDERATIONS

Climate change is expected to lead to an increase in average temperatures as well as an increase in frequency, duration, and intensity of extreme heat events. With no reductions in emissions

SECTION 9: EXTREME HEAT

worldwide, the State of Texas is projected to experience an additional 30 to 60 days per year above 100°F than what is experienced now.⁶

⁶ Nielsen-Gammon, John, Holman, Sara, Buley, Austin and Jorgensen, Savannah. Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, 2021 Update. Texas A&M University Office of the Texas State Climatologist. October 7, 2021. <https://climatexas.tamu.edu/files/ClimateReport-1900to2036-2021Update>



SECTION 10 FLOOD

SECTION 10: FLOOD

Hazard Description	1
Location	1
Extent	4
Historical Occurrences	6
Significant Events	8
Probability of Future Events	11
Vulnerability and Impact	11
Assessment of Impacts	13
Climate Change Considerations	15
National Flood Insurance Program (NFIP) Participation	15
Community Rating System	16
NFIP Compliance and Maintenance	17
Repetitive Loss	17

HAZARD DESCRIPTION

Floods generally result from excessive precipitation. The severity of a flood event is determined by a combination of several major 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. Typically, floods are long-term events that may last for several days.

The primary types of general flooding are inland and coastal flooding. Due to the City of San Marcos' inland location, only inland flooding is profiled in this section. Inland or riverine flooding is a result of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Inland or riverine flooding is overbank flooding of rivers and streams, typically resulting from large-scale weather systems that generate prolonged rainfall over a wide geographic area, thus it is a naturally occurring and inevitable event. 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.

The City of San Marcos area residents are subject to a tremendous amount of rainfall, which often occurs over an extremely short period. This is generally due to unstable tropical storms or hurricanes (see Section 12), and rain events which results in a substantial flooding problem. Floods are a natural and recurrent event. Floods take place every year and in all seasons.

LOCATION

Flooding is the foremost hazard facing the City of San Marcos. The Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide an overview of flood risk but can also be used to identify the areas of the city that are vulnerable to flooding. FIRMs are used to regulate new development and to control the substantial improvement and repair of substantially damaged buildings. Flood Insurance Studies (FIS) are often developed in conjunction with FIRMs. The FIS typically contains a narrative of the flood history of a community and discusses the engineering methods used to

SECTION 10: FLOOD

develop the FIRMs. The FIS also contains flood profiles for studied flood sources and can be used to determine Base Flood Elevations (BFEs) for some areas.

Revised or new studies are now presented as countywide FIS's and include incorporated areas. The City of San Marcos is included in the FIS for Hays County (dated September 2, 2005), the FIS for Caldwell County (dated December 30, 2020), and the FIS for Guadalupe County (dated December 30, 2020). These FIS's compile all previous flood information and include data collected on numerous waterways. Areas that are most vulnerable to flooding include low-lying areas in the city along the San Marcos and Blanco Rivers. According to the 2020 FIS for Caldwell County, the San Marcos River and its tributaries within Caldwell Hays and Guadalupe Counties flow through predominantly rural areas. Flooding mostly occurs to cropland and pastureland. However, larger floods in the past have caused damage to residential property. The City of San Marcos has a history of significant flooding typically due to excessive rainfall in upper portions of the watershed. Topography of the planning area is nearly level to moderately steep and the soils have a wide range of permeability. Most flood-producing storms occur in the spring and summer months, although intense local thunderstorms can produce flooding throughout the year.

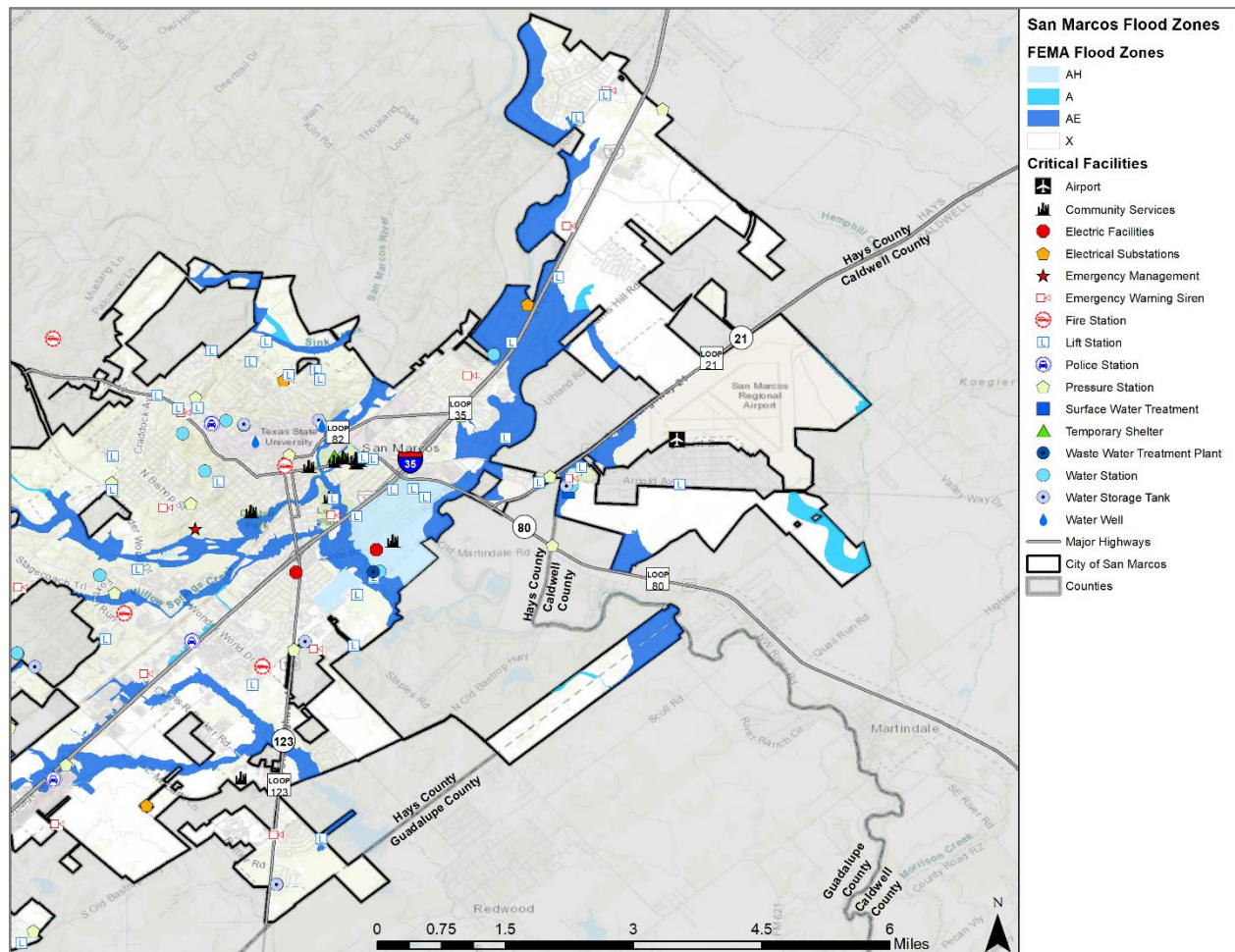
The Flood Insurance Rate Map (FIRM) data provided by FEMA for the City of San Marcos shows the following flood hazard areas:

- Zone AH: Areas subject to inundation by the 1-percent-annual-chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
- 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 AE: Areas subject to inundation by 1-percent-annual-chance shallow flooding. It is the base floodplain where BFEs are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
- Zone X: Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

Locations of flood zones in the City of San Marcos based on the digital Flood Insurance Rate Map (DFIRM) from FEMA are illustrated in Figures 10-1 and 10-2.

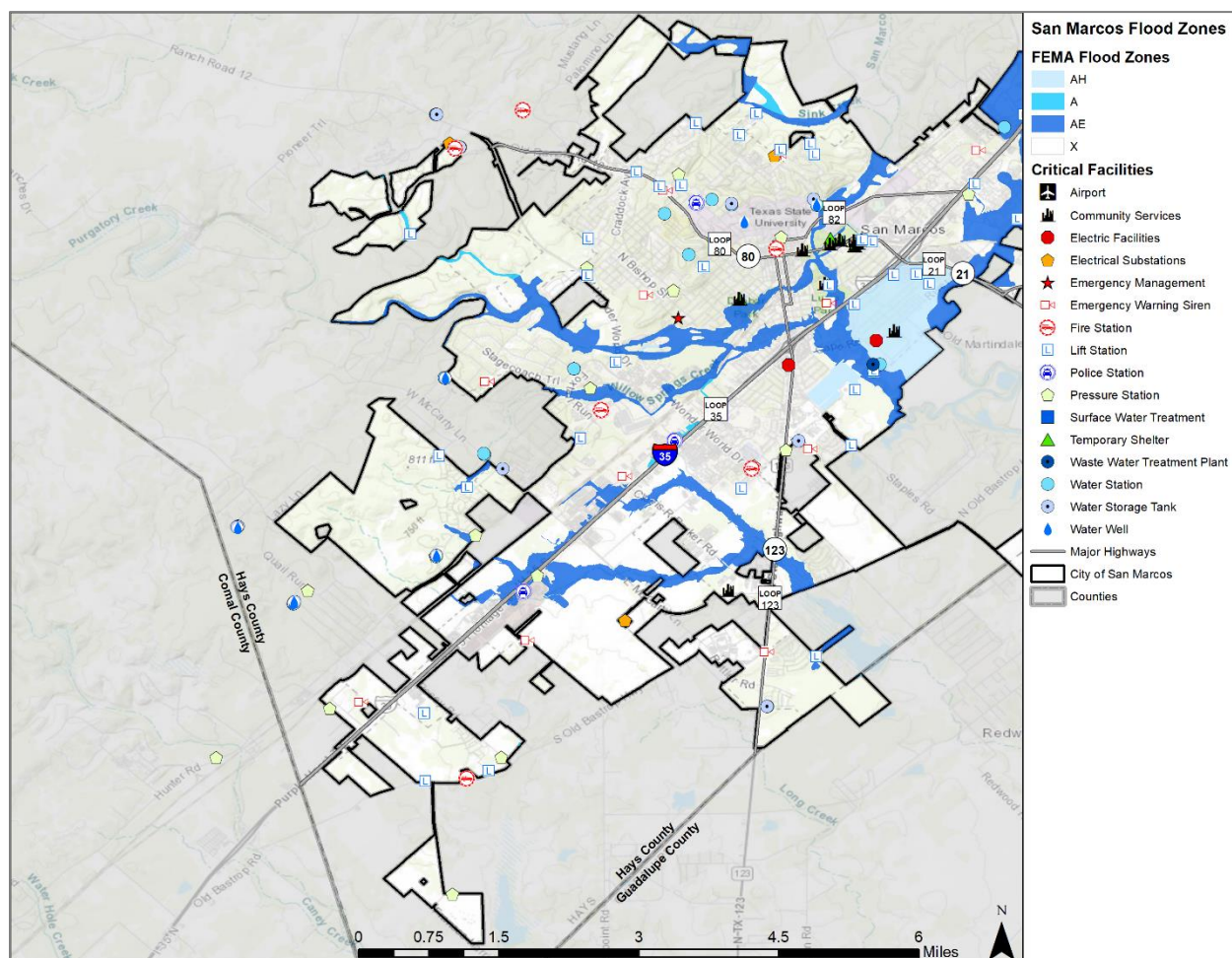
SECTION 10: FLOOD

Figure 10-1. Estimated Flood Zones in City of San Marcos – East



SECTION 10: FLOOD

Figure 10-2. Estimated Flood Zones in City of San Marcos – West



EXTENT

The severity of a flood event is determined by a combination of several factors including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

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. The extent of flood damages can be expected to be greater 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 10-1 provides a description of FEMA flood zones and the flood impact in terms of severity or potential harm. Flood Zones AH, A, AE, and X are the only hazard areas mapped in the planning area. Figures 10-1 and 10-2 should be read in conjunction with the extent for flooding in Tables 10-1 and 10-2 to determine the intensity of a potential flood event.

SECTION 10: FLOOD

Table 10-1. Flood Zones

INTENSITY	ZONE	DESCRIPTION
HIGH	ZONE A	Areas with a 1 percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
	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 Base Flood Elevation (BFE) (old format).
	ZONE AE	The base floodplain where base flood elevations are provided. AE Zones are now used on the new format FIRMs instead of A1-A30 Zones.
	ZONE AO	River or stream flood hazard areas and areas with a 1 percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
	ZONE AH	Areas with a 1 percent annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
	ZONE A99	Areas with a 1 percent annual chance of flooding that will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
	ZONE AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
HIGH COASTAL	ZONE VE, V1-30	Coastal areas with a 1 percent or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
MODERATE to LOW	ZONE X 500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees from 100-year flooding.

SECTION 10: FLOOD

Zone A is interchangeably referred to as the 100-year flood, the 1-percent-annual-chance flood, the Special Flood Hazard Area (SFHA), or more commonly, the base flood. This is the area that will convey the base flood and constitutes a threat to the planning area. The impact from a flood event can be more damaging in areas that will convey a base flood.

Structures built in the SFHA are subject to damage by rising waters and floating debris. Moving flood water exerts pressure on everything in its path and causes erosion of soil and solid objects. Utility systems, such as heating, ventilation, air conditioning, fuel, electrical systems, sewage maintenance systems and water systems, if not elevated above base flood elevation, may also be damaged.

The intensity and magnitude of a flood event is also determined by the depth of flood waters. Table 10-2 describes the stream gauge data provided by the United States Geological Survey (USGS).

Table 10-2. Extent for City of San Marcos¹

JURISDICTION ²	PEAK FLOOD EVENT
City of San Marcos	San Marcos River in San Marcos, Texas reached an overflow elevation of 21.29 in October 1998. The average overflow elevation for San Marcos River is 8.29 feet at this site.
City of San Marcos	Blanco River in San Marcos, Texas reached an overflow elevation of 42.45 in October 2015. The average overflow elevation for Blanco River is 144.39 feet at this site.

The range of flood intensity that the planning area can experience is high, or Zone A. Based on historical occurrences, the City of San Marcos could expect to experience 3 inches of rain within a 2-hour period, resulting in flash flooding.

The data described in Tables 10-1 and 10-2, together with Figures 10-1 and 10-2, and historical occurrences for the area, provides an estimated potential magnitude and severity for the City of San Marcos.

HISTORICAL OCCURRENCES

Historical evidence indicates that areas within the planning area are susceptible to flooding, especially in the form of flash flooding. It is important to note that only flood events that have been reported have been factored into this risk assessment, therefore it is likely that additional flood occurrences have gone unreported before and during the recording period. Table 10-3 identifies historical flood events in the City of San Marcos planning area. Historical data is provided by planning team members and the Storm Prediction Center (NOAA), NCEI database for the City of San Marcos.

¹ Severity estimated by averaging floods at certain stage level over the history of flood events. Severity and peak events are based on U.S. Geological Survey data.

² Severity is provided for jurisdictions where peak data was provided.

SECTION 10: FLOOD

Table 10-3. Historical Flood Events, 1996-2023³

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	5/23/1997	0	0	\$943	\$0
Hays County	6/6/1997	0	0	\$942	\$0
Hays County	6/7/1997	0	0	\$1,413	\$0
Hays County	6/8/1997	2	7	\$235,570	\$4,711
Hays County	6/21/1997	0	0	\$471	\$0
Hays County	6/22/1997	0	0	\$4,711	\$4,711
Hays County	2/21/1998	0	0	\$466	\$0
Hays County	7/3/1998	0	0	\$1,851	\$0
Hays County	8/22/1998	0	0	\$1,849	\$924.40
Hays County	8/23/1998	0	0	\$924	\$0
Hays County	10/17/1998	0	100	\$46,051	\$4,605
Hays County	10/17/1998	0	25	\$368,408	\$2,550
Hays County	10/17/1998	0	25	\$368,408	\$2,550
Hays County	6/21/1999	0	0	\$273	\$0
Hays County	6/9/2000	0	0	\$1,314	\$0
Hays County	11/2/2000	0	0	\$1,735	\$0
Hays County	8/26/2001	0	0	\$851	\$0
Hays County	8/31/2001	0	0	\$2,553	\$1,701
Hays County	8/31/2001	0	0	\$1,702	\$0
Hays County	11/15/2001	0	20	\$17,029	\$4,257
Hays County	6/30/2002	0	0	\$840	\$0
Hays County	2/20/2003	0	0	\$825	\$0
Hays County	6/13/2003	0	0	\$411	\$0
Hays County	9/11/2003	0	0	\$245	\$0
Hays County	1/16/2004	0	0	\$245	\$0

³ Only recorded events with fatalities, injuries, and/or damages are listed, values are in 2023 dollars. Historical events are listed from January 1996 through July 2023. Countywide damages have been adjusted to reflect only a percentage (5.1%) of the damages attributed to the City of San Marcos.

SECTION 10: FLOOD

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	6/9/2004	0	0	\$27,868	\$0
City of San Marcos	11/14/2004	1	0	\$0	\$0
Hays County	3/11/2007	1	0	\$0	\$0
Hays County	7/20/2007	0	0	\$5,100	\$0
Hays County	10/31/2013	0	0	\$64,676	\$0
Hays County	5/24/2015	10	0	\$6,351,726	\$0
Hays County	5/24/2015	0	0	\$6,351,726	\$0
City of San Marcos	5/30/2015	0	0	\$6,227	\$0
Hays County	10/30/2015	0	0	\$63,508	\$0
Hays County	10/30/2015	0	0	\$635,084	\$0
City of San Marcos	4/11/2017	0	0	\$605,607	\$0
Hays County	8/26/2017	0	0	\$6,152	\$0
Hays County	5/3/2019	1	0	\$0	\$0
Hays County	5/3/2019	0	0	\$5,898	\$0
TOTALS		15	177	\$15,183,602	\$26,009

Table 10-4. Summary of Historical Flood Events, 1996-2023⁴

JURISDICTION	NUMBER OF EVENTS	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of San Marcos	13	1	0	\$611,834	\$0
Hays County	117	14	177	\$14,571,768	\$26,009
TOTAL LOSSES	130	15	177	\$15,209,611	

Based on the list of historical flood events for the City of San Marcos planning area, 19 events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

There have been six declared disasters related to flooding and severe storms that resulted in flood events in Hays County and the City of San Marcos between 1996 and 2023 (Table 10-5). Additional details on certain flood events in the City of San Marcos are described below.

⁴ Countywide damages have been adjusted to reflect only a percentage (5.1%) of the damages attributed to the City of San Marcos.

SECTION 10: FLOOD

Table 10-5. Disaster Declarations for Flooding, 1996-2023

DECLARATION DATE	DECLARATION TITLE	DECLARATION TYPE	DISASTER NO.
07/07/1997	Texas Severe Storms/Flooding	DR	DR-1179-TX
10/21/1998	Texas Flooding	DR	DR-1257-TX
07/04/2002	Severe Storms And Flooding	DR	DR-1425-TX
12/20/2013	Severe Storms And Flooding	DR	DR-4159-TX
05/29/2015	Severe Storms, Tornadoes, Straight-Line Winds And Flooding	DR	DR-4223-TX
11/25/2015	Severe Storms, Tornadoes, Straight-Line Winds, And Flooding	DR	DR-4245-TX

Flash Flood on October 14, 2021 – City of San Marcos

A complicated weather pattern developed over South Central Texas when a dryline and cold front moved out of West Texas as an upper-level low moved into the Central Plains. At the same time, the remnants of Pacific Hurricane Pamela moved across northern Mexico. The air mass over the region was warm and moist with near-record precipitable water values. In the City of San Marcos, the thunderstorms produced heavy rain that led to flash flooding. The San Marcos Police Department closed the Hwy 80 bridge over the Blanco River to rescue several people in the river.

Flash Flood on April 11, 2017 – City of San Marcos

Thunderstorms produced heavy rain (up to 8 inches) that led to flash flooding in San Marcos. The I-35 frontage roads from Hwy 80 to McCarty Ln. and Hwy 123 south of the city were closed due to water over the road. Several people had to be rescued from their cars including a high-water rescue on San Antonio Street in San Marcos. Emergency Management reported a total of 60 water rescues. Rains totaled near 8 inches in part of the City of San Marcos and surrounding areas mainly south and east of town. There were 35 residential properties damaged and 7 commercial properties damaged. Monetary damage estimates include infrastructure damage and flooded cars. Nearly 3,000 people were without power. Along with the flash flooding, winds up to 70 mph and dime-sized hail were reported.

Flash Flood on October 2015 – Hays County and City of San Marcos (DR-4245-TX)

A warm front combined with an upper-level trough and deep moisture produced heavy rainfall and severe thunderstorms across much of South Central Texas on October 30th and 31st. Excessive rainfall resulted in widespread flash flooding along the IH-35 corridor Friday morning. Rainfall rates on the order of 5 to 7 inches per hour fell from San Marcos north through South Austin. Some daily rainfall totals exceeded 15 inches. Record flooding occurred in portions of Hays County. River and creek flooding was extensive across the county. Many areas, especially in the City of San Marcos, compared this flooding to the record flooding of October 1998. An estimated 2000 homes were flooded in or near the IH-35 corridor and many of them were destroyed or sustained major damage.

Flash Flood on May 2015 – Hays County (DR-4223-TX)

A historic flash flood occurred on the Blanco River late Saturday night into Sunday. Hundreds of homes were destroyed along the river from the City of Blanco down into Wimberley and San

SECTION 10: FLOOD

Marcos. The flood wave continued downstream for days, affecting residents and homes along the San Marcos and Guadalupe Rivers. Early estimates show damages in excess of 100 million dollars. Thunderstorms produced heavy rain that caused flash flooding. Homes along the banks of the Blanco River from the City of Blanco, through Wimberley, and down to the City of San Marcos experienced a historic flood. Many homes were totally destroyed and swept downstream. Other homes were struck by large debris, including full-size cypress trees which typically lined the banks of the river. The river experienced rises that exceeded 20 feet in 1 hour. Overall, in Hays County, including Wimberley and the City of San Marcos, 321 homes were destroyed, with hundreds more heavily damaged. According to the Hays County Office of Emergency Services, FEMA awarded over 3.5 million dollars in public assistance to Hays County in response to this disaster.

Flash Flood October 2013 – Hays County (DR-4159-TX)

A surface trough was the focus of training storms which produced heavy rainfall that led to major flooding across the Onion Creek and Blanco/San Marcos River watersheds. Thunderstorms produced heavy rain that led to flash flooding in Wimberley, San Marcos, Buda, and Kyle. The Blanco River flooded, and major flooding occurred downstream to San Marcos. Flooding then occurred in the San Marcos River as the flood wave crossed IH-35. Reports indicate that the Blanco River was near or slightly higher than the 1998 flood of record. Sections of San Marcos flooded near the Blanco River including areas of Texas State University and areas along River Road where several evacuations of residences occurred. The Blanco River flooded 100 feet out of its banks. In many areas along the Blanco River, debris was found 15 to 20 feet up. Several roads needed repair and several homes were flooded out. Across Hays County, 47 homes sustained minor damage, 24 sustained major damage, and 1 home was destroyed.

October Floods October 17-21, 1998 – South Central Texas and Hays County (DR-1257-TX)

On the weekend of October 17 to 18, 1998, a pair of hurricanes over the Eastern Pacific and a near-stationary cold front led to a significant flash flooding event along the Guadalupe River and across the San Antonio metro area. Torrential rains began to develop along the Balcones Escarpment in the early morning hours on Saturday, October 17.⁵ All rivers, creeks, and streams along and east of a San Antonio to Austin line remained at or above flood stage from Saturday, October 17th through Sunday, October 18th with a majority continuing to flood through Monday, October 19th. Over 30 inches of rain was estimated over a small area south of San Marcos in 36 hours.

This event broke rainfall records across South Central Texas, producing 18 floods of record in South Central Texas streams. Rainfall amounts in southern Hays County ranged from 15 to 22 inches. Damage and destruction to livestock and agriculture, roads, bridges, and both public and private property and buildings significantly exceeded that of previous flooding. Across the region, thousands to tens of thousands of livestock were killed, as nearly 3,000 homes were destroyed and another 8000 or so homes were damaged. Nearly 1,000 mobile homes were destroyed and another 3,000 were damaged.

⁵ Weather Event Summary: October 1998 Floods – South Central Texas, Austin/San Antonio Weather Forecast Office, October 1998, <https://www.weather.gov/media/ewx/wxevents/ewx-1998flood.pdf>

SECTION 10: FLOOD

Flash Flood May 13-15, 1970 – City of San Marcos (DR-286-TX)

The total storm rainfall for this flood, over a 24-hour period, varied from 6 inches in the upper portion of the watershed to 13 inches recorded at the City of San Marcos. The resulting flood was estimated to have between a 2- and 1-percent-annual-chance flood frequency. Approximately 1,850 acres of floodplain were inundated and approximately half was urban area. Two children drowned. If the flood had occurred during the night, the loss of life could have been greatly multiplied.⁶

PROBABILITY OF FUTURE EVENTS

Based on 130 recorded historical occurrences within a 27.5-year reporting period within the City of San Marcos planning area, flooding is considered “Highly Likely”, or an event probable every year. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

A property’s vulnerability to a flood depends on its location and proximity to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and are often repetitive loss structures. The City of San Marcos encourages development outside of the floodplain, and the impact for flood for the entire planning area is considered minor in terms of damages with more than 10 percent of property destroyed or with major damage, and critical facilities shut down for one week or more. However, the historic fatality indicates a potential severity impact of “Substantial” with multiple fatalities possible depending on the size and duration of the event.

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by flood events.

Table 10-6. Critical Facilities in Special Flood Hazard Area

CRITICAL FACILITIES	POTENTIAL IMPACTS
None	<ul style="list-style-type: none">○ Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.○ Emergency vehicles can be damaged by rising flood waters.○ Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm’s way.○ Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.○ Power outages could disrupt communications, delaying emergency response times.○ Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.○ Washed out roads and bridges can impede emergency response vehicle access to areas.

⁶ Hays County Flood Insurance Study, Flood Insurance Study Number 48209CV001A, September 2, 2005

SECTION 10: FLOOD

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none"> Increased number of structure fires due to gas line ruptures and downed power lines, further straining the capacity and resources of emergency personnel. First responders are exposed to downed power lines, contaminated and unusual debris, hazardous materials, and generally unsafe conditions. Extended power outages and evacuations may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
1 Government Facility	<ul style="list-style-type: none"> Structures can be damaged by rising flood waters. Power outages could disrupt critical care. Backup power sources could be damaged, inundated or otherwise inoperable. Critical staff may be impacted and unable to report for duty, limiting response capabilities. Evacuations may be necessary due to extended power outages, gas line ruptures, or inundation of facilities.
1 Wastewater Treatment Plant, 3 Water Stations, 1 Water Storage Facility, 9 Lift Stations, 1 Pressure Station, 1 Electrical Facility, 1 Electrical Substation	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

Historic loss estimates due to flood are presented in Table 10-7 below.

Table 10-7. Potential Annualized Losses

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
City of San Marcos	\$15,209,611	\$584,985

While all citizens are at risk of the impacts of a flood, forced relocation and disaster recovery drastically impacts low-income residents who lack the financial means to travel, afford a long-term stay away from home, and to rebuild or repair their homes. An estimated 30.6 percent of the planning area population live below the poverty level. Similarly, renters tend to be more vulnerable to the impacts of flood events. Their ability to recover after a flood is often disproportionately impacted by limited affordable replacement housing, financial constraints, and they often do not carry flood insurance to cover losses. Within the City, 74 percent of housing units are renter occupied. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos. While warning times for these type of

SECTION 10: FLOOD

hazard events should be substantial enough for these individuals to seek shelter, individuals who work and recreate outside are also vulnerable to potential impacts of a flood event.

Table 10-8. Populations at Greatest Risk⁷

JURISDICTION	POPULATION BELOW POVERTY LEVEL	RENTER OCCUPIED UNITS
City of San Marcos	15,858	18,990

The severity of a flooding event varies depending on the relative risk to citizens and structures located within the city. Table 10-9 depicts the level of impact for the City of San Marcos.

Table 10-9. Level of Impact Summary

JURISDICTION	IMPACT	DESCRIPTION
City of San Marcos	Substantial	While it is anticipated that the City of San Marcos could anticipate an impact of “minor” with critical facilities shut down for a week or more, and more than 10 percent of property would be destroyed or damaged, the historical fatality resulting from flood indicates a “substantial” impact.

ASSESSMENT OF IMPACTS

Flooding is the deadliest natural disaster that occurs in the U.S. each year, and it poses a constant and significant threat to the health and safety of the people in the City of San Marcos planning area. The impact of climate change could produce larger, more severe flood events, exacerbating the current flood impacts. Worsening flood conditions can be frequently associated with a variety of impacts, including:

- Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm’s way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.
- Health risks and threats to residents are elevated after the flood waters have receded due to contaminated flood waters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes.
- Significant flood events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Floods can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.

⁷ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 10: FLOOD

- 40 buildings and sites in the city are on the National Register of Historic Places. These structures would typically be built at lower elevations and may be more susceptible to flooding.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities.
- Significant flooding can result in the inability of emergency response vehicles to access areas of the community.
- Critical staff may suffer personal losses or otherwise be impacted by a flood event and unable to report for duty, limiting response capabilities.
- City departments may be flooded, delaying response and recovery efforts for the entire community.
- Private sector entities that the jurisdiction and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures substantially damaged by a flood may not be rebuilt for years and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.
- Large floods may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Flood related declines in production may lead to an increase in unemployment.

SECTION 10: FLOOD

- Large floods may result in loss of livestock, potential increased livestock mortality due to stress and water-borne disease, and increased cost for feed.
- Recreation activities may be unavailable and tourism can be unappealing for years following a large flood event, devastating directly related local businesses and negatively impacting economic recovery.
- Vegetation in the city's urban parks may become destroyed or oversaturated from flood waters, impacting air quality and public health.
- Parks, recreational areas, and nature preserves may suffer significant wildlife mortality during and following a flood due to damaged or destroyed ecosystems and water contamination.

The overall extent of damages caused by floods is dependent on the extent, depth and duration of flooding, and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by the City, local businesses, and the community will contribute to the overall economic and financial conditions in the aftermath of a flood event.

CLIMATE CHANGE CONSIDERATIONS

River flooding in Texas is projected to have no substantial change through 2036. This is in large part due to the construction of dams and reservoirs for flood management in the 20th century. There is a mixture of historical trends categorized by season, with no one clear trend to project. In addition, meteorological drivers of river flooding (increased rainfall intensity, decreased soil moisture) are projected to have competing influences. On balance, if an increasing trend is present in river flooding, it will be at the most extreme flood events or in the wettest parts of the state where there is so much rainfall that a decrease in soil moisture would have little mitigating impact.⁸

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) PARTICIPATION

Flood insurance offered through the National Flood Insurance Program (NFIP) is one of the best ways for home and business owners to protect themselves financially against the flood hazard. The City of San Marcos is currently participating in the NFIP and is in good standing.

The City of San Marcos currently has adopted higher standards above the NFIP minimum such as 2 feet of freeboard and a no-rise provision for new construction and substantial improvements of structures.

The flood hazard areas throughout the planning area are subject to periodic inundation, which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, adversely affecting public safety.

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed, or otherwise protected from flood damage. Mitigation actions are included to address

⁸ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.

SECTION 10: FLOOD

flood maintenance issues as well, including routinely clearing debris from drainage systems and bridges and expanding drainage culverts and storm water structures to more adequately convey flood waters.

It is the purpose of the City of San Marcos to continue to promote public health, safety, and general welfare by minimizing public and private losses due to flood conditions in specific areas. The City is guided by their local Flood Damage Prevention Ordinance (Chapter 39 of the San Marcos City Code). The community will continue to comply with NFIP requirements through local permitting, inspection, and record-keeping requirements for new and substantially developed construction. Further, the NFIP program promotes sound development in floodplain areas and includes provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in floodplains;
- Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Ensure that potential buyers are notified that property is in a flood area.

In order to accomplish these tasks, the City of San Marcos seeks to follow these guidelines to achieve flood mitigation by:

- Restricting or prohibiting uses that are dangerous to health, safety, or property in times of flood, such as filling or dumping, that may cause excessive increases in flood heights and/or velocities;
- Requiring that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction as a method of reducing flood losses;
- Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- Controlling filling, grading, dredging, and other development, which may increase flood damage; and
- Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

COMMUNITY RATING SYSTEM

The City of San Marcos is an active participant in the Community Rating System (CRS). CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. Approximately 1,500 communities participate in the CRS, which is less than 10 percent of current NFIP participating communities nationwide. Lower class ratings mean lower flood insurance premiums for residents.

Out of a 10-point rating system (where 1 is the best), the City of San Marcos currently has a class rating of 7. This equates to a 15 percent insurance discount for the residents of the City of San

SECTION 10: FLOOD

Marcos. The City of San Marcos continues to exceed minimum national standards to provide financial relief to homeowners in terms of insurance discounts, as well as significant improvements to construction standards.

NFIP COMPLIANCE AND MAINTENANCE

The City of San Marcos has developed mitigation actions that relate to either NFIP maintenance or compliance. Compliance and maintenance actions can be found in Section 20.

Flooding was identified as a high-risk hazard during the Risk Assessment. As such, many of the mitigation actions were developed with flood mitigation in mind. A majority of these flood actions address compliance with the NFIP and implementing flood awareness programs. The city recognizes the need and is continually working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. In addition, the city is focusing on public flood awareness activities. This includes promoting the availability of flood insurance by placing NFIP brochures and flyers in public libraries or public meeting places around the city.

The city has a designated floodplain administrator. The floodplain administrator for the planning area will continue to maintain compliance with the NFIP including continued floodplain administration, zoning ordinances, and development regulation. The floodplain ordinance adopted by the city outlines the requirements for development in special flood hazard areas.

In accordance with the local flood damage prevention ordinances, the floodplain administrator responsibilities include:

- Permitting and inspecting construction activity in the floodplain;
- Ensuring conformance with floodplain permit requirements;
- Enforcing floodplain regulations;
- Identifying Substantially Damaged structures and ensuring compliance during reconstruction;
- Identifying Substantial Improvements in proposed development permit applications and ensuring compliance;
- Providing floodplain map and flood insurance information to the public;
- Coordinating with FEMA to maintain the community's participation in the NFIP; and
- Keeping records of construction in the floodplain.

The San Marcos flood damage prevention ordinance includes standard language defining substantial damage and substantial improvement using the minimum required threshold of fifty percent of market value.

REPETITIVE LOSS

The Severe Repetitive Loss (SRL) Grant Program under FEMA provides federal funding to assist states and communities in implementing mitigation measures to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP. The Texas Water Development Board (TWDB) administers the SRL grant program for the State of Texas. One of the goals of the Flood Mitigation Assistance (FMA) program is to reduce the burden of repetitive loss and severe repetitive loss properties on the NFIP through mitigation activities that significantly reduce or eliminate the threat of future flood damages.

SECTION 10: FLOOD

Repetitive Loss properties are defined as structures that are:

- Any insurable building for which two or more claims of more than \$1,000 each, paid by the National Flood Insurance Program (NFIP) within any 10-year period, since 1978;
- May or may not be currently insured under the NFIP.

Severe Repetitive Loss properties are defined as residential properties that are:

- Covered under the NFIP and have at least four flood related damage claim payments (building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceed \$20,000; or
- At least two separate claim payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

In either scenario, at least two of the referenced claims must have occurred within any 10-year period and must be greater than 10 days apart.⁹ Table 10-10 shows repetitive loss and severe repetitive loss properties for the City of San Marcos planning area.

Table 10-10. Repetitive Loss and Severe Repetitive Loss Properties

JURISDICTION	BUILDING TYPE	NUMBER OF STRUCTURES	NUMBER OF LOSSES
City of San Marcos	Single Family ¹⁰	111	255
	2-4 Family	2	4
	Assumed Condo	2	4
	Other Residential	1	2
	Non-Residential	1	2

⁹ Source: Texas Water Development Board

¹⁰ Some repetitive loss properties are assumed to be single family residential structures.



SECTION 11

HAIL

SECTION 11: HAIL

Hazard Description	1
Location	1
Extent	2
Historical Occurrences	3
Significant Events	4
Probability of Future Events	5
Vulnerability and Impact	5
Assessment of Impacts	8
Climate Change Considerations	9

HAZARD DESCRIPTION



Hailstorm events are a potentially damaging outgrowth of severe thunderstorms. During 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 typically 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 by-product of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

According to the National Insurance Crime Bureau (NICB), between 2018 and 2020 the State of Texas had the greatest number of hail loss claims in the United States with 605,866 loss claims (23 percent of total hail claims in the U.S.) due to hail events. In this two-year period, Texas experienced a total of 584 severe hail days.

In 2021, 6.8 million properties in the U.S. experienced one or more damaging hail events, resulting in a total of \$16.5 billion in insured losses. Texas had the highest number of properties affected by hail with over 1.5 million properties or 17 percent of total properties in the state affected, an increase of 80,000 properties affected between 2020 and 2021. Texas hailstorms accounted for almost a quarter of total U.S. properties affected by hail in 2021.

LOCATION

Hailstorms are an extension of severe thunderstorms that could potentially cause severe damage. As a result, they are not confined to any specific geographic location and can vary greatly in size, location, intensity, and duration. Therefore, the entire City of San Marcos planning area is equally at risk to hail events. Refer to Figure 11-1 for the location of past hail events in the planning area.

SECTION 11: HAIL

EXTENT

The National Weather Service (NWS) classifies a storm as “severe” if there is hail three-quarters of an inch in diameter (approximately the size of a penny) or greater, based on radar intensity or as seen by observers. The intensity category of a hailstorm depends on hail size and the potential damage it could cause, as depicted in the National Centers for Environmental Information (NCEI) Intensity Scale in Table 11-1.

Table 11-1. Hail Intensity and Magnitude¹

SIZE CODE	INTENSITY CATEGORY	SIZE (Diameter Inches)	DESCRIPTIVE TERM	TYPICAL DAMAGE
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33 – 0.60	Marble	Slight damage to plants and crops
H2	Potentially Damaging	0.60 – 0.80	Dime	Significant damage to plants and crops
H3	Severe	0.80 – 1.20	Nickel	Severe damage to plants and crops
H4	Severe	1.2 – 1.6	Quarter	Widespread glass and auto damage
H5	Destructive	1.6 – 2.0	Half Dollar	Widespread destruction of glass, roofs, and 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

The intensity scale in Table 11-1 ranges from H0 to H10, with increments of intensity or damage potential in relation 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 San Marcos may experience hailstorms ranging from an H0 to an H10. The largest hail event in the City of San Marcos took place on March 16,

¹ NCEI Intensity Scale, based on the TORRO Hailstorm Intensity Scale.

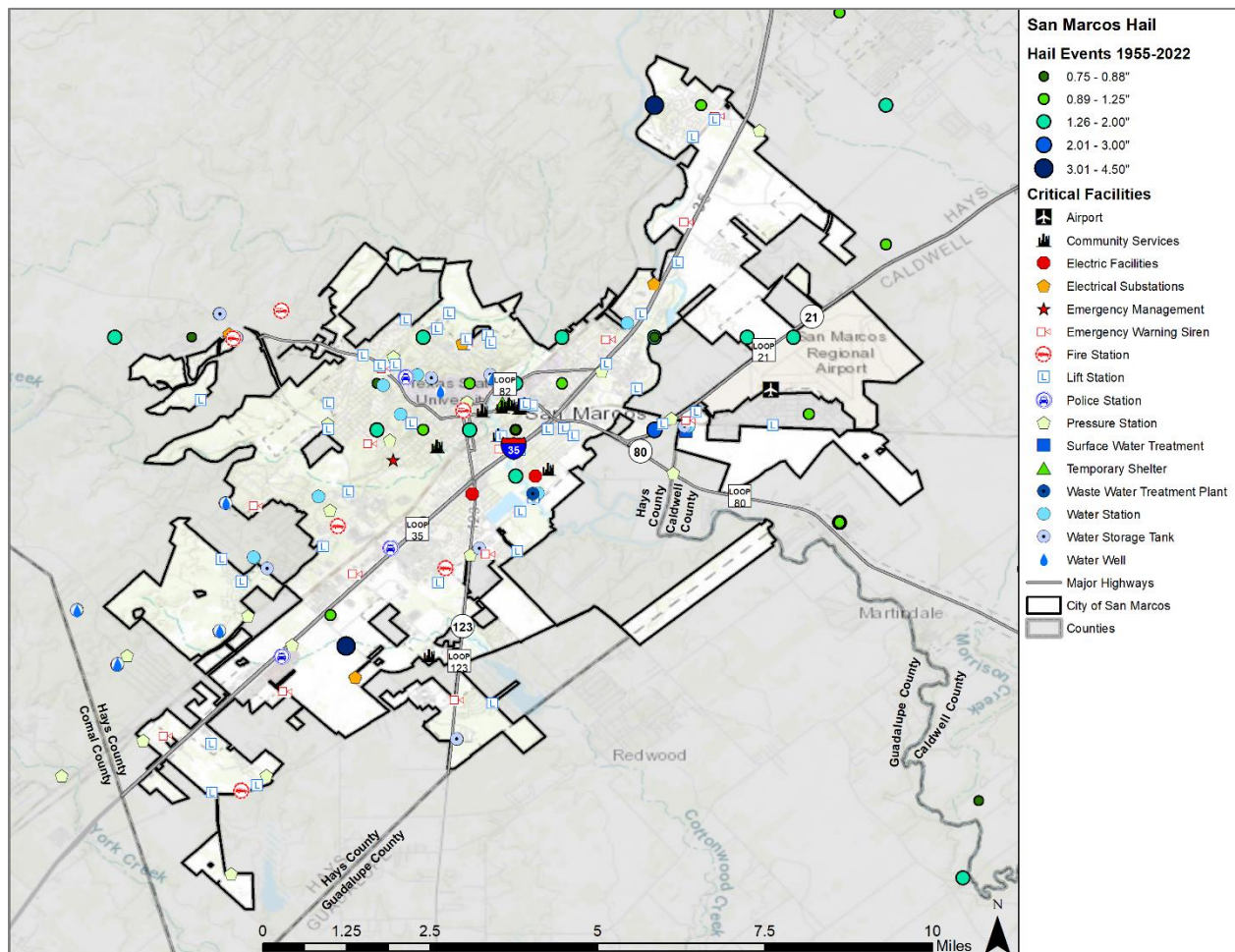
SECTION 11: HAIL

2000, resulting in hail measuring 4.5 inches in diameter, or a H10, which is considered a very destructive hailstorm that can cause extensive damages to structures. This is likely the greatest extent the planning area can anticipate in the future.

HISTORICAL OCCURRENCES

Historical evidence shown in Figure 11-1 demonstrates that the planning area is vulnerable to hail events overall, which typically result from severe thunderstorm activity. Historical events with reported damages, injuries, or fatalities are shown in Table 11-2. A total of 148 reported historical hail events impacted Hays County and the City of San Marcos between 1967 through August 2023; these events were reported to NCEI and NOAA databases and may not represent all hail events to have occurred during the past 56.5 years. Only those events for the City of San Marcos planning area with latitude and longitude available were plotted (Figure 11-1).

Figure 11-1. Spatial Historical Hail Events, 1967-2023



SECTION 11: HAIL

Table 11-2. Historical Damaging Hail Events, 1967-2023²

JURISDICTION	DATE	MAGNITUDE (Inches)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	4/5/1994	1.75	0	0	\$1,004,651	\$1,004,651
City of San Marcos	4/5/1994	2	0	0	\$1,004,651	\$1,004,651
City of San Marcos	11/6/1994	0.75	0	0	\$5,935	\$5,935
City of San Marcos	3/16/2000	4.5	0	0	\$1,037,982	\$0
Hays County	4/7/2000	1	0	0	\$172,896	\$0
City of San Marcos	4/20/2006	4.25	0	1	\$146,983,127	\$0
City of San Marcos	4/29/2013	1	0	0	\$2,547	\$0
TOTALS		(Max Extent)	0	1	\$150,211,789	\$2,015,237

Table 11-3. Historical Hail Events Summary, 1967-2023

JURISDICTION	NUMBER of EVENTS	MAGNITUDE (Inches)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	109	3	0	0	\$1,177,547	\$1,004,651
City of San Marcos	39	4.5	0	1	\$149,034,242	1,010,586
TOTAL LOSSES		(Max Extent)	0	1	\$152,227,026	

Based on the list of historical hail events for the City of San Marcos planning area, 12 of the events have occurred since the 2018 Plan according to reports in the NCEI database.

SIGNIFICANT EVENTS

March 2, 2023 – City of San Marcos

An upper-level shortwave trough moved across Texas and generated thunderstorms including two supercells. These two storms produced severe hail for nearly eight hours across the southern and central parts of the region. A thunderstorm produced hail up the size of quarters in San Marcos. The ground was covered with mostly pea to nickel size hail. Reports of ping pong to golf ball size hail was reported west of San Marcos.

April 28, 2021 – Hays County

Thunderstorms developed along a cold front and moved into South Central Texas. Some of these storms grew to be supercells and produced giant hail, damaging wind gusts, and one tornado. Within the City of San Marcos reports noted the largest size hail was 1.75 inches in diameter (golf ball size). There is no official monetary loss due to damages, as private insurance companies do not release data to the NWS. However, knowing the size of hail and the area affected, it is estimated that millions of dollars of damage occurred throughout the impacted areas.

² Only recorded events with damages or injuries are listed.

SECTION 11: HAIL

April 18, 2015 – Hays County

A line of severe thunderstorms moved southeast across the Hill Country, the Interstate 35 corridor and through eastern South Central Texas during the evening hours. Two-inch diameter hail was reported within the area, with no reported damages or injuries as a result.

April 20, 2006 – City of San Marcos

Reports indicated severe thunderstorms in the City of San Marcos moving toward the northeast region of Hays County. Widespread damage to trees and vegetation was reported along IH-35 near Center Point Road as a result of large hail and winds gusts, continuing northward to the San Marcos Tanger Outlet Mall and Prime Time Outlet Mall. Hundreds of vehicles had been damaged, mostly to windows and dents in the vehicle body. In addition to vehicle damages, reports show that damage was also sustained to signage and roofs as a result of this event. The type of damage indicated straight-line winds, also referred to as "downburst winds," with hail measuring 4.25 inches in diameter and estimated windspeeds between 60 and 70 mph.

Damages from this storm were estimated at \$146,983,127 (2023 dollars) with up to 17,000 vehicles damaged within the area. Losses to businesses as a result of closing the following day were estimated at \$725,830.85 (2023 dollars).

March 16, 2000 – City of San Marcos

Extremely large hail, reported to be 4.5 inches, caused widespread residential damage to roofs and windows as well as damage to vehicles just to the north of the City of San Marcos. Total damages as a result of the event were approximately \$1,037,982 (2023 dollars).

PROBABILITY OF FUTURE EVENTS

Based on available records of historic events, 39 events in a 56.5-year reporting period for City of San Marcos provides a probability of one event per year. This frequency supports a "Highly Likely" probability of future events for the City of San Marcos planning area. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

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, roofs of buildings and homes, and landscaping are most commonly damaged by hail.

Utility systems on roofs of city buildings and critical facilities would be vulnerable and could be damaged. Hail could cause a significant threat to people as they could be struck by hail and falling trees and branches. Outdoor activities and events may elevate the risk to residents and visitors when a hailstorm strikes with little warning. Portable buildings typically utilized by schools and commercial sites such as construction areas would be more vulnerable to hail events than the typical site-built structures.

The City of San Marcos planning area features mobile or manufactured home parks throughout the planning area. These parks are typically more vulnerable to hail events than typical site-built structures. In addition, manufactured homes are located sporadically throughout the planning area which would also be more vulnerable. The U.S. Census data indicates a total of 1,142 (4 percent of total housing stock) manufactured homes located in the City of San Marcos planning area. Another factor of manufactured homes that may increase vulnerability is the age of

SECTION 11: HAIL

installation. Inspection of manufactured home installations changed in 2011 when the process was revised statewide, therefore manufactured homes installed prior to 2011 may be more vulnerable to damages from hail events. In addition, 24 percent (approximately 6,772 structures) of the housing structures in the City of San Marcos planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant hail events.

Table 11-4. Structures at Greater Risk to Hail Events³

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980	RENTER OCCUPIED UNITS
City of San Marcos	1,142	6,772	18,990

While all residents are at risk to the impacts of a hail event, forced relocation and disaster recovery drastically impacts low-income residents who lack the financial means to travel, afford a long-term stay away from home, and to rebuild or repair their homes. An estimated 30.6 percent of the planning area population live below the poverty level. Renters also tend to be more vulnerable to the impacts of wind events and their ability to recover after an event. Within the City of San Marcos, 74 percent of housing units are renter occupied. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos. While warning times for these type of hazard events should be substantial enough for these individuals to seek shelter, individuals who work and recreate outside are also vulnerable to potential impacts of a hail event.

Table 11-5. Populations at Greater Risk to Hail Events⁴

JURISDICTION	POPULATION BELOW POVERTY LEVEL
City of San Marcos	15,858

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by hail events.

Table 11-6. Critical Facilities Vulnerable to Hail Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 6 Fire Stations, 3 Police Stations	<ul style="list-style-type: none">○ Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.○ Emergency vehicles can be damaged by hailstones.○ Power outages could disrupt communications, delaying emergency response times.○ Accumulated hail on the streets may impede emergency response vehicle access to areas.

³ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

⁴ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 11: HAIL

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none"> Extended power outages and evacuations may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Structures can be damaged by hailstones. Power outages could disrupt critical care. Backup power sources could be damaged. Evacuations may be necessary due to extended power outages, gas line ruptures, or structural damages to facilities.
1 Airport	<ul style="list-style-type: none"> Facilities or infrastructure may be damaged, destroyed or otherwise inaccessible. Essential supplies like medicines, water, food, and equipment deliveries may be significantly delayed. Additional emergency responders and critical aid workers may not be able to reach the area for days. Power outages and infrastructure damage may prevent larger airports from acting as temporary command centers for logistics, communications, and emergency operations. Temporary break in operations may significantly inhibit post event evacuations. Damaged or destroyed highway infrastructure may substantially increase the need for airport operations.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

Hail has been known to cause injury to humans and occasionally has been fatal. Overall, the loss estimate of property and crops in the City of San Marcos is \$150,044,828 with an average annualized loss of \$2,646,293. Based on historic loss and damages, the impact of hail damages on the City of San Marcos planning area can be considered “Limited” severity of impact, meaning minor quality of life lost, critical facilities and services shut down for 24 hours or less, and less than 10 percent of property destroyed or with major damage.

Table 11-7. Estimated Annualized Losses by Jurisdiction

JURISDICTION	TOTAL PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
City of San Marcos	\$150,044,828	\$2,646,293

SECTION 11: HAIL

ASSESSMENT OF IMPACTS

Hail events have the potential to pose a significant risk to people and can create dangerous situations. The impact of climate change could produce larger, more severe hail events, exacerbating the current hail impacts. Worsening hail conditions can be frequently associated with a variety of impacts, including:

- Hail may create hazardous road conditions during and immediately following an event, delaying first responders from providing for or preserving public health and safety.
- Individuals and first responders who are exposed to the storm may be struck by hail or falling branches resulting in injuries or possible fatalities.
- Residential structures can be damaged by falling trees, which can result in physical harm to occupants.
- Large hail events will likely cause extensive roof damage to residential structures along with siding damage and broken windows, creating a spike in insurance claims and a rise in premiums.
- Automobile damage may be extensive depending on the size of the hail and length of the storm.
- Hail events can result in power outages over widespread areas increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, damaged structures, hazardous spills, and debris that often accompany hail events, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Downed power lines and large debris can result in the inability of emergency response vehicles to access areas of the community.
- Hazardous road conditions may prevent critical staff from reporting for duty, limiting response capabilities.
- Economic disruption negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Some businesses not directly damaged by the hail event may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Hazardous road conditions will likely lead to increases in automobile collisions, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by large hail events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A significant hail event could significantly damage agricultural crops, resulting in extensive economic losses for the community and surrounding area.
- Hail events may injure or kill livestock and wildlife.
- A large hail event could impact the accessibility of recreational areas and parks due to extended power outages or debris clogged access roads.

SECTION 11: HAIL

The economic and financial impacts of hail will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning conducted by the community, local businesses, and the community will contribute to the overall economic and financial conditions in the aftermath of any hail event.

CLIMATE CHANGE CONSIDERATIONS

While the impact of climate change on the frequency and severity hailstorm events is unclear, the increase of warmer temperatures will likely lead to less hail events during the summer months but is expected to increase the risk of large hailstones during the spring season.⁵

⁵ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 12 HURRICANE / TROPICAL STORM

SECTION 12: HURRICANE / TROPICAL STORM

Hazard Description	1
Location	1
Extent	2
Historical Occurrences	2
Significant Events	4
Probability of Future Events	4
Vulnerability and Impact	4
Assessment of Impacts	6
Climate Change Considerations	8

HAZARD DESCRIPTION

According to the National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with well-defined surface circulation and maximum sustained winds of 74 mph or higher. In the Northern Hemisphere, circulation of winds near the Earth's surface is counterclockwise.

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. Tropical storms resulting in high winds and heavy rainfall can be dangerous to people and property, as Tropical Storm Frances was for southeast Texas in September 1998. Once sustained winds reach or exceed 74 mph, the storm becomes a hurricane. The intensity of a landfalling hurricane is expressed in categories relating wind speeds to potential damage. Tropical storm-force winds are strong enough to be dangerous to those caught in them. For this reason, emergency managers plan to have evacuations completed and personnel sheltered before winds of tropical storm-force arrive, which precedes the arrival of hurricane-force winds.



LOCATION

The location of the City of San Marcos approximately 150 miles from the coast makes the planning area vulnerable to threats directly and indirectly related to a hurricane event, such as high-force winds and flooding. While the City of San Marcos is not located along the Gulf Coast, due to the regional nature of hurricanes and tropical storms, the city is exposed and susceptible to the impacts of hurricane and tropical storm events. Hurricanes and tropical storms can impact the City of San Marcos from June to November, the official Atlantic U.S. hurricane season. The City of San Marcos planning area is in a low to moderate risk area for hurricane wind speeds up to 200 miles per hour (mph).

SECTION 12: HURRICANE / TROPICAL STORM

EXTENT

As a hurricane develops, the barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour, the storm is deemed a hurricane.

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (Table 12-1). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. However, a lower category storm 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 12-1. Extent Scale for Hurricanes¹

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+

Based on the historical storm tracks, most hurricanes are tropical storms when they reach Hays County and the City of San Marcos, the average extent to be mitigated for is a Category 2 storm.

HISTORICAL OCCURRENCES

Previous occurrences include storms that had a direct path through the City of San Marcos planning area as well as large storms that impacted the planning area without directly passing over the city. Table 12-2 lists the storms that have impacted the City of San Marcos planning area from 1996 through 2023. Historical hurricane data for the City of San Marcos is provided on a countywide basis per the NCEI and NOAA databases.

¹ Source: National Hurricane Center, https://www.nhc.noaa.gov/HAW2/english/basics/saffir_simpson.shtml

SECTION 12: HURRICANE / TROPICAL STORM

Figure 12-1. Location of Historic Hurricane Tracks

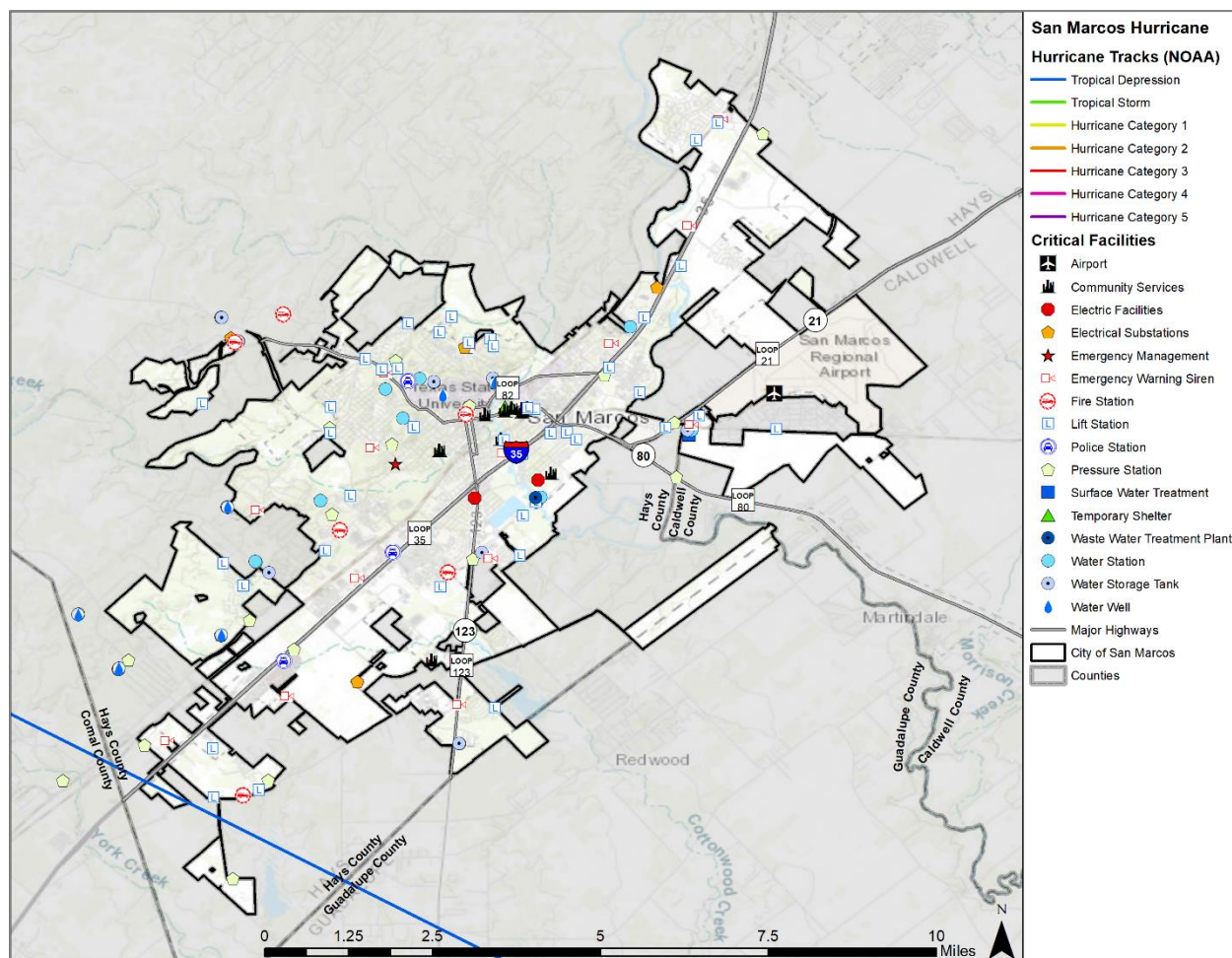


Table 12-2. Historical Hurricane/Tropical Storm Events, 1996-2023²

DATE	STORM NAME	CATEGORY (Max)	PROPERTY DAMAGE	CROP DAMAGE
8/8-8/13/1998	Frances	Tropical Storm	\$0	\$0
8/5-8/11/2002	Fay	Tropical Storm	\$0	\$0
8/15-8/19/2007	Erin	Tropical Storm	\$0	\$0
8/4-8/10/2010	Hermine	Tropical Storm	\$0	\$0
6/16-6/21/2015	Bill	Tropical Storm	\$0	\$0
8/16-9/2/2017	Harvey	Category 4	\$135,071 ³	\$0
TOTALS			\$135,071	

² Values are in 2023 dollars.

³ Estimated damages include \$14,440 (2023 dollars) in damages reported by the San Marcos Community Forest Program.

SECTION 12: HURRICANE / TROPICAL STORM

Based on the list of historical hurricane events for the City of San Marcos planning area, no events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

Hurricane Harvey, August 16 – September 2, 2017

Hurricane Harvey moved onshore as a Category 4 hurricane over San Jose Island east of Rockport during the late evening of August 25th. Harvey moved inland, entering southern DeWitt County during the morning of August 26th as a Category 1 hurricane. It continued to weaken as it moved farther inland eventually reaching south-central Gonzales County as a tropical storm during the late evening of August 26th. The center of the storm made a loop through Gonzales, Karnes, and DeWitt counties before exiting the County Warning Area during the afternoon of August 27th and moving into Victoria County. The eastern half of Hays County experienced tropical storm force winds with gusts as high as 50 mph during the storm. This produced some minor tree damage and knocked out power. Due to rising water on creeks and the threat of a small dam breach, 100 people were evacuated during the height of the event. A sinkhole developed on Highway 21 due to the heavy rain amounts. Across the county, rainfall totals averaged 8 to 12 inches along and east of Interstate 35. Monetary loss are estimates due to flooding which resulted in \$135,071 in damages.

Tropical Storm Hermine, September 6 – September 8, 2010

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

PROBABILITY OF FUTURE EVENTS

Based on historical occurrences of significant hurricane events, the probability of future events is “Likely”, with an event probable in the next three years for the City of San Marcos planning area. Impacts of climate change are not expected to increase the average frequency of events but may lead to an increase in the intensity of these storms. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

Hurricane and tropical storm events can cause major damage to large areas; hence, all existing buildings, facilities, and populations are equally exposed and vulnerable to this hazard and could potentially be impacted. The City of San Marcos planning area features multiple mobile or manufactured home parks throughout the planning area. These mobile home parks are typically more vulnerable to hurricane events than typical site-built structures. The U.S. Census data indicates a total of 1,142 manufactured homes located in the City of San Marcos planning area (Table 12-3). In addition, 24 percent of the single family residential (SFR) structures in the City of San Marcos were built before 1980.⁴ These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant events.

⁴ Source: US Census Bureau data estimates for 2021.

SECTION 12: HURRICANE / TROPICAL STORM

In addition, renters tend to be more vulnerable to the impacts of hurricane events. Their ability to recover after a hurricane is often disproportionately impacted by limited affordable replacement housing, financial constraints, and lack of insurance to cover losses. Within the city, 74 percent of housing units are renter occupied. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos.

Table 12-3. Structures at Greater Risk⁵

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980	RENTER OCCUPIED UNITS
City of San Marcos	1,142	6,772	18,990

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by hurricane and tropical storm events.

Table 12-4. Critical Facilities Vulnerable to Hurricane and Tropical Storm Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
6 Fire Stations, 3 Police Stations, 1 EOC	<ul style="list-style-type: none">Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.Emergency vehicles can be damaged by falling trees or flying debris.Power outages could disrupt communications, delaying emergency response times.Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.Debris/downed trees can impede emergency response vehicle access to areas.Increased number of structure fires due to gas line ruptures and downed power lines, further straining the capacity and resources of emergency personnel.First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.Extended power outages and evacuations may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none">Structures can be damaged by falling trees or flying debris.Power outages could disrupt critical care.Backup power sources could be damaged.Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.Evacuations may be necessary due to extended power outages, gas line ruptures, or structural damages to facilities.
1 Airport	<ul style="list-style-type: none">Facilities or infrastructure may be damaged, destroyed or otherwise inaccessible.Essential supplies like medicines, water, food, and equipment deliveries may be significantly delayed.

⁵ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 12: HURRICANE / TROPICAL STORM

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none">○ Additional emergency responders and critical aid workers may not be able to reach the area for days.○ Power outages and infrastructure damage may prevent larger airports from acting as temporary command centers for logistics, communications, and emergency operations.○ Temporary break in operations may significantly inhibit post event evacuations.○ Damaged or destroyed highway infrastructure may substantially increase the need for airport operations.
1 Water Plant, 1 Wastewater Treatment Plant, 46 Lift Stations, 64 Water Infrastructures and Facilities	<ul style="list-style-type: none">○ Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks.○ Disruptions and outages impact public welfare as safe drinking water is critical.○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease.○ Exposure to untreated wastewater is harmful to people and the environment.○ Any service disruptions can negatively impact or delay emergency management operations.

Storm track data was available for the past 150 years; however, property and crop loss data is only partially available from 1960 to the present. Table 12-5 shows impact or loss estimation for storms impacting the planning area. Annual loss estimates were based on the 27.5 year reporting period (Table 12-5). The average annual loss estimate for the City of San Marcos planning area is \$4,912.

Table 12-5. Potential Annualized Losses City of San Marcos, 1996-2023

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
City of San Marcos	\$135,071	\$4,912

With limited reported damages and no reported injuries or fatalities, the potential severity of impact from a hurricane for the City of San Marcos planning area is considered to be “Limited”, meaning injuries and illnesses are treatable with first aid, shutdown of critical facilities and services for 24-hours or less, and less than ten percent of property destroyed or with major damage.

ASSESSMENT OF IMPACTS

Hurricane and tropical storm events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. The impact of climate change could produce larger, more severe hurricane events, exacerbating the current hurricane impacts. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.

SECTION 12: HURRICANE / TROPICAL STORM

- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Driving conditions in the planning area may be dangerous during a hurricane event, especially over elevated bridges, elevating the risk of injury and accidents during evacuations if not timed properly.
- Emergency evacuations may be necessary prior to a hurricane landfall, requiring emergency responders, evacuation routing, and temporary shelters.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During hurricane landfall, first responders may be prevented from responding to calls as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Hurricane events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Extended power outages can also be deadly for individuals reliant on electricity to live independently in their homes.
- Extreme hurricane events may rupture gas lines and down trees and power lines, increasing the risk of structure fires during and after a storm event.
- Extreme hurricane events may lead to prolonged evacuations during search and rescue, and immediate recovery efforts requiring additional emergency personnel and resources to prevent entry, protect residents, and protect property.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.
- City departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the city and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by the hurricane may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to hurricane damage. In the City of San Marcos, 24 percent of homes were built before 1980, and 40 buildings and sites in the city are on the National Register of Historic Places, many of which pre-date modern building codes.
- Vegetation in the city's urban parks may become flattened or oversaturated from high winds and heavy rains.

SECTION 12: HURRICANE / TROPICAL STORM

- Large scale hurricanes can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- As the City of San Marcos continues to add population, the number of people and housing developments exposed to the hazard increases. Continued public education on the city's risks to hurricane and tropical storm events will continue to be key to the city's overall mitigation strategy.

The economic and financial impacts of hurricane events on the area will depend on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the City, communities, local businesses, and the community will also contribute to the overall economic and financial conditions in the aftermath of any hurricane event.

CLIMATE CHANGE CONSIDERATIONS

Hurricane and tropical storm events have the potential to pose a significant risk to people and property. Such events can create dangerous situations for public health and safety officials and cause catastrophic damages. The impact of climate change could produce larger, more severe hurricane events, exacerbating the current hurricane impacts. The economic and financial impacts of hurricanes and tropical storms will depend entirely on the scale of the events, what is damaged, and how quickly repairs to critical components of the economy can be implemented.

The current climate assessment report for Texas indicates an expected increase in the intensity of very strong hurricanes, despite an expected lack of increase, or even a decrease, in hurricane frequency overall. Different research studies have produced some conflicting results. While some recent research has pointed to an apparent trend for U.S. tropical cyclones to move more slowly at landfall, much like Hurricane Harvey, other research suggests that Texas may be spared from such a slowdown. At this point, the enhanced risk is difficult to quantify, but substantial scientific progress on this topic is likely as climate models become better able to simulate the observed spatial distribution, frequency, and intensity of hurricanes.⁶

⁶ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 13 LIGHTNING

SECTION 13: LIGHTNING

Hazard Description	1
Location	1
Extent	1
Historical Occurrences	3
Significant Events	4
Probability of Future Events	4
Vulnerability and Impact	4
Assessment of Impacts	7
Climate Change Considerations	7

HAZARD DESCRIPTION

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder that often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.

According to the National Weather Service (NWS), the 10-year (2012–2021) average for fatalities is 23 people with an average of 300 injuries in the United States each year by lightning. Lightning can occur as cloud-to-ground flashes or as intra-cloud lightning flashes. Direct lightning strikes can cause significant damage to buildings, critical facilities, infrastructure, and communication equipment affecting emergency response. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire.

LOCATION

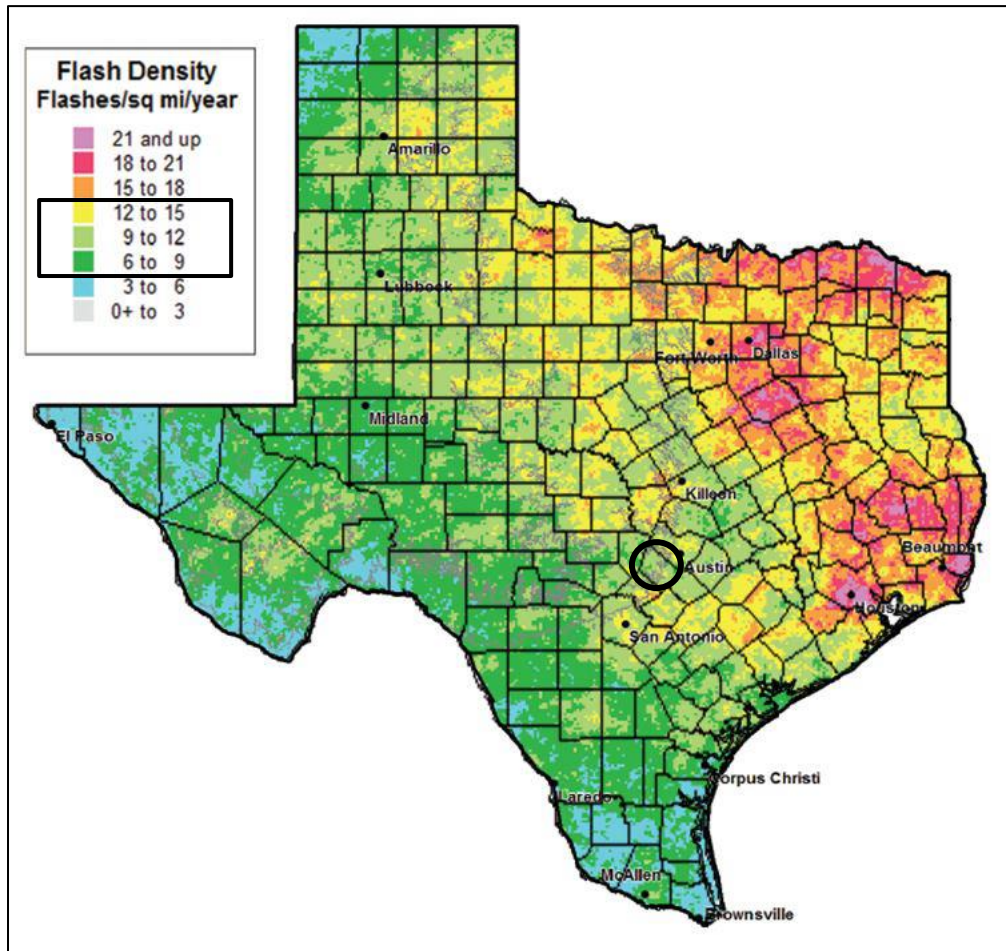
Lightning can strike in any geographic location and is considered a common occurrence in Texas. The City of San Marcos planning area is in a region of the country that is moderately susceptible to a lightning strike. Therefore, lightning could occur at any location within the entire planning area. It is assumed that the entire City of San Marcos planning area is uniformly exposed to the threat of lightning.

EXTENT

According to the National Oceanic and Atmospheric Administration (NOAA), the average number of cloud-to-ground flashes for the State of Texas between 2006 and 2016 was 11.3 flashes per square mile. Vaisala’s U.S. National Lightning Detection Network lightning flash density map (Figure 13-1) shows a range of 6 to 21 cloud-to-ground lightning flashes per square mile per year for the entire City of San Marcos planning area. This rate equates to approximately 214 to 750 flashes per year for the entire planning area.

SECTION 13: LIGHTNING

Figure 13-1. Lightning Flash Density, 2006-2016



The extent for lightning can be expressed in terms of the number of strikes in an interval. NOAA utilizes lightning activity levels (LALs) on a scale from 1-6. LAL rankings reflect the frequency of cloud-to-ground lightning either forecast or observed (Table 13-1).

Table 13-1. NOAA Lightning Activity Levels (LAL)

LAL	CLOUD & STORM DEVELOPMENT	LIGHTNING STRIKES/ 15 MIN
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15

SECTION 13: LIGHTNING

LAL	CLOUD & STORM DEVELOPMENT	LIGHTNING STRIKES/ 15 MIN
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	>25
6	Similar to LAL 3 except thunderstorms are dry.	

The National Centers for Environmental Information (NCEI) does not include the LAL for historical lightning events, therefore in order to determine the extent of lightning strikes, the yearly average range of estimated number of lightning strikes within the planning area (214 to 750 flashes) and a cloud-to-ground flash density of 6 to 21 per square mile were divided by the number¹ of thunderstorm events that occur annually in the planning area. The City of San Marcos should expect an average range of 0 to 1 lightning strike within 15 minutes at any given time during a lightning or combined lightning and thunderstorm event, indicating lightning strikes have an average LAL range of 1 to 2. The highest anticipated being a 2 on the LAL range for the planning area in the future.

HISTORICAL OCCURRENCES

Since January 1996, there have been five recorded events for Hays County and the City of San Marcos planning area. It is highly likely multiple lightning occurrences have gone unreported before and during the recording period. The NCEI is a national data source organized under the NOAA and considered a reliable resource for hazards. However, the flash density for the planning area along with input from local team members indicates regular lightning occurrences that simply have not been reported.

Table 13-2 Historical Lightning Events, 1996- 2023²

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	5/15/2010	0	0	\$135,747	\$0
Hays County	6/2/2013	0	0	\$63,419	\$0
Hays County	10/31/2013	0	0	\$12,681	\$0
Hays County	10/31/2013	0	0	\$12,681	\$0
Hays County	5/8/2014	0	0	\$6,225	\$0
TOTALS		0	0	\$230,754	\$0

¹ Analysis includes the highest number of events recorded in a given year during the reporting period in order to account for typical under reporting of thunderstorm and lightning events.

² Damages are reported in 2023 dollars. Events are reported from January 1996 through July 2023.

SECTION 13: LIGHTNING

Table 13-3. Summary of Historical Lightning Events, 1996-2023

JURISDICTION	NUMBER of EVENTS	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hay County	5	0	0	\$230,754	\$0
City of San Marcos	0	0	0	\$0	\$0
TOTAL LOSSES	5	0	2	\$230,754	

Based on the list of historical lightning events for the City of San Marcos planning area, no events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

May 8, 2014 – Hays County

An upper-level trough and surface cold front combined to bring severe weather, causing isolated severe thunderstorms that produced severe wind gusts, large hail, and flash flooding. Within Hays County, lightning from a thunderstorm struck a house causing a fire, with damage estimates reported to be \$6,225 (2023 dollars). No injuries were reported as a result of this event.

June 2, 2013 – Hays County

A cold front moved through South Central Texas causing thunderstorms, with some storms producing large hail and damaging wind gusts. In Hays County, it was reported that a lightning strike caused a structural fire with damage estimates of approximately \$63,419 (2023 dollars).

May 15, 2010 – Hays County

A cold front moved into South Central Texas and stalled, producing severe thunderstorms and flash flooding. The Austin American-Statesman reported that a house caught fire, and was destroyed, as a result of a lightning strike. Total losses were approximately \$135,747 (2023 dollars).

PROBABILITY OF FUTURE EVENTS

Based on estimated flash density, historical records and input from the planning team, the probability of occurrence for future lightning events in the City of San Marcos planning area is considered “Highly Likely”, or an event probable in the next year. According to NOAA, the City of San Marcos planning area is located in an area of the country that experiences approximately 6 to 21 lightning flashes per square mile per year (approximately 214 to 750 flashes per year). Given this estimated probability of events, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the planning area. Impacts of climate change are not expected to increase the average frequency of lightning events but may lead to an increase in the intensity of events when they do occur. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

Vulnerability is difficult to evaluate since lightning events can occur at different strength levels, in random locations, and can create a broad range of damages depending on the strike location. Due to the randomness of these events, all existing and future structures and facilities in the City

SECTION 13: LIGHTNING

of San Marcos planning area could potentially be impacted and remain vulnerable to possible injury and property loss from lightning strikes. Hays County and the City of San Marcos planning area has five reported lightning events since 1996 per the NCEI, however the city is vulnerable and could be impacted by lightning.

The direct and indirect losses associated with these events include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources. The entire population of the City of San Marcos is considered exposed to the lightning hazard. The peak lightning season in the State of Texas is from June to August; however, the most fatalities occur in July. Fatalities occur most often when people are outdoors and/or participating in some form of recreation. Populations located outdoors are considered at risk and more vulnerable to a lightning strike compared to those inside a structure. Moving to a lower-risk location will decrease a person’s vulnerability.

The entire general building stock and all infrastructure of the City of San Marcos planning area are considered exposed to the lightning hazard. Lightning can be responsible for damages to buildings, cause electrical, forest, grass, and/or wildfires, and damage infrastructure such as power transmission lines and communication towers.

While all residents are at risk to the impacts of lightning, forced relocation and disaster recovery drastically impacts low-income residents who lack the financial means to travel, afford a long-term stay away from home, and to rebuild or repair their homes. An estimated 30.6 percent of the planning area population live below the poverty level. In addition, renters tend to be more vulnerable to the impacts of lightning events. Their ability to recover after a lightning event is often disproportionally impacted by limited affordable replacement housing, financial constraints, and lack of insurance to cover losses. Within the city, 74 percent of housing units are renter-occupied (Table 13-4). Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos.

Table 13-4. Populations at Greatest Risk³

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980	RENTER OCCUPIED UNITS
City of San Marcos	1,142	6,772	18,990

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by lightning events.

Table 13-5. Critical Facilities Vulnerable to Lightning Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 6 Fire Stations, 3 Police Stations	○ Emergency operations and services may be significantly impacted due to power outages, damaged facilities, fires and/or loss of communications as a result of lightning strikes.

³ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 13: LIGHTNING

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none"> Emergency vehicles, including critical equipment, can be damaged by lightning strikes or by falling trees damaged by lightning. Power outages could disrupt communications, delaying emergency response times. Downed trees due to lightning strikes can impede emergency response vehicle access to areas. Lightning strikes can be associated with structure fires and wildfires, further straining the capacity and resources of emergency personnel. Extended power outages may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Structures can be damaged by falling trees damaged by lightning. Power outages could disrupt critical care. Backup power sources could be damaged. Evacuations may be necessary due to extended power outages, fires, or other associated damages to facilities.
1 Airport	<ul style="list-style-type: none"> Facilities, infrastructure, or critical equipment including communications may be damaged, destroyed or otherwise inoperable. Essential supplies like medicines, water, food, and equipment deliveries may be delayed. Economic disruption due to power outages and fires negatively impact airport services as well as area businesses reliant on airport operations.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

Impact of lightning experienced in the City of San Marcos planning area has resulted in no injuries or fatalities. Overall, the average loss estimate for the City of San Marcos (in 2023 dollars) is \$230,754, having an approximate annual loss estimate of \$8,391 (Table 13-6). The best available data and the historic impacts indicate a “Limited” severity of impact, meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for less than 24 hours, and less than 10 percent of property is destroyed or with major damage.

Table 13-6. Potential Annualized Losses⁴

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
City of San Marcos	\$230,754	\$8,391

⁴ Damage values are in 2023 dollars.

SECTION 13: LIGHTNING

ASSESSMENT OF IMPACTS

Lightning events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. The impact of climate change could produce more frequent and severe lightning events, exacerbating the current lightning impacts. Additional impacts to the planning area can include:

- Lightning events could impact recreational activities, placing residents and visitors in imminent danger, potentially requiring emergency services or park evacuation.
- Older structures built to less stringent building codes may suffer greater damage from a lightning strike as they are typically built with less fire-resistant materials and often lack any fire mitigation measures such as sprinkler systems. In the City of San Marcos, 24 percent of homes were built before 1980. Additionally, 40 buildings and sites in the city are on the National Register of Historic Places, many of which similarly lack fire mitigation materials or measures.
- Vegetation in the city's urban parks may be destroyed by lightning caused brush fires, impacting air quality and public health.
- Individuals exposed to the storm can be directly struck, posing significant health risks and potential death.
- Structures can be damaged or crushed by falling trees damaged by lightning, which can result in physical harm to the occupants.
- Lightning strikes can result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Lightning strikes can be associated with structure fires and wildfires, creating additional risk to residents and first responders.
- Emergency operations and services may be significantly impacted due to power outages and/or loss of communications.
- City departments may be damaged, delaying response and recovery efforts for the entire community.
- Economic disruption due to power outages and fires negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Some businesses not directly damaged by lightning events may be negatively impacted while utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the city, local businesses, and the community will also contribute to the overall economic and financial conditions in the aftermath of any significant lightning event.

CLIMATE CHANGE CONSIDERATIONS

As CO₂ increases and the land surface warms, stronger updrafts are more likely to produce lightning. In a climate with double the amount of CO₂, we may see fewer lightning storms overall,

SECTION 13: LIGHTNING

but 25 percent stronger storms, with a 5 percent increase in lightning. Lightning damage is also likely to increase because of its role in igniting forest fires, where dry vegetation, also caused by rising temperatures, creates more 'fuel' for fires, meaning even a small climate change may have huge consequences. While the impact climate change will have on our weather still remains uncertain, researchers agree that implementing simple measures like lightning detection systems and installing grounding systems in buildings could go a long way in avoiding deaths and injuries.⁵

Lightning events have the potential to pose a significant risk to people and property throughout the planning area. The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. While no increase in the number of hazard events is anticipated, the impact of the hazard may see an increase in losses. As populations grow and urban development continues to rise, the overall vulnerability and impact are expected to increase in the next five years.

⁵ Environmental Journal, Nathan Neal, January 11, 2021.



SECTION 14 THUNDERSTORM WIND

SECTION 14: THUNDERSTORM WIND

Hazard Description	1
Location	1
Extent	2
Historical Occurrences	3
Significant Events	6
Probability of Future Events	7
Vulnerability and Impact	7
Assessment of Impacts	10
Climate Change Considerations	11

HAZARD DESCRIPTION

Thunderstorms create extreme wind events which include straight-line winds. Wind is the horizontal motion of the air past a given point, beginning with differences in air pressures. Pressure that is higher at one place than another sets up a force pushing from high toward low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air accelerates.

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.

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.



Straight-line winds are responsible for most thunderstorm wind damages. One type of straight-line wind, the downburst, is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and make air travel extremely hazardous.

LOCATION

Thunderstorm wind events can develop in any geographic location and are considered a common occurrence in Texas. Therefore, a thunderstorm wind event could occur at any location within the City of San Marcos planning area, as these storms develop randomly and are not confined to any geographic area within the city. It is assumed that the entire City of San Marcos planning area is uniformly exposed to the threat of thunderstorm winds.

SECTION 14: THUNDERSTORM WIND

EXTENT

The extent or magnitude of a thunderstorm wind event is measured by the Beaufort Wind Scale. Table 14-1 describes the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

Table 14-1. Beaufort Wind Scale¹

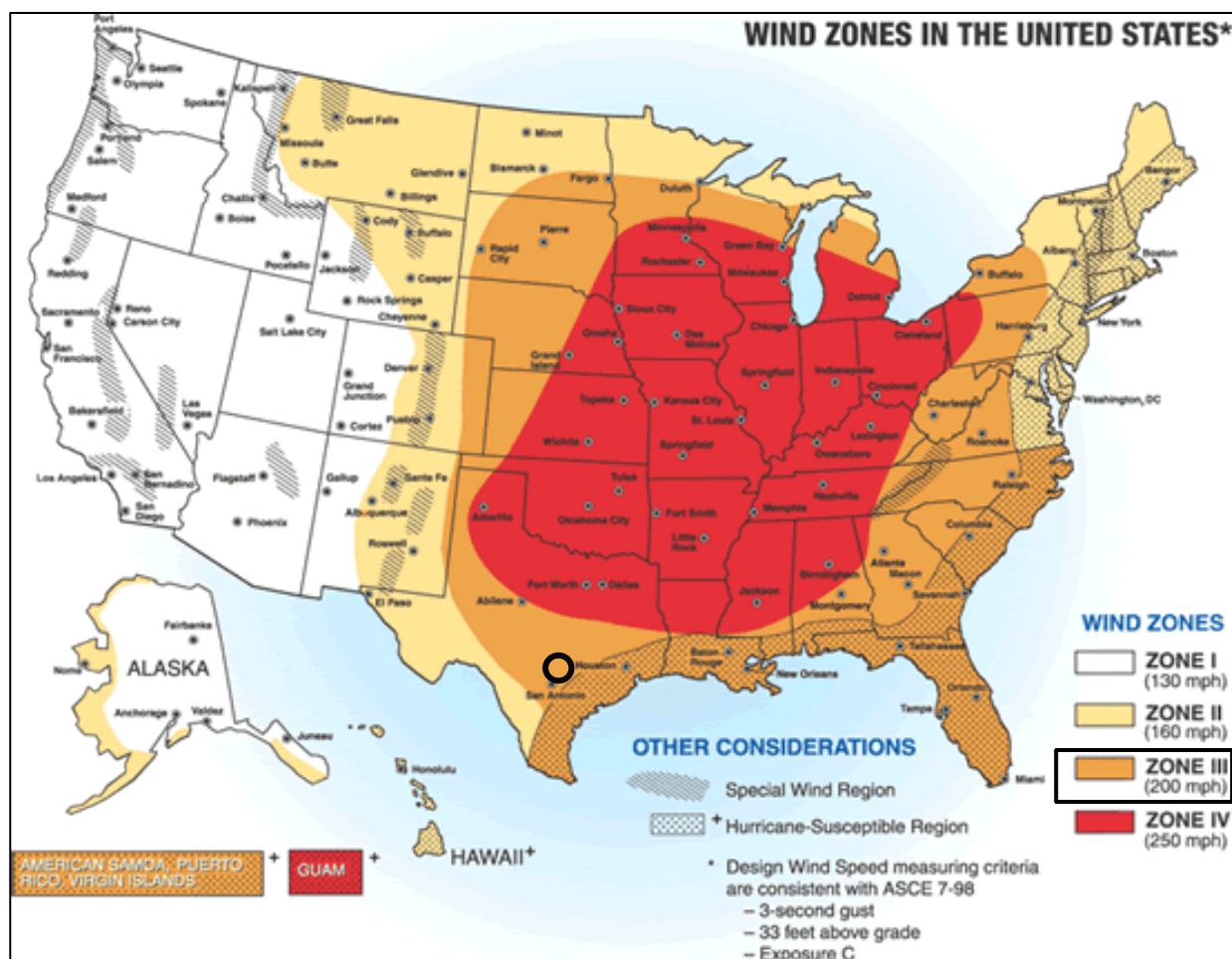
FORCE	WIND (mph)	WIND (Knots)	WMO CLASSIFICATION	APPEARANCE OF WIND EFFECTS
0	Less than 1	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-8	4-6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	9-14	7-10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	15-21	11-16	Moderate Breeze	Dust, leaves, and loose paper lifted; small tree branches move
5	22-28	17-21	Fresh Breeze	Small trees in leaf begin to sway
6	29-36	22-27	Strong Breeze	Larger tree branches moving, whistling in wires
7	37-44	28-33	Near Gale	Whole trees moving, resistance felt walking against wind
8	45-53	34-40	Gale	Whole trees in motion, resistance felt walking against wind
9	54-62	41-47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	63-72	48-55	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	73-83	56-63	Violent Storm	If experienced on land, widespread damage
12	84+	64-71	Hurricane	Violence and destruction

Figure 14-1 displays the wind zones as derived from NOAA.

¹ Source: World Meteorological Organization

SECTION 14: THUNDERSTORM WIND

Figure 14-1. Wind Zones in the United States²



On average, the planning area experiences one thunderstorm wind event every year. The city is located within Wind Zone III, meaning it can experience winds up to 200 mph. The City of San Marcos has experienced a significant wind event, or an event with winds in the range of “Force 11” on the Beaufort Wind Scale with winds above 81 mph. This is the worst to be anticipated for the entire planning area. Based on a search of past events between 1955 and July 2023, the greatest magnitude wind event the City of San Marcos has experienced was 70 knots, or 81 mph, on January 1, 2007, and resulted in \$146,318 in property damages.

HISTORICAL OCCURRENCES

Historical evidence shows that the planning area is vulnerable to thunderstorm events. Tables 14-2 and 14-3 depict historical occurrences of thunderstorm wind events for the City of San Marcos planning area according to the NCEI database.

Since 1955, 23 thunderstorm wind events are known to have occurred in the City of San Marcos planning area, with an additional 68 events occurring within Hays County. Table 14-3 presents information on known historical events impacting the City of San Marcos planning area with

² The City of San Marcos is indicated by the black circle.

SECTION 14: THUNDERSTORM WIND

resulting in damages, injuries, or fatalities. It is important to note that high wind events associated with other hazards, such as tornadoes, are not accounted for in this section. Property damage estimates are not always available. Where an estimate has been provided in a table for losses, the dollar amounts have been altered to indicate the damage in 2023 dollars.³

Table 14-2. Historical Thunderstorm Wind Events, 1955-2023

MAXIMUM WIND SPEED RECORDED (knots)	NUMBER OF REPORTED EVENTS
0-30	2
31-40	0
41-50	4
51-60	8
61-70	5
71-80	0
81-90	0
91-100+	0
Unknown	4

Table 14-3. Historical Damaging Thunderstorm Wind Events, 1955-2023⁴

LOCATION	DATE	TIME	MAGNITUDE (knots)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of San Marcos	4/5/1994	5:00 PM	52	0	0	\$10,046,506	\$0
City of San Marcos	5/13/1994	1:20 PM	Unknown	0	0	\$1,003,969	\$100,397
City of San Marcos	5/29/1994	11:35 PM	Unknown	0	0	\$10,040	\$10,040
Hays County	6/11/1995	1:04 AM	0	0	0	\$0	\$297
City of San Marcos	8/14/1996	3:05 PM	Unknown	0	0	\$37,657	\$0
Hays County	7/22/1997	9:00 PM	Unknown	0	0	\$471	\$0
City of San Marcos	3/7/1998	6:00 PM	Unknown	0	0	\$54,779	\$0
City of San Marcos	3/16/1998	3:25 AM	Unknown	0	0	\$54,779	\$0
Hays County	8/30/1998	7:12 PM	Unknown	0	0	\$1,849	\$0
Hays County	3/26/2000	7:10 PM	Unknown	0	0	\$1,765	\$0

³ Only recorded events with fatalities, injuries or damages are listed. Magnitude is listed when available. Damage values are in 2023 dollars. Events are analyzed from January 1996 through July 2023.

⁴ Countywide damages have been adjusted to reflect only a percentage (5.1%) of the damages attributed to the City of San Marcos.

SECTION 14: THUNDERSTORM WIND

LOCATION	DATE	TIME	MAGNITUDE (knots)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of San Marcos	7/31/2000	1:15 PM	Unknown	0	0	\$8,570	\$0
Hays County	10/22/2000	3:50 PM	Unknown	0	0	\$1,302	\$0
Hays County	3/19/2002	8:35 PM	Unknown	0	0	\$8,448	\$8,448
Hays County	4/7/2002	7:50 PM	Unknown	0	0	\$8,401	\$0
City of San Marcos	6/2/2003	3:45 PM	60	0	0	\$11,285,776	\$0
City of San Marcos	8/11/2003	2:10 PM	60	0	0	\$48,132	\$0
Hays County	10/13/2004	4:10 PM	60	0	0	\$3,956	\$0
City of San Marcos	1/13/2007	7:00 AM	70	0	0	\$146,318	\$0
City of San Marcos	4/25/2007	12:10 AM	70	0	0	\$71,648	\$0
City of San Marcos	6/11/2009	8:42 PM	50	0	0	\$68,656	\$0
Hays County	4/2/2013	4:06 PM	43	0	0	\$32	\$0
Hays County	6/2/2013	3:50 AM	43	0	0	\$13	\$0
Hays County	6/13/2013	2:23 PM	43	0	0	\$13	\$0
Hays County	6/12/2014	8:15 PM	56	0	0	\$317	\$0
Hays County	5/4/2018	8:20 AM	70	0	0	\$1,501	\$0
Hays County	6/9/2019	6:48 PM	52	0	0	\$59	\$0
Hays County	6/9/2019	6:50 PM	70	0	0	\$295	\$0
City of San Marcos	6/9/2019	6:50 PM	65	0	0	\$5,781	\$0
Hays County	1/10/2020	8:20 PM	65	0	0	\$5,855	\$0
Hays County	8/2/2020	1:17 PM	52	0	0	\$6	\$0
Hays County	5/18/2021	3:20 PM	61	0	0	\$281	\$0
City of San Marcos	7/19/2021	3:45 PM	61	0	0	\$27,122	\$0
Hays County	5/24/2022	10:47 PM	50	0	0	\$52	\$0
Hays County	6/27/2022	12:50 PM	52	0	0	\$102	\$0
City of San Marcos	6/27/2022	3:05 PM	52	0	0	\$1,999	\$0
City of San Marcos	6/27/2022	3:18 PM	61	0	0	\$9,995	\$0
City of San Marcos	6/27/2022	3:30 PM	52	0	0	\$1,999	\$0
TOTAL				0	0	\$22,918,444	\$119,182

SECTION 14: THUNDERSTORM WIND

Table 14-4. Summary of Historical Damaging Thunderstorm Wind Events, 1955-2023⁵

LOCATION	NUMBER OF EVENTS	MAGNITUDE (knots)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of San Marcos	23	70	0	0	\$22,883,726	\$110,437
Hays County	68	70	0	0	\$34,718	\$8,745
TOTAL LOSSES	91	(Max Extent)	0	0	\$23,037,626	

Based on the list of historical thunderstorm wind events for the City of San Marcos planning area, 17 of the events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

June 27, 2022

A thunderstorm developed along a cold front and produced wind gusts estimated at 70 mph. The thunderstorm wind knocked down fences, bent over a stop sign, broke trees, and moved a light metal shed into a field. All the damage occurred in the Blanco Vista neighborhood near Five Mile Dam north of San Marcos.

January 13, 2007

Thunderstorms formed in advance of a cold front over much of South Central Texas early on the morning of January 13th. The storms produced spotty heavy rainfall as they tracked slowly northward along IH-35. One of the thunderstorms developed into a supercell and produced a brief tornado near San Marcos. The severe thunderstorm struck just south of the San Marcos Police Headquarters building near 7:00 am and produced winds estimated at 70 to 80 mph northward along IH-35. At the beginning of the damage path, tin metal roofs were torn off several buildings and tossed several hundred feet away. Damage was noted to roofs and eaves as well as walls of some buildings. Typically, all the damage was blown toward the north. These severe winds continued from the initial damage location for approximately one mile to a residential area. All along this path, it was reported that sections of tin ripped from roofs, with pieces tossed several hundred feet away. At one location, a large wooden deck was torn from a one-story building.

June 2, 2003

A line of thunderstorms formed along a cold front in Central Texas and moved quickly southward. As the storms moved through Hays County, they produced a downburst that struck the town of San Marcos and then moved southeastward into Caldwell County. An NWS Storm Survey Team reported numerous large tree limbs of diameter from 6 to 12 inches broken or blown over in San Marcos and along the I-35 corridor. Blown over trees and limbs were generally pointed toward a southeast direction. Many business signs and awnings were damaged along with roof damage to several businesses. Metal or tin roofs of some businesses peeled off on the side of the incoming high winds. Based on the damage and its pattern, it appeared that damage was the result of straight-line winds indicative of a strong downburst estimated at 60 knots or greater. The strong winds also toppled over a semi-truck. At Dudley Johnson Park, the winds knocked over portable

⁵ Countywide damages have been adjusted to reflect only a percentage (5.1%) of the damages attributed to the City of San Marcos.

SECTION 14: THUNDERSTORM WIND

toilets and blew down numerous trees across the roads. Total damage in the town was estimated at \$11,285,776 (2023 dollars).

April 5, 1994

Thunderstorms produced widespread large hail, accompanied by damaging winds that knocked down tree limbs, stripped leaves from trees and knocked out power and telephone communications to San Marcos for several hours. Total property damage was reported as \$10,046,506 (2023 dollars).

PROBABILITY OF FUTURE EVENTS

Most thunderstorm winds occur during the spring and summer seasons and during the months of March, April, May, June, July, and August. Based on available records of historic events, there have been 91 events in a 68.5-year reporting period, which indicates an event is probable in the next year. Even though the intensity of thunderstorm wind events is not always damaging for the City of San Marcos, the frequency of occurrence for a thunderstorm wind event is “Highly Likely”. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

Vulnerability is difficult to evaluate since thunderstorm wind events can occur at different strength levels, in random locations, and can create relatively narrow paths of destruction. Due to the randomness of these events, all existing and future structures and facilities within the City of San Marcos planning area could potentially be impacted and remain vulnerable to possible injury and property loss from strong winds.

Trees, power lines and poles, signage, manufactured housing, radio towers, concrete block walls, storage barns, windows, garbage receptacles, brick facades, and vehicles, unless reinforced, are vulnerable to thunderstorm wind 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. In numerous instances roofs have been reported as having been torn off of buildings. The portable buildings typically used at schools and construction sites would be more vulnerable to thunderstorm wind events than typical site-built structures and could potentially pose a greater risk for wind-blown debris.

According to the American Community Survey’s five-year estimates for 2021, a total of 1,142 manufactured homes are located in the City of San Marcos planning area (4 percent of total housing). Another factor of manufactured homes that may increase vulnerability is the age of installation. Inspection of manufactured home installations changed in 2011 when the process was revised statewide, therefore manufactured homes installed prior to 2011 may be more vulnerable to damages from wind events. In addition, 24 percent (approximately 6,772 structures) of the housing units were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damage during significant wind events.

SECTION 14: THUNDERSTORM WIND

Table 14-5. Structures at Greater Risk⁶

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
City of San Marcos	1,142	6,772

While all residents are vulnerable to the impacts of thunderstorm wind, forced relocation and disaster recovery drastically impacts low-income residents who lack the financial means to travel, afford a long-term stay away from home, and to rebuild or repair their homes. An estimated 30.6 percent of the planning area population live below the poverty level. Renters also tend to be more vulnerable to the impacts of wind events and their ability to recover after an event. Within the city, 74 percent of housing units are renter occupied. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos. While warning times for these type of hazard events should be substantial enough for these individuals to seek shelter, individuals who work and recreate outside are also vulnerable to potential impacts of a thunderstorm wind event.

Table 14-6. Populations at Greatest Risk⁷

JURISDICTION	POPULATION BELOW POVERTY LEVEL	RENTER OCCUPIED UNITS
City of San Marcos	15,858	18,990

Critical facilities within the city including emergency services, health care, airports, and water, wastewater, and water purification plants are all vulnerable to the impacts of thunderstorm wind events. Vulnerability of critical infrastructure to thunderstorms is greatest in power and communications facilities, which can result in loss of service and cascading impacts. The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by thunderstorm wind events.

Table 14-7. Critical Facilities Vulnerable to Thunderstorm Wind

CRITICAL FACILITIES	POTENTIAL IMPACTS
6 Fire Stations, 3 Police Stations, 1 EOC	<ul style="list-style-type: none">Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.Emergency vehicles can be damaged by falling trees or flying debris.Power outages could disrupt communications, delaying emergency response times.Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.Debris/downed trees can impede emergency response vehicle access to areas.

⁶ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

⁷ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 14: THUNDERSTORM WIND

CRITICAL FACILITIES	POTENTIAL IMPACTS
	<ul style="list-style-type: none"> Increased number of structure fires due to gas line ruptures and downed power lines, further straining the capacity and resources of emergency personnel. First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Structures can be damaged by falling trees or flying debris. Power outages could disrupt critical care. Backup power sources could be damaged. Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities. Evacuations may be necessary due to extended power outages, gas line ruptures, or structural damages to facilities.
1 Airports	<ul style="list-style-type: none"> Facilities or infrastructure may be damaged, destroyed or otherwise inaccessible. Essential supplies like medicines, water, food, and equipment deliveries may be significantly delayed. Additional emergency responders and critical aid workers may not be able to reach the area for days. Power outages and infrastructure damage may prevent larger airports from acting as temporary command centers for logistics, communications, and emergency operations. Temporary break in operations may significantly inhibit post event evacuations. Damaged or destroyed highway infrastructure may substantially increase the need for airport operations.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

Historic loss estimates due to flood are presented in Table 14-7 below. Overall, in the past 68.5 years there has been a reported total of \$23,037,626 damages (in 2023 dollars) in the City of San Marcos due to thunderstorm wind events. The estimated average annual loss from a thunderstorm wind event is \$336,315.

Table 14-8. Potential Annualized Losses

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
City of San Marcos	\$23,037,626	\$336,315

SECTION 14: THUNDERSTORM WIND

A thunderstorm wind event can also result in traffic disruptions, injuries, and in rare cases, fatalities. With no reported injuries or fatalities and limited damages, the impact of thunderstorm wind events experienced in the City of San Marcos would be considered “Limited,” with less than 10 percent of property expected to be destroyed and critical facilities shut down for less than 24 hours.

ASSESSMENT OF IMPACTS

Thunderstorm wind events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. The impact of climate change could produce larger, more severe thunderstorm wind events, exacerbating the current thunderstorm wind impacts. Thunderstorm wind conditions can be frequently associated with a variety of impacts, including:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During exceptionally heavy wind events, first responders may be prevented from responding to calls, as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Thunderstorm wind events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.
- City departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the city and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Some businesses not directly damaged by thunderstorm wind events may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.

SECTION 14: THUNDERSTORM WIND

- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to thunderstorm winds. In the City of San Marcos, 24 percent of homes were built before 1980. Additionally, 40 buildings and sites in the city are on the National Register of Historic Places, many of which pre-date modern building codes.
- Large scale wind events can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Recreational areas and parks may be damaged or inaccessible due to downed trees or debris, causing temporary impacts to area businesses.
- Thunderstorm wind events could impact tourism and recreational activities, placing visitors in imminent danger, potentially requiring emergency services or evacuations.

The economic and financial impacts of thunderstorm winds on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the community, local businesses, and the community will also contribute to the overall economic and financial conditions in the aftermath of any thunderstorm wind event.

CLIMATE CHANGE CONSIDERATIONS

The impacts on the frequency and severity of severe thunderstorm wind events due to climate change are unclear. According to the Texas A&M 2021 Climate Report Update, changes in severe thunderstorm reports over time have been more closely linked to changes in population than changes in the hazard event. At this time, there is low confidence of an ongoing trend in the overall frequency and severity of thunderstorm events, due to the lack of climate data records for severe thunderstorms. Based on climate models that are available, the environmental conditions needed for severe thunderstorms are estimated to become more likely, resulting in an overall increase in the number of days capable of producing a severe thunderstorm event.⁸

⁸ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 15 TORNADO

SECTION 15: TORNADO

Hazard Description	1
Location	1
Extent	3
Historical Occurrences	5
Significant Events	5
Probability of Future Events	6
Vulnerability and Impact	6
Assessment of Impacts	9
Climate Change Considerations	10

HAZARD DESCRIPTION



Tornadoes are among the most violent storms on the planet. A tornado is a rapidly 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 and have wind speeds of 250 miles per hour or more. In extreme cases, winds may approach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long.

The most powerful tornadoes are produced by “Supercell Thunderstorms.” These thunderstorms are created when horizontal wind shears (winds moving in different directions at different altitudes) begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado.

Table 15-1. Variations among Tornadoes

WEAK TORNADOES	STRONG TORNADOES	VIOLENT TORNADOES
<ul style="list-style-type: none">○ 69% of all tornadoes○ Less than 5% of tornado deaths○ Lifetime 1-10+ minutes○ Winds less than 110 mph	<ul style="list-style-type: none">○ 29% of all tornadoes○ Nearly 30% of all tornado deaths○ Lifetime of 20 minutes or longer○ Winds 110 – 205 mph	<ul style="list-style-type: none">○ 2% of all tornadoes○ 70% of all tornado deaths○ Lifetime can exceed one hour○ Winds greater than 205 mph

LOCATION

Tornadoes do not have any specific geographic boundary and can occur throughout the city uniformly. It is assumed that the entire City of San Marcos planning area is susceptible to a potential tornado event. The entire City of Marcos planning area is located in Wind Zone III where tornado winds can be as high as 200 mph, refer to Figure 15-1.

SECTION 15: TORNADO

Figure 15-1. FEMA Wind Zones in the United States

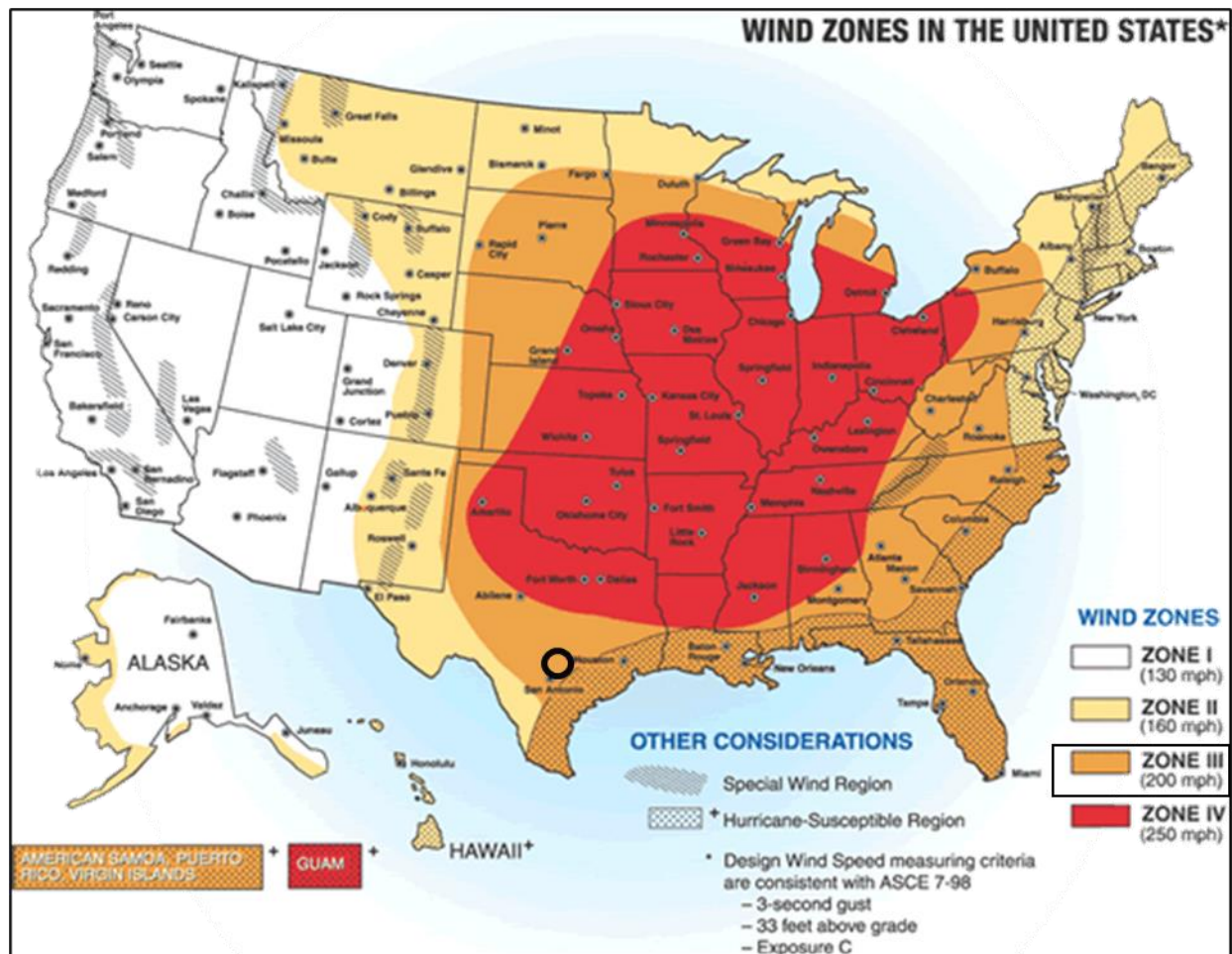
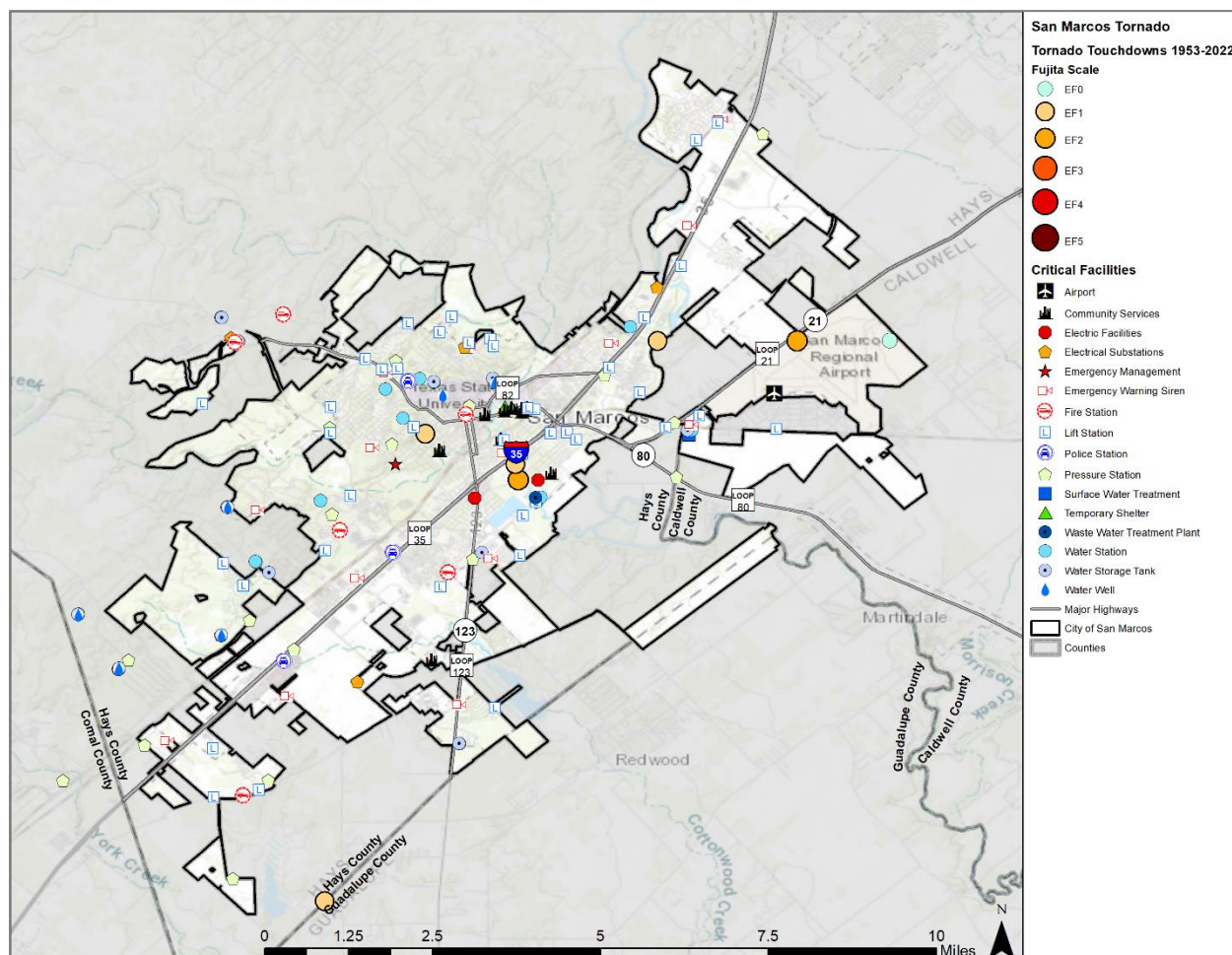


Figure 15-2 shows the locations of historic tornado events in the City of San Marcos between 1950 and 2022.

SECTION 15: TORNADO

Figure 15-2. Historical Tornado Events in City of San Marcos



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).

Tornado magnitudes prior to 2007 were determined using the traditional version of the Fujita Scale, which estimated tornado wind speeds based on the damage caused by an event. Since February 2007, the Enhanced Fujita Scale has been utilized to classify tornadoes, which included improvements to the original scale. The original Fujita scale had limitations, such as a lack of damage indicators, no account for construction quality and variability, and no definitive correlation between damage and wind speed. These limitations led to some tornadoes being rated in an inconsistent manner and, in some cases, an overestimate of tornado wind speeds. The Enhanced Fujita scale retains the same basic design and six strength categories as the previous scale. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures. Table 15-2 includes both scales for reference when analyzing historical tornadoes since tornado events prior to 2007 will follow the original Fujita Scale.

SECTION 15: TORNADO

Table 15-2. The Fujita Tornado Scale¹

Enhanced Fujita Scale				Fujita Scale			
Category	Wind Speed	Damage Level	Damage	Category	Wind Speed	Intensity	Damage
EF0	65-85 MPH	Gale	The environment sustained minor damage: tree branches are broken, some shallow-rooted trees are uprooted, and some chimneys are damaged.	F0	45-78 MPH	Gale	Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
EF1	86-110 MPH	Weak	The environment sustained moderate damage: mobile homes are tipped over, windows are broken, roof tiles may be blown off, and some tree trunks have snapped.	F1	79-117 MPH	Moderate	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
EF2	111-135 MPH	Strong	The environment sustained considerable damage: mobile homes are destroyed, roofs are damaged, debris flies in the air, and large trees are snapped or uprooted.	F2	118-161 MPH	Significant	Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165 MPH	Severe	The environment sustained severe damage: roofs and walls are ripped off buildings, small buildings are destroyed, and most trees are uprooted.	F3	162-209 MPH	Severe	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
EF4	166-200 MPH	Devastating	The environment sustained devastating damage: well-built homes are destroyed, buildings are lifted off their foundations, cars are blown away, and large debris flies in the air.	F4	210-261 MPH	Devastating	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown, and large missiles generated.
EF5	200+ MPH	Incredible	The environment sustained incredible damage: well-built homes are lifted from their foundations, reinforced concrete buildings are damaged, the bark is stripped from trees, and car-sized debris flies through the air.	F5	262-317 MPH	Incredible	Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

¹ Source: <http://www.tornadoproject.com/fscale/fscale.htm>

SECTION 15: TORNADO

Both the Fujita Scale and Enhanced Fujita Scale should be referenced in reviewing previous occurrences since tornado events prior to 2007 will follow the original Fujita Scale. The greatest magnitude reported within the planning area is F5 on the Fujita Scale, an “Incredible Tornado.” Based on the planning area’s location in Wind Zone III there is a potential to experience anywhere from an EF0 to an EF5 depending on the wind speed. Previous tornado events in the City of San Marcos, (converted from the Fujita Scale) have been between EF0 and EF1 (Figure 15-1). This is the strongest event the planning area can anticipate in the future.

HISTORICAL OCCURRENCES

Only reported tornadoes were factored into the Risk Assessment. It is likely that a high number of occurrences have gone unreported over the past 73.5 years. Historical tornado data for the City of San Marcos is shown on a countywide basis per the NCEI database.

Figure 15-2, above, identifies the locations of previous occurrences in the City of San Marcos planning area from January 1950 through July 2023. A total of 5 events have been recorded by the Storm Prediction Center (NOAA) and National Centers for Environmental Information (NCEI) databases for the City of San Marcos. The strongest event reported in the City of San Marcos was an EF1 tornado (86-110 mph) that resulted in minor damage to homes in the Southridge Estates subdivision.

Table 15-4. Historical Tornado Events, 1950-2023²

JURISDICTION	DATE	TIME	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
City of San Marcos	6/10/1997	10:17 AM	Unknown	0	0	\$0
City of San Marcos	10/22/2000	3:40 PM	Unknown	0	0	\$0
City of San Marcos	12/30/2002	3:25 PM	F0	0	0	\$0
City of San Marcos	1/13/2007	7:08 AM	F1	0	0	\$73,159
City of San Marcos	10/30/2015	6:28 AM	EF1	0	0	\$0
TOTAL				0	0	\$73,159

Based on the list of historical tornado events for the City of San Marcos planning area, there have been no recorded events since the 2018 Plan.

SIGNIFICANT EVENTS

October 30, 2015

A warm front combined with an upper-level trough and deep moisture produced heavy rainfall and severe thunderstorms across much of South Central Texas on October 30th and 31st. A tornado developed near Centerpoint Road and Old Zorn Road in Guadalupe County and continued to the north-northeast for approximately 2.25 miles into Hays County ending near Centerpoint Road and Viewpoint Road. The tornado caused minor roof damage to a few homes where it first developed. As it continued north-northeastward, the tornado struck a series of electrical transmission line

² Events reported from January 1950 through July 2023. Magnitude is listed when available. Damage values are in 2023 dollars.

SECTION 15: TORNADO

towers, causing 11 towers to either partially or completely collapse. The tornado continued through an open field near Centerpoint Road causing mainly tree damage. Several homes east of Centerpoint Road, in the Southridge Estates subdivision, received minor roof damage along with large tree limbs snapped. In addition, a garage with an attached apartment completely collapsed in the Southridge Estates subdivision. Peak winds were estimated to be 90-100 mph.

January 13, 2007

Thunderstorms formed in advance of a cold front over much of South Central Texas early on the morning of January 13. The storms produced spotty heavy rainfall as they tracked slowly northward along IH-35. One of the thunderstorms developed into a supercell and produced a brief tornado near San Marcos. Much more severe damage was seen near the center of this path at the Police Headquarters. Just south of the building, metal roofs had been torn off a structure and tossed toward the north. In the south parking lot adjacent to the building, three telephone poles were blown down; one toward the west, one toward the north, and one toward the south. In total, 35 vehicles at the Police Building sustained damage with numerous dents and large gashes in car bodies as well as windows and windshields fractured. A large area of brick was ejected from an upper portion of the building's north wall. The conclusion of the survey team was that this damage at the Police Headquarters was due to a small and short-lived tornado that occurred just behind the 70 to 80 mph thunderstorm winds. Damage was also found about 200 yards north of the Police Building at a business that manufactures lighting fixtures. This was thought to be a second touchdown of the small tornado. Here a large dumpster was spun almost 360 degrees and several trailers were slammed into each other. A single-wide trailer was tipped over on its side. Windows and doors at the building were broken, with some blown inward and some blown outward. Based on the type and level of damage, the tornado was an F1 on the Fujita Scale. The tornado path was estimated to be 100 yards wide and three-tenths of a mile long.

PROBABILITY OF FUTURE EVENTS

Tornadoes 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 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 of San Marcos has a 7 percent annual chance of a tornado event. This frequency supports an "Unlikely" probability of future events, or an event probable in the next ten years. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

Due to the randomness of tornado events, all existing and future buildings, facilities, and infrastructure in the City of San Marcos planning area are considered to be exposed to this hazard and could potentially be impacted. The damage caused by a tornado is typically a result of high wind velocity and wind-blown debris.

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:

SECTION 15: TORNADO

- Manufactured homes;
- Homes on crawlspaces (more susceptible to lift); and
- Buildings with large spans, such as shopping malls, gymnasiums, and factories.

Tornadoes can cause a significant threat to people as they could be struck by flying debris, falling trees or branches, utility lines, and poles. Blocked roads could prevent first responders to respond to calls. Tornadoes commonly cause power outages which could cause health and safety risks to residents and visitors, as well as to patients in hospitals.

The City of San Marcos planning area features mobile or manufactured home parks throughout the planning area. These parks are typically more vulnerable to tornado events than typical site-built structures. In addition, manufactured homes are located sporadically throughout the planning area which would also be more vulnerable. U.S. Census data indicates a total of 1,142 (4 percent of total housing stock) manufactured homes located in the City of San Marcos. Another factor of manufactured homes that may increase vulnerability is the age of installation. Inspection of manufactured home installations changed in 2011 when the process was revised statewide, therefore, manufactured homes installed prior to 2011 may be more vulnerable to damages from tornado events. In addition, 24 percent (approximately 6,772 structures) of the housing structures in the City of San Marcos were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damage during significant tornado events.

Table 15-6. Structures at Greater Risk to Tornado Events³

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980	RENTER OCCUPIED UNITS
City of San Marcos	1,142	6,772	18,990

While all residents are at risk to the impacts of a tornado, forced relocation and disaster recovery drastically impacts low-income residents who lack the financial means to travel, afford a long-term stay away from home, and to rebuild or repair their homes. An estimated 30.6 percent of the planning area population live below the poverty level. Renters also tend to be more vulnerable to the impacts of wind events and their ability to recover after an event. Within the city, 74 percent of housing units are renter occupied. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos. While warning times for these type of hazard events should be substantial enough for these individuals to seek shelter, individuals who work and recreate outside are also vulnerable to potential impacts of a tornado event.

Table 15-7. Populations at Greater Risk to Tornado Events⁴

JURISDICTION	POPULATION BELOW POVERTY LEVEL
City of San Marcos	15,858

³ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

⁴ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 15: TORNADO

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by tornado events.

Table 15-8. Critical Facilities Vulnerable to Tornado Event

CRITICAL FACILITIES	POTENTIAL IMPACTS
6 Fire Stations, 3 Police Stations, 1 EOC	<ul style="list-style-type: none"> Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications. Emergency vehicles can be damaged by falling trees or flying debris. Power outages could disrupt communications, delaying emergency response times. Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities. Debris/downed trees can impede emergency response vehicle access to areas. Increased number of structure fires due to gas line ruptures and downed power lines, further straining the capacity and resources of emergency personnel. First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions. Extended power outages and evacuations may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Structures can be damaged by falling trees or flying debris. Power outages could disrupt critical care. Backup power sources could be damaged. Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities. Evacuations may be necessary due to extended power outages, gas line ruptures, or structural damages to facilities.
1 Airport	<ul style="list-style-type: none"> Facilities or infrastructure may be damaged, destroyed or otherwise inaccessible. Essential supplies like medicines, water, food, and equipment deliveries may be significantly delayed. Additional emergency responders and critical aid workers may not be able to reach the area for days. Power outages and infrastructure damage may prevent larger airports from acting as temporary command centers for logistics, communications, and emergency operations. Temporary break in operations may significantly inhibit post event evacuations. Damaged or destroyed highway infrastructure may substantially increase the need for airport operations.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical.

SECTION 15: TORNADO

CRITICAL FACILITIES	POTENTIAL IMPACTS
Water Infrastructure and Facilities	<ul style="list-style-type: none">○ A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease.○ Exposure to untreated wastewater is harmful to people and the environment.○ Any service disruptions can negatively impact or delay emergency management operations.

The total property loss estimates to tornado events is \$73,159, having an approximate annual loss estimate of \$1,045 (2023 dollars). Based on historic damages, the impact of a tornado event on the City of San Marcos planning area would be considered “Minor”, with critical facilities and services shutdown for 24 hours or less and less than 10 percent of properties destroyed or with major damage.

Table 15-9. Estimated Annualized Losses by Jurisdiction

JURISDICTION	TOTAL PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
City of San Marcos	\$73,159	\$1,045

ASSESSMENT OF IMPACTS

Tornadoes have the potential to pose a significant risk to the population and can create dangerous situations. Often providing and preserving public health and safety is difficult following a tornado event. The impact of climate change could produce larger, more severe tornado events, exacerbating the current tornado impacts. More destructive tornado conditions can be frequently associated with a variety of impacts, including:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Manufactured homes may suffer substantial damage as they would be more vulnerable than typical site-built structures.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Tornadoes often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outages can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Tornadoes can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders must enter the damage area shortly after the tornado passes to begin rescue operations and to organize cleanup and assessments efforts, therefore they are exposed to downed power lines, unstable and unusual debris, hazardous materials, and

SECTION 15: TORNADO

generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.

- Emergency operations and services may be significantly impacted due to damaged facilities, loss of communications, and damaged emergency vehicles and equipment.
- City departments may be damaged or destroyed, delaying response and recovery efforts for the entire community.
- Private sector entities that the city and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the tornado may be negatively impacted while roads and utilities are being restored, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures destroyed by a tornado may not be rebuilt for years, reducing the tax base for the community.
- Large or intense tornadoes may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Recreation activities may be unavailable, and tourism can be unappealing for years following a large tornado, devastating directly related local businesses.

The economic and financial impacts of a tornado event on the community will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses, and the community will contribute to the overall economic and financial conditions in the aftermath of a tornado event.

CLIMATE CHANGE CONSIDERATIONS

The impacts on the frequency and severity of tornado events due to climate change are unclear. According to the Texas A&M 2021 Climate Report Update, the most robust trend in tornado activity in Texas is a likelihood for a greater number of tornadoes in large outbreaks, although the factors contributing to this trend are not expected to continue. Tornadoes spawn from less than 10 percent of thunderstorms, usually supercell thunderstorms that are in a wind shear

SECTION 15: TORNADO

environment that promotes rotation.⁵ Based on climate models that are available, the environmental conditions needed for severe thunderstorm events are estimated to become more likely, resulting in an overall increase in the number of days capable of producing a severe thunderstorm event and potential tornadoes to develop from these storms.⁶

⁵ Treisman, Rachel. *The exact link between tornadoes and climate change is hard to draw. Here's why*. NPR. December 13, 2021. <https://www.npr.org/2021/12/13/1063676832/the-exact-link-between-tornadoes-and-climate-change-is-hard-to-draw-heres-why>

⁶ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 16 WILDFIRE

SECTION 16: WILDFIRE

Hazard Description	1
Location	1
Extent	3
Historical Occurrences	7
Significant Events	10
Probability of Future Events	10
Vulnerability and Impact	10
Assessment of Impacts	15
Climate Change Considerations	16

HAZARD DESCRIPTION

A wildfire event 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. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. The fires 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 wildfire.

A wildfire event often begins unnoticed and spreads quickly, lighting brush, trees, and homes on fire. For example, a wildfire may be started by a campfire that was not doused properly, a tossed cigarette, burning debris, or arson.

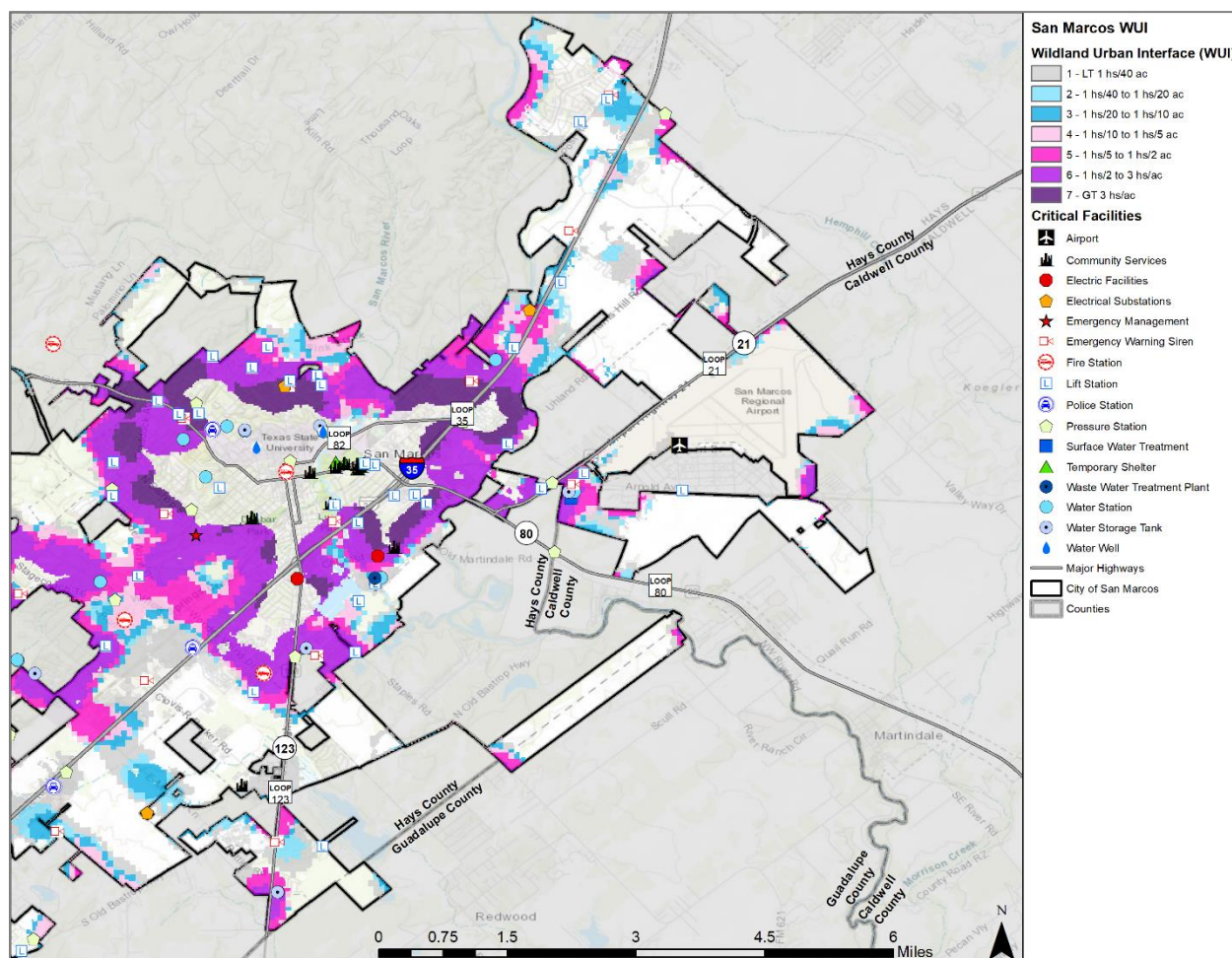
Texas has seen a significant increase in the number of wildfires in the past 30 years, which included wildland, interface, or intermix fires. Wildland fires are fueled almost exclusively by natural vegetation, while interface or intermix fires are urban / wildland fires in which vegetation and the built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

LOCATION

A wildfire event can be a potentially damaging consequence of drought conditions, lightning, or wind event, if the conditions allow. Wildfires can vary greatly in terms of size, location, intensity, and duration. While wildfires are not confined to any specific geographic location, they are most likely to occur in open grasslands. The threat to people and property from a wildfire event is greater in the fringe areas where developed areas meet open grass lands, such as the Wildland Urban Interface (WUI) (Figures 16-1 and 16-2). It is estimated that 51.6 percent of the total population in the City of San Marcos live within the WUI. However, the entire City of San Marcos planning area is at some risk for wildfires.

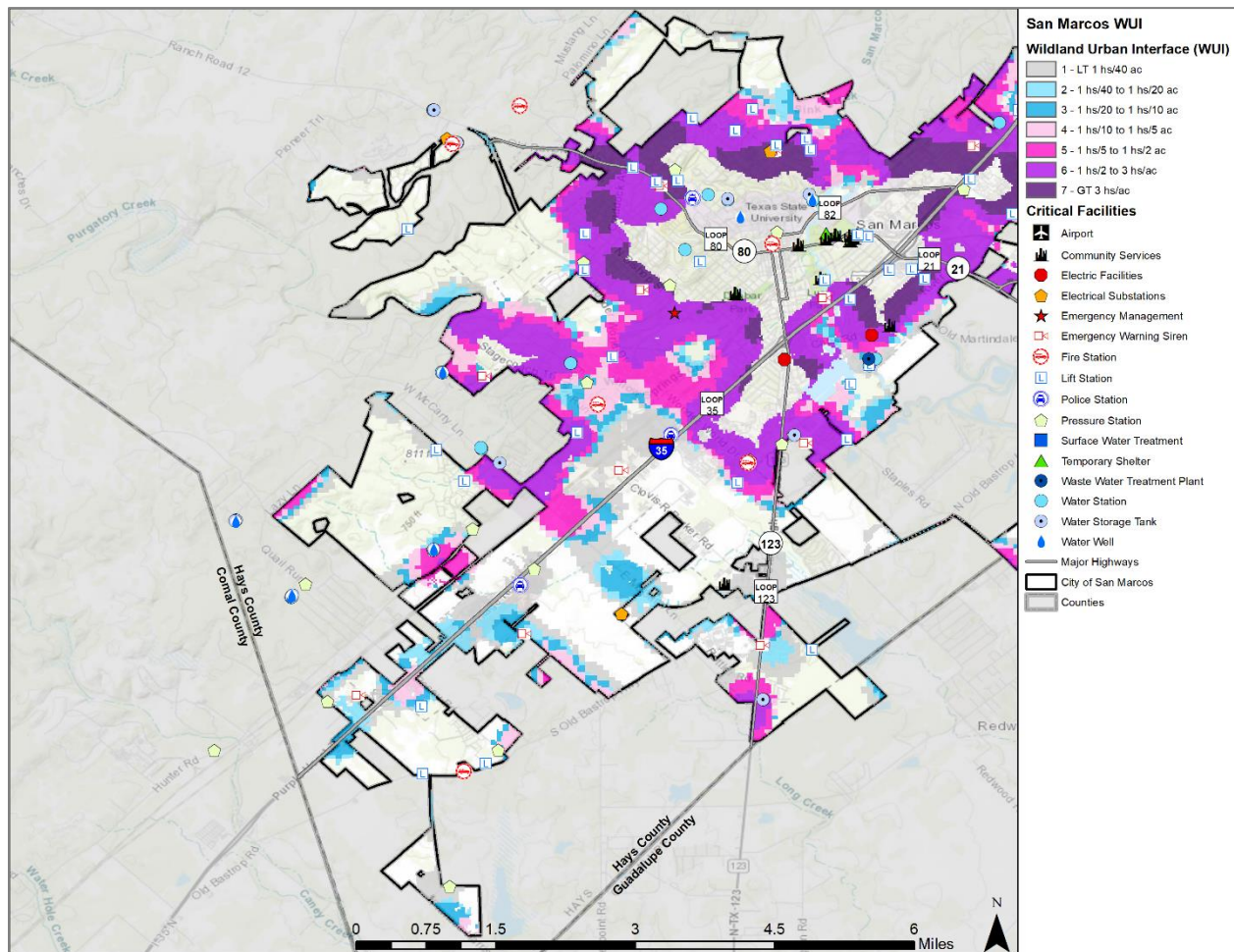
SECTION 16: WILDFIRE

Figure 16-1. Wildland Urban Interface Map – City of San Marcos - East



SECTION 16: WILDFIRE

Figure 16-2. Wildland Urban Interface Map – City of San Marcos – West



EXTENT

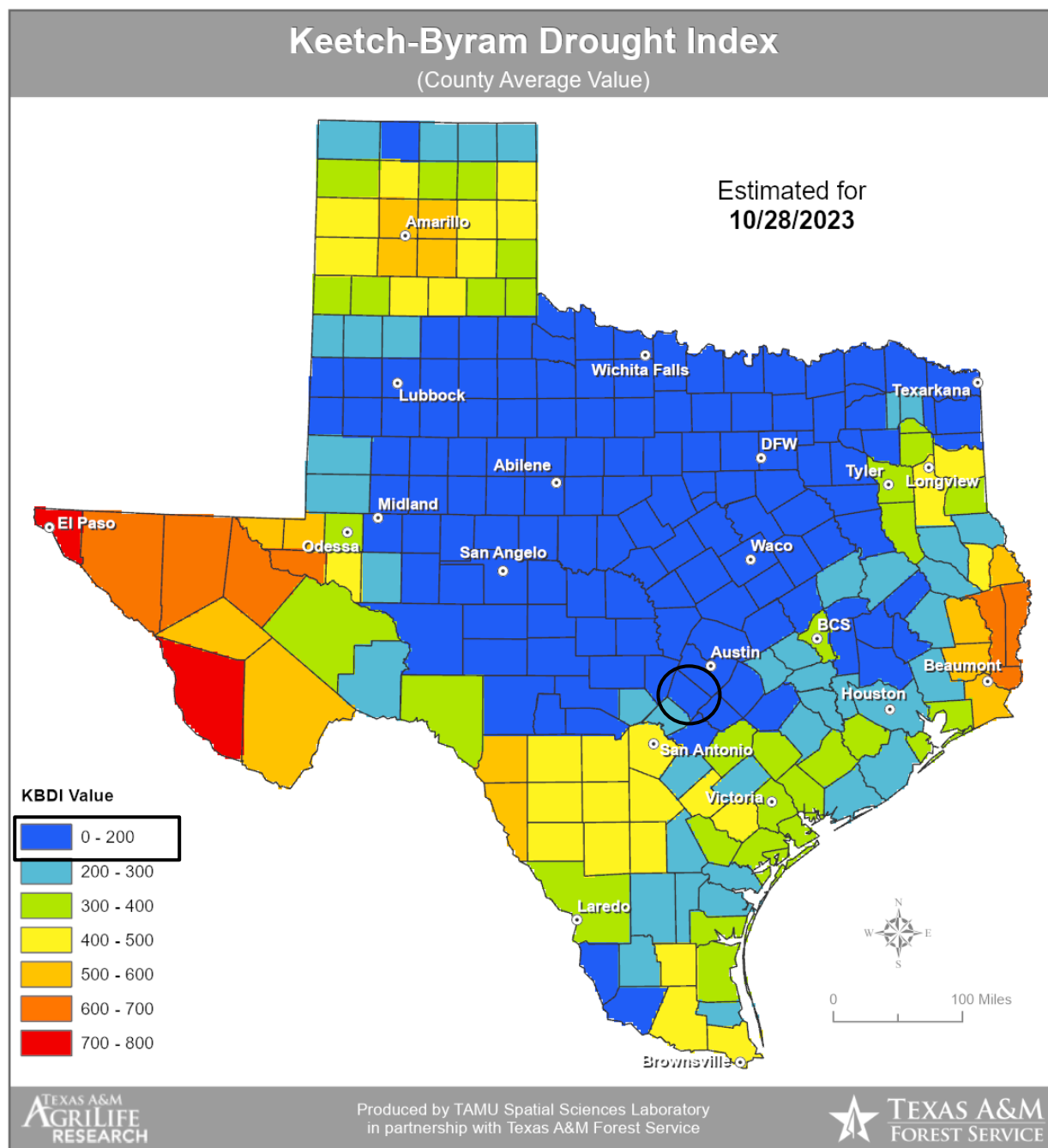


Risk for a wildfire event is measured in terms of magnitude and intensity using the Keetch Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential based on a daily water balance,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

Each color in Figure 16-3 represents the drought index at that location. The drought index ranges from 0 to 800. A drought index of 0 represents no moisture depletion, and a drought index of 800 represents absolutely dry conditions.

SECTION 16: WILDFIRE

Figure 16-3. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2023¹



Fire behavior can be categorized at four distinct levels on the KBDI:

- **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.

¹ City of San Marcos is located within the black circle.

SECTION 16: WILDFIRE

- **200 -400:** Fires more readily burn and will carry across an area with no gaps. Heavier fuels will not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and possibly through the night.
- **400 -600:** Fires 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.

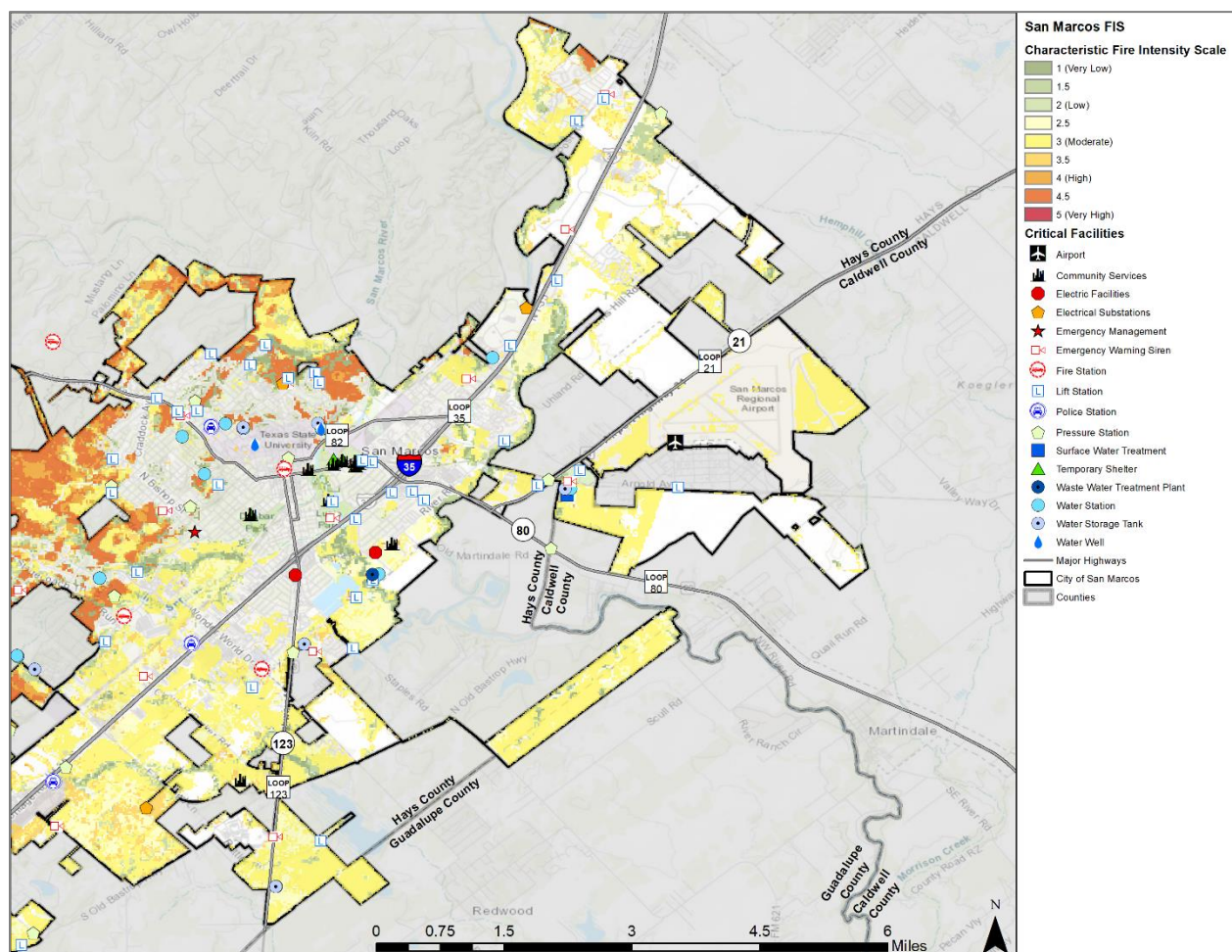
The KBDI is a good measure of the readiness of fuels for a wildfire event. It should be referenced as the area experiences changes in precipitation and soil moisture, while caution should be exercised in dryer, hotter conditions.

The range of intensity for the City of San Marcos planning area in a wildfire event is within 144 to 789. The average extent to be mitigated for the City of San Marcos planning area, is a KBDI of 523. At this level, fire intensity begins to significantly increase. Fire will readily burn in all directions exposing mineral soils in some locations. The worst the planning area can anticipate based on historical occurrences and readily available fuel is a KBDI of 200 to 600, as 523 falls within this range. At the high end of this range, 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.

The Texas Forest Service's Fire Intensity Scale identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. The City of San Marcos has a potential for predominantly limited to moderate wildfire intensities. Figures 16-4 and 16-5 identify the wildfire intensity for the City of San Marcos planning area.

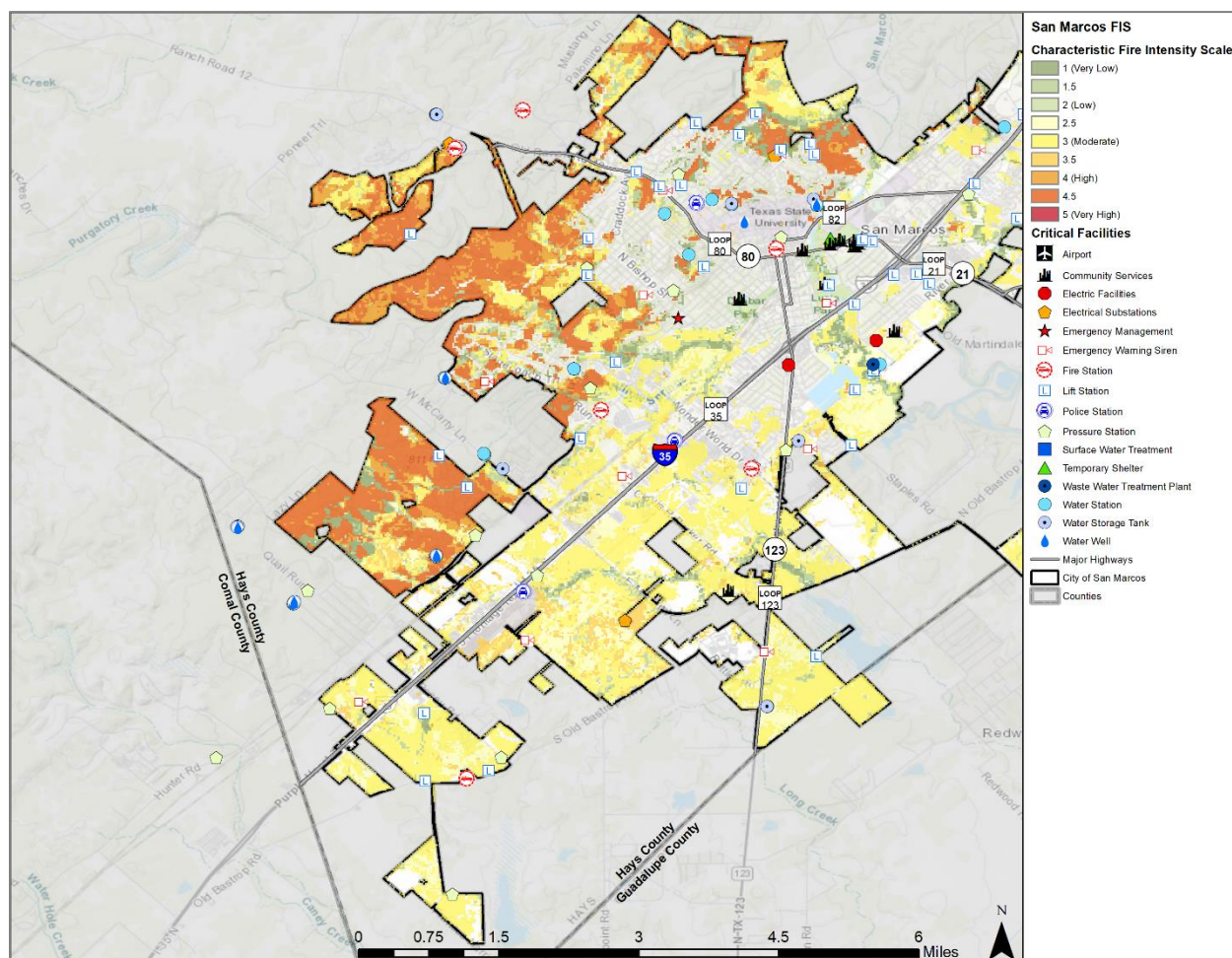
SECTION 16: WILDFIRE

Figure 16-4. Fire Intensity Scale Map – City of San Marcos - East



SECTION 16: WILDFIRE

Figure 16-5. Fire Intensity Scale Map – City of San Marcos – West

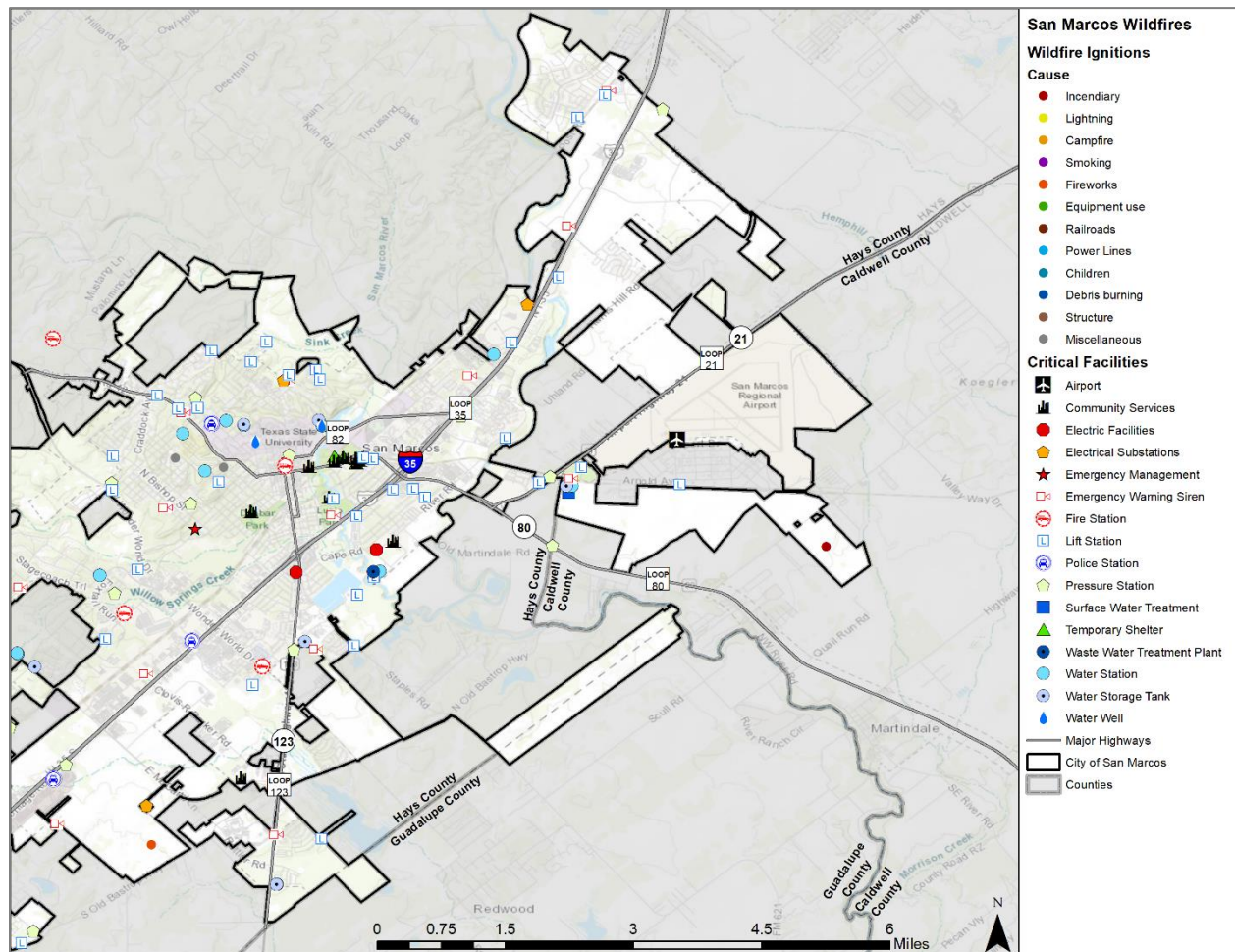


HISTORICAL OCCURRENCES

The Texas Forest Service reported 12 wildfire events between 2005 and 2021. The National Centers for Environmental Information (NCEI) includes two records of wildfire events during that same period. Only one NCEI event on September 4, 2011, has recorded damages with an estimated \$7,832,138 in total property damages. The Texas Forest Service (TFS) started collecting wildfire data reported by volunteer fire departments in 2005. Due to a lack of recorded data for wildfire events prior to 2005, frequency calculations are based on a 17-year reporting period, using only data from recorded years. The map below shows approximate locations of wildfires, which can be grass or brushfires of any size (Figures 16-6 and 16-7). Tables 16-2 and 16-3 identify the number of wildfires and total acreage burned each year within the City of San Marcos boundaries.

SECTION 16: WILDFIRE

Figure 16-6. Location and Historic Wildfire Events for the City of San Marcos – East



SECTION 16: WILDFIRE

Figure 16-7. Location and Historic Wildfire Events for the City of San Marcos – West

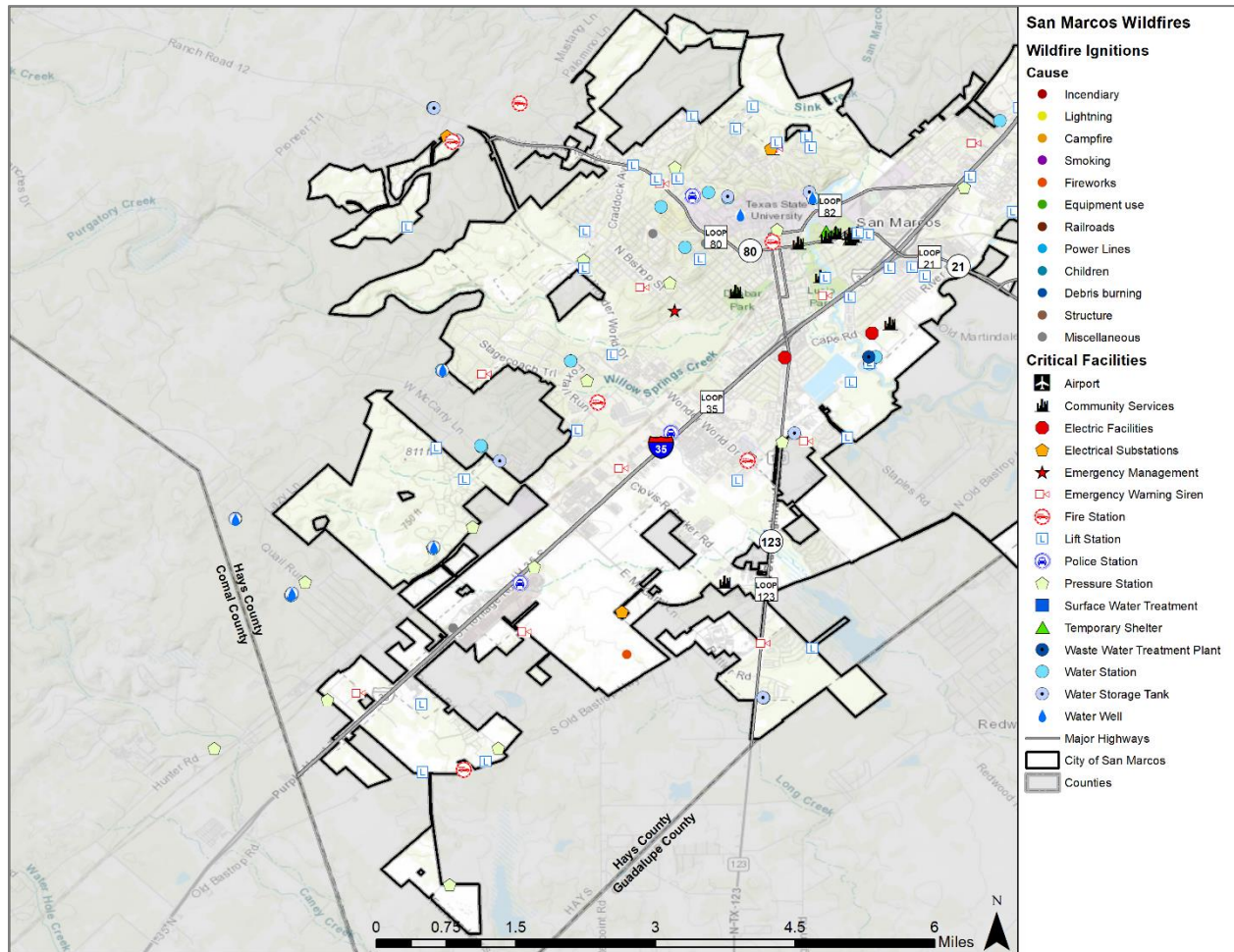


Table 16-1. Historical Wildfire Events Summary, 2005 - 2021

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
City of San Marcos	12	100

Table 16-2. Historical Wildfire Events by Year

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
City of San Marcos	0	1	0	0	0	0	1	1	0	6	0	0	0	1	0	0	0
Total: 12																	

SECTION 16: WILDFIRE

Table 16-3. Acreage of Suppressed Wildfire by Year

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
City of San Marcos	0	0	67	0	0	0	1	15	0	1	0	0	15	1	0	0	0
Total: 100																	

Based on the list of historical wildfire events for the City of San Marcos planning area, 0 events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

There have been seven declared disasters related to fires that resulted in wildfire events in Hays County and the City of San Marcos between 1970 and April 2023 (Table 16-4).

Table 16-4. Disaster Declarations for Fire, 1970-2023

DECLARATION DATE	DECLARATION TITLE	DECLARATION TYPE	DISASTER NO.
09/01/1999	Extreme Fire Hazards	EM	EM-3142
01/05/2001	TX - Amhurst Street Fire - 09/04/00	FM	FM-2352
01/11/2006	Niederwald Fire	FM	FM-2617
01/11/2006	Extreme Wildfire Threat	DR	DR-1624
11/15/2006	Rim Rock Fire	FM	FM-2680
03/14/2008	Wildfires	EM	EM-3284
03/14/2008	Old Bastrop Highway Fire Complex	FM	FM-2751

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. With twelve events in a 17-year period, an event within the City of San Marcos is “Highly Likely”, meaning an event is probable within the next year. According to NOAA, research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons, indicating an increase in the frequency and severity of events in the planning area going forward. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

Periods of drought, dry conditions, high temperatures, and low humidity are factors that contribute to the occurrence of a wildfire event, as was experienced in 2011. Areas along railroads and people whose homes are in woodland or grassland settings have an increased risk of being affected by wildfire.

SECTION 16: WILDFIRE

The heavily populated, urban areas of City of San Marcos are not likely to experience large, sweeping fires. Unoccupied buildings and open spaces that have not been maintained have the greatest vulnerability to wildfire. The overall level of concern for wildfires is located mostly along the perimeter of the study area where wildland and urban areas interface. Figures 16-1 and 16-2 illustrate the areas that are the most vulnerable to wildfire throughout the city. Areas along major highways such as Interstate 35 and Routes 21, 80, and 123 in the city have an increased vulnerability where empty lots and unoccupied areas are located.

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by wildfire events.

Table 16-5. Critical Facilities Vulnerable to Wildfire Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 2 Police Station, 3 Fire Station, 10 Emergency Warning Sirens	<ul style="list-style-type: none">○ Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible, or personnel are unable to report for duty.○ First responders are at greater risk of injury when in close proximity to the hazard while extinguishing flames, protecting property, or evacuating residents in the area.○ Critical city departments may not be able to function and provide necessary services depending on the location of the fire and the structures or personnel impacted.○ Roadways in or near the WUI could be damaged or closed due to smoke and limited visibility, slowing, or preventing access for emergency response vehicles.○ Fire suppression costs can be substantial, exhausting the financial resources of the community.○ First responders can experience heart disease, respiratory problems, and other long-term related illnesses from prolonged exposure to smoke, chemicals, and heat.○ Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.○ Power outages could disrupt communications, delaying emergency response times.○ Critical staff may be injured or otherwise unable to report for duty, limiting response capabilities.
2 Government Facilities	<ul style="list-style-type: none">○ Structures can be damaged or destroyed in the path of the wildfire.○ Power outages could disrupt critical care.○ Backup power sources could be damaged.○ Critical staff may be unable to report for duty, limiting capabilities.○ Evacuations may be necessary due to wildfire threat, extended power outages, or structural damages to facilities.

SECTION 16: WILDFIRE

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 Airport	<ul style="list-style-type: none"> Facilities or infrastructure may be damaged, destroyed or otherwise inaccessible. Essential supplies like medicines, water, food, and equipment deliveries may be significantly delayed. Additional emergency responders and critical aid workers may not be able to reach the area for days. Power outages and infrastructure damage may prevent larger airports from acting as temporary command centers for logistics, communications, and emergency operations.
1 Wastewater Treatment Plants, 1 Surface Water Treatment Facility, 1 Water Wells, 9 Water Stations, 4 Water Storage Tanks, 25 Lift Stations, 3 Electrical Substations, 1 Electrical Facility, 10 Pressure Stations	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

Within the City of San Marcos, a total of 12 fire events were reported from 2005 through 2021. All of these events were suspected wildfires. Historic annualized acreage loss estimates due to wildfires are presented in Table 16-6 below. The average frequency is approximately one event a year.

Table 16-6. Potential Annualized Acreage Losses²

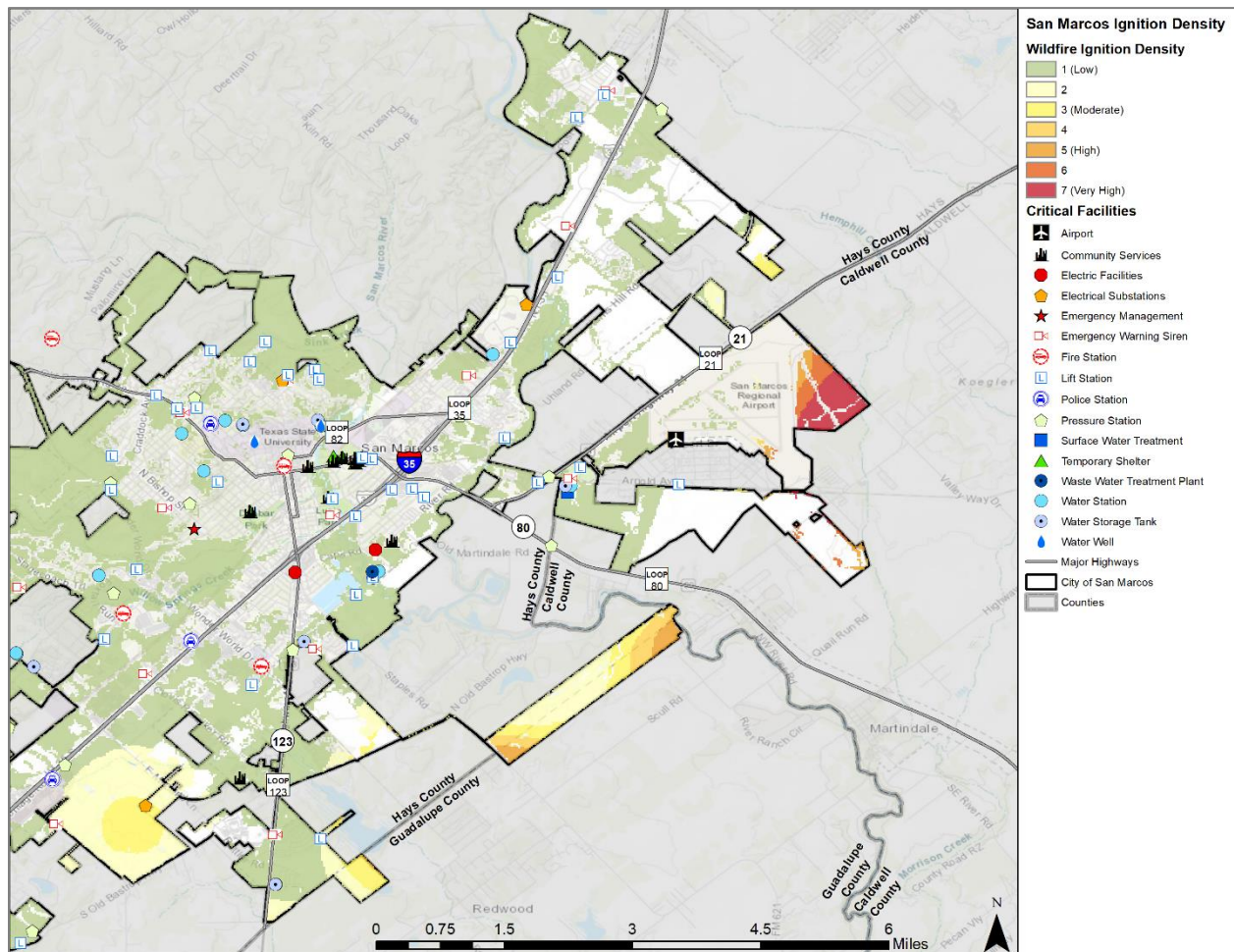
JURISDICTION	ACRES BURNED	ANNUAL ACRE LOSSES
City of San Marcos	100	5.9

Figures 16-8 and 16-9 show the threat of wildfire to the City of San Marcos planning area.

² Events divided by 17 years of data.

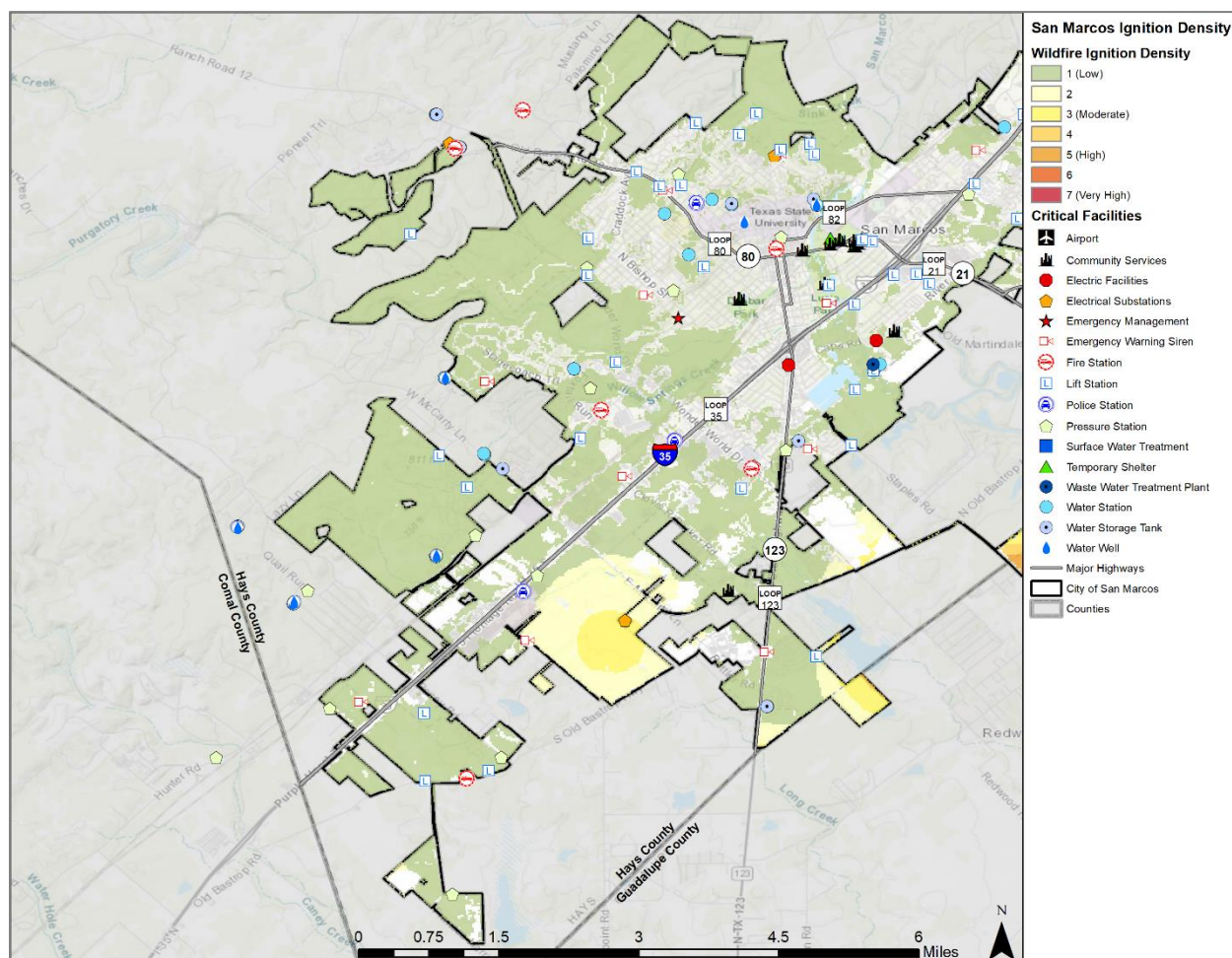
SECTION 16: WILDFIRE

Figure 16-8. Wildfire Ignition Density – City of San Marcos – East



SECTION 16: WILDFIRE

Figure 16-9. Wildfire Ignition Density – City of San Marcos – West



Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long-term health effects. The elderly or those individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event.

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 wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity.

The severity of impact from major wildfire events can be substantial. Such events can cause multiple deaths, shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. Severity of impact is gauged by acreage burned, homes and structures lost, and the number of resulting injuries and fatalities.

For the City of San Marcos planning area, the impact from a wildfire event can be considered "Limited," meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10 percent of property is destroyed or with major

SECTION 16: WILDFIRE

damage. Severity of impact is gauged by acreage burned, homes and structures lost, injuries and fatalities.

Table 16-7. Impact for City of San Marcos

JURISDICTION	IMPACT	DESCRIPTION
City of San Marcos	Limited	City of San Marcos has an estimated 29,286 people or 51.6% of the total population that live within the Wildland Urban Interface (WUI). Average housing density is most commonly 3 houses per 1 acre. City of San Marcos residents may suffer minor injuries that can be treated with first aid. Critical facilities could be shut down for 24 hours or less, and less than 10 percent of total property could be damaged.

ASSESSMENT OF IMPACTS

A Wildfire event poses a potentially significant risk to public health and safety, particularly if the wildfire is initially unnoticed and spreads quickly. The impacts associated with a wildfire are not limited to direct damage. The impact of climate change could produce larger, more widespread wildfire events, exacerbating the current wildfire impacts. Significant wildfire events can be frequently associated with a variety of impacts, including:

- The City of San Marcos' parks are vulnerable to the impacts of wildfire events. Recreation and tourism can be unappealing for years following a large wildfire, devastating directly related businesses.
- Recreation activities throughout the city's parks may be unavailable and tourism can be unappealing for years following a large wildfire event, devastating directly related local businesses and negatively impacting economic recovery.
- Newer developments around the City of San Marcos (La Cima, Kissing tree, apartments on Wonderworld, RR12) are at greater risk as the urban sprawl infringes on the WUI, increasing risk to residents, structures and infrastructure.
- Persons in the area at the time of the fire are at risk for injury or death from burns and/or smoke inhalation.
- First responders are at greater risk of physical injury when in close proximity to the hazard while extinguishing flames, protecting property, or evacuating residents in the area.
- First responders can experience heart disease, respiratory problems, and other long-term related illnesses from prolonged exposure to smoke, chemicals, and heat.
- Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible, or personnel are unable to report for duty.
- Critical city departments may not be able to function and provide necessary services depending on the location of the fire and the structures or personnel impacted.
- Non-critical businesses may be directly damaged, suffer loss of utility services, or be otherwise inaccessible, delaying normal operations and slowing the recovery process.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Roadways in or near the WUI could be damaged or closed due to smoke and limited visibility.

SECTION 16: WILDFIRE

- Older homes are generally exempt from modern building code requirements, which may require fire suppression equipment in the structure. In the City of San Marcos, 24 percent of homes were built before 1980. Additionally, 40 buildings and sites in the city are on the National Register of Historic Places, many of which pre-date modern building codes.
- Vegetation in the city's urban parks may be destroyed in a wildfire, impacting air quality and public health.
- Some high-density neighborhoods feature small lots with structures close together, increasing the potential for fire to spread rapidly.
- Air pollution from smoke may exacerbate respiratory problems of vulnerable residents.
- Charred ground after a wildfire cannot easily absorb rainwater, increasing the risk of flooding and potential mudflows.
- Wildlife may be displaced or destroyed.
- Historical or cultural resources may be damaged or destroyed.
- Tourism can be significantly disrupted, further delaying economic recovery for the area.
- Economic disruption negatively impacts the programs and services provided by the community due to short- and long-term loss in revenue.
- Fire suppression costs can be substantial, exhausting the financial resources of the community.
- Residential structures lost in a wildfire may not be rebuilt for years, reducing the tax base for the community.
- Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground delivery lines, and soil erosion or debris deposits into waterways after the fire.
- Tourism and recreational activities could be impacted and can be unappealing for years following a large wildfire, devastating directly related businesses.

The economic and financial impacts of a wildfire event on local government will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses, and the community will contribute to the overall economic and financial conditions in the aftermath of a wildfire event.

CLIMATE CHANGE CONSIDERATIONS

Wildfires require the alignment of a number of factors, including temperature, humidity, and the lack of moisture in fuels, such as trees, shrubs, grasses, and forest debris. All these factors have strong direct or indirect ties to climate variability and climate change. Research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons. Increases in temperatures and the thirst of the atmosphere due to human--caused climate change have increased aridity of forest fuels during the fire season.³

Vapor pressure deficit, an indicator of the ability of moisture to evaporate, is projected to increase as temperatures rise and carbon dioxide fertilization reduces transpiration, leading to both lower humidity and increased surface dryness. Overall, increased dryness should extend the wildfire

³ NOAA Wildfire Climate Connection, August 2022: wildfire-climate-connection.

SECTION 16: WILDFIRE

season in places where the fire season is presently constrained by low levels of aridity, such as eastern Texas.⁴

Extreme heat and extended periods of drought contribute to wildfire risk in the planning area. Extreme temperatures and periods of drought destroy vegetation in the area, contributing to available fuels that spread wildfires. Additional climate change impacts from drought and extreme heat are discussed in Sections 6 and 9 of this Plan. The projected increases in favorable wildfire conditions, including drought and extreme heat, indicate an increase in favorable wildfire conditions. Additional information and studies are needed to determine the degree and rate of any increased wildfire risk.

⁴ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 17 WINTER STORM

SECTION 17: WINTER STORM

Hazard Description	1
Location	3
Extent	3
Historical Occurrences	4
Significant Events	6
Probability of Future Events	7
Vulnerability and Impact	7
Assessment of Impacts	9
Climate Change Considerations	11

HAZARD DESCRIPTION



THE BLANCO VISTA NEIGHBORHOOD OF SAN MARCOS BLANKETED WITH SEVERAL INCHES OF SNOW AS A MASSIVE WINTER WEATHER SYSTEM CAUSED POWER OUTAGES ON FEB. 15, 2021. (JORDAN VONDEHAAR/THE TEXAS TRIBUNE)

[HTTPS://WWW.TEXASTRIBUNE.ORG/2021/11/19/TEXAS-WINTER-STORM-ELECTIONS/](https://www.texastribune.org/2021/11/19/texas-winter-storm-elections/)

A severe winter storm event is identified as a storm with snow, ice, or freezing rain. This type of storm can cause significant problems for area residents. Winter storms are associated with freezing or frozen precipitation such as freezing rain, sleet, snow, and the combined effects of winter precipitation and strong winds. Wind chill is a function of temperature and wind. Low wind chill is a product of high winds and freezing temperatures.

Winter storms that threaten the City of San Marcos planning area usually begin as powerful cold fronts that push south from central Canada. Although the city is at risk to ice hazards, extremely cold temperatures, and snow, the effects and frequencies of winter storm events are generally mild and short-lived.

As indicated in Figure 17-1, the City of San Marcos is located in USDA Hardiness Zone 8b, with a portion of northwest Hays County residing in Zone 8a. Zone 8b and 8a have annual minimum temperatures between 10°F and 20°F. During times of ice and snow accumulation, response times will increase until public works road crews are able to make major roads passable. Table 17-1 describes the types of winter weather possible to occur in the City of San Marcos.

SECTION 17: WINTER STORM

Figure 17-1. Annual Minimum Temperature¹

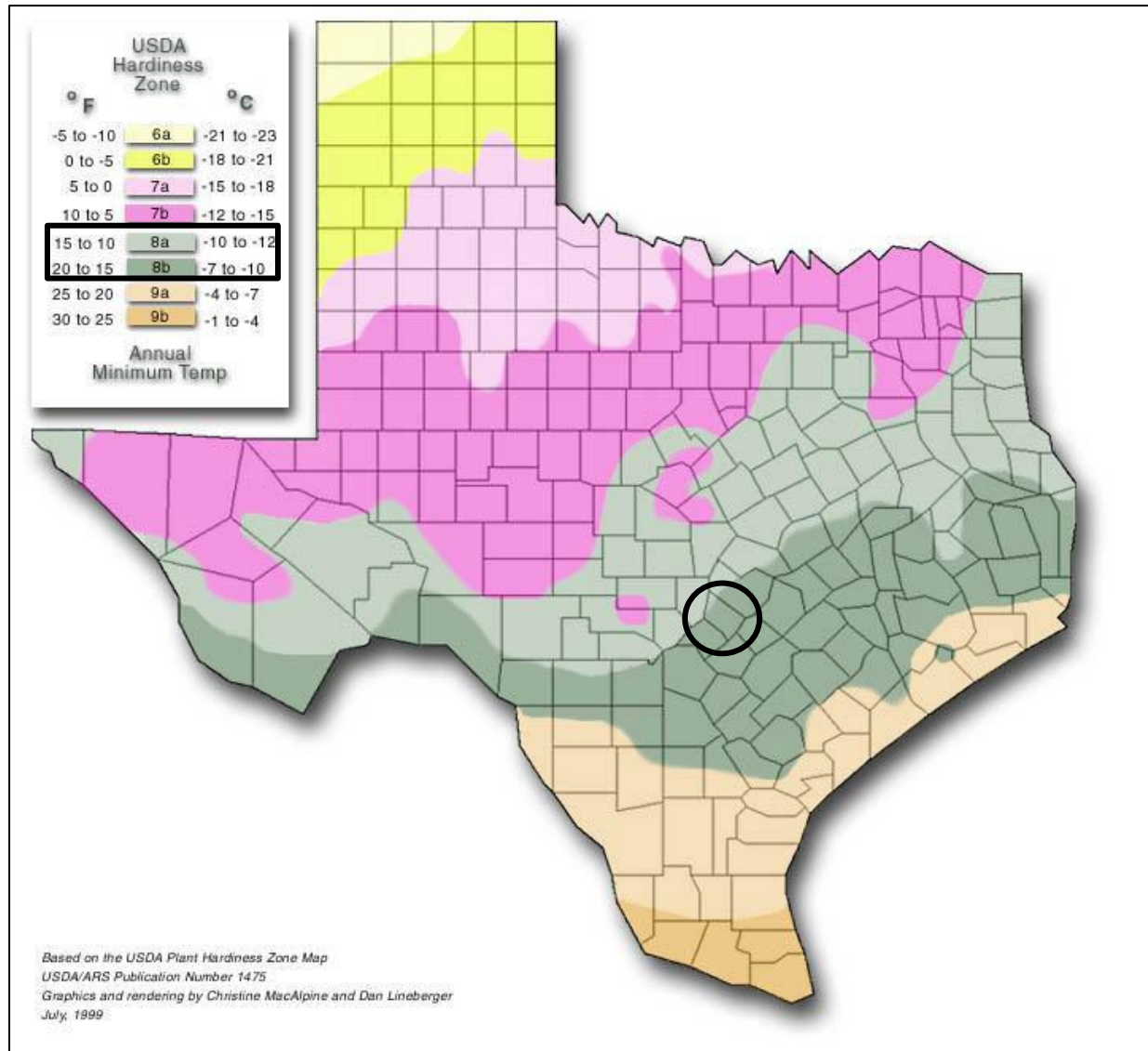


Table 17-1. Types of Winter Weather

TYPE OF WINTER WEATHER	DESCRIPTION
Winter Weather Advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter Storm Watch	Severe winter weather conditions may affect your area (freezing rain, sleet, or heavy snow may occur separately or in combination).
Winter Storm Warning	Severe winter weather conditions are imminent.

¹ USDA

SECTION 17: WINTER STORM

TYPE OF WINTER WEATHER	DESCRIPTION
Freezing Rain or Freezing Drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
Blizzard Warning	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/Freeze Warning	Below freezing temperatures are expected and may cause significant damage to plants, crops, and fruit trees.
Wind Chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

LOCATION

Winter storm events are not confined to specific geographic boundaries. Therefore, all existing and future buildings, facilities, and populations in the City of San Marcos are considered to be exposed to a winter storm hazard and could potentially be impacted.

While the entire City of San Marcos is vulnerable to winter storm events, the areas of the city that reported the highest percentage of damages after Winter Storm Uri in February 2021, were concentrated in the central and eastern areas of the city. The hardest-hit areas tended to be in low-income neighborhoods with older homes built before 1985 and higher shares of renter households.

EXTENT

The extent or magnitude of a severe winter storm is measured in intensity based on the temperature and level of accumulations as shown in Table 17-2. Table 17-2 should be read in conjunction with the wind chill factor described in Figure 17-2 to determine the intensity of a winter storm. The chart is not applicable when temperatures are over 50°F or winds are calm. This is an index developed by the National Weather Service.

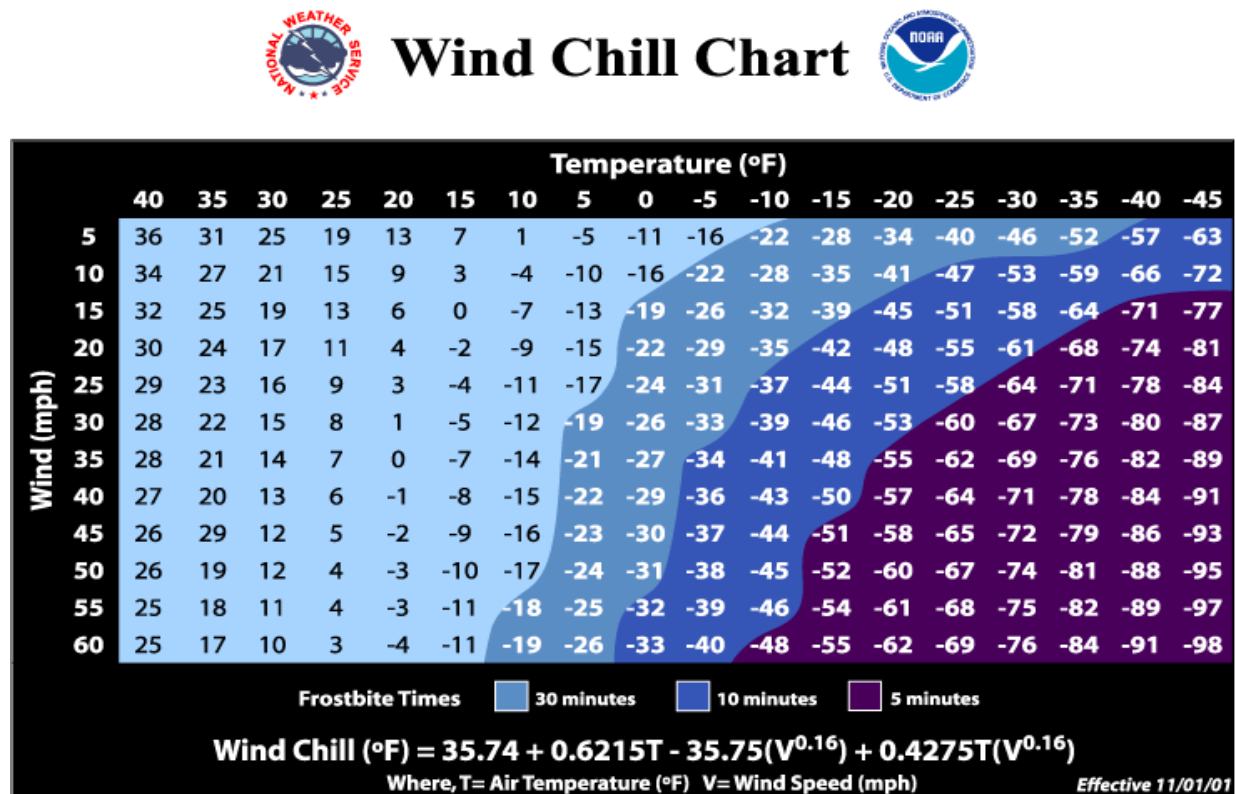
Table 17-2. Magnitude of Severe Winter Storms

INTENSITY	TEMPERATURE RANGE (Fahrenheit)	EXTENT DESCRIPTION
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 gusty winds between 15 and 20 mph with significant accumulation

SECTION 17: WINTER STORM

INTENSITY	TEMPERATURE RANGE (Fahrenheit)	EXTENT DESCRIPTION
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

Figure 17-2. Wind Chill Chart



Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30°F day would feel just as cold as a calm day with 0°F temperatures. The City of San Marcos has 26 previous occurrences recorded from January 1996 through July 2023. The City of San Marcos has never experienced a blizzard but has been subject to ice storms, sleet, and winter storms.

The average number of cold days is similar for the entire planning area. Therefore, the intensity or extent of a winter storm event to be mitigated for the area ranges from mild to moderate according to the definitions at Table 17-2. The City of San Marcos planning area can expect anywhere between 0.1 to 4.0 inches of ice and snow during a winter storm event, and temperatures below 20°F with winds ranging from 0 to 35 mph.

HISTORICAL OCCURRENCES

Table 17-3 shows historical occurrences for the City of San Marcos from January 1996 through July 2023 provided by the NCEI database. Based upon NCEI records, there have been 26

SECTION 17: WINTER STORM

recorded winter storm events within the City of San Marcos planning area. Historical winter storm information, as provided by the NCEI, identifies winter storm activity across a multi-county forecast area for each event. The appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event, when appropriate. Historical winter storm data for the City of San Marcos is provided on a countywide basis per the NCEI database. Table 17-3 shows historical incident information for the planning area.

Table 17-3. Historical Winter Storm Events, 1996-2023²

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	2/1/1996	0	0	\$0	\$0
Hays County	1/7/1997	0	0	\$0	\$0
Hays County	1/11/1997	0	0	\$0	\$0
Hays County	12/23/1998	0	0	\$0	\$0
Hays County	12/12/2000	0	0	\$0	\$0
Hays County	11/28/2001	0	0	\$0	\$0
Hays County	2/24/2003	0	0	\$0	\$0
Hays County	12/7/2005	0	0	\$0	\$0
Hays County	1/15/2007	0	0	\$182,897	\$0
Hays County	2/3/2011	0	0	\$0	\$0
Hays County	11/26/2013	0	0	\$0	\$0
Hays County	1/23/2015	0	0	\$0	\$0
Hays County	2/16/2015	0	0	\$0	\$0
Hays County	12/7/2017	0	0	\$0	\$0
Hays County	1/16/2018	0	0	\$0	\$0
Hays County	2/5/2020	0	0	\$0	\$0
Hays County	1/10/2021	0	0	\$0	\$0
Hays County	2/11/2021	0	0	\$87,734 ³	\$0
Hays County	2/13/2021	0	0	\$0	\$0
Hays County	2/16/2021	0	0	\$0	\$0

² Values are in 2023 dollars. Events reported from January 1996 through July 2023.

³ Estimated damages includes \$87,734 (2023 dollars) in damages reported by the San Marcos Community Forest Program.

SECTION 17: WINTER STORM

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hays County	1/11/2022	0	0	\$0	\$0
Hays County	1/20/2022	0	0	\$0	\$0
Hays County	2/3/2022	0	0	\$0	\$0
Hays County	2/12/2022	0	0	\$0	\$0
Hays County	1/30/2023	0	0	\$0	\$0
Hays County	2/1/2023	0	0	\$2,400,000	\$0
TOTALS		0	0	\$2,670,631	

Table 17-4. Historical Winter Storm Events Summary, 1996-2023

JURISDICTION	NUMBER OF EVENTS	DEATHS	INJURIES	PROPERTY DAMAGES	CROP DAMAGES
Hays County	26	0	0	\$2,670,631	\$0

Based on the list of historical winter storm events for the City of San Marcos, eleven of the events have occurred since the 2018 Plan.

SIGNIFICANT EVENTS

February 1 – 2, 2023 – Hays County – Texas Severe Winter Storm (DR-4705-TX)

A cold front brought a shallow layer of cold air. Warm, moist southeasterly flow above this cold air produced light freezing rain and freezing drizzle for several days. The freezing rain began around 1 pm on January 30th and continued off and on through February 2nd. The ice brought down trees and tree branches in Wimberley and Dripping Springs. The cost of property damage was estimated at \$2.4 million. The Pedernales Electric Cooperative, which provides electricity to parts of Hays County, reported \$13 million in damage.

February 11 – 20, 2021 – Hays County - Winter Storm Uri (DR-4586)

Winter Storm Uri was one of the most impactful winter events in the state's history. The winter storm event lasted a week and brought snow, sleet, and freezing rain to the South Central Texas area. Within the San Marcos area, freezing drizzle caused bridges to ice over, with multiple vehicle collisions and a thin sheet of ice on several roads in the area. A portion of I-35 was closed due to icing and multiple accidents. Following the ice event, snow fell on the 14th and 15th with total snowfall ranging from 4.0 to 7.0 inches within the San Marcos area.

Impacts on infrastructure from the storm included power outages lasting longer than four days, frozen interior and exterior pipes, loss of running water, and impassable road due to snow and ice. The storm took an emotional toll on residents, many who were experiencing compounding crisis events with the ongoing Covid-19 pandemic.

SECTION 17: WINTER STORM

Fatalities across the state were attributed to hypothermia, vehicle accidents, carbon monoxide poisoning, and chronic medical conditions complicated by a lack of electricity over several days.⁴ Statewide, more than 69 percent of households lost power at some point during the event, with average disruptions lasting 42 hours, 21 of which were consecutive. Water service was also disrupted with 49 percent of households losing running water with an average disruption of 52 hours.⁵

January 15, 2007 – Hays County

South Central Texas experienced a strong cold front, with temperatures ranging from the mid-30s to just below freezing, and at the same time, an upper-level disturbance began to approach South Texas from the southwest. Light precipitation from the upper-level system began causing it to freeze with reports indicating approximately 1 to 2 inches of snowfall. The serious problems were associated with coatings of freezing rain and drizzle with hundreds of accidents reported on interstate highways as well as city and rural roads, causing additional closures and problems. Within Hays County, most roads and bridges, as well as schools and businesses, were closed across the county. The City of San Marcos estimated its cost for overtime and crews at \$182,897 (2023 dollars).

PROBABILITY OF FUTURE EVENTS

According to historical records, Hays County and the City of San Marcos have experienced 26 winter storm events over a 27.5-year reporting period. The probability of a future winter storm event affecting the City of San Marcos planning area is “Highly Likely,” with a winter storm likely to occur within the next year. See additional information on climate change at the end of this section.

VULNERABILITY AND IMPACT

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 for long periods.

An economic impact may occur due to 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.

The City of San Marcos identified the following critical facilities as assets that are considered the most important to the planning area and are susceptible to a range of impacts caused by winter storm events.

⁴ Stewart, Shelby. “Remembering Houston’s Deep Freeze of 2021”. Houstonia Magazine. December 21, 2022. <https://www.houstoniamag.com/news-and-city-life/houston-storm-uri-deep-freeze-february-2021>

⁵ Donald, Jess. “Winter Storm Uri. The Economic Impact of the Storm”. October 2021. FiscalNotes. Texas Comptroller of Public Accounts. <https://comptroller.texas.gov/economy/fiscal-notes/2021/oct/winter-storm-impact.php>

SECTION 17: WINTER STORM

Table 17-5. Critical Facilities Vulnerable to Winter Storm Events

CRITICAL FACILITIES	POTENTIAL IMPACTS
1 EOC, 6 Fire Stations, 3 Police Stations	<ul style="list-style-type: none"> Emergency operations, services and response times may be significantly impacted due to power outages, and/or loss of communications. Exposure to extreme cold can cause illnesses in first responders if exposed for a period of time. Roads may become impassable due to snow and/ice impacting response times by emergency services. It may also hinder emergency services personnel's ability to report for duty. Extended power outages due to increased usage may lead to possible looting, destruction of property, and theft, further burdening law enforcement resources. Emergency response apparatuses are not designed for cold temperatures or winter storm events and may not be operable during events.
9 Government Buildings, 2 Recreation Centers	<ul style="list-style-type: none"> Power outages due to increased usage could disrupt critical care. Backup power sources could be damaged. Increased number of patients due to exposure to cold temperatures could lead to a strain on staff. Water pipes can freeze and burst leading to flooding within facilities.
1 Airport	<ul style="list-style-type: none"> Facilities, infrastructure, or critical equipment including communications may be damaged, destroyed or otherwise inoperable. Essential supplies like medicines, water, food, and equipment deliveries may be delayed. Economic disruption due to power outages negatively impacting airport services as well as area businesses reliant on airport operations. Exposure risks to outdoor workers.
1 Water Plant, 1 Wastewater Treatment Plants, 46 Lift Stations, 64 Water Infrastructure and Facilities	<ul style="list-style-type: none"> Wastewater and drinking water facilities and infrastructure may be damaged or destroyed resulting in service disruption or outage for multiple days or weeks. Disruptions and outages impact public welfare as safe drinking water is critical. A break in essential and effective wastewater collection and treatment is a health concern, potentially spreading disease. Exposure to untreated wastewater is harmful to people and the environment. Any service disruptions can negatively impact or delay emergency management operations.

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, especially in the neighborhoods with older housing stock. Of all occupied housing units in the city, 65 percent depend on electricity to heat their homes. 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. In addition, populations living below the poverty level may not be able to afford to run heat on a regular basis or extend period of time.

SECTION 17: WINTER STORM

Population over 65 and under the age of 5 in the City of San Marcos is estimated at 13 percent of the total population, or an estimated total of 8,442 potentially vulnerable residents in the planning area based on age. An estimated 30.6 percent of the planning area population live below the poverty level.

Older homes tend to be more vulnerable to the impacts of winter storm events, with 24 percent of the units in the city being built before 1980. Of occupied housing units, 74 percent are renter occupied. Renters can face more challenges with recovery following an event including home repairs or implementing personal mitigation measures before an extreme cold event. Students attending Texas State University, many of which are likely to be renters, are also a vulnerable population within the City of San Marcos.

Table 17-6. Structures at Greater Risk of Winter Storm Events⁶

JURISDICTION	HOUSING UNITS BUILT BEFORE 1980	RENTER OCCUPIED UNITS
City of San Marcos	6,772	18,990

Table 17-7. Populations at Greater Risk of Winter Storm Events⁷

JURISDICTION	YOUTH (UNDER 5)	ELDERLY (OVER 65)	POPULATION BELOW POVERTY LEVEL
City of San Marcos	2,408	6,034	15,858

Historic loss, in 2023 dollars, is estimated at \$2,670,631 in damages over the 27.5-year recording period giving an approximate loss of \$97,114 in damages annually (Table 17-8). The potential severity of impact for Hays County and the City of San Marcos County planning area is “Limited” with injuries treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10 percent of property destroyed or with major damage.

Table 17-8. Winter Storm Event Damage Totals, 1996-2023

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Hays County	\$2,670,631	\$97,114

ASSESSMENT OF IMPACTS

The greatest risk from a winter storm hazard is to public health and safety. The impact of climate change could produce longer, more intense winter storm events, exacerbating the current winter storm impacts. Worsening winter storm conditions can be frequently associated with a variety of impacts, including:

⁶ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.
⁷ US Census Bureau American Community Survey Five-Year Estimates 2017-2021 data for the City of San Marcos.

SECTION 17: WINTER STORM

- Vulnerable populations, particularly the elderly (9.3 percent of total population) and children under 5 (3.7 percent of total population), can face serious or life-threatening health problems from exposure to extreme cold including hypothermia and frostbite.
- Loss of electric power or other heat source can result in increased potential for fire injuries or hazardous gas inhalation because residents burn candles for light or use fires or generators to stay warm.
- Response personnel, including utility workers, public works personnel, debris removal staff, tow truck operators, and other first responders, are subject to injury or illness resulting from exposure to extreme cold temperatures.
- Response personnel would be required to travel in potentially hazardous conditions, elevating the life safety risk due to accidents and potential contact with downed power lines.
- Operations or service delivery may experience impacts from electricity blackouts due to winter storms.
- Power outages are possible throughout the planning area due to downed trees and power lines and/or rolling blackouts.
- Critical facilities without emergency backup power may not be operational during power outages.
- Emergency response and service operations may be impacted by limitations on access and mobility if roadways are closed, unsafe, or obstructed.
- Hazardous road conditions will likely lead to increases in automobile collisions, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by ice and snow events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A winter storm event could lead to tree, shrub, and plant damage or death.
- Severe cold and ice could significantly damage vegetation in city parks.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to impacts of winter storm events. In the City of San Marcos, 24 percent of homes were built before 1980. Additionally, 40 buildings and sites in the city are on the National Register of Historic Places, many of which pre-date modern building codes.
- Schools may be forced to shut early due to treacherous driving conditions.
- Exposed water pipes may be damaged by severe or late season winter storms at both residential and commercial structures, causing significant damages.

The economic and financial impacts of winter weather on the community will depend on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by businesses and the community will also contribute to the overall economic and financial conditions in the aftermath of a winter storm event.

SECTION 17: WINTER STORM

CLIMATE CHANGE CONSIDERATIONS

Climate change is expected to reduce the number of extreme cold events statewide but increase in the variability of events.⁸ Extreme cold events will continue to be possible but overall winters are becoming milder, and the frequency of extreme winter weather events are decreasing due to the warming of the Arctic and less extreme cold air coming from that region.⁹ A trend that is expected to continue with winter extremes estimated to be milder by 2036 compared to extremes in the historic record.¹⁰

⁸ Fourth National Climate Assessment. Chapter 23 Southern Great Plains. U.S. Global Change Program. 2018.

⁹ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.

¹⁰ Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036, Texas A&M University Office of the Texas State Climatologist, 2021 update.



SECTION 18 MITIGATION STRATEGY

SECTION 18: MITIGATION STRATEGY

Mitigation Goals	1
Goal 1.....	1
Goal 2.....	1
Goal 3.....	2
Goal 4.....	2
Goal 5.....	2
Goal 6.....	3

MITIGATION GOALS

Based on the results of the risk and capability assessments, the Planning Team developed and prioritized the mitigation strategy. This involved utilizing the results of both assessments and reviewing the goals and objectives that were included in the previous 2018 Plan. At the Mitigation Workshop in July 2023, Planning Team members reviewed the mitigation strategy from the previous 2018 Plan. The consensus among all members present was that the strategy developed for the 2018 Plan did not require changes, as it identified overall improvements to be sought in the Plan Update. However, the order and priority of the goals and objectives were reorganized.

GOAL 1

Protect public health and safety.

OBJECTIVE 1.1

Advise the public about health and safety precautions to guard against injury and loss of life from hazards.

OBJECTIVE 1.2

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

OBJECTIVE 1.3

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

OBJECTIVE 1.4

Protect critical facilities and services.

GOAL 2

Build and support local capacity and commitment to continuously become less vulnerable to hazards.

OBJECTIVE 2.1

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

OBJECTIVE 2.2

Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

OBJECTIVE 2.3

Build hazard mitigation concerns into county, city, and ISD planning and budgeting processes.

SECTION 18: MITIGATION STRATEGY



GOAL 3

Increase public understanding, support, and demand for hazard mitigation.

OBJECTIVE 3.1

Heighten public awareness regarding the full range of natural and man-made hazards the public may face.

OBJECTIVE 3.2

Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards and increase individual efforts to respond to potential hazards.

OBJECTIVE 3.3

Publicize and encourage the adoption of appropriate hazard mitigation measures.

GOAL 4

Protect new and existing properties.

OBJECTIVE 4.1

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

OBJECTIVE 4.2

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

OBJECTIVE 4.3

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

GOAL 5

Maximize the resources for investment in hazard mitigation.

OBJECTIVE 5.1

Maximize the use of outside sources of funding.

OBJECTIVE 5.2

Maximize participation of property owners in protecting their properties.

OBJECTIVE 5.3

Maximize insurance coverage to provide financial protection against hazard events.

OBJECTIVE 5.4

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

SECTION 18: MITIGATION STRATEGY

GOAL 6

Promote growth in a sustainable manner.

OBJECTIVE 6.1

Incorporate hazard mitigation activities into long-range planning and development activities.

OBJECTIVE 6.2

Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

OBJECTIVE 6.3

Utilize regulatory approaches to prevent creation of future hazards to life and property.



SECTION 19 PREVIOUS ACTIONS

SECTION 19: PREVIOUS ACTIONS

Summary	1
City of San Marcos.....	2

SUMMARY

Planning Team members were given copies of the previous mitigation actions submitted in the 2018 Plan at the mitigation workshop. The City of San Marcos reviewed the previous actions and provided an analysis as to whether the action had been completed, should be deferred as an ongoing activity, or be deleted from the Plan Update. The actions from the 2018 Plan are included in this section as they were written in 2018, with the exception of the “2024 Analysis” section.

SECTION 19: PREVIOUS ACTIONS

CITY OF SAN MARCOS

City of San Marcos – Action #1	
Proposed Action:	Promote Flood Insurance in the Community: Placing National Flood Insurance Program information brochures in City Hall.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	The cost and labor required to promote the NFIP is negligible. The benefit is difficult to estimate.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Existing staff
Potential Funding Sources:	Existing staff / in-kind services, free brochures from FEMA
Lead Agency/Department Responsible:	City of San Marcos Emergency Management, Floodplain Administration
Implementation Schedule:	1 month

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #2	
Proposed Action:	Acquisition or Elevation of Repetitive Loss Properties: As of 09/2016, San Marcos has 110 RL properties that need mitigation to reduce the over \$9.1 million in payments that have been made.
BACKGROUND INFORMATION	
Site and Location:	110 Properties within the City
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Cost effectiveness for these acquisitions or elevations are determined on a per structure or project basis.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	The estimated acquisition cost is \$100,000 per structure (\$11 million total for 110 structures). The estimated cost to elevate a residential structure a total of 3 feet in a shallow flooding area is \$30,000 per structure (\$3.3 million total for 110 structures).
Potential Funding Sources:	FEMA, TDEM, TWDB, GLO, Hays County
Lead Agency/Department Responsible:	City of San Marcos City Council
Implementation Schedule:	48 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #3	
Proposed Action:	Increase of Warning Signs and Barricades at Low Water Crossings: Increase number of barricades for low water crossings.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This item would only take the amount of time / labor required to amend an ordinance within the city. The benefit would be for substantially improved or new development.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Potential Funding Sources:	Funding for cost share: in-kind services
Lead Agency/Department Responsible:	City of San Marcos City Council
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #4	
Proposed Action:	Attend Advanced Local Floodplain Management Courses: Send certified member of staff to advanced courses.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	If attending the course at the Emergency Management Institute, the cost of the course would be very low, and only include a minimal meal ticket purchase. The benefit of an informed floodplain administrator would help both new and existing residents through guidance on how to mitigate flood damages to development.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing staff, cost of accommodations for FEMA training off-site
Potential Funding Sources:	Existing staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Floodplain Management
Implementation Schedule:	6 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #5	
Proposed Action:	Improve Flood Warning Systems: Enhancing stream flow gage network by increasing number of gages throughout community by at least six.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This action promotes public safety services through enhancing the communities existing method of detecting flooding.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Potential Funding Sources:	Existing staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	Phase over 60 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #6	
Proposed Action:	Storm Ready Designation from National Weather Service: Application for designation that classifies community's level of preparedness for severe weather and storms.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	There is a high level of effort to complete the application, however no other cost applies. The level of increased preparedness would benefit the entire population.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Severe Winter Weather, Lightning, Hailstorm, Windstorm, Tornado, Floods, Hurricane/Tropical Storm
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing staff
Potential Funding Sources:	Existing staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	6 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #7	
Proposed Action:	Increase Public Awareness of Hazard Mitigation: Public awareness campaign of providing natural hazard mitigation information and guidance for citizens on the city website, with links to HaysInformed.com also being included.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	There is minimal cost and labor required to make this enhancement to the existing San Marcos City website.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Severe Winter Storm, Lightning, Hailstorm, Windstorm, Tornado, Expansive Soils, Flood, Hurricane/Tropical Storm, Earthquake, Dam/Levee Failure, Wildfire
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing staff/ in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	1 month

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #8	
Proposed Action:	Adopt Wildfire Maps from Hays County Firewise project: Formally adopt the maps created through the Hays County application for Firewise designation in order to begin to control development in accordance with the avoidance of hazard areas, or development with consideration of proper mitigation.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	The benefit of mitigating against wildfire for future development as well as for instituting fire mitigation in existing areas of development greatly saves the community from the costs of potential damages. Reducing risk to existing buildings / infrastructure.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Priority (High, Moderate, Low):	Low
Estimated Cost:	Existing staff
Potential Funding Sources:	Existing staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Fire Marshal's Office in coordination with Hays County Fire Marshal's office
Implementation Schedule:	6 months
2024 ANALYSIS:	
Defer to Plan Update.	

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #9	
Proposed Action:	Coordination of marketing Large Item Pick-up day for Wildfire Mitigation: Enhancement of existing large item pick-up to emphasize the wildfire mitigation benefits of cleaning brush and overgrown lots.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This slight change to marketing an existing event would likely lessen the risk for wildland fire for residents located within the Wildland Urban Interface.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire, Lightning, Windstorm, Tornado
Priority (High, Moderate, Low):	Low
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Public Works
Implementation Schedule:	2 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #10	
Proposed Action:	Drought Monitoring Program: Provide widget on City homepage that provides the latest US Drought Monitor conditions for the day.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	It is more cost effective to establish additional evacuation routes than other mitigation alternatives.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management Coordinator
Implementation Schedule:	6 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #11	
Proposed Action:	Evacuation Plans/Alternate Road Considerations: Documentation of an evacuation plan that includes multiple exits for leaving the community.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	It is more cost effective to establish additional evacuation routes than other mitigation alternatives.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane/Tropical Storm, Flood, Dam/Levee Failure, Wildfire
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #12	
Proposed Action:	Soil Compaction Recommendation/Road construction using techniques to Mitigate Expansive Soils: Adoption of road techniques that require a higher level of soil compaction to mitigate expansive soils. Recommendation documents for soil compaction to lessen the possible effects of expansive soils for residential foundations.
BACKGROUND INFORMATION	
Site and Location:	Not identified in HMP
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This recommendation would add a level of protection to future development of foundations so that they mitigate against expansive soil damage.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Expansive Soils
Priority (High, Moderate, Low):	Low
Estimated Cost:	Existing Staff, cost of engineering support
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos City Hall
Implementation Schedule:	6 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #13	
Proposed Action:	Sanding Capability Enhancements: Research of methods and equipment that could be a benefit cost efficient method to increase sanding capability.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	The community already has resources for spreading sand but recognizes that the extent of sanding is limited by the current equipment. The cost alternatives would have to be weighed against the recent years' events and the number of ice days that were experienced during which City roads were impassable.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Severe Winter Weather
Priority (High, Moderate, Low):	Low
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Public Works
Implementation Schedule:	12 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #14	
Proposed Action:	Adoption of Ordinance for Public Land Use Risk Assessment Reviews: Ordinance update to require any public facility location be reviewed against hazard area layers in order to require location selections consider the safest possible locations, with applicable mitigation standards required during development permitting for increased resilience against relevant hazards.
BACKGROUND INFORMATION	
Site and Location:	City-wide public facilities
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This enhancement to existing permitting and review processes is an action that would save the community from potential losses related to hazards that affect critical facilities and infrastructure that all citizens depend upon for services.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Earthquake, Wildfire, Expansive Soils, Dam/Levee Failure
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Planning in coordination with Emergency Management Coordinator
Implementation Schedule:	6 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #15	
Proposed Action:	Adoption of Ordinances for Public Building Structural Engineering Reviews: Ordinance update to require any public facility building plan be structurally reviewed and enforce highest possible building code levels that increase resiliency against natural hazards.
BACKGROUND INFORMATION	
Site and Location:	City-wide public facilities
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This enhancement to existing permitting and review processes is an action that would save the community from potential losses related to hazards that affect critical facilities and infrastructure that all citizens depend upon for services.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado, Windstorm, Flood, Hurricane/Tropical Storm, Wildfire, Earthquake, Hailstorm, Severe Winter Storms, Lightning
Priority (High, Moderate, Low):	High
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Planning
Implementation Schedule:	6 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #16	
Proposed Action:	Dam Safety Tabletop Exercise Program: Coordination with dam custodians in order to exercise evacuation and emergency procedures. Make inundation maps public.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	The majority of the labor and cost for this effort would be covered by the owner of the dam. The benefit would be an increased familiarity with the evacuation procedures and expectations that will result in safer conditions for citizens and visitors.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam/Levee Failure
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff resources / in-kind services
Potential Funding Sources:	San Marcos and USACE
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	12 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #17	
Proposed Action:	Sessom Creek Improvements: Existing CIP project that would improve drainage off Sessom Creek.
BACKGROUND INFORMATION	
Site and Location:	Sessom Creek
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This project potentially already has funding due to its presence in the Capital Improvements Plan.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Medium
Estimated Cost:	\$300,000
Potential Funding Sources:	CIP Budget
Lead Agency/Department Responsible:	City of San Marcos Engineering
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #18	
Proposed Action:	Adoption of Homelessness Study Results: Adoption of homelessness study proposed in San Marcos Comprehensive Plan, in order to plan for mitigation measures that serve this vulnerable population.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This existing effort is planned for and adopted as an action for the community. The adoption of the resulting report will not cost any funds. The benefits will be serving the vulnerable homeless population.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Severe Winter Storms, Lightning, Hailstorm, Windstorm, Tornado, Flood, Hurricane/Tropical Storm, Earthquake, Dam/Levee Failure, Wildfire
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Existing Staff
Potential Funding Sources:	Existing Staff / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Mitigation Planning Committee
Implementation Schedule:	6 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #19	
Proposed Action:	Extension of River Ridge Parkway West: Action R11 of the San Marcos Transportation Plan, this action will increase the ability to divert traffic during flooding events.
BACKGROUND INFORMATION	
Site and Location:	River Ridge Parkway West
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This is a project from an existing community plan that likely already has dedicated funding for completion.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,743,000
Potential Funding Sources:	Transportation Budget
Lead Agency/Department Responsible:	City of San Marcos Engineering
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #20	
Proposed Action:	Land Conservation for Aquifer Recharge: The preservation of land in flood-prone areas and in the 1% floodplain will help mitigate flooding by reducing the amount of impervious surfaces and allowing more recharge and infiltration of water during rain events.
BACKGROUND INFORMATION	
Site and Location:	Land in flood-prone areas and in 1% floodplain
Risk Reduction Benefit: (Current Cost/Losses Avoided)	This effort would integrate benefits to not only San Marcos, but to other parts of the county and areas that are served by the aquifer. The benefits would be significant, and the natural conservation effort would receive consideration during benefit cost analysis.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Depending on Cost Per Acre as land is acquired
Potential Funding Sources:	Local, State, Federal, Non-government and other source
Lead Agency/Department Responsible:	City of San Marcos Engineering, Floodplain Administrator and Parks Department
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #21	
Proposed Action:	Regional Detention / Water Quality Strategy: Strategy design to mitigate drought and flooding by use of regional detention.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Existing plan item for comprehensive plan, this project is likely to receive City funding.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Drought
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	Stormwater Budget
Lead Agency/Department Responsible:	City of San Marcos Engineering
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #22	
Proposed Action:	Cooling Plan Development and Implementation: Evaluate the risks presented by excessive heat and humidity, especially in terms of high-risk populations such as the elderly or low income. Pursue the possibility of local churches serving as cooling stations during extreme heat event.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Cost-effective and beneficial in minimizing injuries during extreme heat events.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat
Priority (High, Moderate, Low):	Low
Estimated Cost:	None
Potential Funding Sources:	Existing staff resources / in-kind services
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	12 months

2024 ANALYSIS:
Completed.

SECTION 19: PREVIOUS ACTIONS

City of San Marcos – Action #23	
Proposed Action:	Purchase and Installation of Generators for Temporary Sheltering Efforts: Purchase and installation of generators for temporary sheltering efforts in all public facilities capable of housing citizens.
BACKGROUND INFORMATION	
Site and Location:	City-wide public facilities
Risk Reduction Benefit: (Current Cost/Losses Avoided)	If grant funding is eligible, the cost/benefit of this project would have to be positive
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Severe Winter Storms, Lightning, Hailstorm, Winter Storm, Tornado, Flood, Hurricane/Tropical Storm, Earthquake, Dam/Levee Failure, Wildfire
Priority (High, Moderate, Low):	Medium
Estimated Cost:	Existing staff / in-kind services, grant writing assistance
Potential Funding Sources:	Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	City of San Marcos Emergency Management
Implementation Schedule:	18 months

2024 ANALYSIS:
Defer to Plan Update.



SECTION 20 MITIGATION ACTIONS

SECTION 20: MITIGATION ACTIONS

Summary	1
City of San Marcos.....	3
City of San Marcos Green Initiative Projects	43

SUMMARY

As discussed in Section 2, at the mitigation workshop the planning team and stakeholders met to develop mitigation actions for each of the natural hazards included in the Plan Update. Each of the actions in this section were prioritized based on FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criteria necessary for the implementation of each action.

As part of the economic evaluation of the STAPLEE analysis, jurisdictions analyzed each action in terms of the overall costs, measuring whether the potential benefit to be gained from the action outweighed costs associated with it. As a result of this exercise, priority was assigned to each mitigation action by marking them as High (H), Moderate (M), or Low (L). An action that is ranked as "High" indicates that the action will be implemented as soon as funding is received. A "Moderate" action is one that may not be implemented right away depending on the cost and number of residents served by the action. Actions ranked as "Low" indicate that they will not be implemented without first seeking grant funding and after "High" and "Moderate" actions have been completed.

The City of San Marcos is committed to identifying feasible green infrastructure solutions to be included in the Hazard Mitigation Action Plan. Adopting and implementing long term nature-based mitigation solutions will assist the city in meeting its mitigation goals and objectives while reducing the carbon footprint of the city where possible. Natural-based solutions are sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience. The Planning Team identified additional projects highlighted below to enhance the resilience within the City of San Marco's planning area. Please see Appendix I for the Green Initiatives and Resiliency Toolkit.

Within each mitigation action worksheet, the Planning Team considered all potential funding sources that could be utilized to implement the proposed project. To ensure all potential funding resources are considered and are not limited to those sources identified within the action worksheet, please see Appendix G for a list of all available state and federal grant programs as of 2023. The Planning Team will continue to seek out other available funding sources during the five-year cycle as notices of funding opportunity (NOFO) are released.

All mitigation actions created by Planning Team members are presented in this section in the form of Mitigation Action Worksheets. More than one hazard is sometimes listed for an action, if appropriate. Actions presented in this section represent a comprehensive range of mitigation actions per current state and FEMA Guidelines, including two actions, per hazard, and of two different types.

SECTION 20: MITIGATION ACTIONS

Table 20-1. City of San Marcos Mitigation Action Matrix

TYPE OF ACTION													
Action #1 – Plans/Regulations (Blue)							Action #4 – Structural (Orange)						
Action #2 – Education/Awareness (Red)							Action #5 – Preparedness/Response (Black)						
Action #3 – Natural Systems Protections (Green)													
Jurisdiction	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	Hail	Hurricane / Tropical Storm	Lightning	Thunderstorm Wind	Tornado	Wildfire	Winter Storm
City of San Marcos	XX XX	XX XX	XX XX	XX X	XX XX	XX XX	XX XX	XX XX	XX XX	XX XX	XX XX	XX XX	XX XX

SECTION 20: MITIGATION ACTIONS

CITY OF SAN MARCOS

City of San Marcos – Action #1	
Proposed Action:	Encourage drought-tolerant landscape design through measures such as: Incorporating drought tolerant or xeriscape practices into landscape ordinances to reduce dependence on irrigation.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Enhances water conservation for private and city-owned properties by reducing the amount of stress placed on the aquifer during drought conditions.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Addition to City Ordinances

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #2	
Proposed Action:	<p>Encourage community to take water-saving measures, such as the following:</p> <p>Installing low-flow water-saving showerheads and toilets.</p> <p>Turning water flow off while brushing teeth or during other cleaning activities.</p> <p>Adjusting sprinklers to water the lawn and not the sidewalk or street.</p> <p>Running the dishwasher and washing machine only when they are full.</p> <p>Checking for leaks in plumbing or dripping faucets.</p> <p>Installing rain-capturing devices for irrigation.</p> <p>Encouraging the installation of graywater systems in homes to encourage water reuse.</p>
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the amount of stress placed on the aquifer during drought conditions.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on new/existing buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$25,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #3	
Proposed Action:	Increase earthquake awareness: Developing a bilingual outreach program about earthquake risk and mitigation activities in homes, schools, and businesses. Educating community members and property owners on safety techniques to follow during and after an earthquake.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	While the chance of such an event is low, there is a fault line that exists below the city. In the event a minor earthquake occurs many people would not know what actions to take. This campaign would allow for a base knowledge for the residents as to what actions to take in the event of such an incident.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Earthquake
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$10,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #4	
Proposed Action:	Provide bilingual information on structural and non-structural retrofitting: Developing a technical assistance information program for community members and property owners. Teaching them how to seismically strengthen their houses can be an effective mitigation activity. The program can include providing local government building departments with copies of existing strengthening and repair information for distribution.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	While the chance of such an event is low, there is a fault line that exists below the city. In the event a minor earthquake occurs minimal actions to mitigate damages to structures would be of great benefit.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Earthquake
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #5	
Proposed Action:	Reduce Urban Heat Island Effect: Increasing tree plantings around buildings to shade parking lots and along public rights-of-way. Encouraging installation of green roofs, which provide shade and remove heat from the roof surface and surrounding air. Using cool roofing products that reflect sunlight and heat away from a building.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the effects of extreme heat as urban areas develop forming an "island" of heat. This would allow for the reduction of the temperature in the city caused by extreme heat that is compounded by what is called a "heat island".
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Addition to City Ordinances

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #6	
Proposed Action:	Increase awareness of extreme heat risk and safety: Provide bilingual education to the community regarding the signs and symptoms of heat exhaustion/stroke and how to avoid becoming a victim of these maladies.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduce demand on emergency response personnel and hospital system.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #7	
Proposed Action:	Increase awareness of extreme cold risk and safety: Provide bilingual education to the community regarding the signs and symptoms of hypothermia and how to avoid becoming victims.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduce demand on emergency response personnel and hospital system.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #8	
Proposed Action:	Protect buildings from hail damage for new buildings and retrofitting existing buildings: Including measures such as structural bracing, shutters, laminated glass in windowpanes, and hail-resistant roof coverings or flashing in building design to minimize damage. Improving roof sheathing to prevent hail penetration. Installing hail resistant roofing and siding.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduction of damage due to hailstorms that could cost community members, property owners, business owners, and the city millions of dollars.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduces risk to new and existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #9	
Proposed Action:	Increase Hail Risk Awareness: Mailing bilingual safety brochures with monthly water bills. Posting bilingual warning signage at local parks, special events, and other outdoor venues. Teaching school children about the dangers of hail and how to take safety precautions.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduce demand on emergency response personnel and hospital system.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #10	
Proposed Action:	Protect critical facilities and equipment: Installing lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities. Installing and maintaining surge protection on critical electronic equipment.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduction of damages to critical infrastructure due to lightning strikes.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security, Transportation
Effect on New/Existing Buildings:	Reduce risk to new and existing structure and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #11	
Proposed Action:	Conduct bilingual lightning awareness programs.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduce demand on emergency response personnel and hospital system.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #12	
Proposed Action:	<p>Retrofit public buildings and critical facilities: Improving roof coverings (e.g., no pebbles, remove ballast roof systems). Anchoring roof-mounted heating, ventilation, and air conditioning units. Retrofitting buildings with load-path connectors to strengthen the structural frames. Requiring upgrading of reused buildings that will house critical facilities. Protecting traffic lights and other traffic controls from high winds. Converting traffic lights to mast arms.</p>
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	<p>Reduce the risk of injuries and fatalities. Reduction of damage to public and critical infrastructures due to high winds.</p>
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Thunderstorm Wind
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	<p>Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS</p>
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #13	
Proposed Action:	Increase thunderstorm wind risk awareness: Provide bilingual education to community members and property owners regarding benefits of wind retrofits. Educate design professionals to include wind mitigation during new building designs.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduction of damage to public and critical infrastructures due to high winds.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Thunderstorm Wind
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #14	
Proposed Action:	Require wind-resistant building techniques: Structural bracing Straps and clips Anchor bolts Laminated or impact-resistant glass Reinforced pedestrian and garage doors Window shutters Waterproof adhesive sealing strips Interlocking roof shingles
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduction of damage to public and critical infrastructures due to tornados
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$500,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Office of Emergency Management / GMO
Incorporation into Existing Plans:	Addition to City Ordinances

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #15	
Proposed Action:	Conduct bilingual tornado awareness activities: Educate community via social media outlets. Distribution of tornado risks / hazards and other information.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce the risk of injuries and fatalities. Reduce demand on emergency response personnel and hospital system.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #16	
Proposed Action:	Promote safer development in the future to ensure that life and property are uniformly protected from wildfire risk.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk to residents, reduce on-going repair costs, continue essential services in the event of a wildfire incident.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication, Safety/Security
Effect on New/Existing Buildings:	Reduce risk to future structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	San Marcos Fire Department & Office of Emergency Management
Implementation Schedule:	Within 3 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:
Collaborate with entities in the area that have adopted WUI codes and the fire department to determine the best approach to adopt these regulations.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #17	
Proposed Action:	Improving the city's ability to provide temporary sheltering services.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damage at critical facilities; Reduce burden on emergency services during and after an event; Reduce risk of injury to residents and vulnerable populations by ensuring shelter during and after an event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Office of Emergency Management & Public Works
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan; Capital Improvement Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety. Protects infrastructure, reduces cost of reparation, and prevents injuries and fatalities.

SECTION 20: MITIGATION ACTIONS

City of San Marcos– Action #18	
Proposed Action:	Acquisition or Elevation of Repetitive Loss Properties.
BACKGROUND INFORMATION	
Site and Location:	110 Properties in the city-limits (Specific locations not to be identified within HMP)
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Eliminate risk of flood damages to high-risk structures and prevent future losses in high-risk flood hazard areas; Reduce downstream impacts associated with development in the floodplain; Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure Natural Systems Protection (vacant land)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane/Tropical Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	Acquisition cost is \$100,000 per structure Elevation \$30,000 per structure
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Office of Emergency Management & Floodplain Administrator
Implementation Schedule:	Within 5 years of plan adoption, as funding becomes available
Incorporation into Existing Plans:	Floodplain Ordinance; Capital Improvement Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #19	
Proposed Action:	Increase of Warning Signs and Barricades at Low Water Crossings: Increase number of barricades for low water crossings.
BACKGROUND INFORMATION	
Site and Location:	City-wide low water crossings
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promote hazard awareness and protect residents from potential injuries and damage. Reduce risk to residents through improved communications and warning notification.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 2 years of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #20	
Proposed Action:	Improve Flood Warning Systems: Enhancing stream flow gauge network by increasing number of gauges throughout community by at least six.
BACKGROUND INFORMATION	
Site and Location:	City-wide low water crossings
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promote hazard awareness and protect residents from potential injuries and damage. Reduce risk to residents through improved communications and early warning.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$120,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption; Phase project.
Incorporation into Existing Plans:	Floodplain Management Plan; Capital Improvement Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #21	
Proposed Action:	Adopt Wildfire Maps from Hays County Firewise project: Formally adopt the maps created through the Hays County application for Firewise designation in order to begin to control development in accordance with the avoidance of hazard areas, or development with consideration of proper mitigation.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of wildfires and the spread of wildfire for existing and future development practices. Reduces risk of damage and injuries.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Fire Marshal's Office in coordination with Hays County Fire Marshal's office
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	CWPP

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #22	
Proposed Action:	Drought Monitoring Program: Monitoring and inclusion of drought water conservation measures: Provide widget on City homepage that provides the latest US Drought Monitor conditions for the day.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce impacts of drought through water conservation thereby reducing potential injury or fatalities to vulnerable population and reducing risk to property damage.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$10,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 2 years of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #23	
Proposed Action:	Evacuation Plans/Alternate Road Considerations: Documentation of an evacuation plan that includes multiple exits for leaving the community.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk residents through improved evacuation alternatives and awareness efforts.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Flood, Hurricane/Tropical Storm, Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication, Transportation
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 2 years of plan adoption
Incorporation into Existing Plans:	Evacuation Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #24	
Proposed Action:	Soil Compaction Recommendation/Road construction using techniques: Adoption of road techniques that require a higher level of soil compaction to mitigate expansive soils. Recommendation documents for soil compaction to lessen the possible effects of expansive soils for residential foundations.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk to structures and infrastructure due to expansive soils by maintaining adequate soil moisture.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Expansive Soils
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication
Effect on New/Existing Buildings:	Reduces risk to future structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$10,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	City Administration and Council
Implementation Schedule:	Within 5 years of plan adoption
Incorporation into Existing Plans:	Addition to City Ordinances

COMMENTS:

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #25	
Proposed Action:	Sessom Creek Improvements: Existing CIP project that would improve drainage off Sessom Creek.
BACKGROUND INFORMATION	
Site and Location:	Sessom Creek
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity. Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduces risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$300,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works & Engineering
Implementation Schedule:	Within 2-3 years of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #26	
Proposed Action:	Extension of River Ridge Parkway West: Action R11 of the San Marcos Transportation Plan, this action will increase the ability to divert traffic during flooding events.
BACKGROUND INFORMATION	
Site and Location:	River Ridge Parkway West
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity; Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduces risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,743,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works & Engineering
Implementation Schedule:	Within 2-3 years of plan adoption
Incorporation into Existing Plans:	Transportation Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #27	
Proposed Action:	Land Conservation for Aquifer Recharge: The preservation of land in flood-prone areas and in the 1% floodplain will help mitigate flooding by reducing the amount of impervious surfaces and allowing more recharge and infiltration of water during rain events.
BACKGROUND INFORMATION	
Site and Location:	City-wide land in flood-prone areas and within the floodplain
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the number of impervious surfaces and allowing for more recharge and infiltration of water during rain events.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduces risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000 (Depending on Cost Per Acre as land is acquired)
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works & Engineering, Floodplain Administrator and Parks Department
Implementation Schedule:	Within 2-3 years of plan adoption
Incorporation into Existing Plans:	Floodplain Management Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #28	
Proposed Action:	Regional Detention/Water Quality Strategy: Strategy design to mitigate drought and flooding by use of a regional detention.
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce flood risk through improved drainage capacity; Reduce risk of damages and injuries; Reduce emergency response demands.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduces risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works & Engineering
Implementation Schedule:	Within 1-3 years of plan adoption
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #29	
Proposed Action:	Acquire and install generators with hard-wired quick connections at all critical facilities.to promote temporary sheltering efforts: Purchase and installation of generators for temporary sheltering efforts in all public facilities capable of housing community residents.
BACKGROUND INFORMATION	
Site and Location:	City-wide critical facilities
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Provide power for critical facilities during power outages and ensure continuity of critical services.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Office of Emergency Management
Implementation Schedule:	Within 5 years of plan adoption, or as funding becomes available
Incorporation into Existing Plans:	Comprehensive Plan

COMMENTS:
CRS & WHY MITIGATION ACTION IS APPROPRIATE:
Helps ensure critical facilities continue to provide services during a power outage caused by unforeseen events.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #30	
Proposed Action:	Project ID 793: Leah Drive Extension: Extend Leah Drive 700 LF from Civic Center Loop to Cottonwood Pkwy and install 2,500 LF of 12" water from Clovis Barker to Cottonwood Pkwy per WMP #9. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Leah Drive 700 LF from Civic Center Loop to Cottonwood Pkwy; Clovis Barker to Cottonwood Pkwy per WMP #9
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity/stormwater diversion; Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Transportation
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering, Development and County; TXDOT
Implementation Schedule:	2025
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #31	
Proposed Action:	Project ID 679: Purgatory Creek Improvements Phase 1: The project addresses flood mitigation including channel modifications, H&H analysis, ROW acquisition, utility, storm drain and bridge modifications, trails, and environmental permitting. The project considers recommendations from various master plans including the Comprehensive, Stormwater, Phase 1 limits is from the San Marcos River to near Johnson Avenue. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	San Marcos River to Wonder World Drive
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity/stormwater diversion; Reduce risk of injuries to residents.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$29,677,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering and Development
Implementation Schedule:	2026
Incorporation into Existing Plans:	Capital Improvement Plan; Transportation/Greenways and Parks Master Plans

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #32	
Proposed Action:	Project ID 748: Purgatory Creek Improvements Phase 2: The project addresses flood mitigation including channel modifications, H&H analysis, ROW acquisition, utility, storm drain and bridge modifications, trails, and environmental permitting. Phase 2 project designs, permitting and right-of-way acquisition will be conducted. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Phase 2 project limits is from near Johnson Avenue to Wonder World Drive.
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity/stormwater diversion; Reduce risk of injuries to residents.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$10,750,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering and Development
Implementation Schedule:	2028-20230
Incorporation into Existing Plans:	Comprehensive, Stormwater, Transportation/Greenways and Parks Master Plans

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #33	
Proposed Action:	Project ID 173: River Ridge Extension to Post Road: Extend roadway to include bicycle lanes and sidewalks to provide accessibility to IH35, approx. 3,100 lf with railroad overpass. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	River Ridge Extension to Post Road
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk to residents through improved evacuation alternatives; improve firefighting capabilities through improved access alternatives
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Flood, Hurricane/Tropical Storm, Tornado, Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Transportation
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$10,500,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2031 - 2033
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety. Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #34	
Proposed Action:	Project ID 796: Fire Administration and Training Facility Phase 2: Complete design and construct a new Fire Administration, Logistics and Support Services, Driving Track, Technical Rescue Training Facility, and 3-Story Apartment/Hotel/Motel burn building. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Fire Administration and Training Facility
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages at critical facilities; Ensure continuity of critical services during and after event; Reduce risk of injury to emergency and critical personnel.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food, Water Shelter, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$22,950,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2025-2027
Incorporation into Existing Plans:	Training Facility Master Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety. Helps ensure critical facilities continue to provide services during an unforeseen event.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #35	
Proposed Action:	Project ID 8: Fire Department New Station – Airport: This will be a dual-purpose Airport Rescue Fire Fighting (ARFF) station and a municipal structure fire and EMS station. It will need to house specialized ARFF vehicles as well as house engine/ladder companies, an ambulance, and possibly a brush truck. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Fire Station located at airport property along SH 21
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages at critical facilities; Ensure continuity of critical services during and after event; Reduce risk of injury to emergency and critical personnel.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food, Water Shelter, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$17,510,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering and Airport (50/50 match)
Implementation Schedule:	2025-2026
Incorporation into Existing Plans:	Capital Improvement Plan
COMMENTS:	
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:	
Promotes public safety. Helps ensure critical facilities continue to provide services during an unforeseen event.	

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #36	
Proposed Action:	Project ID 771: Fire Department New Station #7 - Yarrington and IH 35: Construct new station near First year of funding for updates to design, second year for construction. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Fire Station at Yarrington and IH 35
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages at critical facilities; Ensure continuity of critical services during and after event; Reduce risk of injury to emergency and critical personnel.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food, Water Shelter, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$12,540,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue, TIRZ; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2025-2026
Incorporation into Existing Plans:	Capital Improvement Plan
COMMENTS:	
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:	
Promotes public safety. Protects infrastructure, reduces cost of reparation, and prevents injury to residents.	

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #37	
Proposed Action:	Project ID 801: Fire Station 1: Purchase land, design, and construct a new downtown Fire Station, including soft-costs. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Fire Station 1
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages at critical facilities; Ensure continuity of critical services during and after event; Reduce risk of injury to emergency and critical personnel.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food, Water Shelter, Health/Medical
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$23,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2023-2026
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Promotes public safety. Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #38	
Proposed Action:	Project ID 43: Bypass Creek Improvements: Widen bypass creek from IH 35 to SH 80. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	IH 35 to SH 80
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk of flood damages through improved drainage capacity/stormwater diversion; Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Transportation
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$135,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2028-2033
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #39	
Proposed Action:	Project ID 684: Land Acquisition for future detention/WQ/ Flood storage: Acquire land over multiple years for future stormwater detention, water quality, and flood storage improvements. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	City-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Eliminate risk of flood damages to high-risk structures and prevent future losses in high-risk flood hazard areas; Reduce downstream impacts associated with development in the floodplain; Reduce risk of injuries to residents; Reduce burden on emergency services during and after a flood event.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2028-2030
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents. Protects communities and reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #40	
Proposed Action:	Project ID 731: Wallace Addition Offsite Drainage Imps: Offsite drainage improvements. The existing Cape Road Channel as well as Staples Road ditch including culverts do not have adequate capacity to convey 25 year fully developed storm event. Cape Channel improvements, culverts upsizing and Staples Road ditch diversion via a proposed culvert under Staples Road and a channel along fish hatchery property. (See Appendix H for list of Capital Improvement Projects)
BACKGROUND INFORMATION	
Site and Location:	Wallace Addition neighborhood
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages caused by flooding by maintaining or restoring drainage capacity.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$11,525,000
Potential Funding Sources:	Texas Water Development Board (TWDB) Flood Infrastructure Funding (FIF) program will provide \$1.74M in Grant and \$4.06M in FIF Debt Financing.
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	2023-2025
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects communities and reduces risk of flooding. Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

CITY OF SAN MARCOS GREEN INITIATIVE PROJECTS

City of San Marcos – Action #41	
Proposed Action:	Explore and diversify water supplies to ensure long term needs are met. May include obtaining additional ground and surface water supplies, Aquifer Storage and Recovery (ASR) systems, ground or surface water desalination, reclaim water storage, and potable reuse.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Ensure potable water and reduces risk of water contamination.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$15,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Utilities and Conservation Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents. Promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #42	
Proposed Action:	Explore and diversify energy supplies to ensure long term needs are met. May include renewable energy systems such as solar, wind, geothermal, biomass, and hydropower.
BACKGROUND INFORMATION	
Site and Location:	Community-wide critical facilities and infrastructures.
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Provide alternative source of power for critical infrastructures and facilities during power outages and ensure continuity of critical services.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$10,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Utilities and Conservation Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Ensure critical facilities and infrastructure continue to provide services caused by unforeseen events.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #43	
Proposed Action:	Safeguard redundancy and security of the water and electric utility systems for reliability. May include conversion of existing above-ground electric lines to underground, and installation of backup power sources.
BACKGROUND INFORMATION	
Site and Location:	Community-wide critical facilities and infrastructures.
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages to infrastructure; Ensure continuity of critical services during and after event; Reduce damages associated with power outages; Reduce risk of injuries or fatalities to vulnerable populations.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$10,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; State Grants: GLO, TAMFS, TDA, TDEM, TWDB, TXDOT; Federal Grants: FEMA HMA Grants, CDBG, CDC, DOH, EDA, EPA, HUD, NFIP, NFWF, NOAA, NRCS, SBA, USACE, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Utilities and Conservation Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Ensure critical infrastructure continue to provide services caused by unforeseen events.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #44	
Proposed Action:	Support the implementation of an Urban and Community Forestry Strategic Management Plan: conduct a tree inventory and tree canopy study to develop a comprehensive Urban and Community Forestry Strategic Management Plan. The plan will guide City work, creating policy and procedures that promote greater cooperation within the city to support greenhouse gas emission management, while improving public tree management, natural landscapes and engaging and educating the community on the importance of tree cover for overall urban resilience.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the impact of carbon emissions and restore natural ecosystems.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations
MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$599,444
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; USDA Inflation-Reduction-Act-Urban-and-Community-Forestry: Inflation Reduction Act - Urban and Community Forestry
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	City was awarded, pending funding to begin work estimated 10/2/2023 through 9/30/2028
Incorporation into Existing Plans:	Sustainability Plan
COMMENTS:	
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:	
Protects community and promotes sustainability of the community.	

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #45	
Proposed Action:	Identify potential planting areas within community and public properties. Develop a program/contract/agreement with community organizations that supports the planting of trees, use of native plants and mulching throughout community public properties, and other green initiatives that would reduce the effects of urbanization and greenhouse gas emissions.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the impact of carbon emissions and restore natural ecosystems.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits, youth groups, adult programs, programs for individuals with disabilities. State Grants: GLO, TAMFS, TDA, TDEM, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
https://www.arboday.org/programs/treecityusa/
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #46	
Proposed Action:	Contract and/or hire additional arborist to help preserve trees, plan review, tree protection inspection, inspection of new tree planting.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce risk to community by providing expertise on staff to help educate and promote the importance of green initiatives and use of the natural environments in reducing the effects of hazardous events.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness – Preparedness Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$50,000 per year / per employee
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #47	
Proposed Action:	Support and expand current tree maintenance program.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduce damages to infrastructure; Ensure continuity of services during and after event; Reduce damages associated with power outages; Reduce risk of injuries or fatalities to vulnerable populations.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane/Tropical Storm, Flood, Thunderstorm Wind, Hail, Lightning, Tornado, Winter Storm, Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits, youth groups, adult programs, programs for individuals with disabilities. State Grants: GLO, TAMFS, TDA, TDEM, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Natural Area Management Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents. Promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #48	
Proposed Action:	Coordinate with local school districts and youth/camp programs to enhance their curriculum to incorporate the importance of protecting the natural environments and provide bilingual educational resources.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the impact of carbon emissions and restores natural ecosystems.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Energy
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits, ISDs, youth groups, adult programs, programs for individuals with disabilities.
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #49	
Proposed Action:	Incorporate incentives for planting more than the minimum number of trees on new developments
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the impact of carbon emissions and restores natural ecosystems.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Extreme Heat, Expansive Soils, Flood
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	10% incentive for each tree
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits.
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Natural Area Management Plan; Local Codes / Ordinances

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #50	
Proposed Action:	Incorporate green initiatives into City's local codes and ordinances such as sink water into soil landscaping design, silva cells/blue green technology, bioswales, etc.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Enhances biofiltration. Reduces risk of flood damage through improved drainage capacity by retaining stormwater naturally in the ground by moving it to the trees.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Natural Area Management Plan; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community. Reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #51	
Proposed Action:	Obtain LEED (Leadership in Energy and Environmental Design) Certification.
BACKGROUND INFORMATION	
Site and Location:	Community-wide critical facilities and new development.
Risk Reduction Benefit: (Current Cost/Losses Avoided)	LEED provides a framework for healthy, efficient, and cost-saving green buildings and promotes sustainability.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	Reduces risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Minimum charge of \$2,900. Fees for large projects it can be \$1 million or more.
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #52	
Proposed Action:	Becomes part of SITES rating system.
BACKGROUND INFORMATION	
Site and Location:	Community-wide critical facilities and new development.
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Ensures sustainability in the planning, design, construction and management of landscapes and other outdoor spaces. SITES projects enhance biodiversity and mitigate climate change, while conserving resources, improving public health and protecting critical ecosystems.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	Reduces risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
https://sustainablesites.org/
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and prevents injury to residents.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #53	
Proposed Action:	Improve Green Space Development Requirements: Incorporate green initiatives into local codes and ordinances such as use of native plants, mowing protections for wildflowers, new trees, and milkweed green.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Ensures preservation of the area's biodiversity.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Planning and Development Services
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Natural Area Management Plan; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #54	
Proposed Action:	Obtain certification to become a Firewise community.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Provides a collaborative framework to help increase the ignition resistance of the community and to reduce wildfire risks at the local level.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$10,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #55		
	Proposed Action:	Incorporate necessary measures to preserve native species within the community, including continued support assisting with gaining NWF Certified Wildlife Habitats.
	BACKGROUND INFORMATION	
	Site and Location:	Community-wide
	Risk Reduction Benefit: (Current Cost/Losses Avoided)	Reduces the loss of the natural environments and native species by improving native bird populations and their habitats.
	Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Parks and Recreations Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Natural Area Management Plan

COMMENTS:
https://tpwd.texas.gov/wildlife/birding/bird-city-texas/birdcitytexas_applicationcriteria.pdf https://www.nwf.org/certifiedwildlifehabitat https://www.nwf.org/MayorsMonarchPledge/About/Pledge-Action-Items#:~:text=Issue%20a%20Proclamation%20to%20raise,homes%20or%20in%20their%20neighborhoods
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #56	
Proposed Action:	Increase public transportation efficiency through multi-model transit routes.
BACKGROUND INFORMATION	
Site and Location:	Community-wide transit routes
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Improvements to community-wide transportation infrastructure to promote energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Transportation
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Transportation Plan; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #57		
	Proposed Action:	Strengthen and explore financial incentives to support building reuse and preservation.
	BACKGROUND INFORMATION	
	Site and Location:	Community-wide public facilities and infrastructures
	Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes energy resilience and carbon reduction.
	Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$300,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Planning & Development Services
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #58	
Proposed Action:	Explore parking regulations including Housing and Transportation (H+T) Affordability Index 73 for transportation planning.
BACKGROUND INFORMATION	
Site and Location:	Community-wide parking and transit systems
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Improvements to community-wide transportation infrastructure to promote energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Transportation
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$30,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Planning & Development Services
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Transportation Plan; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #59	
Proposed Action:	Develop design standards for utilizing sustainable building materials for public facilities.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Improvements to community by promoting energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$30,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Local Codes/Ordinances; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #60	
Proposed Action:	Promote water conservation and quality land conservation through land purchases and easements.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Planning & Development Services
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Local Codes/Ordinances; Natural Area Management Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community. Reduces risk of flooding.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #61	
Proposed Action:	Develop standards for connectivity and walkability around neighborhoods. Audit existing developments for potential.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Improvements to community-wide transportation infrastructure to promote energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Planning and Development Services
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Local Codes/Ordinances; Natural Area Management Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #62	
Proposed Action:	Encourage development that meets minimum metrics for density, connectivity, and affordability.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Communication
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue
Lead Agency/Department Responsible:	Planning and Development Services
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Local Codes/Ordinances; Natural Area Management Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #63	
Proposed Action:	Continue to encourage use of green programs such as green guy recycling, household hazardous waste, pharmaceutical disposal, curbside service, bulk pick-up, brush drop-off, community clean-up, etc.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment. Promotes energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	10,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits
Lead Agency/Department Responsible:	Neighborhood Enhancement
Implementation Schedule:	On-going
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
https://sanmarcostx.gov/328/Resource-Recovery-Garbage-Recycling
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #64	
Proposed Action:	Create an MOU with Sustainable San Marcos organization to develop a community garden program.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment. Promotes energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits
Lead Agency/Department Responsible:	Neighborhood Enhancement
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #65	
Proposed Action:	Encourage use of permeable driveways/parking lots for new construction city-owned property.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment. Promotes energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$3,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits; State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #66	
Proposed Action:	Develop and implement a strategic plan to replace fleet vehicles with electric vehicles.
BACKGROUND INFORMATION	
Site and Location:	Community-wide transit routes
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Improvements to community-wide transportation infrastructure to promote energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Transportation
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$300,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 7 years of plan adoption
Incorporation into Existing Plans:	Transportation Plan; Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #67	
Proposed Action:	Encourage the installation of green roofs, vertical gardens, and sunshades in downtown area and other feasible locations to regulate temperature and humidity, reduce environmental pollution, and create shaded urban spaces.
BACKGROUND INFORMATION	
Site and Location:	Downtown Area
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment. Promotes energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 4 years of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects community and promotes sustainability of the community.

SECTION 20: MITIGATION ACTIONS

City of San Marcos – Action #68	
Proposed Action:	Consider the installation of green roofs on new construction of city-owned property and encourage such rooftops on commercial properties.
BACKGROUND INFORMATION	
Site and Location:	Community-wide
Risk Reduction Benefit: (Current Cost/Losses Avoided)	Promotes protection of natural resources and the environment. Promotes energy resilience and carbon reduction.
Type of Action: (Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, or Education and Awareness)	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Earthquake, Extreme Heat, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Community Lifeline: (Safety/Security, Food, Water Shelter, Health/Medical, Energy (Power/Fuel), Communication, Transportation, Hazardous Materials)	Safety/Security, Food/Water/Shelter
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Department Budget, Staff time, Bonds, Tax Revenue; Local non-profits. State Grants: GLO, TAMFS, TDA, TDEM, TXDOT, TWDB; Federal Grants: EPA, HUD, NFIP, NFWF, USDA, USFS, USFWS
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 60 months of plan adoption
Incorporation into Existing Plans:	Sustainability Plan

COMMENTS:
NFIP & WHY MITIGATION ACTION IS APPROPRIATE:
Protects infrastructure, reduces cost of reparation, and promotes sustainability of the community.



SECTION 21 PLAN MAINTENANCE

SECTION 21: PLAN MAINTENANCE

Plan Maintenance Procedures	1
Incorporation	1
Process of Incorporation	1
Monitoring and Evaluation	3
Monitoring	4
Evaluation	4
Updating	5
Plan Revisions	5
Five (5) Year Review	5
Continued Public Involvement	5

PLAN MAINTENANCE PROCEDURES

The following is an explanation of how the City of San Marcos, and the general public will be involved in implementing, evaluating, and enhancing the Plan over time. When the Plan is discussed in all maintenance procedures it includes mitigation actions and hazard assessments. The sustained hazard mitigation planning process consists of four main parts:

- Incorporation
- Monitoring and Evaluation
- Updating
- Continued Public Involvement

INCORPORATION

The City of San Marcos will be responsible for further development and implementation of mitigation actions. Each action has been assigned to a specific city department. The following describes the process by which the city will incorporate elements of the mitigation plan into other planning mechanisms.

PROCESS OF INCORPORATION

Once the Plan Update is adopted, the City of San Marcos will implement actions based on priority and the availability of funding. The City of San Marcos planning area currently implements policies and programs to reduce loss to life and property from hazards. The mitigation actions developed for this Plan Update enhance this ongoing 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 city seeks 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.

The City of San Marcos will integrate 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. Coordinating and integrating components of other plans and policies into goals and objectives of the Plan Update

SECTION 21: PLAN MAINTENANCE

will further maximize funding and provide possible cost-sharing of key projects, thereby reducing loss of lives and property and mitigating hazards affecting the area.

Upon formal adoption of the Plan Update, planning team members will work to integrate the hazard mitigation strategies into other plans and codes as they are developed. Planning team members will conduct periodic reviews of plans and policies, once per year at a minimum, and analyze the need for revisions in light of the approved Plan. The planning team will review all comprehensive land use plans, capital improvement plans, annual budget reviews, emergency operations or management plans, and transportation plans to guide and control development. The city will ensure that capital improvement planning in the future will also contribute to the goals of this hazard mitigation Plan Update to reduce the long-term risk to life and property from all hazards. Within one year of formal adoption of the hazard mitigation Plan Update, existing planning mechanisms will be reviewed by the city.

The City of San Marcos will review and revise, as necessary, the long-range goals and objectives in strategic plans and budgets to ensure that they are consistent with this mitigation action plan. Additionally, the planning area will work to advance the goals of this hazard mitigation plan through its routine, ongoing, long-range planning, budgeting, and work processes.

Table 21-1 identifies types of planning mechanisms and examples of methods for incorporating the Plan Update into other planning efforts. The team members, listed in Table 21-2 below, will be responsible for the review of these planning mechanisms and their incorporation of the Plan, with the exception of the Floodplain Management Plans; a Floodplain Administrator on staff will be responsible for incorporating the plan when floodplain management plans are updated or new plans are developed.

Table 21-1. Methods of Incorporation of the Plan

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
Annual Budget Review	Assistant EMC	Various departments and key personnel that participated in the planning process will review this Plan Update and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action.
Capital Improvement Plans	Assistant EMC	Prior to any revisions to the Capital Improvement Plan (CIP), city departments will review the risk assessment and mitigation strategy sections of this Plan Update, as limiting public spending in hazardous zones is one of the most effective long-term

SECTION 21: PLAN MAINTENANCE

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
		mitigation actions available to local governments.
Comprehensive Plans	Assistant EMC	The City of San Marcos adopted The Vision SMTX Comprehensive Plan, the City's General Plan, in 2023. In future revisions and updates to the General Plan, the mitigation vision and goals of this Plan Update will be reviewed.
Floodplain Management Plans	Floodplain Administrator	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding and information found in Section 10 of this Plan Update discussing the people and property at risk of flooding will be reviewed and revised when updating the flood management plans or developing new plans.
Grant Applications	Assistant EMC	This Plan Update will be evaluated when grant funding is sought for mitigation projects. If a project is not in the Plan Update, a Plan Revision may be necessary to include the action in the Plan.
Regulatory Plans	Assistant EMC	Currently, the City of San Marcos has regulatory plans in place, such as Emergency Operations Plans, Continuity of Operations Plans, Land Use Plans, and Evacuation Plans. This Plan Update 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.

MONITORING AND EVALUATION

Periodic revisions of the Plan are required to ensure that goals, objectives, and mitigation actions are kept current. When the plan is discussed in these sections it includes the risk assessment and mitigation actions as a part of the monitoring, evaluating, updating and review process. Revisions may be required to ensure the Plan is in compliance with federal and state statutes and regulations. This section outlines the procedures for completing Plan revisions, updates, and

SECTION 21: PLAN MAINTENANCE

review. Table 21-2 indicates the department and title of the party responsible for Plan monitoring, evaluating, updating, and review of the Plan.

Table 21-2. Team Members Responsible for Plan Monitoring, Evaluating, Updating, and Review of the Plan

DEPARTMENT	TITLE
Office of Emergency Management	Assistant Emergency Management Coordinator
Office of Emergency Management	Emergency Management Coordinator
Office of Emergency Management	Emergency Management Specialist

MONITORING

Designated Planning Team members are responsible for monitoring, evaluating, updating, and reviewing the Plan, as shown in Table 21-2. Individuals holding the title listed in Table 21-2 will be responsible for monitoring the Plan on an annual basis. Plan monitoring includes reviewing and incorporating into the Plan other existing planning mechanisms that relate or support goals and objectives of the Plan; monitoring the incorporation of the Plan into future updates of other existing planning mechanisms as appropriate; reviewing mitigation actions submitted and coordinating with various city departments to determine if mitigation actions need to be re-evaluated and updated; evaluating and updating the Plan as necessary; and monitoring plan maintenance to ensure that the process described is being followed, on an annual basis, throughout the planning process. The Planning Team will develop a brief report that identifies policies and actions in the Plan that have been successfully implemented and any changes in the implementation process needed for continued success. A summary of meeting notes will report the particulars involved in developing an action into a project. In addition to the annual monitoring, the Plan will be similarly reviewed immediately after extreme weather events include but not limited to state and federally declared disasters.

EVALUATION

As part of the evaluation process, the Planning Team will assess changes in risk; determine whether the implementation of mitigation actions is on schedule; determine whether there are any implementation problems, such as technical, political, legal, or coordination issues; and identify changes in land development or programs that affect mitigation priorities for each respective department or organization.

The Planning Team will meet on an annual basis to evaluate the Plan and identify any needed changes and assess the Plan's effectiveness in achieving its stated purpose and goals. The team will evaluate the number of mitigation actions implemented along with the loss-reduction associated with each action. Actions that have not been implemented will be evaluated to determine if any social, political, or financial barriers are impeding implementation and if any changes are necessary to improve the viability of an action. The team will evaluate changes in land development and/or programs that affect mitigation priorities. The annual evaluation process will help to determine if any changes are necessary. In addition, the Plan will be similarly evaluated immediately after extreme weather events including but not limited to state and federally declared disasters.

SECTION 21: PLAN MAINTENANCE

UPDATING

PLAN REVISIONS

At any time, minor technical changes may be made to update the City of San Marcos Hazard Mitigation Action Plan Update 2024. Material changes to mitigation actions or major changes in the overall direction of the Plan or the policies contained within it, must be subject to formal adoption by the City of San Marcos.

The City of San Marcos will review proposed revisions and vote to accept, reject, or amend the proposed change. Upon ratification, the Revision will be transmitted to TDEM.

In determining whether to recommend approval or denial of a Plan Revision request, the city will consider the following factors:

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

FIVE (5) YEAR REVIEW

The Plan will be thoroughly reviewed by the Planning Team at the end of three years from the approval date, to determine whether there have been significant changes in the planning area that necessitate changes in the types of mitigation actions proposed. Factors that may affect the content of the Plan include new development in identified hazard areas, increased exposure to hazards, disaster declarations, increase or decrease in capability to address hazards, and changes to federal or state legislation.

The Plan review process provides the City of San Marcos an opportunity to evaluate mitigation actions that have been successful, identify losses avoided due to the implementation of specific mitigation measures, and address mitigation actions that may not have been successfully implemented as assigned.

It is recommended that the full Executive and Advisory Planning Team (Section 2, Tables 2-1 and 2-2) meet to review the Plan at the end of three years because grant funds may be necessary for the development of a five-year update. Reviewing planning grant options in advance of the five-year Plan update deadline is recommended considering the timelines for grant and planning cycles can be in excess of a year.

Following the Plan review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and Plan Revision process outlined herein. Upon completion of the review, update, and revision process, the revised Plan will be submitted to TDEM for final review and approval in coordination with FEMA.

CONTINUED PUBLIC INVOLVEMENT

Public input was an integral part of the preparation of this Plan and will continue to be essential for Plan updates. The public will be directly involved in the annual evaluation, monitoring, reviews and cyclical updates. Changes or suggestions to improve or update the Plan will provide opportunities for additional public input.

SECTION 21: PLAN MAINTENANCE

The public can review the Plan on the participating jurisdictions' websites, where officials and the public are invited to provide ongoing feedback, via email.

The Planning Team may also designate voluntary community members from the planning area or willing stakeholder members from the private sector businesses that were involved in the Plan's development to provide feedback on an annual basis. It is important that stakeholders and the immediate community maintain a vested interest in preserving the functionality of the planning area as it pertains to the overall goals of the mitigation plan. The Planning Team is responsible for notifying stakeholders and community members on an annual basis and maintaining the Plan.

Media, including local newspaper and radio stations, will be used to notify the public of any maintenance or periodic review activities during the implementation, monitoring, and evaluation phases. Additionally, local news media will be contacted to cover information regarding Plan updates, status of grant applications, and project implementation. Local and social media outlets, such as Facebook and Twitter, will keep the public and stakeholders apprised of potential opportunities to fund and implement mitigation projects identified in the Plan.



The San Marcos Bell
Dedicated to Volunteerism and Service
The Town of San Marcos purchased this 1000-lb gray cast iron bell about 1890. The bell sounded its robust peal to call the "fire boys" to duty. The bell also signified numerous events and called citizens to assembly. For 23 years the bell hung in a tower over the Fire House. The bell was removed from the aging tower in 1972 and restored for the Texas State Sesquicentennial in 1986. In 2001 the bell was put on permanent display in relation to the 150th anniversary of the City of San Marcos.

Dedicated March 2, 2011
The Heritage Association of San Marcos
The City of San Marcos

APPENDIX A PLANNING TEAM

APPENDIX A: PLANNING TEAM

Planning Team Members	1
Stakeholders	3

PLANNING TEAM MEMBERS

The City of San Marcos Hazard Mitigation Action Plan 2024 was organized using a direct representative model. An Executive Planning Team from the participating jurisdictions, shown in Table A-1, was formed to coordinate planning efforts and request input and participation in the planning process. Table A-2 reflects the Advisory Planning Team, consisting of area organizations and departments that participated throughout the planning process. Table A-3 is comprised of stakeholders who were invited to provide Plan input. Public outreach efforts and meeting documentation is provided in Appendix E.

Table A-1. Executive Planning Team

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos Office of Emergency Management	Assistant Emergency Management Coordinator
City of San Marcos Office of Emergency Management	Emergency Management Coordinator
City of San Marcos Office of Emergency Management	Emergency Management Specialist

Table A-2. Advisory Planning Team

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos	Administrative Service Manager for City Directors
City of San Marcos	Assistant City Manager I
City of San Marcos	Assistant City Manager II
City of San Marcos	Assistant Chief of Police
City of San Marcos	Assistant Chief of Operations
City of San Marcos	Assistant Director of Planning and Development Services
City of San Marcos	Assistant Director of Engineering
City of San Marcos	Assistant Director of Finance
City of San Marcos	Assistant Director of Human Resources
City of San Marcos	Assistant Director of I.T.
City of San Marcos	Assistant Director of Neighborhood Enhancement

APPENDIX A: PLANNING TEAM

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos	Assistant Director of Planning and Development Services
City of San Marcos	Assistant Director of Parks and Recreation
City of San Marcos	Assistant Director of Public Works
City of San Marcos	Assistant Director of Water / Wastewater
City of San Marcos	Assistant City Manager
City of San Marcos	City Attorney
City of San Marcos	City Manager
City of San Marcos	Code Compliance Officer I
City of San Marcos	Code Compliance Officer II
City of San Marcos	Community Enhancement Initiatives Manager
City of San Marcos	Community Urban Forester
City of San Marcos	Conservation Coordinator
City of San Marcos	Director of Destination Services
City of San Marcos	Director of Engineering
City of San Marcos	Director of Human Resources / Civil Service
City of San Marcos	Director of I.T.
City of San Marcos	Director of Neighborhood Enhancement
City of San Marcos	Director of Parks and Recreation
City of San Marcos	Director of Planning and Development
City of San Marcos	Director of Public Works
City of San Marcos	Director of Utilities
City of San Marcos	Diversity, Equity, & Inclusion Coordinator
City of San Marcos	Environmental Health & Safety Manager
City of San Marcos	Fire Chief
City of San Marcos	Fire Department Representative

APPENDIX A: PLANNING TEAM

ORGANIZATION / DEPARTMENT	TITLE
City of San Marcos	Fire Department Engineer I
City of San Marcos	Fire Department Engineer II
City of San Marcos	Floodplain Administrator
City of San Marcos	Grants Coordinator
City of San Marcos	I.T. Security Manager
City of San Marcos	Library Director
City of San Marcos	SMTX / TXST Intern
City of San Marcos	Stormwater Systems Manager

STAKEHOLDERS

The following groups listed in Table A-3 represent a list of organizations invited to stakeholder meetings, public meetings, and workshops throughout the planning process and include: members of community groups, non-profit organizations, private businesses, utility providers, neighboring counties, school and universities, and state and federal agencies. The public were also invited to participate via e-mail throughout the planning process. Many of the invited organizations and stakeholders participated and were integral to providing comments and data for the Plan. For a list of attendees at meetings, please see Appendix E¹.

Table A-3. Stakeholders

AGENCY	TITLE	STAKEHOLDER TYPE
American Red Cross	Regional Manager of Communications	Nonprofit / Community Based Organization
Bastrop County	Assistant Emergency Management Coordinator	Neighboring Community
Blanco River Regional Recovery Team	Executive Director	Community Based Organization
Caldwell County	Emergency Management Coordinator	Neighboring Community
Capital Area Council of Governments	Executive Director	Regional Agency
Central Texas Food Bank	Media Representative	Nonprofit / Community Based Organization
COAD - SMTX	Chair Board Member	Community Based Organization

¹ Information contained in Appendix E is exempt from public release under the Freedom of Information Act (FOIA).

APPENDIX A: PLANNING TEAM

AGENCY	TITLE	STAKEHOLDER TYPE
Comal County	Emergency Management Coordinator	Neighboring Community
Environmental Protection Agency	Regional Administrator	Federal Agency
Greater San Marcos Youth Council Inc.	Executive Director	Community Based Organization
Greater Spring Project	Chief Executive	Community Based Organization
Hays County	Director of Emergency Management	Neighboring Community
Hays County Food Bank	Community Relations Coordinator	Nonprofit / Community Based Organization
Lower Colorado River Authority	Public Information Officer	Utility Service
Lower Colorado River Authority	San Marcos Representative	Utility Service
Meals on Wheels	Chief Development Officer	Nonprofit / Community Based Organization
NOAA	Regional Representative	Federal Agency
Salvation Army	Center Manager	Nonprofit / Community Based Organization
San Marcos Area Chamber of Commerce	Operations & Membership Manager	Community Based Organization
San Marcos CISD	Superintendent	Academia
San Marcos Greenbelt Alliance	Representative	Community Based Organization
San Marcos Housing Authority	Executive Director	Authority to Regulate Development
San Marcos Regional Animal Shelter	Rescue Response	Community Based Organization
ServPro	General Manager	Profit Organization
ServPro	Sale Representative	Profit Organization
State Legislature	District 45	State Legislature
State Legislature	District 73	State Legislature
State Senate	District 21	State Senate
State Senate	District 25	State Senate
Texas A&M Agrilife Extension	District 10 Representative	State Agency

APPENDIX A: PLANNING TEAM

AGENCY	TITLE	STAKEHOLDER TYPE
Texas Commission on Environmental Quality	Regional Representative	State Agency
Texas Department of Emergency Management	Region 6, District 12 Coordinator	State Agency / Involved in Mitigation Activities
Texas Department of Transportation	District Engineer	State Agency
Texas Development Water Board	Region K Planner	State Agency
Texas Development Water Board	Region L Planner	State Agency
Texas Floodplain Management Association	Hays County Engineer	State Agency
Texas Forest Service	Mitigation and Prevention Specialist	State Agency
Texas Health and Human Services Commission	Adults and People with Disabilities Office	State Agency
Texas Parks and Wildlife	Hill Country Wildlife District - District Leader	State Agency
Texas State University	Emergency Management Coordinator	Academia
Texas Windstorm Insurance Association	Media Representative	State Agency
Travis County	Chief Deputy Emergency Management Coordinator	Neighboring Community
U.S. Army Corps of Engineers	Southwest Regional Representative	Federal Agency
U.S. Fish & Wildlife	Southwest Regional Representative	Federal Agency



APPENDIX B PUBLIC SURVEY RESULTS

APPENDIX B: PUBLIC SURVEY RESULTS

Overview	1
Public Survey Results	2

OVERVIEW

The City of San Marcos prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available via the City's websites. This survey link was also distributed at public meetings and stakeholder events throughout the planning process.

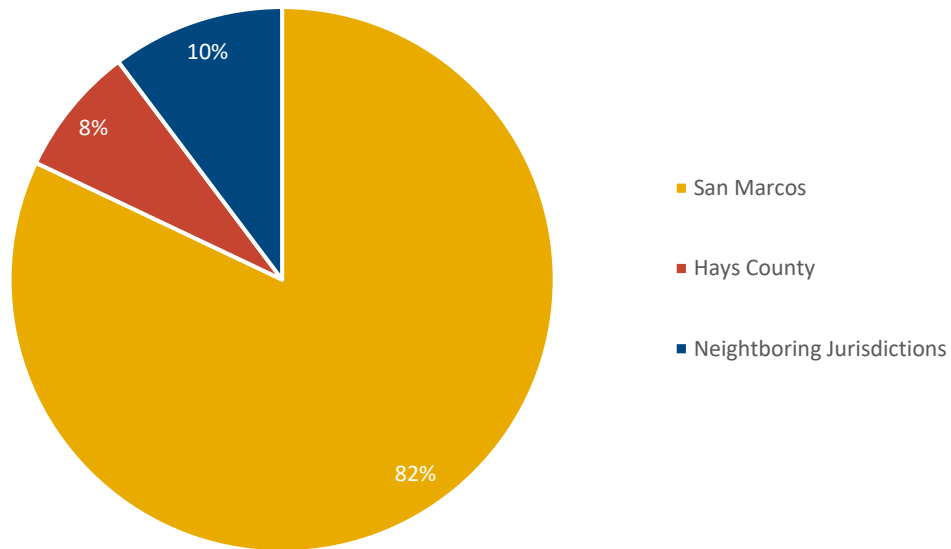
A total of 39 surveys were collected, the results of which are analyzed in Appendix B. The purpose of the survey was twofold: 1) to solicit public input during the planning process, and 2) to help the jurisdictions identify any potential actions or problem areas.

The following survey results depict the percentage of responses for each answer. Similar responses have been summarized for questions that did not provide a multiple-choice answer or that required an explanation.

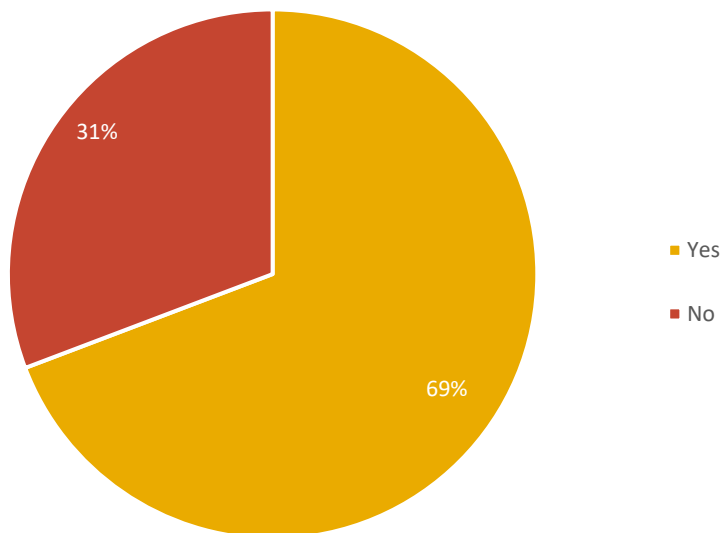
APPENDIX B: PUBLIC SURVEY RESULTS

PUBLIC SURVEY RESULTS

1. Please state the jurisdiction (city or community) where you reside.

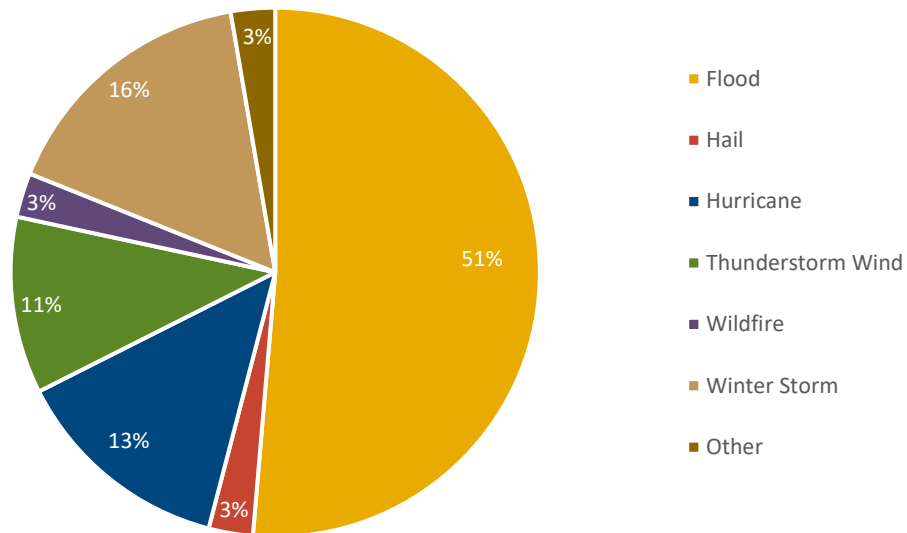


2. Have you ever experienced or been impacted by a disaster?

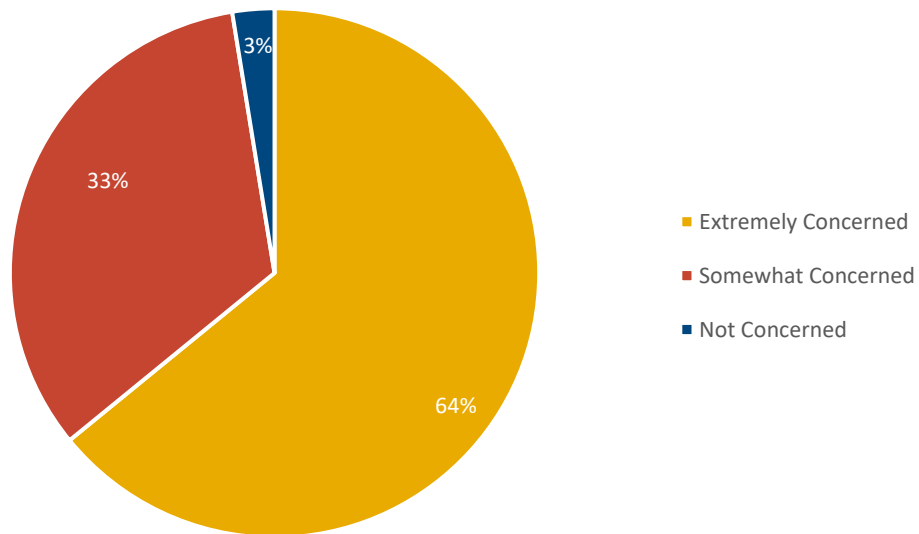


APPENDIX B: PUBLIC SURVEY RESULTS

3. If you answered “Yes” to Question #2, please explain.

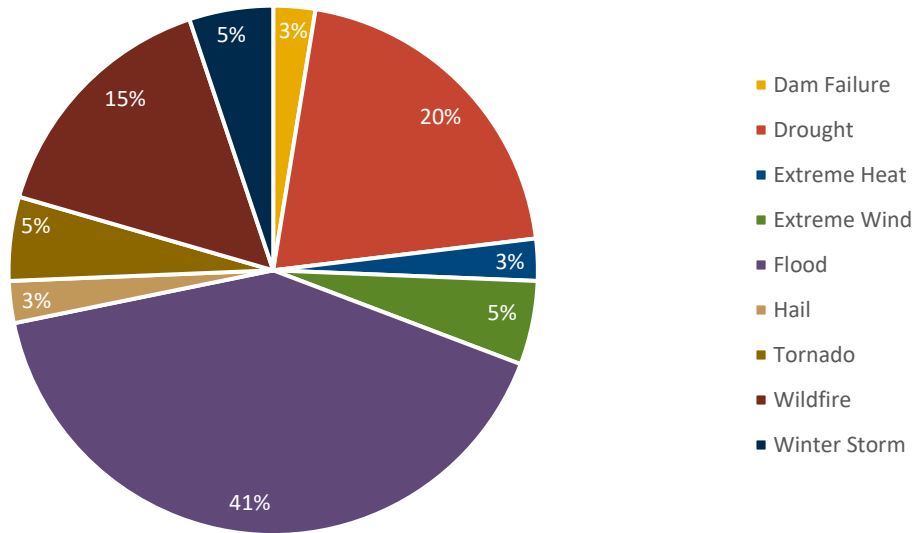


4. How concerned are you about the possibility of your community being impacted by a disaster?

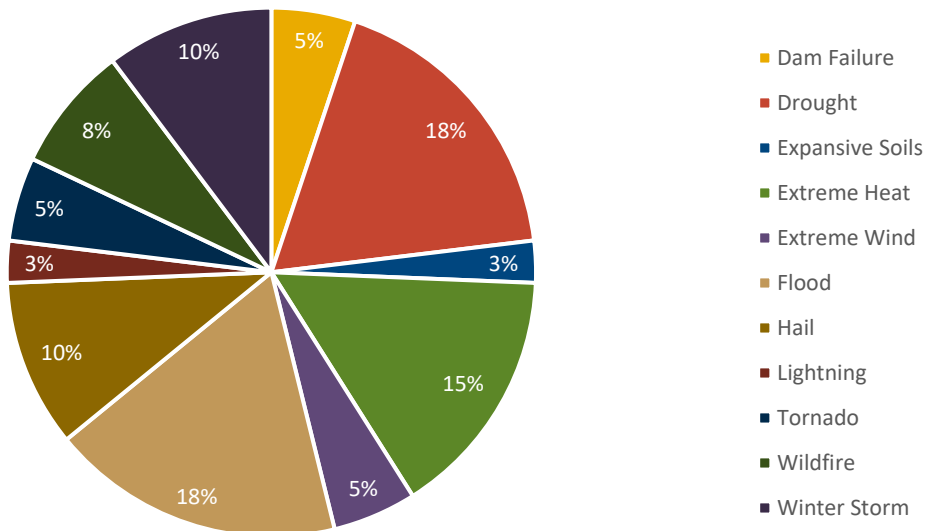


APPENDIX B: PUBLIC SURVEY RESULTS

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

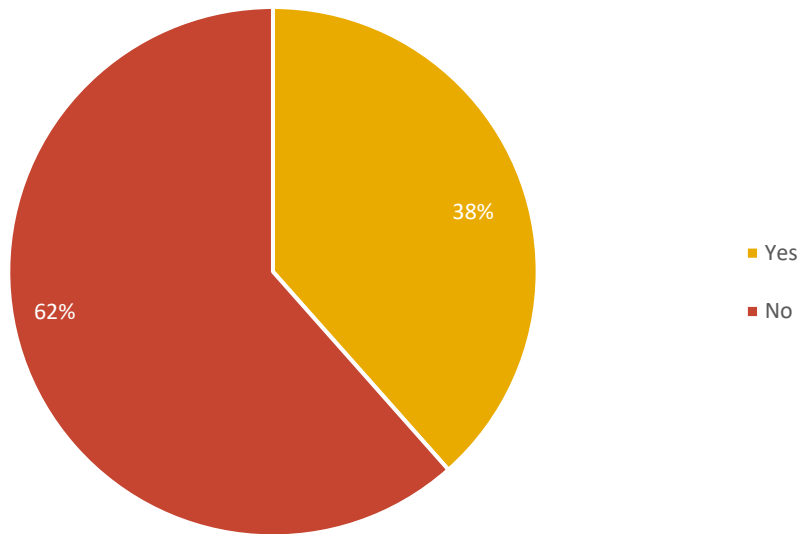


6. Please select the one hazard you think is the second highest threat to your neighborhood:

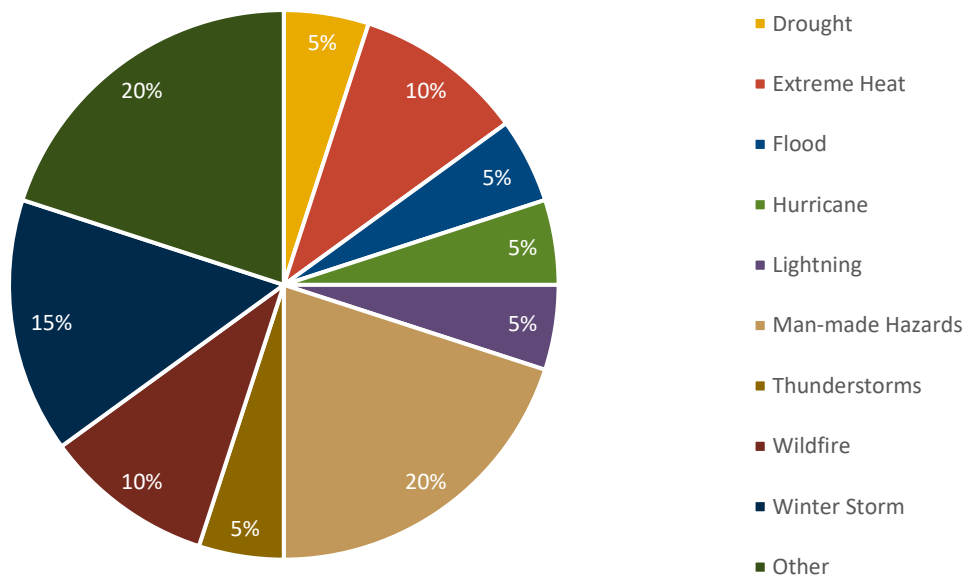


APPENDIX B: PUBLIC SURVEY RESULTS

7. Is there another hazard not listed above that you think is a wide-scale threat to your neighborhood?

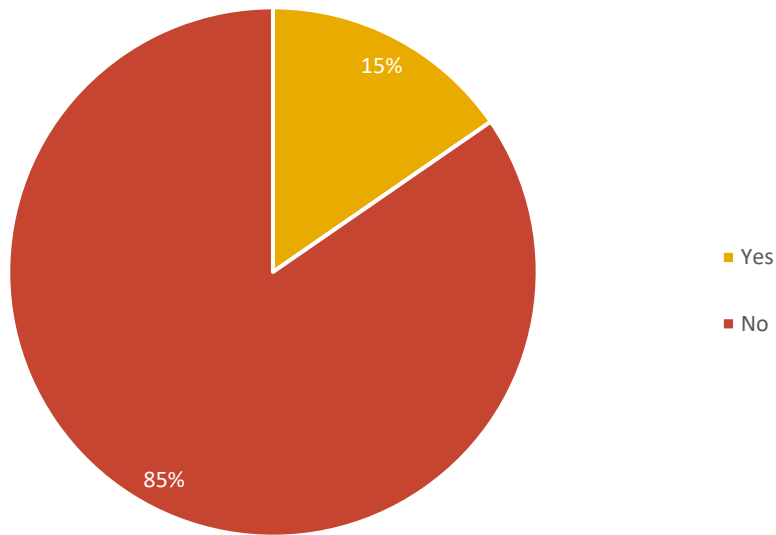


8. If you answered "Yes" to Question #7, please explain.

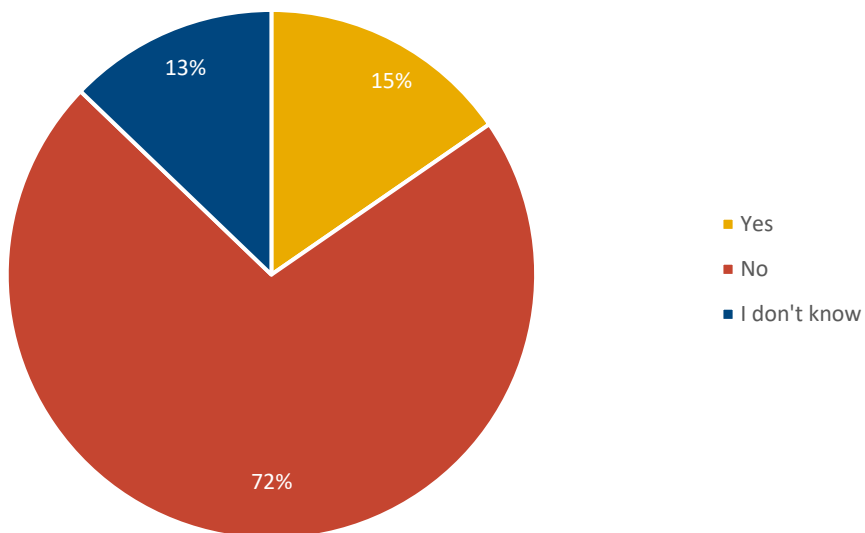


APPENDIX B: PUBLIC SURVEY RESULTS

9. Is your home located in a floodplain?

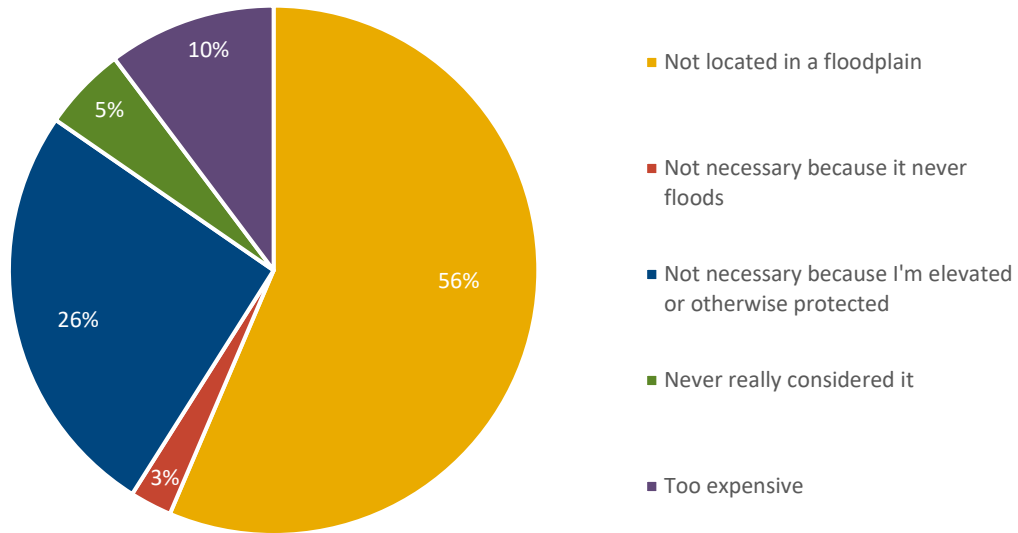


10. Do you have flood insurance?

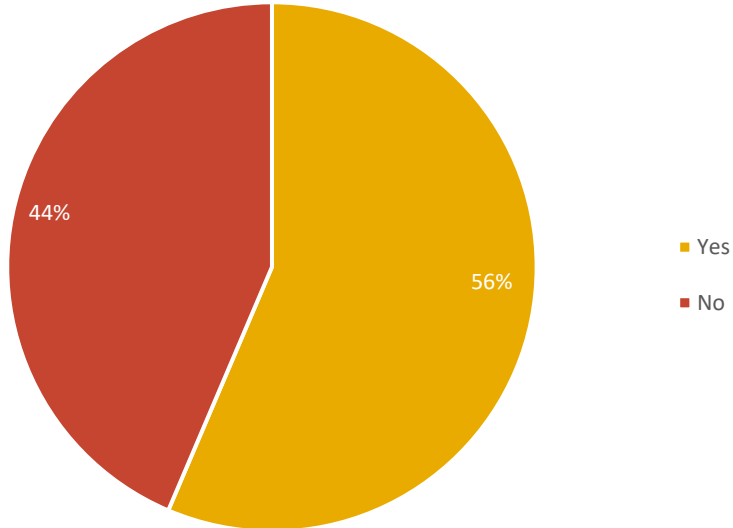


APPENDIX B: PUBLIC SURVEY RESULTS

11. If you do not have flood insurance, why not?

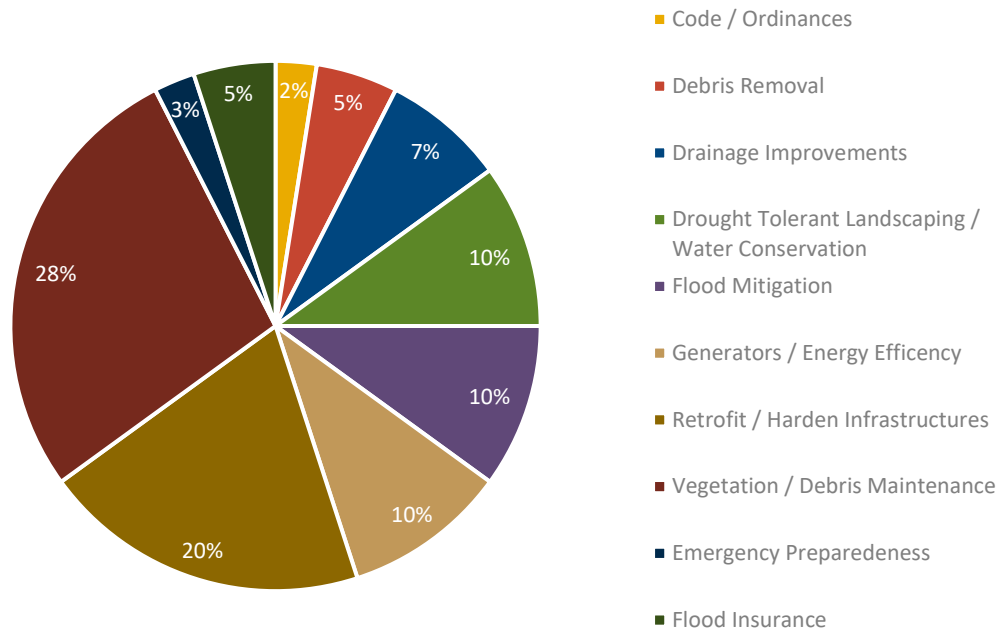


12. Have you taken any actions to make your home or neighborhood more resistant to hazards?

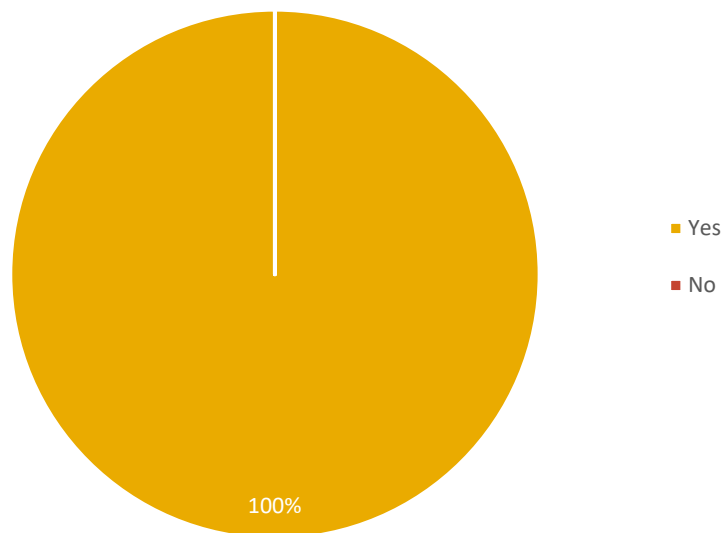


APPENDIX B: PUBLIC SURVEY RESULTS

13. If you answered “Yes” to Question #12, please explain.

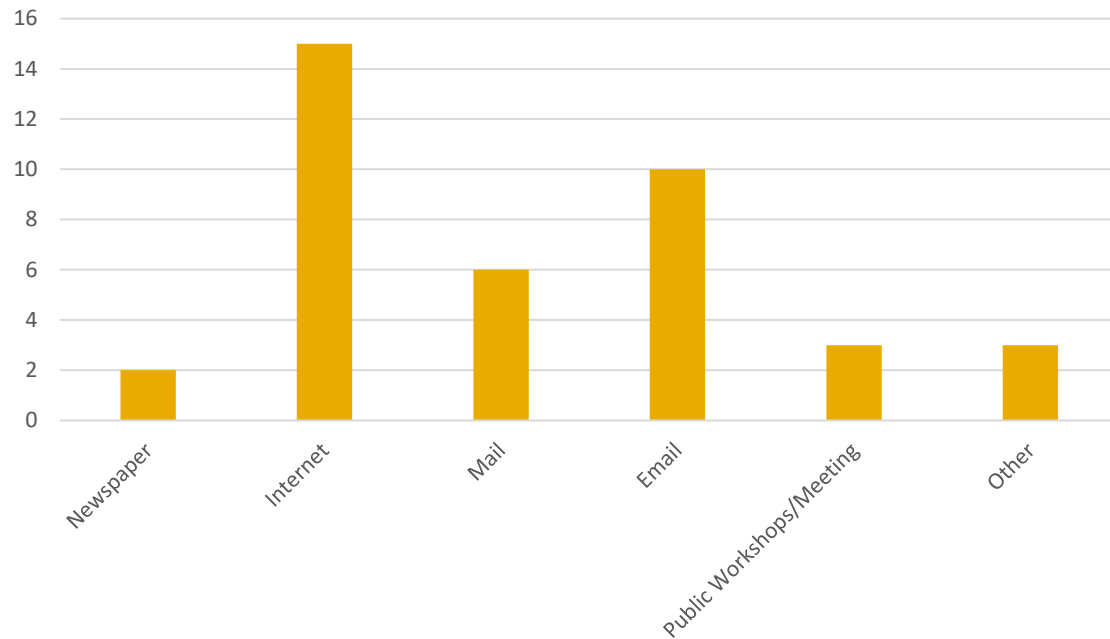


14. Are you interested in making your home or neighborhood more resistant to hazards?

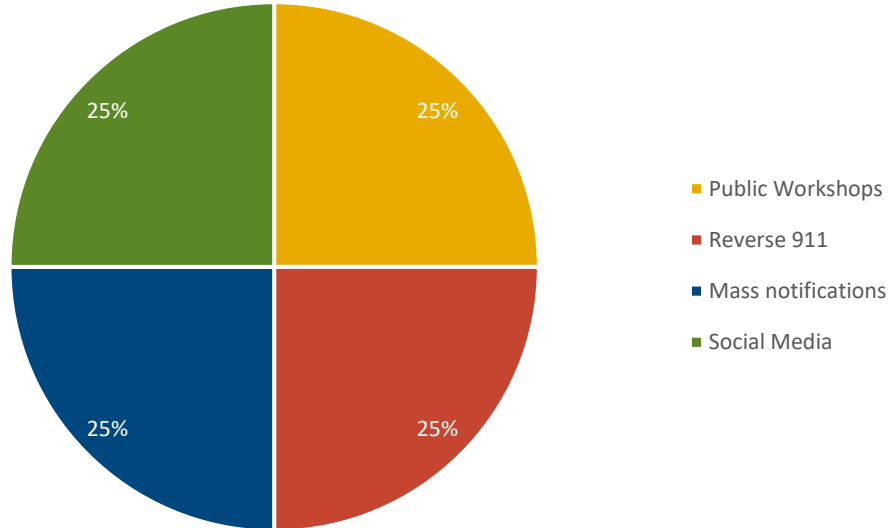


APPENDIX B: PUBLIC SURVEY RESULTS

15. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

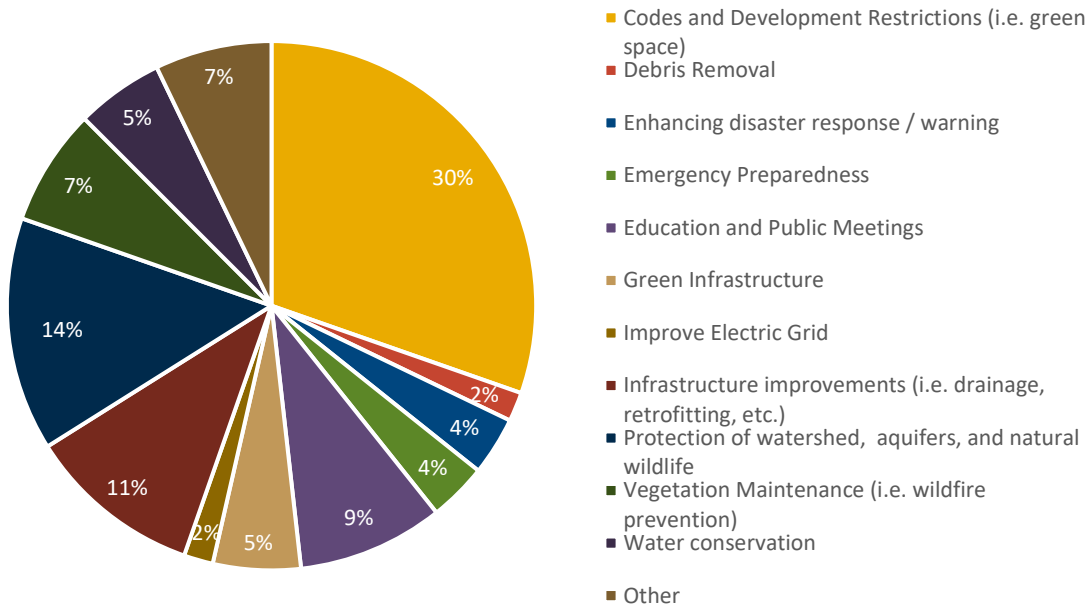


16. If you answered "Other" to Question #15, please explain.

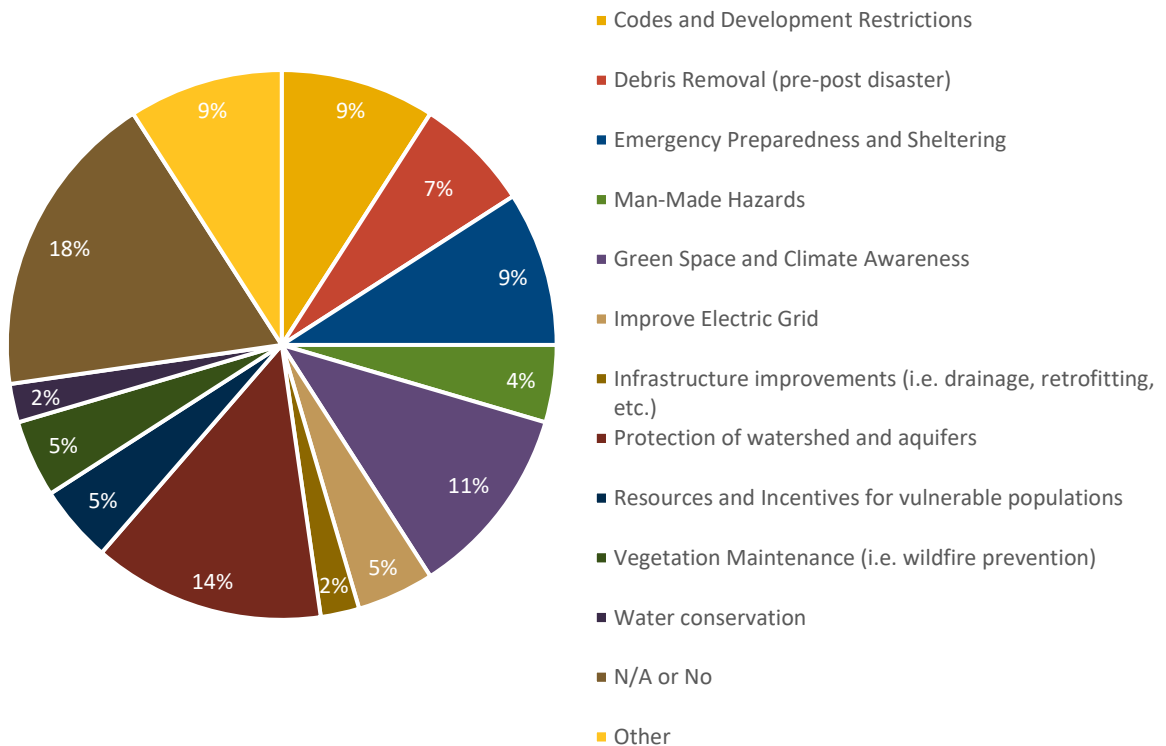


APPENDIX B: PUBLIC SURVEY RESULTS

17. In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?

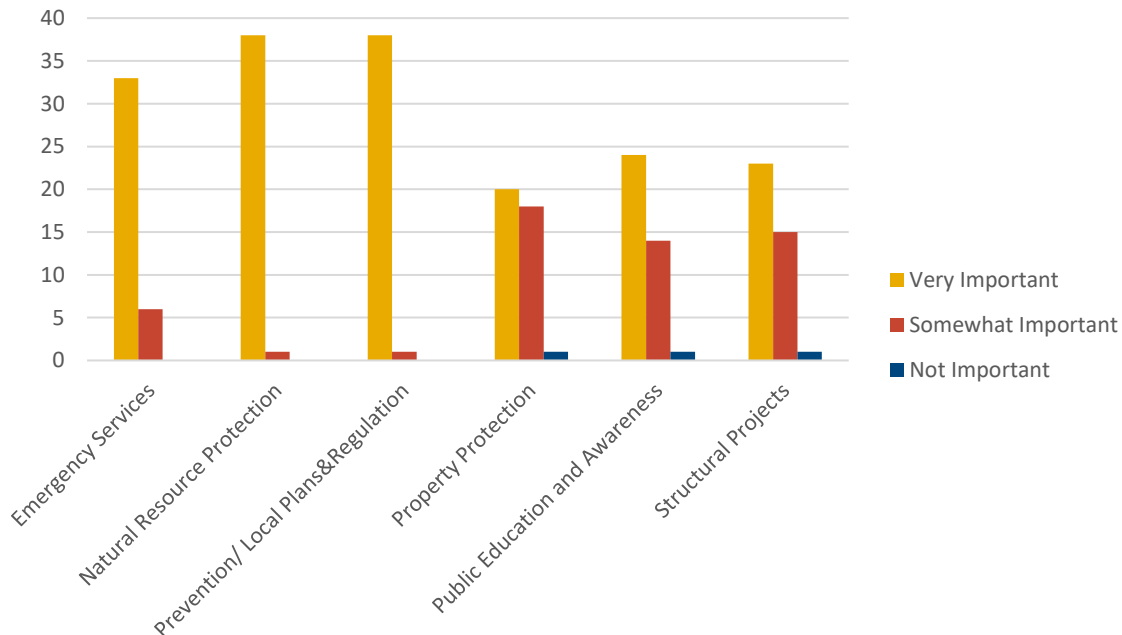


18. Are there any other issues regarding the reduction of risk and loss associated with hazards or disaster in the community that you think are important?



APPENDIX B: PUBLIC SURVEY RESULTS

19. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.



Emergency Services - Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.

Natural Resource Protection - Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.

Prevention/Local Plans & Regulations - Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.

Property Protection - Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.

Public Education and Awareness - Actions to inform citizens about hazards and techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.

Structural Projects - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, seawalls detention/retention basins, channel modification, retaining walls, and storm sewers.



APPENDIX C

CRITICAL FACILITIES

APPENDIX C: CRITICAL FACILITIES

Overview.....	1
Critical Facilities	1

OVERVIEW

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under FOIA. Figure C-1 locates all critical facilities that were included in the risk assessment. Mapped facilities were provided by Planning Team members. Table C-1 notes the critical facilities by type. Figures C-2 through C-17 show the location of the facilities by type.

CRITICAL FACILITIES

Figure C-1. Critical Facilities in the City of San Marcos

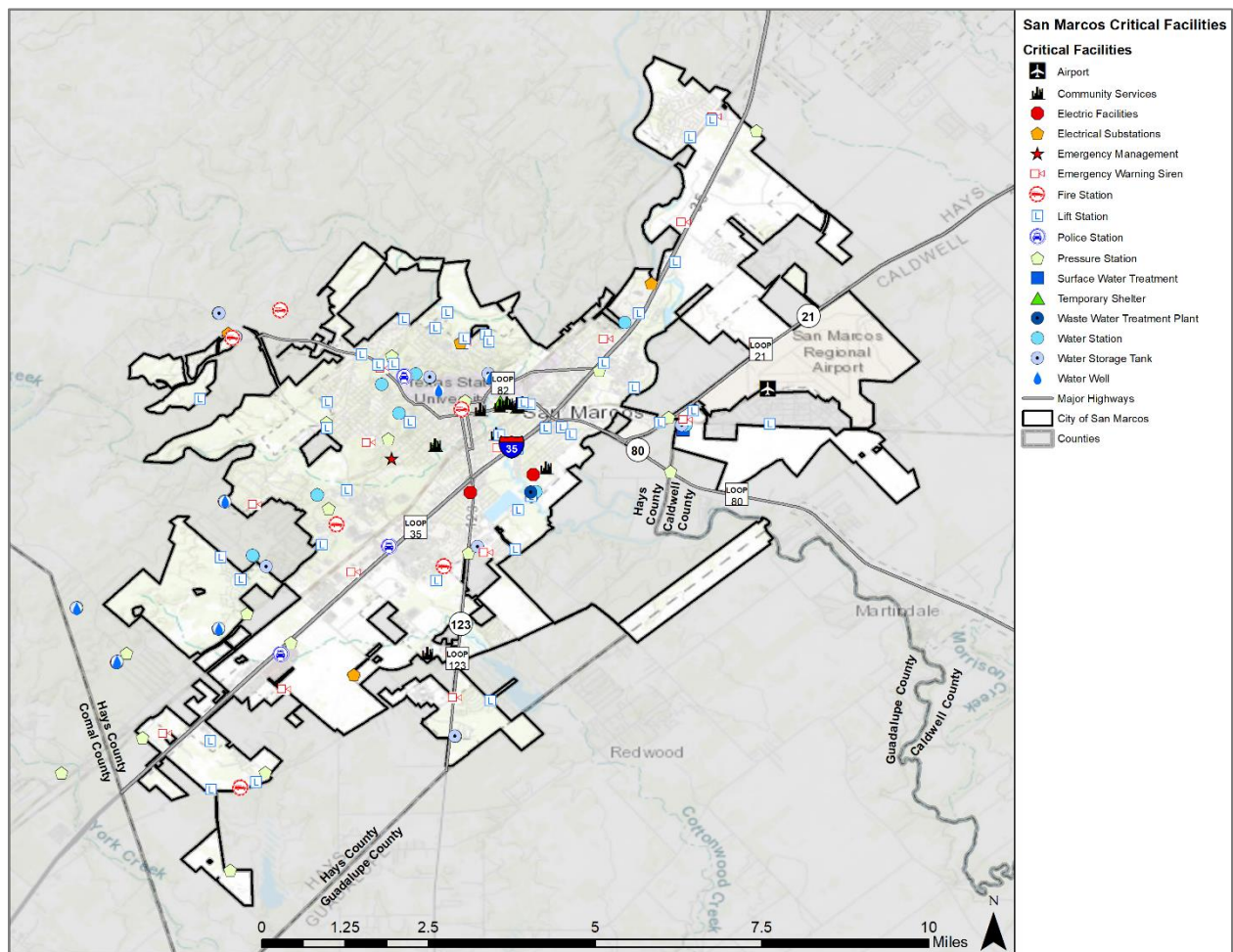


Table C-1. Critical Facilities by Type in the City of San Marcos

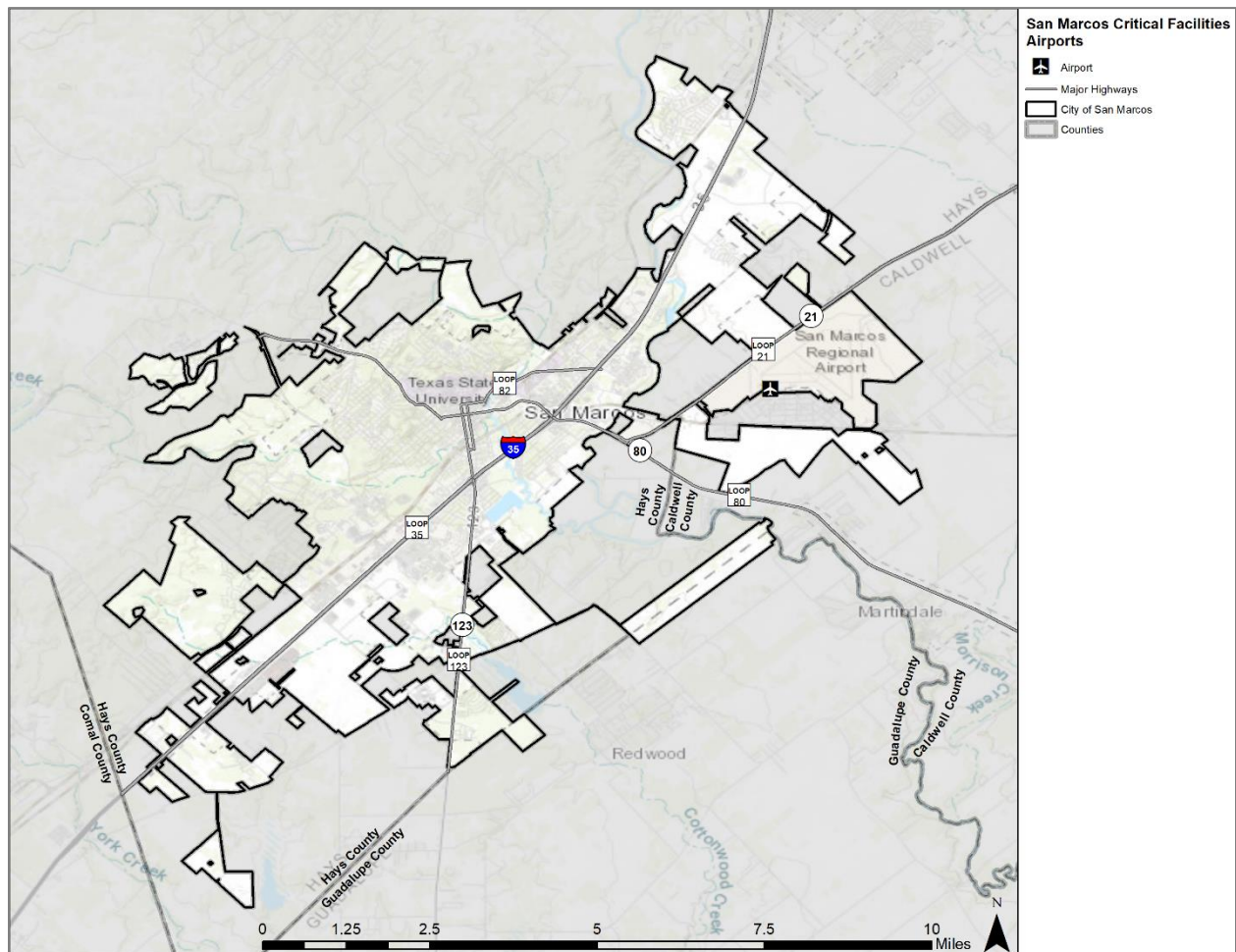
TYPE	NUMBER
Activity / Recreation Center (shelter)	2
Airport	1

APPENDIX C: CRITICAL FACILITIES

TYPE	NUMBER
Animal Shelter	1
Electrical Substation	6
Emergency Warning Siren	14
EOC	1
Fire Station	6
Government Building	9
Lift Station (wastewater)	42
Police Station	3
Waste Water Treatment Plant	1
Water Pressure Station	22
Water Station	20
Water Storage Tank	15
Water Treatment Plant (surface)	1
Water Well	7

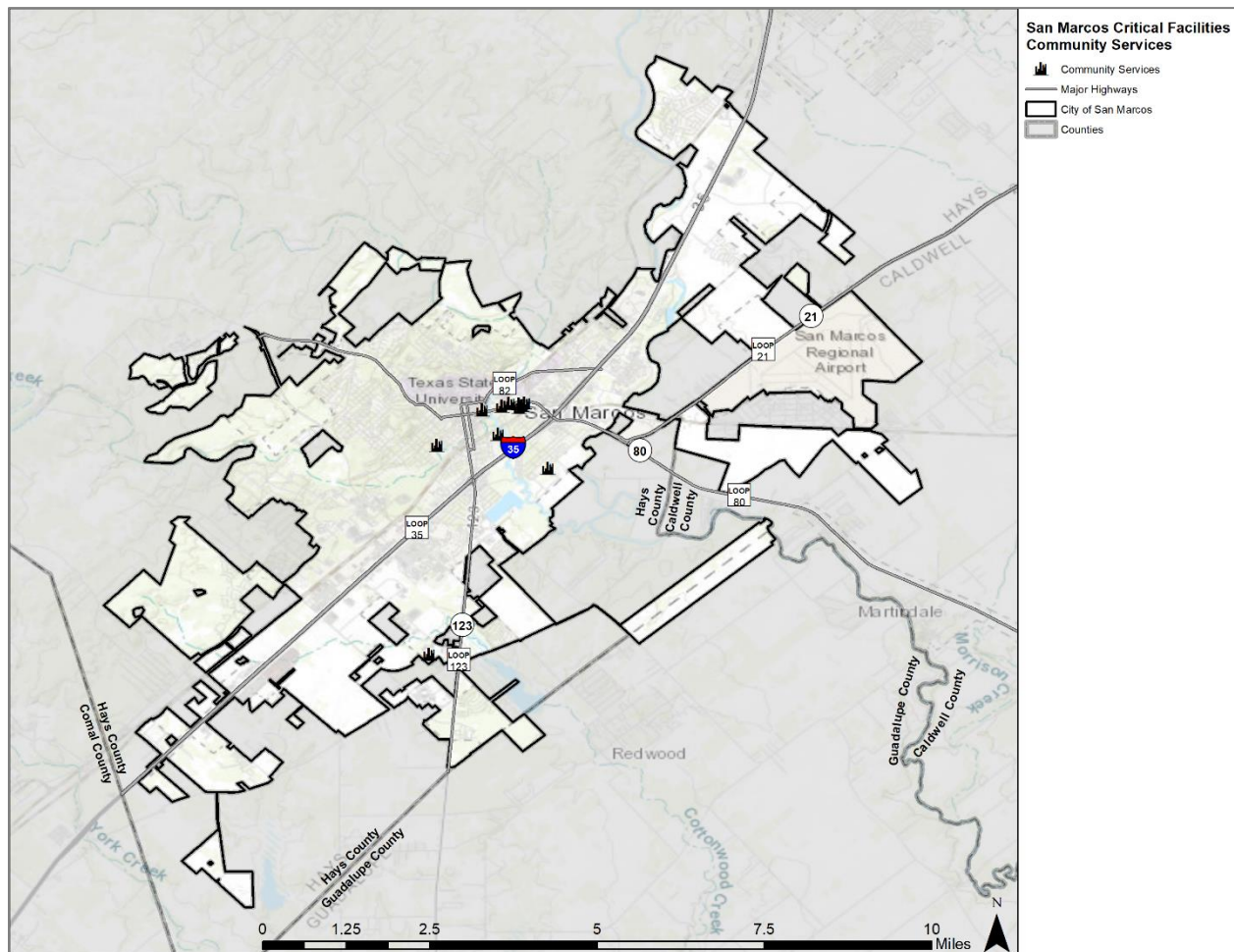
APPENDIX C: CRITICAL FACILITIES

Figure C-2. Critical Facilities in the City of San Marcos – Airports



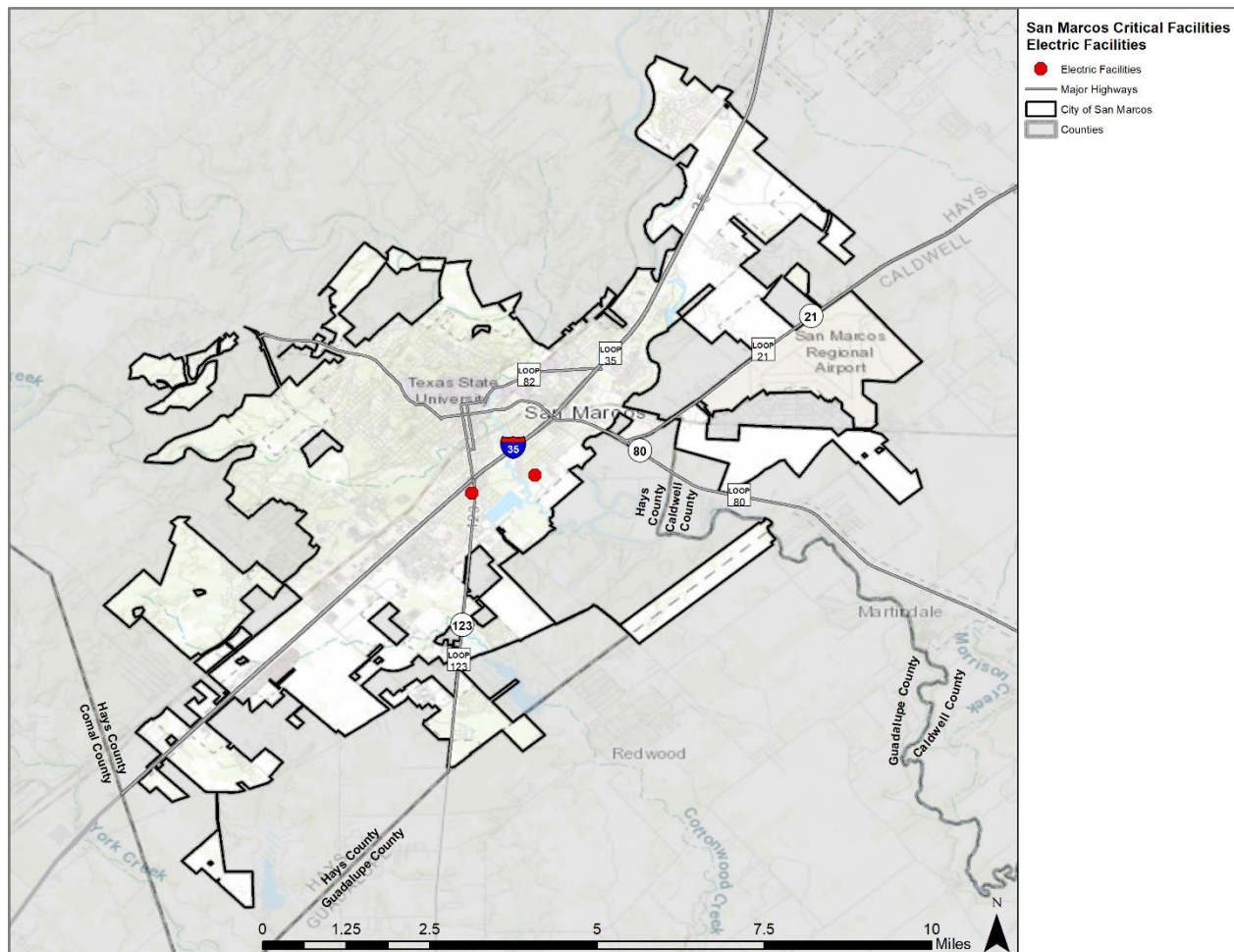
APPENDIX C: CRITICAL FACILITIES

Figure C-3. Critical Facilities in the City of San Marcos – Community Services



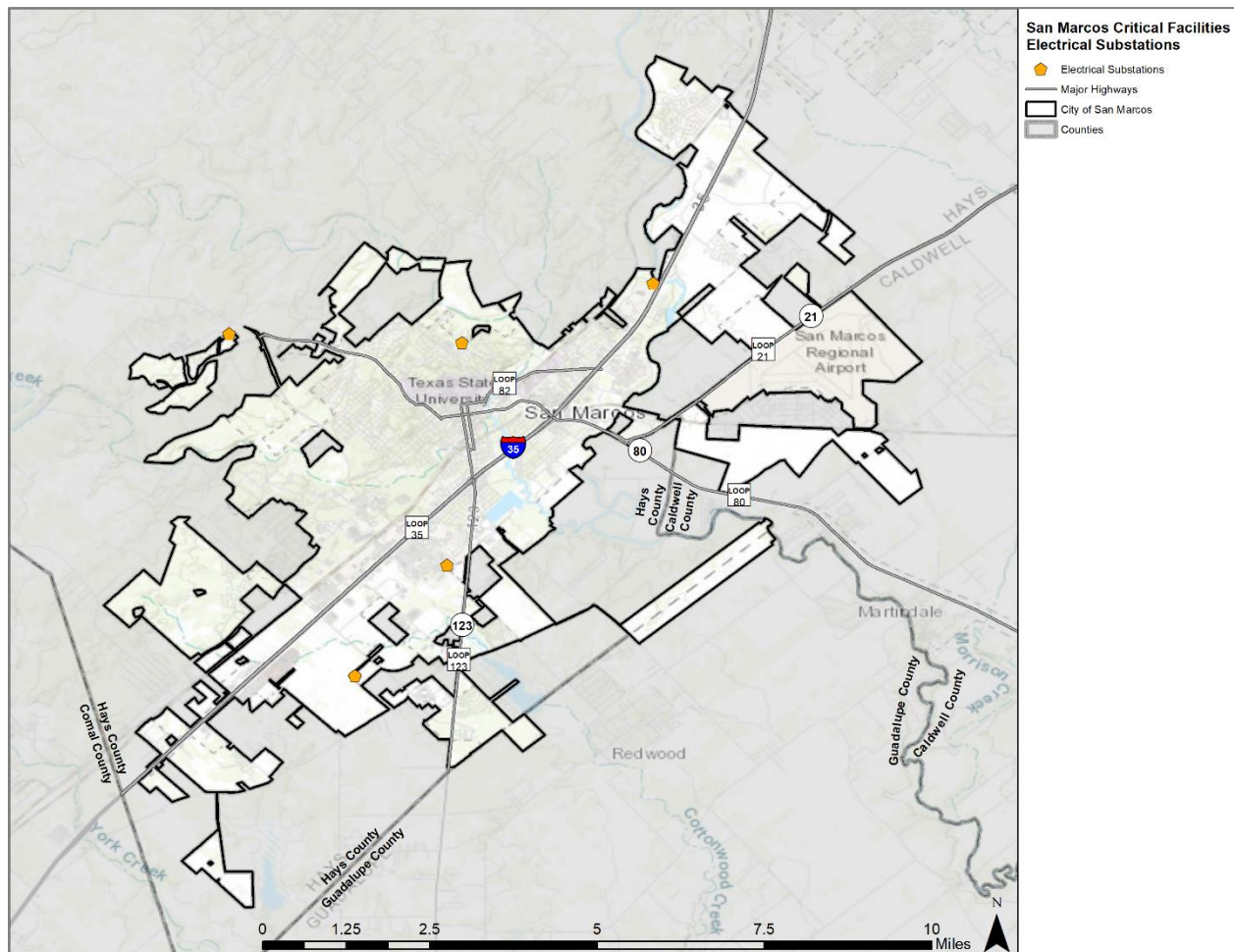
APPENDIX C: CRITICAL FACILITIES

Figure C-4. Critical Facilities in the City of San Marcos – Electric Facilities



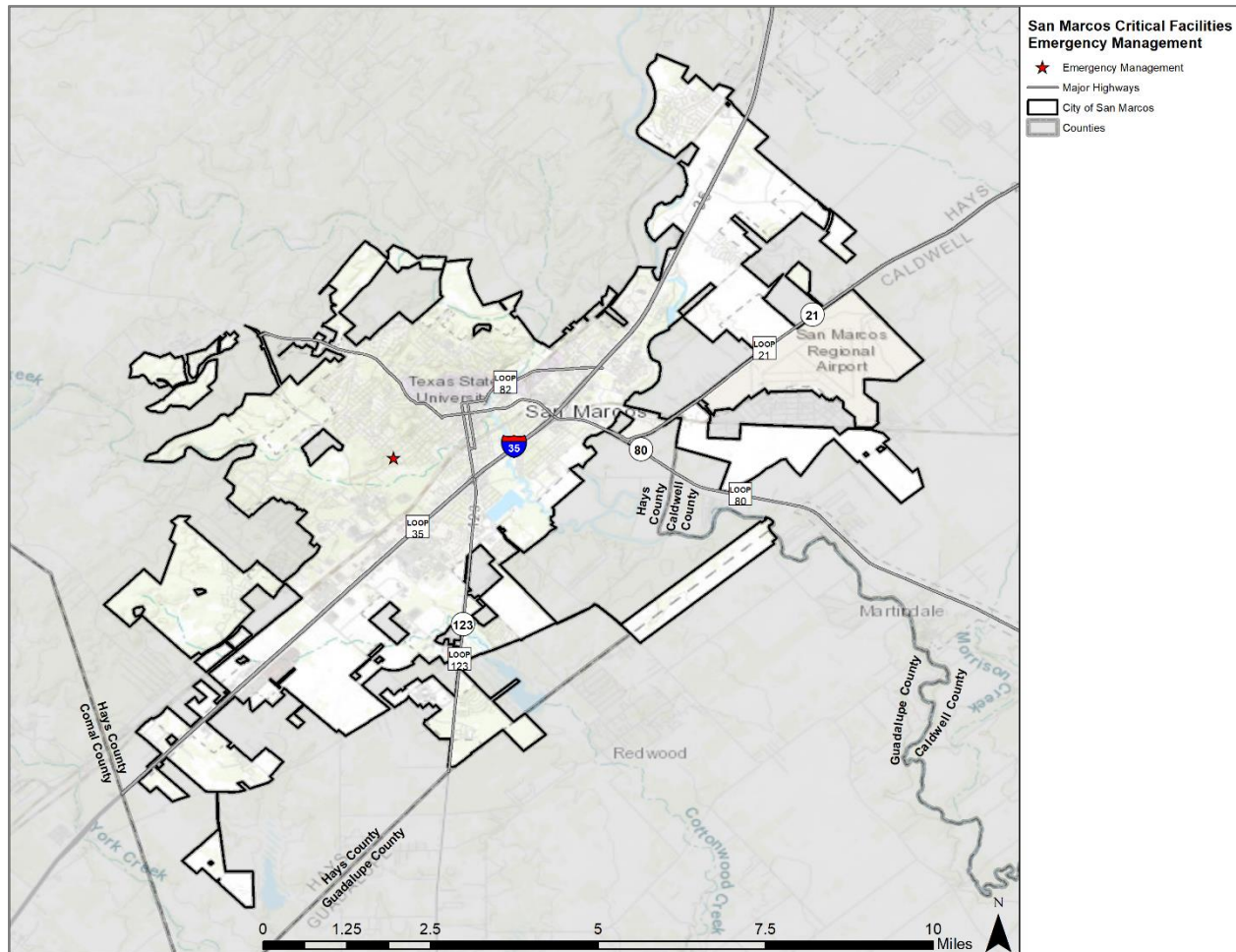
APPENDIX C: CRITICAL FACILITIES

Figure C-5. Critical Facilities in the City of San Marcos – Electrical Substations



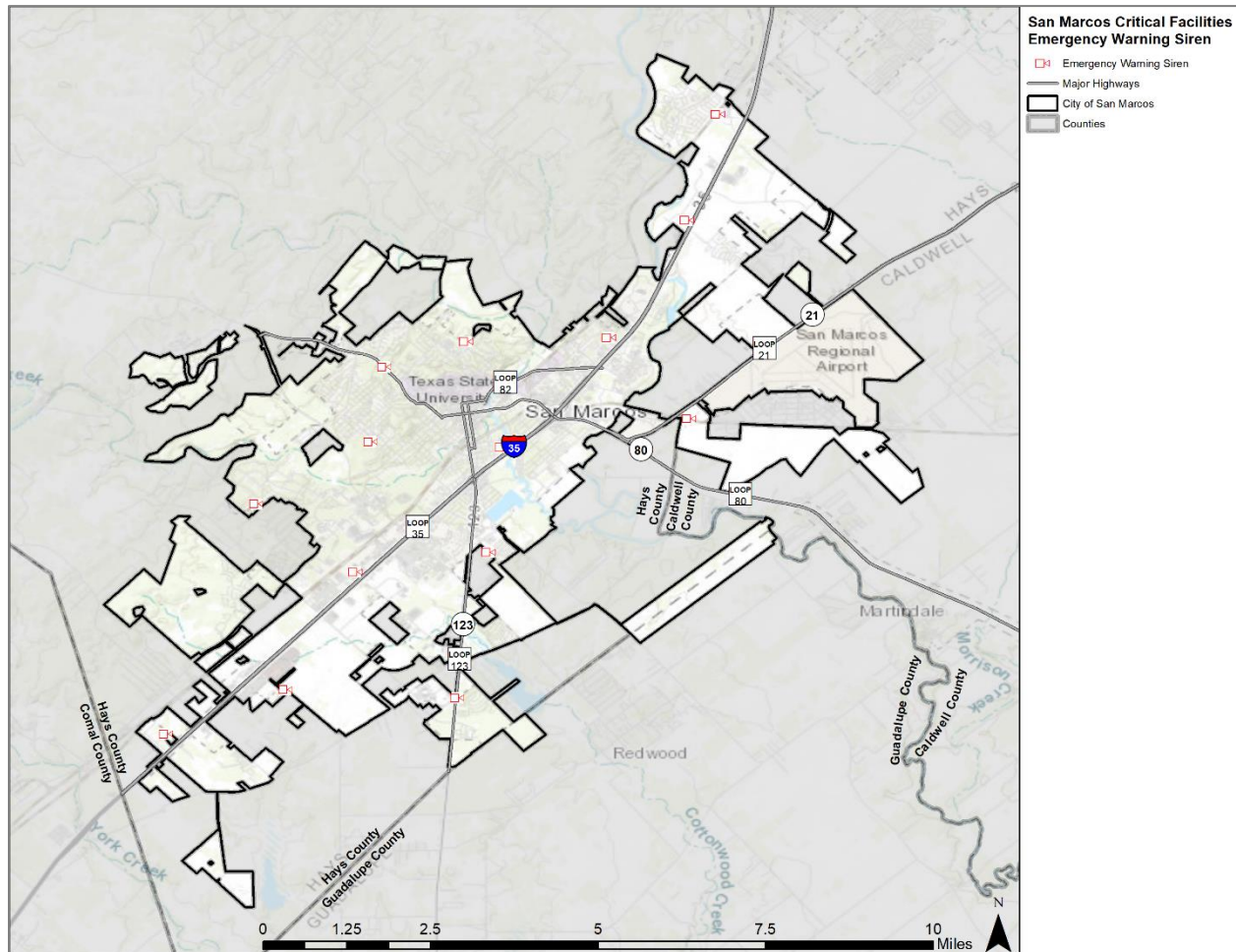
APPENDIX C: CRITICAL FACILITIES

Figure C-6. Critical Facilities in the City of San Marcos – Emergency Management



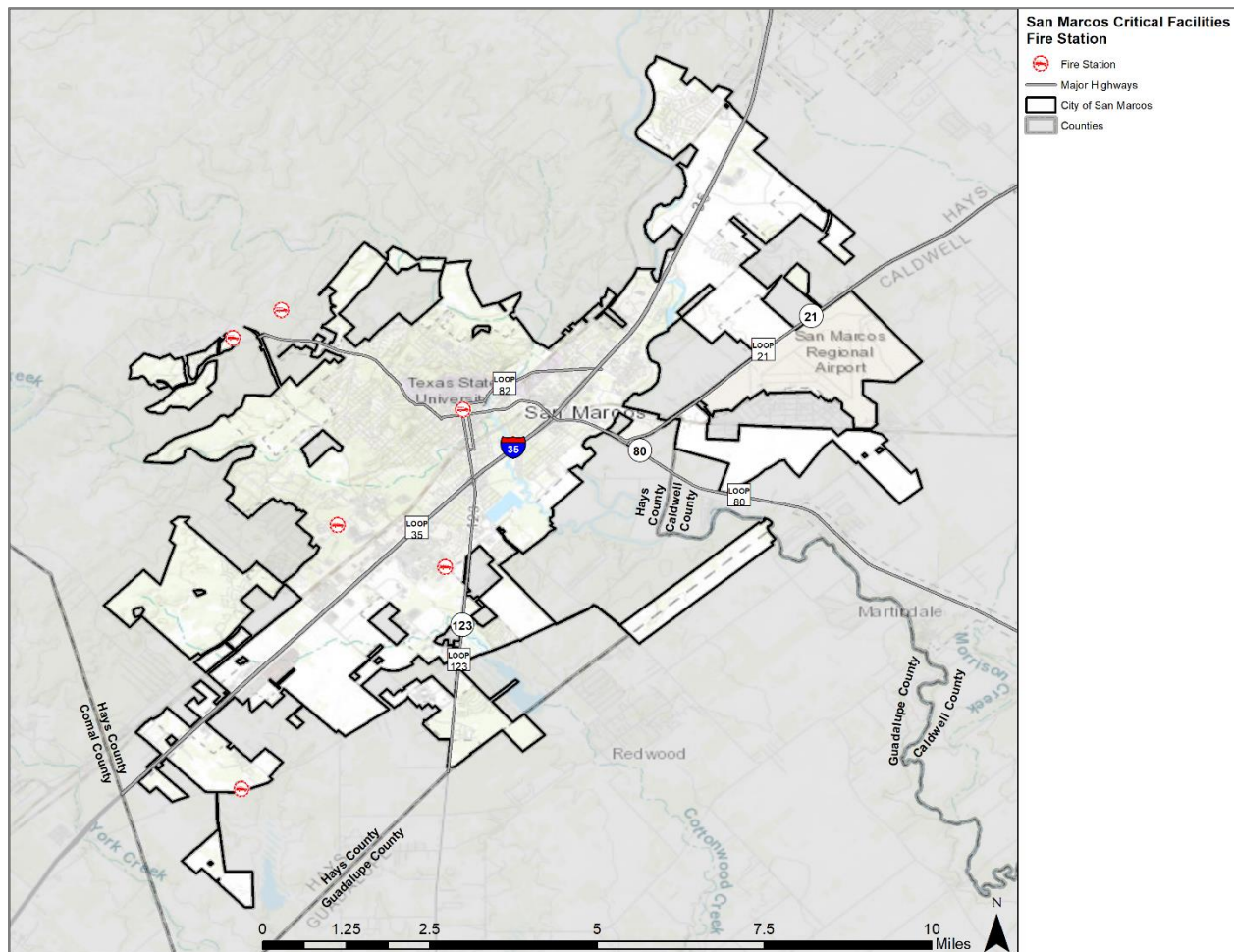
APPENDIX C: CRITICAL FACILITIES

Figure C-7. Critical Facilities in the City of San Marcos – Emergency Warning Sirens



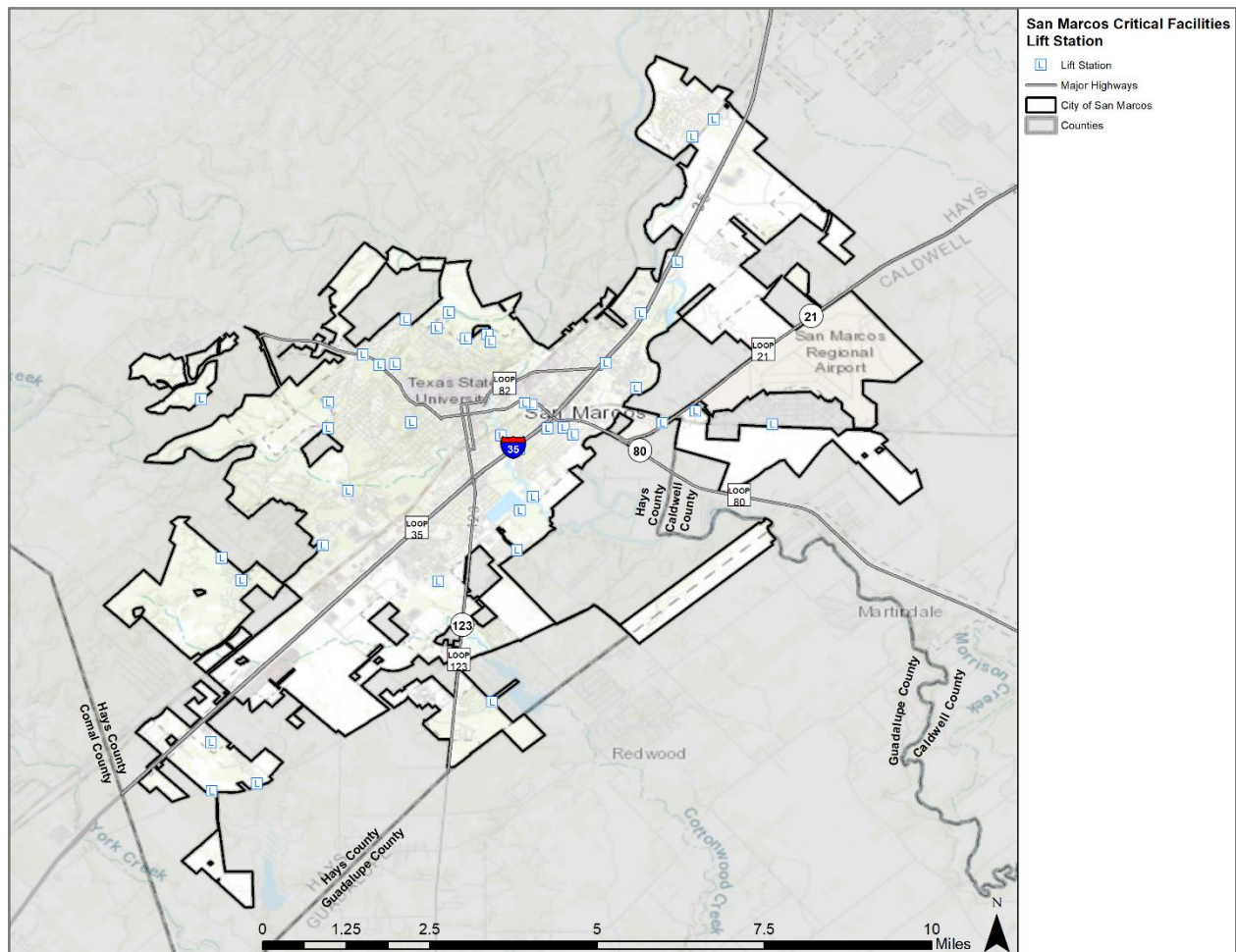
APPENDIX C: CRITICAL FACILITIES

Figure C-8. Critical Facilities in the City of San Marcos – Fire Stations



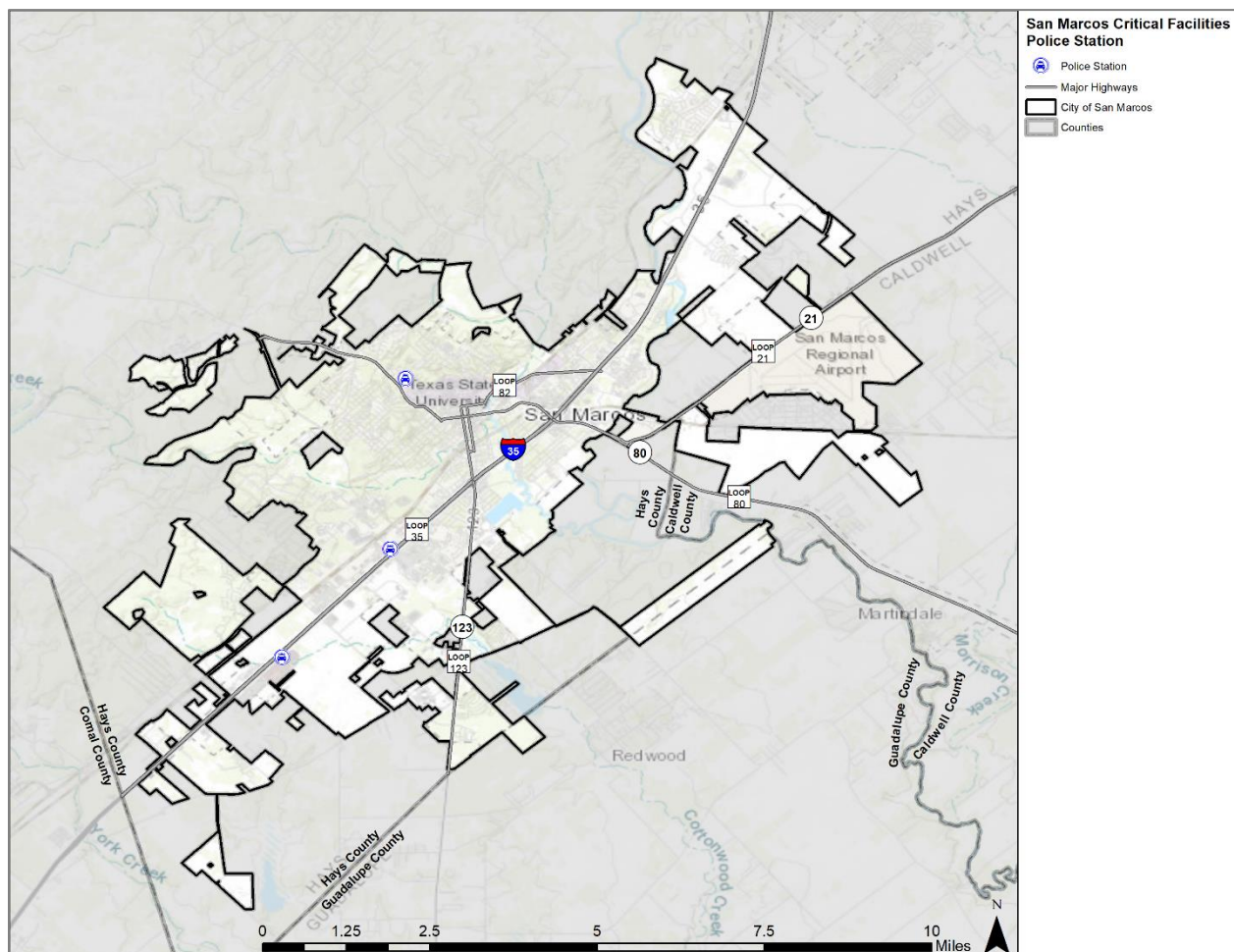
APPENDIX C: CRITICAL FACILITIES

Figure C-9. Critical Facilities in the City of San Marcos – Lift Stations



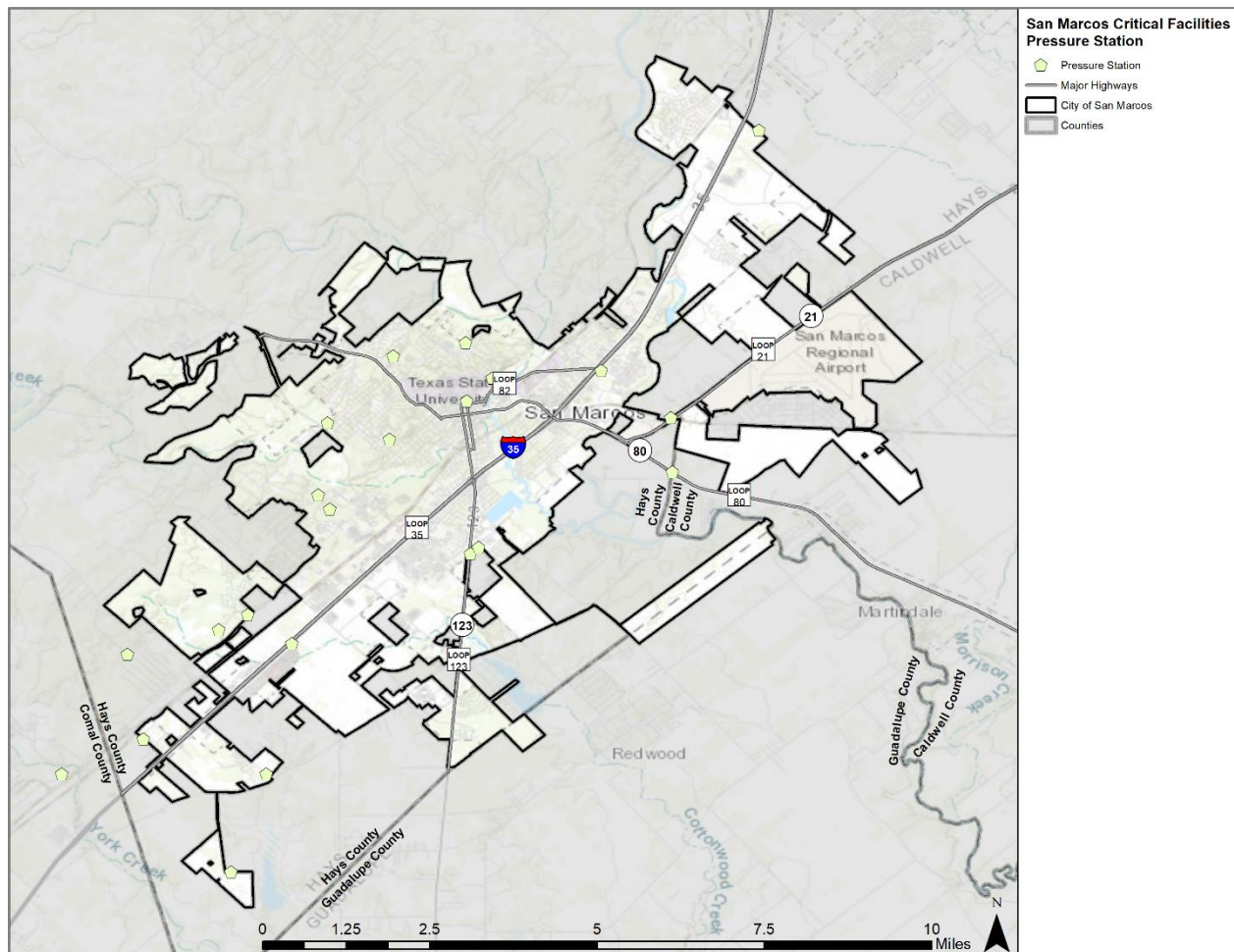
APPENDIX C: CRITICAL FACILITIES

Figure C-10. Critical Facilities in the City of San Marcos – Police Stations



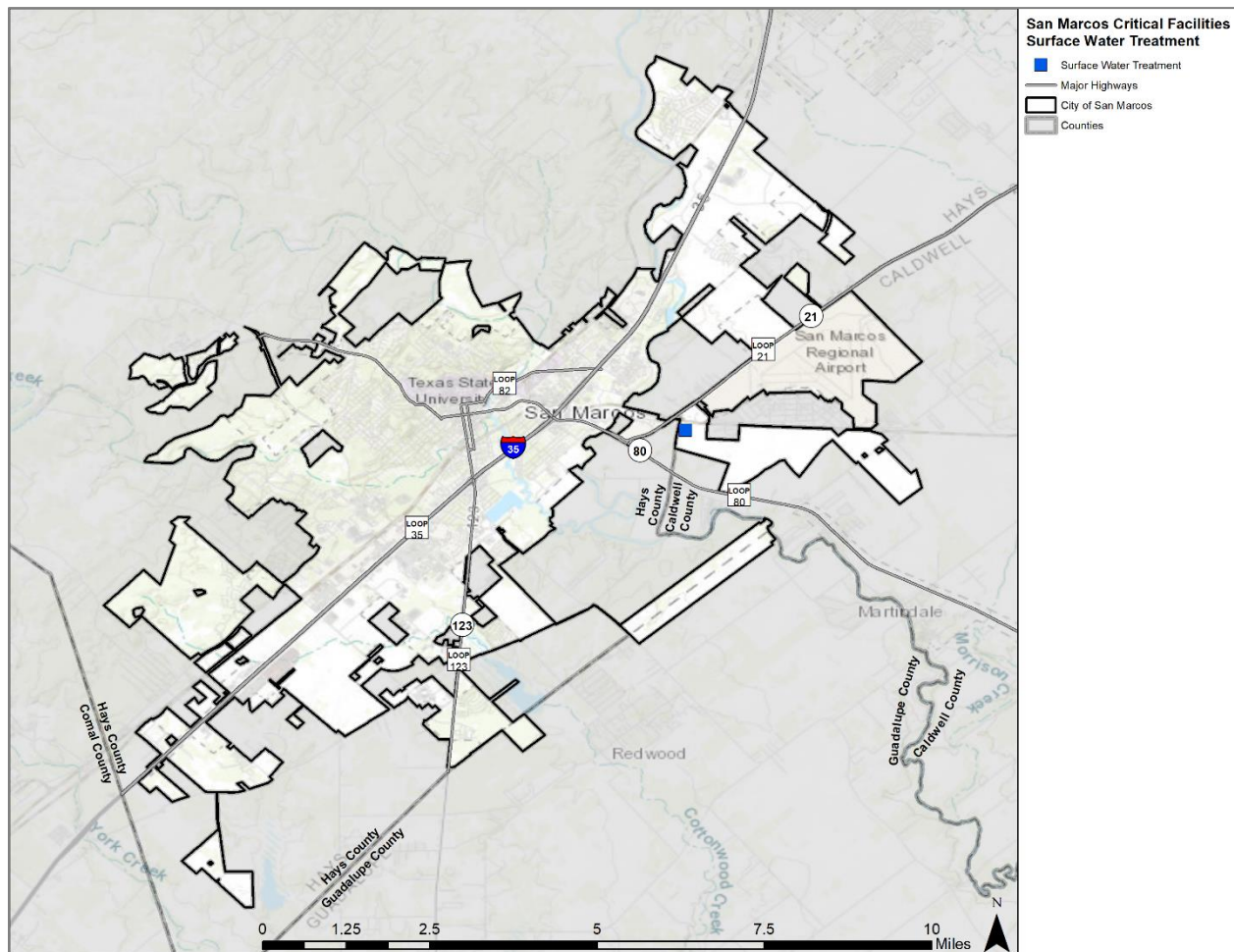
APPENDIX C: CRITICAL FACILITIES

Figure C-11. Critical Facilities in the City of San Marcos – Pressure Stations



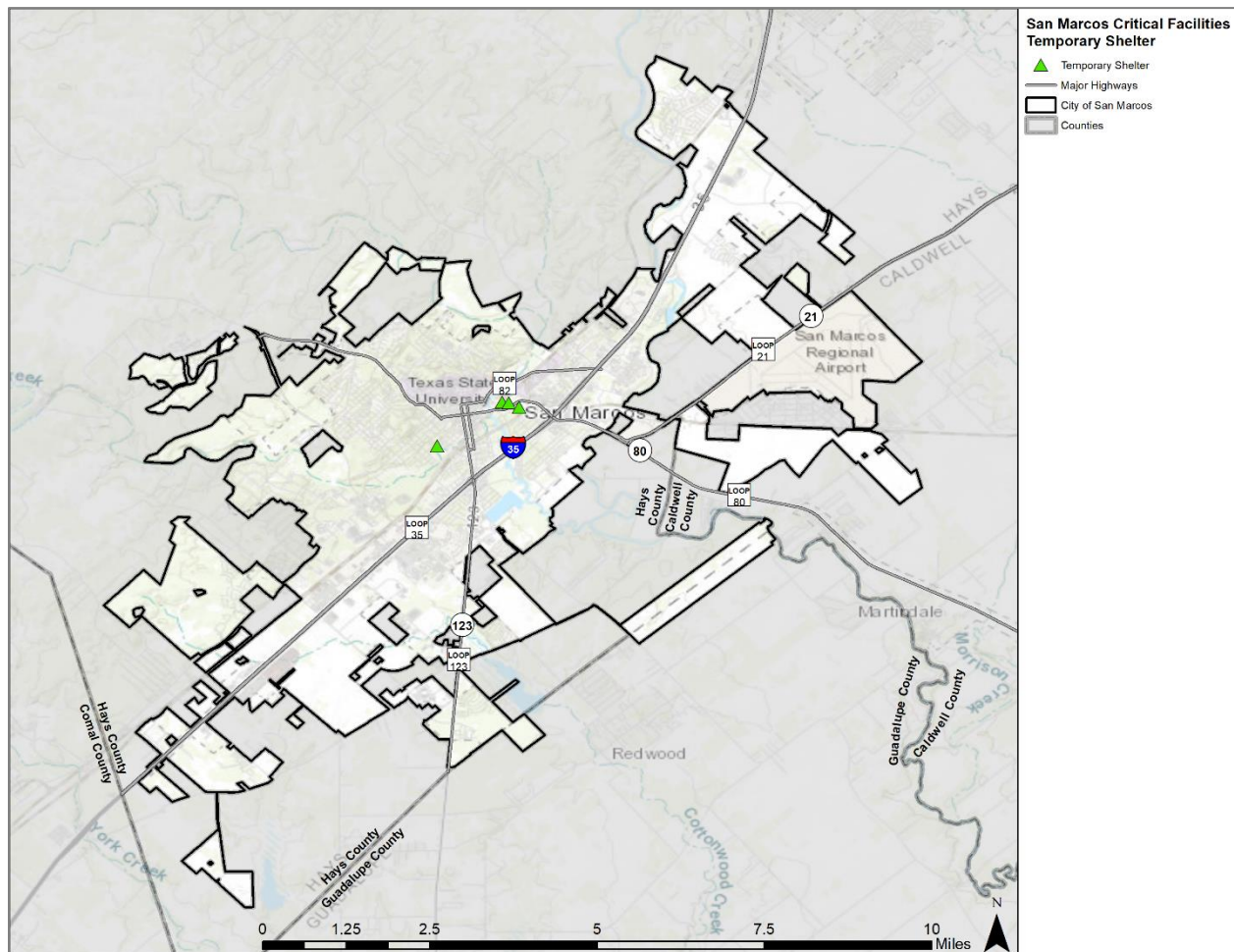
APPENDIX C: CRITICAL FACILITIES

Figure C-12. Critical Facilities in the City of San Marcos – Surface Water Treatment



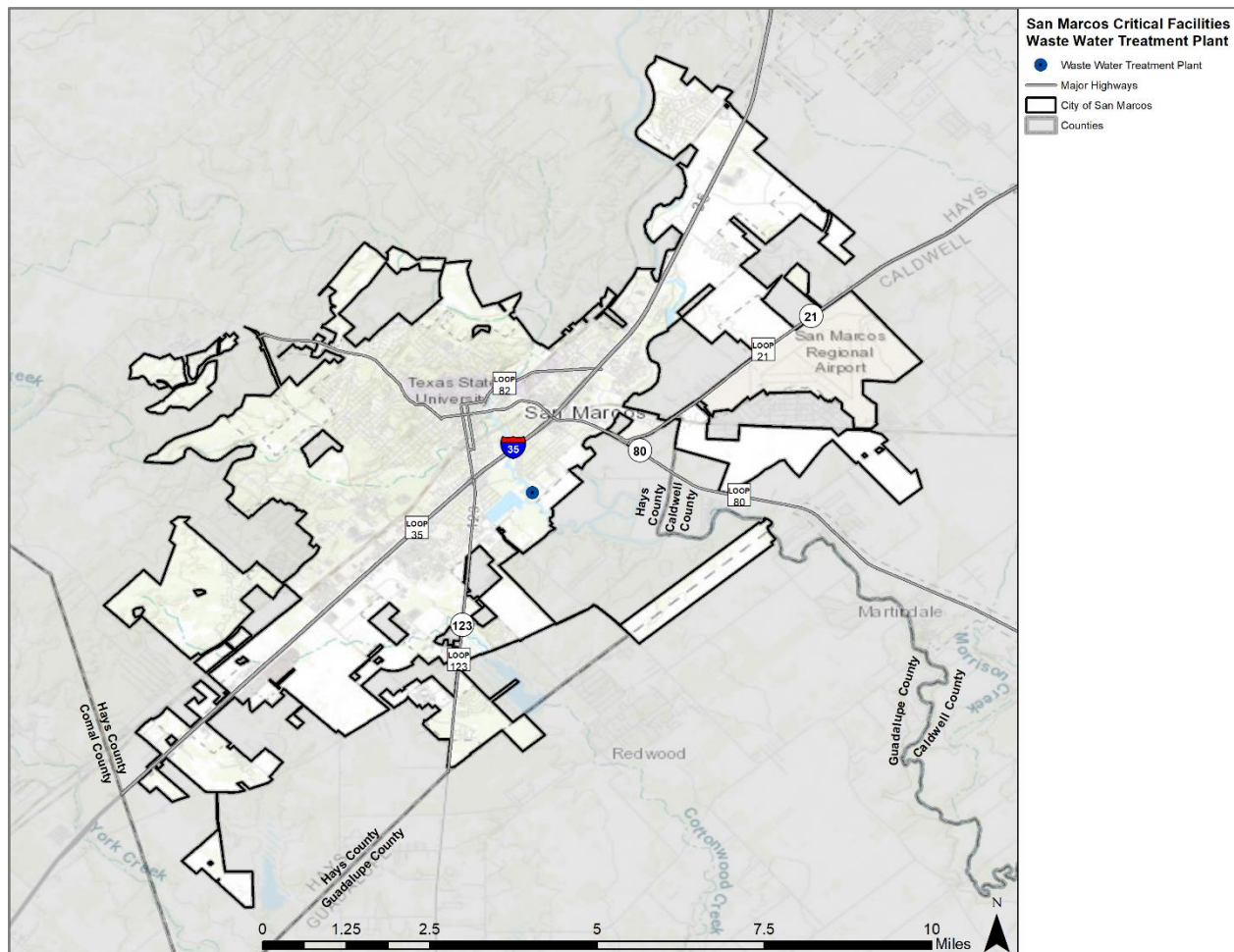
APPENDIX C: CRITICAL FACILITIES

Figure C-13. Critical Facilities in the City of San Marcos – Temporary Shelter



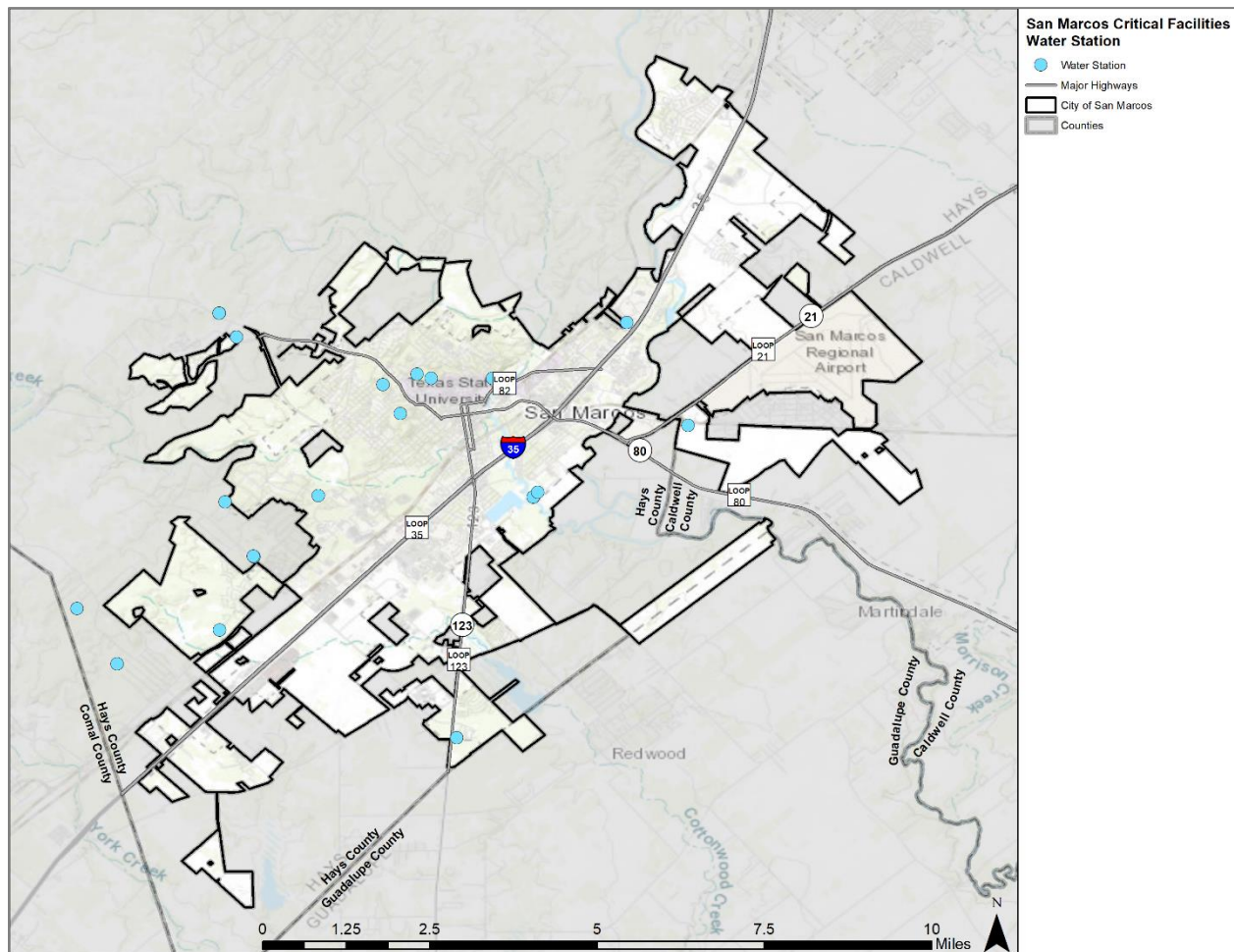
APPENDIX C: CRITICAL FACILITIES

Figure C-14. Critical Facilities in the City of San Marcos – Waste Water Treatment Plant



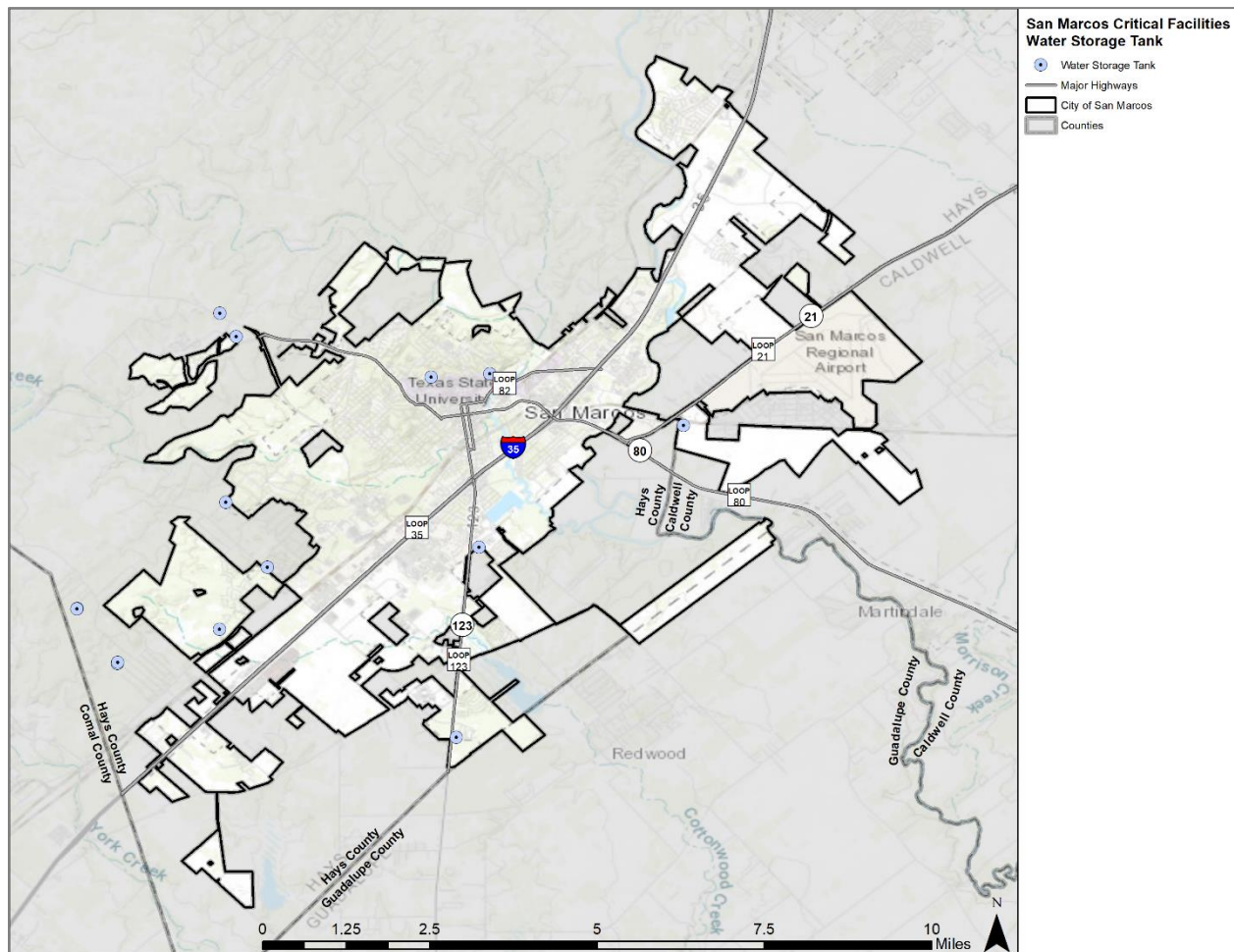
APPENDIX C: CRITICAL FACILITIES

Figure C-15. Critical Facilities in the City of San Marcos – Water Stations



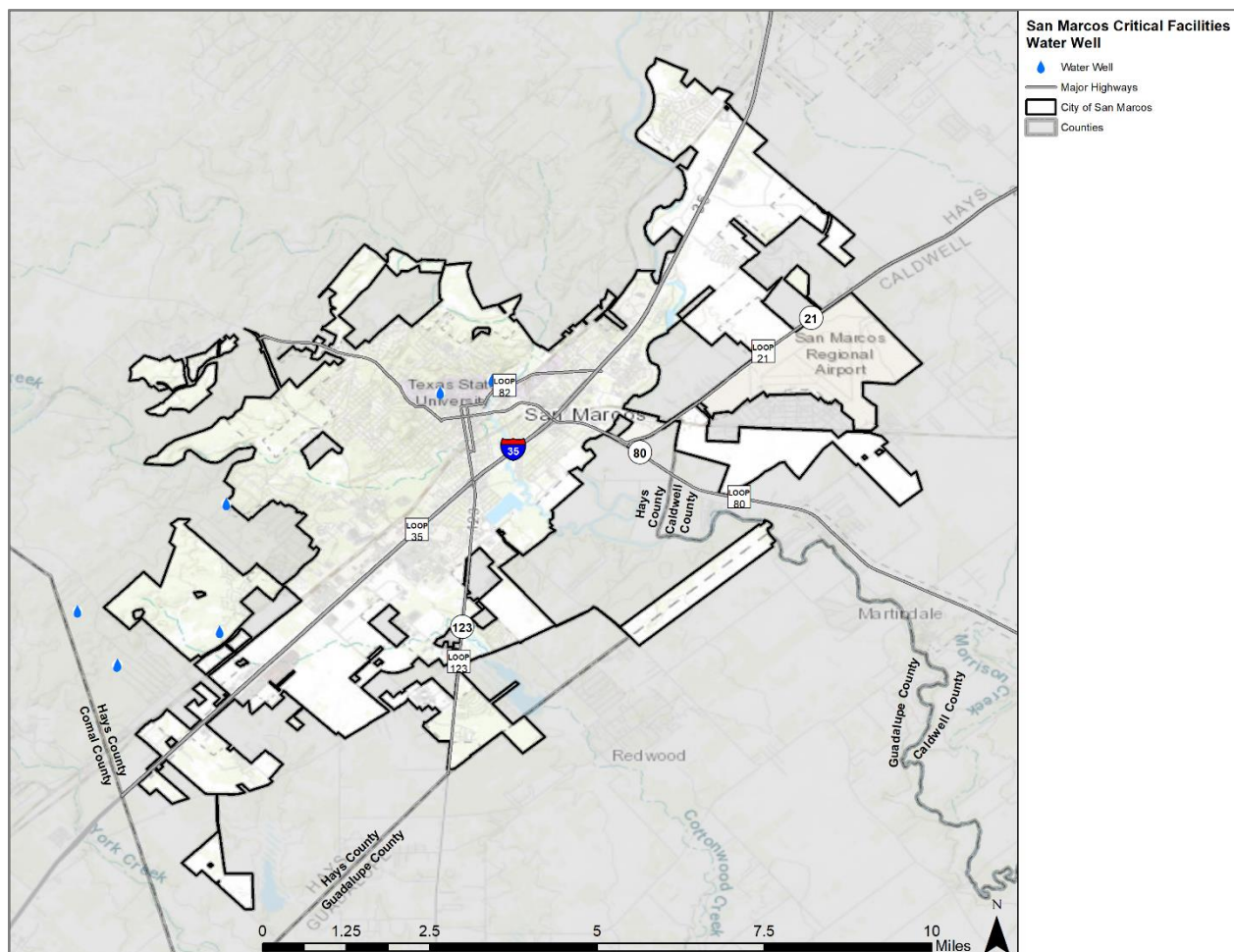
APPENDIX C: CRITICAL FACILITIES

Figure C-16. Critical Facilities in the City of San Marcos – Water Storage Tanks



APPENDIX C: CRITICAL FACILITIES

Figure C-17. Critical Facilities in the City of San Marcos – Water Wells





APPENDIX D

DAM LOCATIONS

APPENDIX D: DAM LOCATIONS

Overview.....	1
Dam Locations.....	1
NRCS Dam Location and Inundation Maps.....	1

OVERVIEW

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

DAM LOCATIONS

Table D-1 below reflects all dams that are located in the City of San Marcos. This list includes High, Significant, and Low Hazard Dams. Section 5 of the Plan doesn't profile dams that were deemed to pose no past, current, or future risk to the planning area as no loss of life or impact to critical facilities or infrastructure is expected in the event of a breach. The asterisk denotes those that were profiled in the hazard assessment.

Table D-1. List of Dam Locations and Storage Capacities

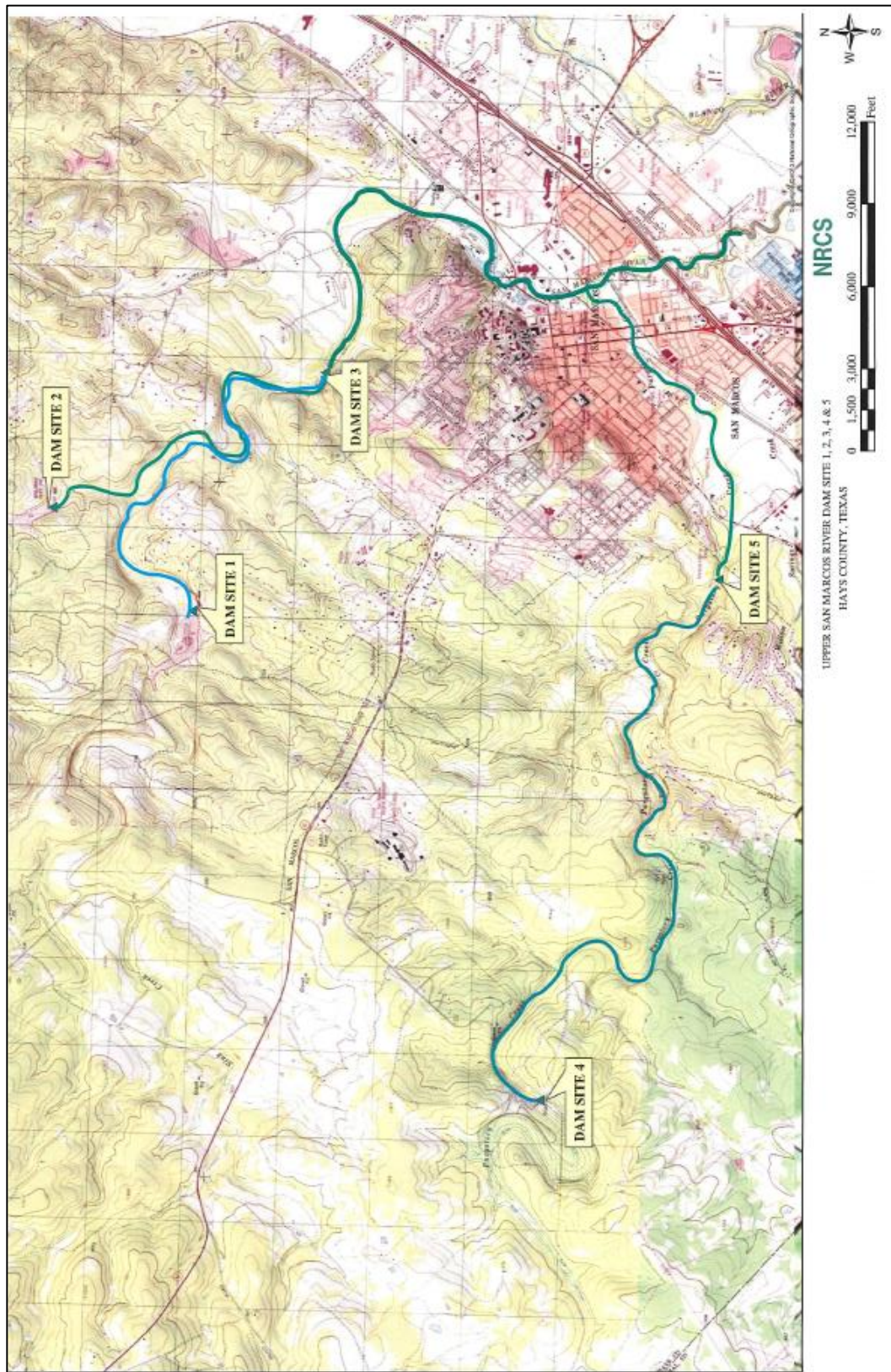
JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
City of San Marcos	29.940481	-97.901602	8	60
City of San Marcos*	29.884867	-98.031862	101	8,421
City of San Marcos*	29.868866	-97.969228	73.5	7,329
City of San Marcos*	29.906897	-97.945358	60	4,323
City of San Marcos*	29.918931	-97.973812	80	18,399
City of San Marcos*	29.932733	-97.961998	51	3,034
City of San Marcos	29.86	-97.933332	21	70
City of San Marcos	29.889772	-97.934317	7	160
City of San Marcos	29.878687	-97.932696	8	61
City of San Marcos	29.856126	-97.905907	10	300

NRCS DAM LOCATION AND INUNDATION MAPS

The team provided the Natural Resources Conservation Service (NRCS) dam location and inundation maps for five dams profiled in the plan including Upper San Marcos River WS SCS Sites 1-5. In addition, the team provided the San Marcos GIS inundation zones for each dam along with combined inundation areas that are interrelated. The dam failure profile (Section 5) includes the estimated number of structures most at risk in the immediate area within a one- or three-mile radius, depending on the capacity of the dam, for all five profiled dams. The inundation area maps extend beyond this radius to show the breach overflow areas subject to minimal flooding. The number and types of structures in the inundation areas, beyond the one- and three-mile radius, was not available. However, the risk in these extended areas is considered minimal due to the limited capacity of the dams.

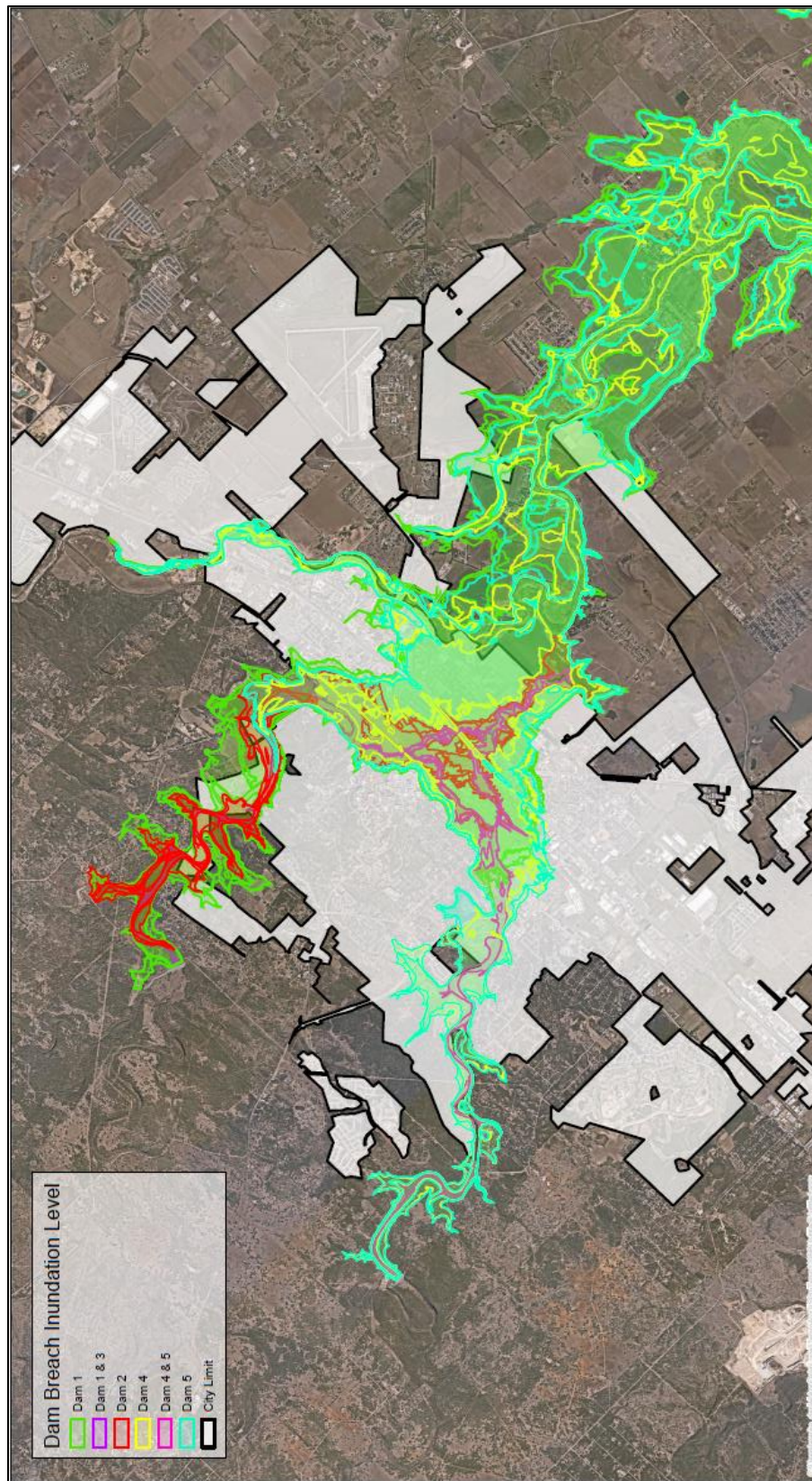
APPENDIX D: DAM LOCATIONS

Figure D-1. Dam Location Map Upper San Marcos River WS SCS Sites 1-5



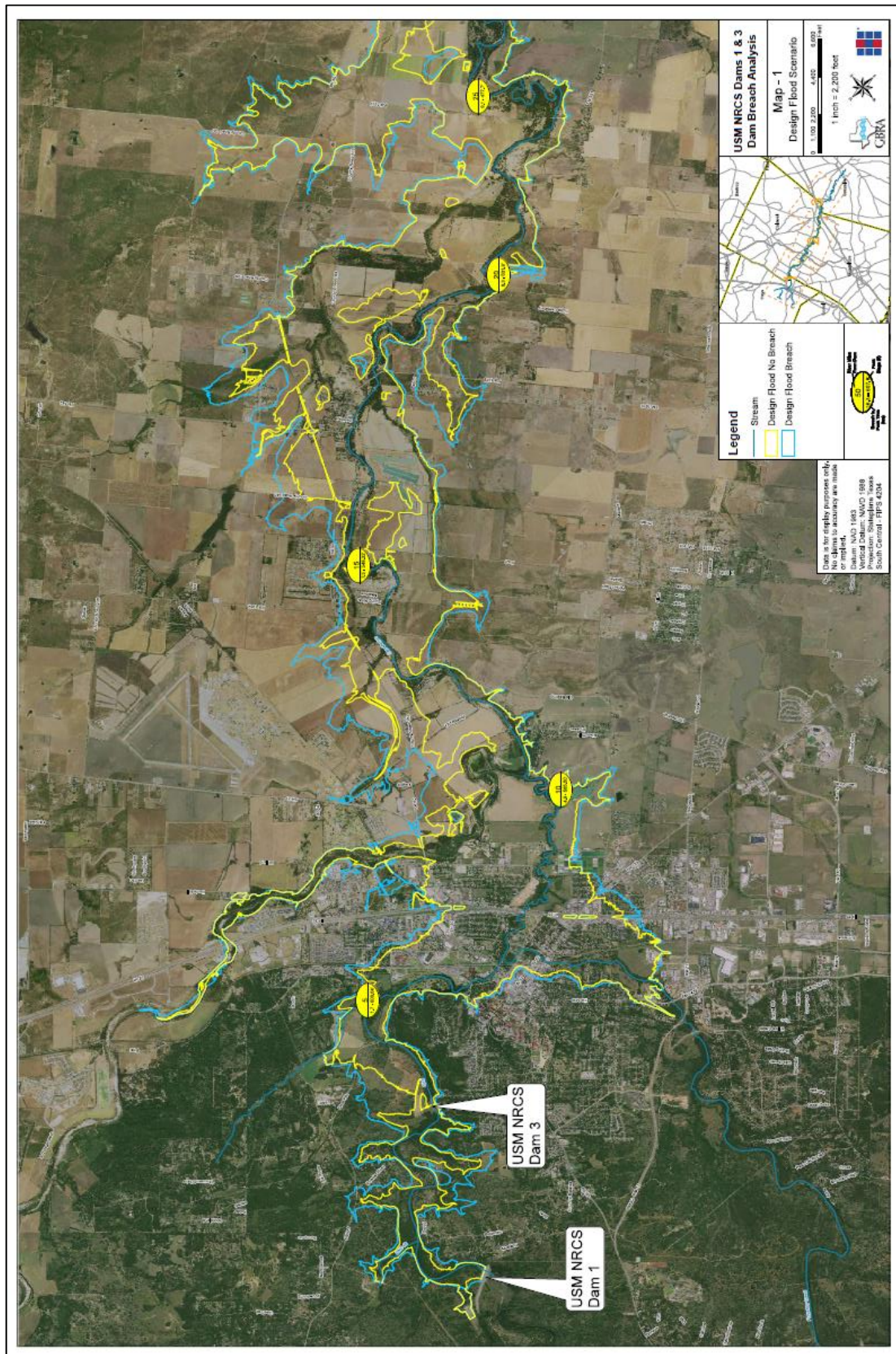
APPENDIX D: DAM LOCATIONS

Figure D-2. Dam inundation Map Upper San Marcos River WS SCS Sites 1-5



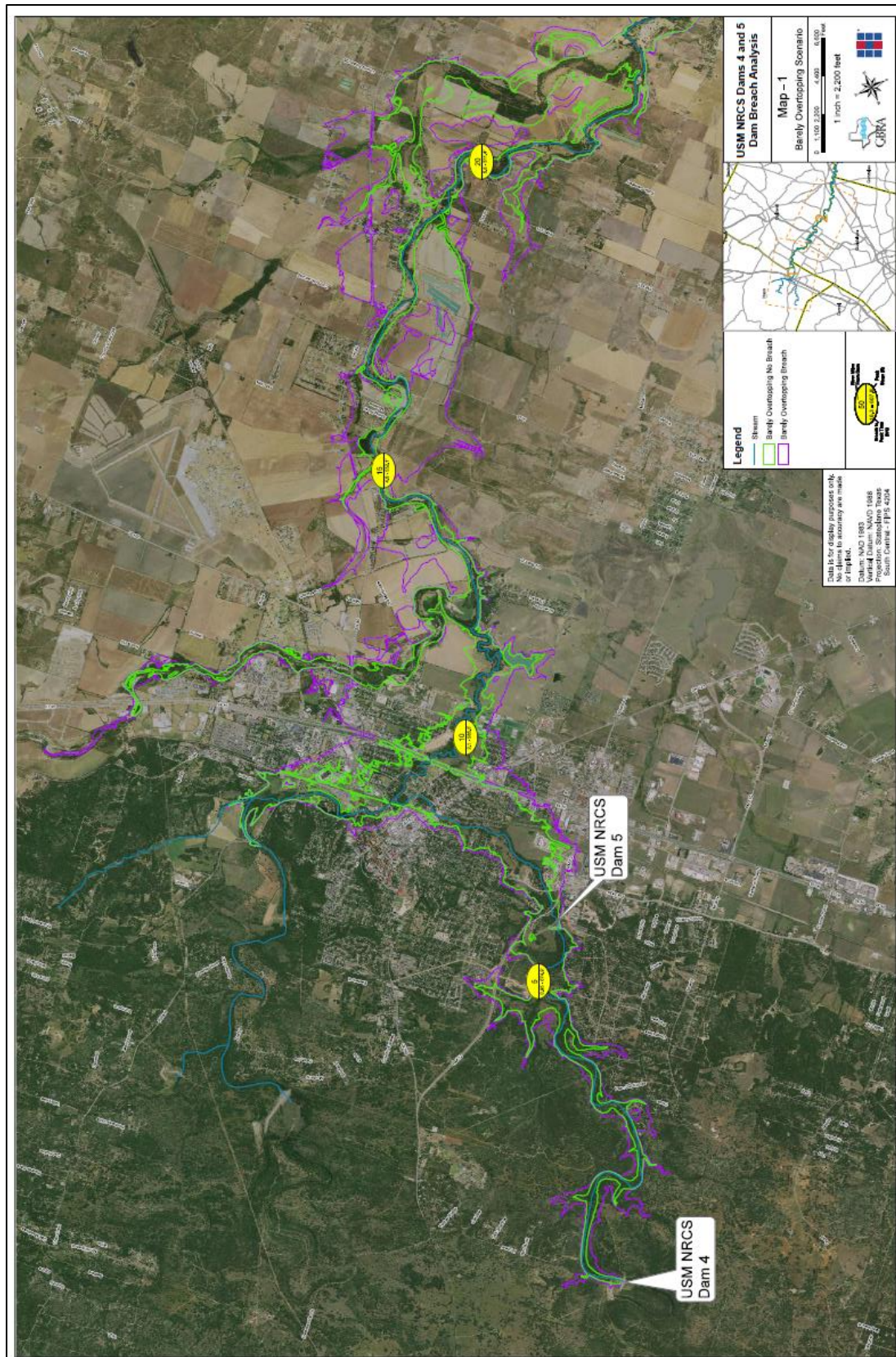
APPENDIX D: DAM LOCATIONS

Figure D-3. NRCS Dam inundation Map Upper San Marcos River WS SCS Sites 1&3



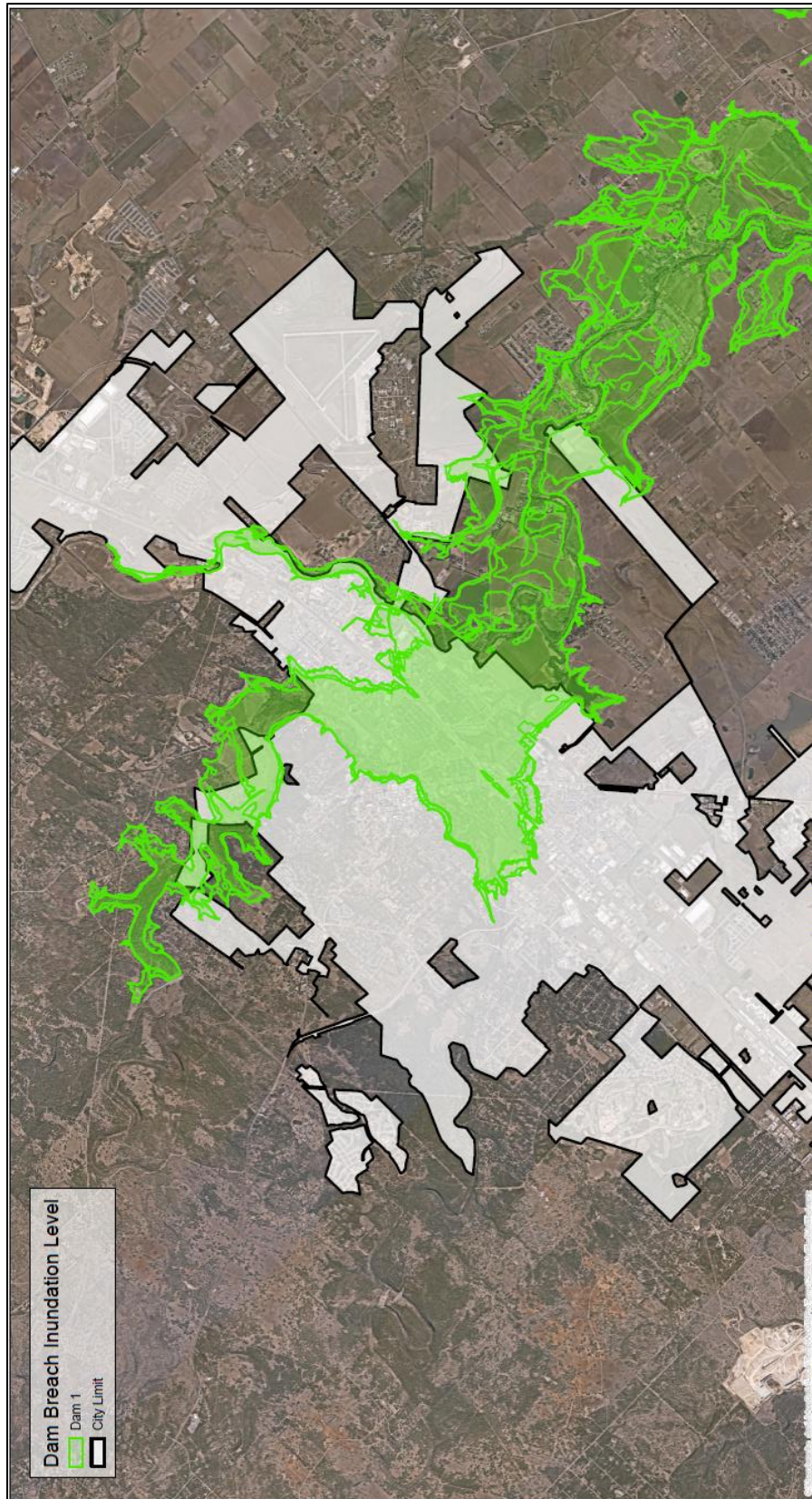
APPENDIX D: DAM LOCATIONS

Figure D-4. NRCS Dam inundation Map Upper San Marcos River WS SCS Sites 4&5



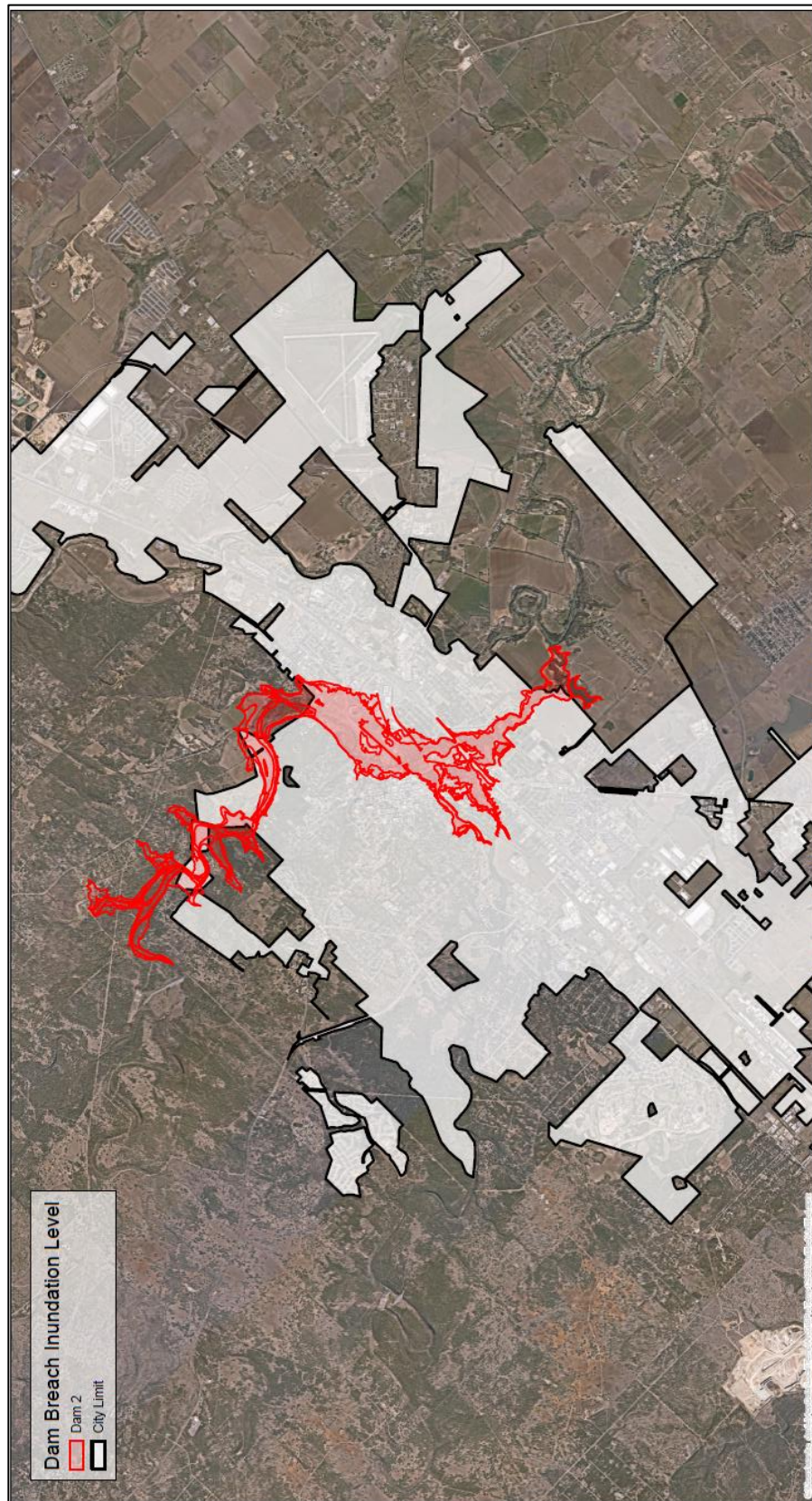
APPENDIX D: DAM LOCATIONS

Figure D-5. Dam inundation Map Upper San Marcos River WS SCS Site 1



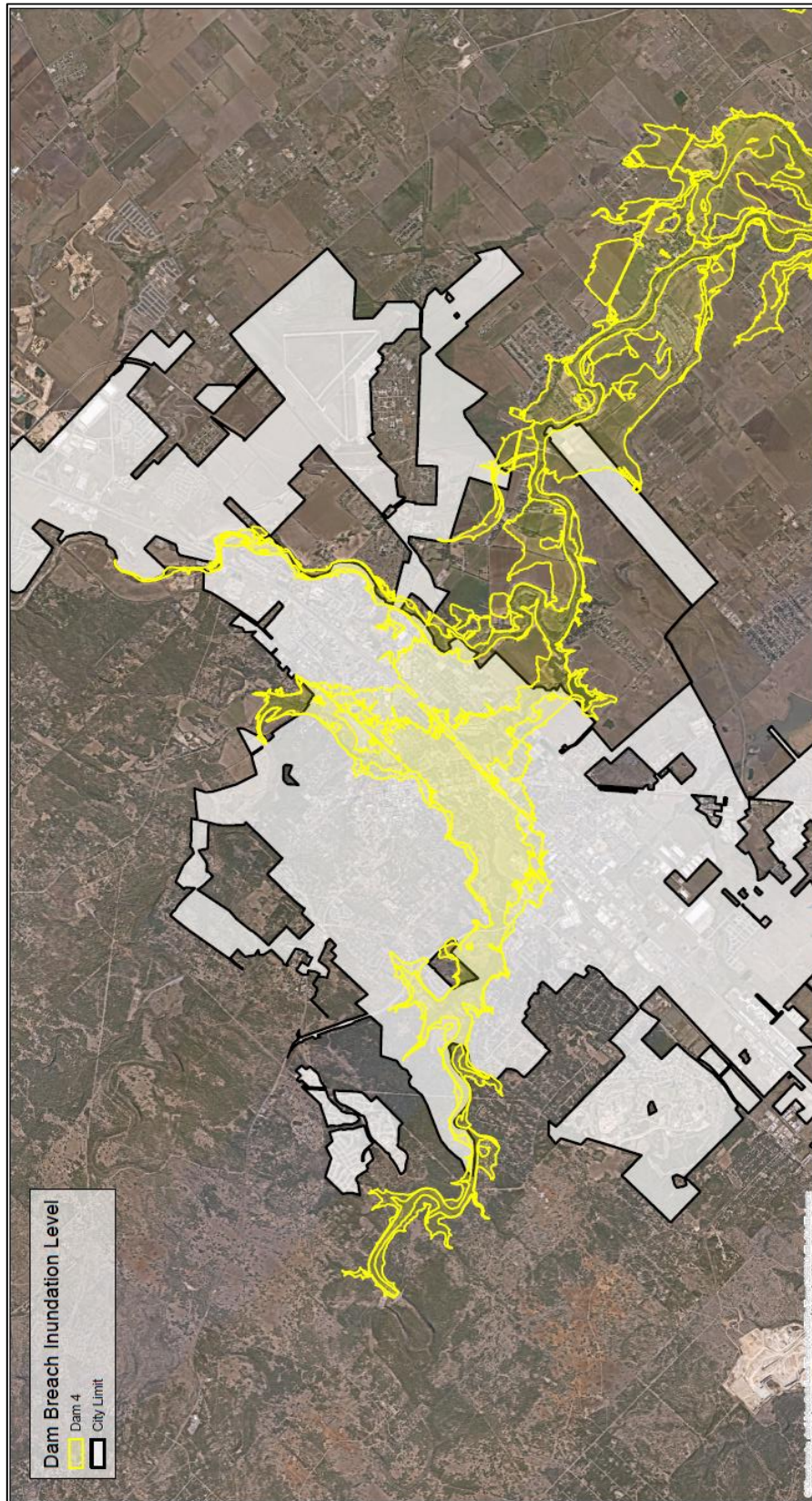
APPENDIX D: DAM LOCATIONS

Figure D-6. Dam inundation Map Upper San Marcos River WS SCS Site 2



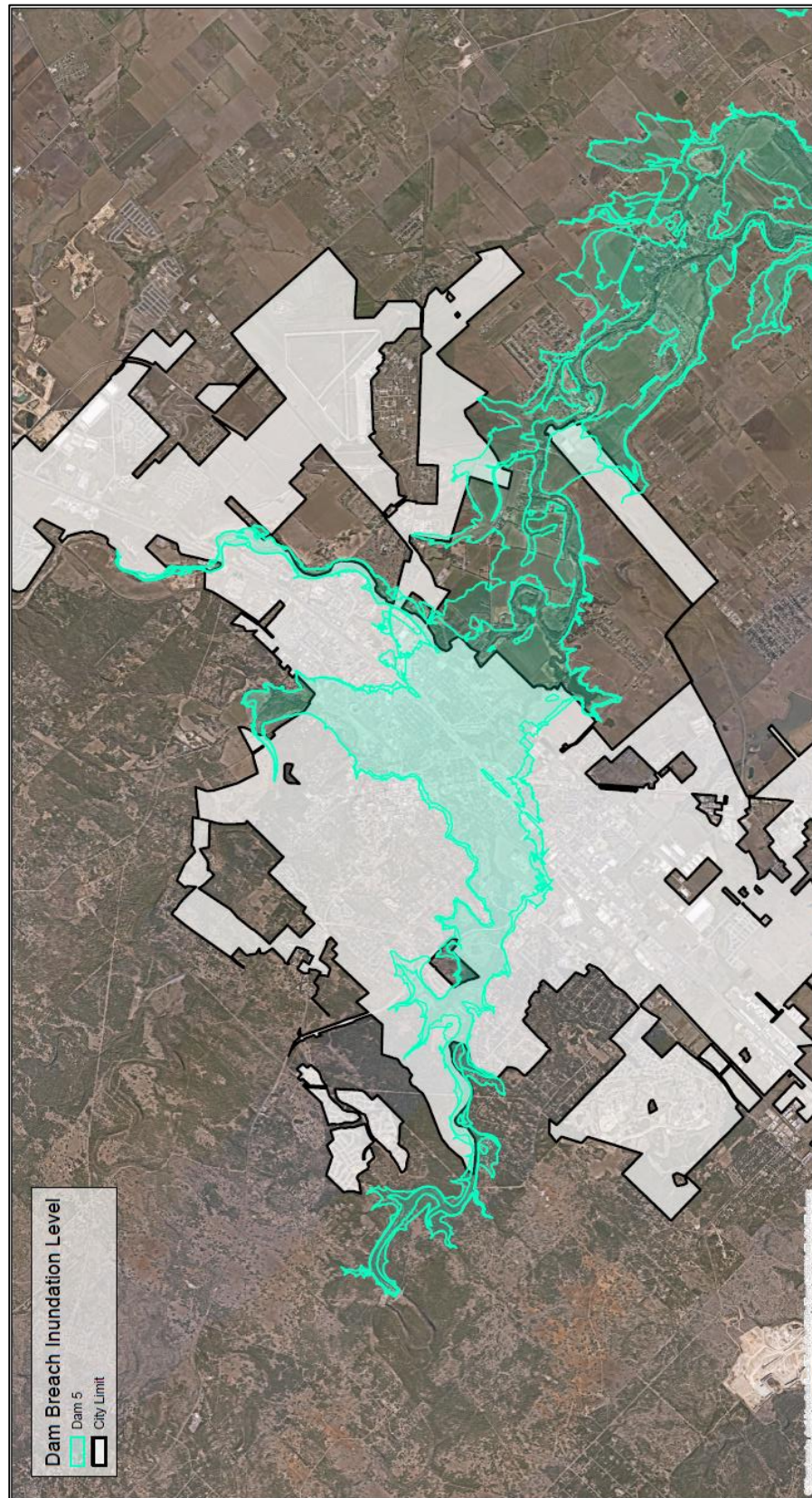
APPENDIX D: DAM LOCATIONS

Figure D-7. Dam inundation Map Upper San Marcos River WS SCS Site 4



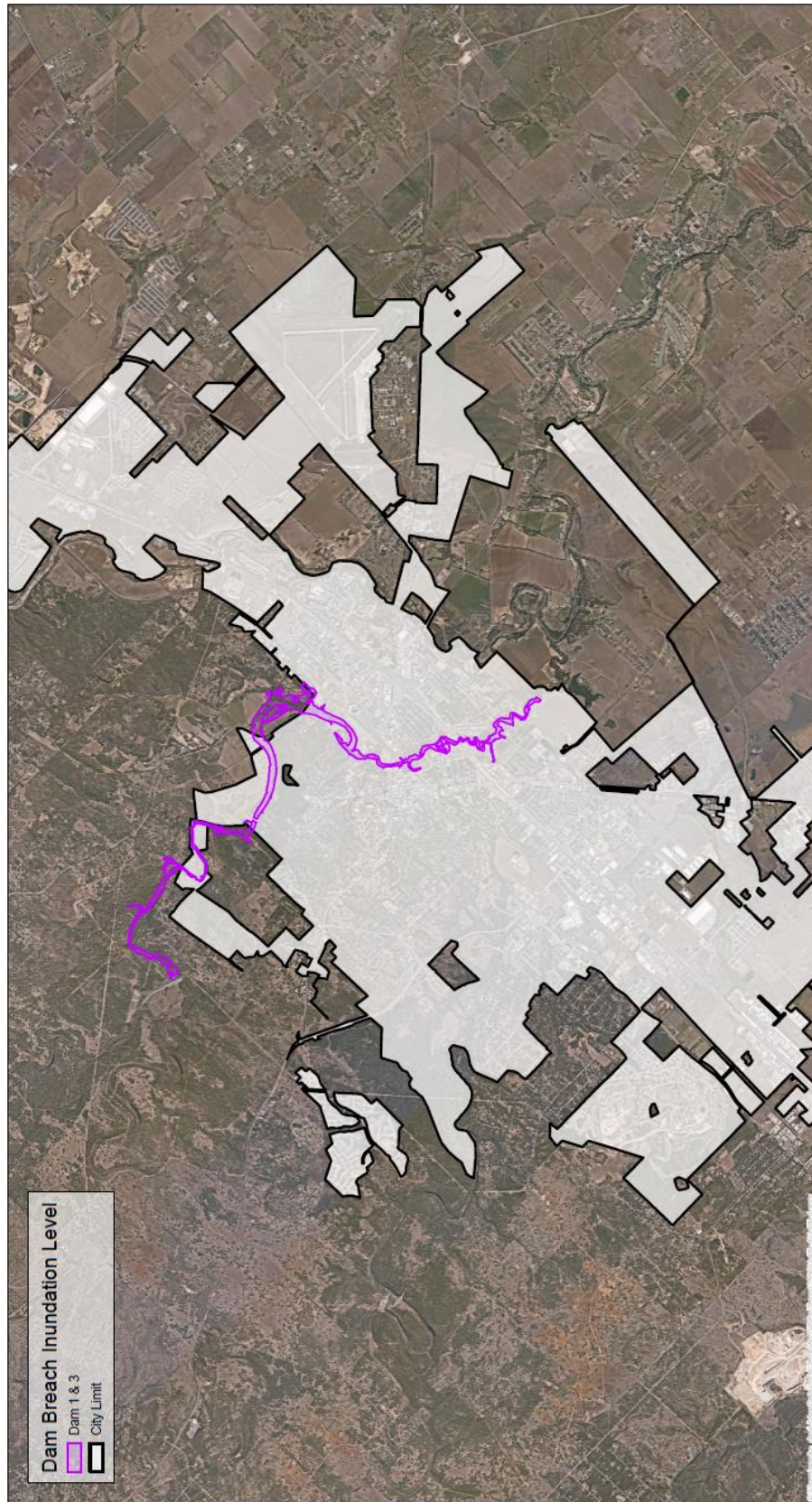
APPENDIX D: DAM LOCATIONS

Figure D-8. Dam inundation Map Upper San Marcos River WS SCS Site 5



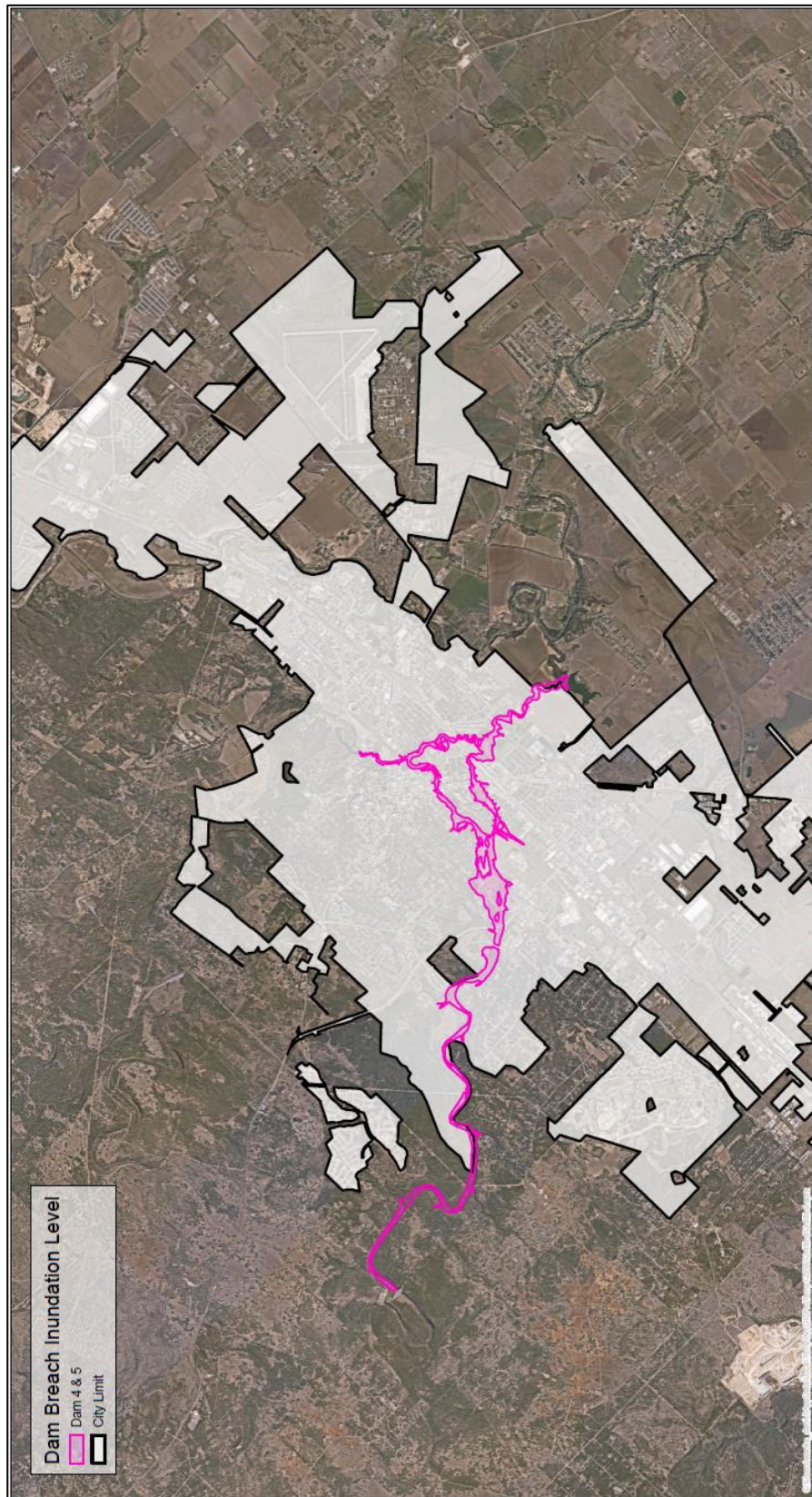
APPENDIX D: DAM LOCATIONS

Figure D-9. Dam inundation Map Upper San Marcos River WS SCS Site 1&3



APPENDIX D: DAM LOCATIONS

Figure D-10. Dam inundation Map Upper San Marcos River WS SCS Site 4&5





APPENDIX E MEETING DOCUMENTATION

APPENDIX E: MEETING DOCUMENTATION

Workshop Documentation	1
Public Meeting Documentation.....	6
Public Notices	11



WORKSHOP DOCUMENTATION



This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

The City of San Marcos held a series of Planning Team workshops: a Kickoff Workshop on March 9, 2023, a Risk Assessment Workshop May 10, 2023, a Mitigation Strategy Workshop on July 12, 2023, and a Green Initiatives Workshop on September 6, 2023. At each of these workshops, members of the Planning Team were informed of the planning process, expressed opinions, and volunteered information. The City of San Marcos hosted public meetings. The sign-in sheets for each workshop and public meeting are included below. For more details on the workshops and planning process, see Section 2.

APPENDIX E: MEETING DOCUMENTATION



Figure E-1. City of San Marcos Kickoff Workshop, March 9, 2023



 <div> <p>CITY OF SAN MARCOS HAZARD MITIGATION PLAN</p> <p>Kick-Off Public Meeting</p> <p>San Marcos Activity Center</p> <p>501 E. Hopkins St.</p> <p>San Marcos, TX</p> <p>March 9th, 2023 @ 5 PM 2:30 pm</p> </div> 				
Name	Jurisdiction	Title	Email	Phone
Pearl Martin	San Marcos COSM	Asst. EMC	martin.pearl@sanmarcostx.gov	512-781-2067
SABAS AVILA	San Marcos	DIR. OF P.W.	savila@sanmarcostx.gov	512-293-8018
Jesse Treviño	COSM	Code	jtrevino@sanmarcostx.gov	512-216-0907
Chase Stapp	COSM	CMO	cstapp@sanmarcostx.gov	512-553-8704
Adam Rossini	COSM	STORMWATER	arossini@sanmarcostx.gov	8025
Carl Stewart	COSM	Asst. IT DIR	cstewart@sanmarcostx.gov	8120
Jordan Hutto	SMTD	Engineer	jhutto@sanmarcostx.gov	
Hayden Migl	COSM	CMO	hmigl@sanmarcostx.gov	8095
Scott Quimby	COSM	Code	squimby@sanmarcostx.gov	512-393-1892
Kayla Burnett	H2O Partners	Mitigation Specialist	kburnett@h2opartnersusa.com	512-541-9156

 <div> <p>CITY OF SAN MARCOS HAZARD MITIGATION PLAN</p> <p>Kick-Off Public Meeting</p> <p>San Marcos Activity Center</p> <p>501 E. Hopkins St.</p> <p>San Marcos, TX</p> <p>March 9th, 2023 @ 5 PM 2:30 pm</p> </div> 				
Name	Jurisdiction	Title	Email	Phone
Nathan Bearley	SMTX/TXST	Intern	N-B225@txstate.edu	512-994-8579
Bridget Bruncau	SMOEM	Emergency Management Specialist	Bbruncau@sanmarcostx.gov	512-214-5702
Shanna O'Brien	SMTX	Environmental Health & Safety Manager	so'Brien@sanmarcostx.gov	512-393-8478
Rhonda Murphy	H2O partners	Mitigation planner	rmurphy@h2opartnersusa.com	512-571-2088


APPENDIX E: MEETING DOCUMENTATION

Figure E-2. City of San Marcos Risk Assessment Workshop, May 10, 2023


 <div> CITY OF SAN MARCOS HAZARD MITIGATION PLAN Risk Assessment Public Meeting San Marcos Activity Center 501 E. Hopkins St. San Marcos, TX May 10th, 2023 @ 5:00 PM </div> 				
Name	Jurisdiction	Title	Email	Phone
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Ambrose Garcia	Serupro	General Manager	agarcia@seruprosmmb.com	612-760-0313
Robert Eby	COAD	Chair	sireeby@gmail.com	214-734-4198
Rene Martin	San Marcos	Asst. EMC	rmartin@sanmarcos.tx.gov	512-781-2062
Bridget Bruneau	COSM OEM	Emergency Management Specialist	bbruneau@sanmarcostx.gov	512-214-5708
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Nate Beasley	TXST/SMTX EM	Intern	N-B225@txstate.edu	512-994-8579

 <div> CITY OF SAN MARCOS HAZARD MITIGATION PLAN Risk Assessment Workshop PSC Admin Training/EOC 227 West 2217 E. McCarty Lane, San Marcos, TX 78666 May 10th, 2023 @ 2:00 PM </div> 				
Name	Jurisdiction	Title	Email	Phone
Adam Rossing	COSM	STORMWATER Mgt.	ARossing@SanMarcosTX.gov	512-393-8095
Rhonda Murphy	H2O Partners	Mitigation Planner	Rmurphy@H2opartnersusa.com	512-571-2088
Rene Martin	COSM	Asst. EMC	rmartin@sanmarcos.tx.gov	512-781-2062
Nate Beasley	SMTX EM/ TXST	intern	N-B225@txstate.edu	512-994-8579
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Bridget Bruneau	COSM	Emergency Management	bbruneau@sanmarcostx.gov	
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Amy Thomaidis	COSM	Resource Recovery	athomaidis@sanmarcostx.gov	512-393-8419

APPENDIX E: MEETING DOCUMENTATION



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Risk Assessment Workshop
PSC Admin Training/EOC 227 West
2217 E. McCarty Lane, San Marcos, TX 78666
May 10th, 2023 @ 2:00 PM



Name	Jurisdiction	Title	Email	Phone
Rob Finch	City of San Marcos	EMC	rfinch@sanmarcostx.gov	512-618-6830
William Guthrie	City of San Marcos	Fire	wguthrie@sanmarcostx.gov	n/a
Amanda Hernandez	City of San Marcos	Director of Planning and Development	ahernandez@sanmarcostx.gov	n/a
Michael Maddux	City of San Marcos	IT Security Manager	mmaddux@sanmarcostx.gov	512-393-8293
Jeffery Quimby	City of San Marcos	Code Compliance	jquimby@sanmarcostx.gov	512-393-1092
Stevie-Ann Hodgson-O'Donnell	H2O Partners Inc.	Mitigation Outreach Specialist	shodgson@h2opartnersusa.com	631-921-2460

Figure E-3. City of San Marcos Mitigation Strategy Workshop, July 12, 2023

CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Mitigation Strategy Workshop
PSC Admin Training/EOC 227 West
2217 E. McCarty Lane, San Marcos, TX 78666
July 12th, 2023 @ 2:00 PM

Name	Jurisdiction	Title	Email	Phone
Rob Finch	COSM	EMC	rfinch@sanmarcostx.gov	512-618-6830
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Rene Martin	COSM OEM	Asst. EMC	rmartin@sanmarcostx.gov	512-781-2367
Bridget Brunau	COSM OEM	EM Specialist	bbunrau@sanmarcostx.gov	787-355-7761
Kileen Whitaker	H2O Partners	Grant Specialist		512-780-9104
Rhonda Murphy				

APPENDIX E: MEETING DOCUMENTATION






<div>  <div> CITY OF SAN MARCOS HAZARD MITIGATION PLAN Mitigation Strategy Workshop Virtual Attendance – Microsoft Teams July 11th, 2023 @ 2:00 PM </div>  </div>				
Name	Jurisdiction	Title	Email	Phone
Amanda Hernandez	City of San Marcos	Director of Planning and Development	ahernandez@sanmarcostx.gov	n/a
Shanna O'Brien	City of San Marcos	Environmental Health & Safety Manager	sobrien@sanmarcostx.gov	512-393-8378
Grisell Perez-Carey	City of San Marcos	Diversity, Equity, & Inclusion Coordinator	gperez-carey@sanmarcostx.gov	n/a
Carl Stewart	City of San Marcos	Asst. Director of I.T.	cstewart@sanmarcostx.gov	512-393-8120
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Michael Maddux	City of San Marcos	IT Security Manager	mmaddux@sanmarcostx.gov	512-393-8293


Figure E-4. City of San Marcos Green Initiatives Workshop, September 6, 2023

<div>  <div> CITY OF SAN MARCOS HAZARD MITIGATION PLAN Green Initiatives Workshop San Marcos City Hall 630 E. Hopkins Street, San Marcos, TX 78666 September 6, 2023 @ 11:30 AM </div>  </div>				
Name	Jurisdiction	Title	Email	Phone
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Amanda Hernandez	COSM	Director	ahernandez@sanmarcostx.gov	393-8237
Diane Insley	COSM	Library Director	dinsley@sanmarcostx.gov	512-393-8214

APPENDIX E: MEETING DOCUMENTATION



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
 Green Initiatives Workshop
 San Marcos City Hall
 630 E. Hopkins Street, San Marcos, TX 78666
 September 6, 2023 @ 11:30 AM



Name	Jurisdiction	Title	Email	Phone
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Binion	Cosm	AD-PW	pbinion@sanmarcostx.gov	393-8451
Samuel Avila	Cosm	P.W. Dir.	savila@sanmarcostx.gov	512-393-8018
Sham Conder	Cosm	Director Eng/Asst	SConder	512-393-8124
Bob Klett	Cosm	Asst chief PD	BKlett	512-753-2102



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
 Green Initiatives Workshop
 San Marcos City Hall
 Microsoft Teams Virtual Attendance
 September 6, 2023 @ 11:30 AM



Name	Jurisdiction	Title	Email	Phone
Kari Fontenot	City of San Marcos	Assistant to the City Manager	kfontenot@sanmarcostx.gov	512-393-8101
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Linda Spacek	City of San Marcos	Human Resources	lspacek@sanmarcos.tx.gov	512-393-8072
Hayden Migl	City of San Marcos	City Manager - Administrative Service Manager	hmigl@sanmarcostx.gov	512-393-8095
Laurie Moyer	City of San Marcos	Assistant City Manager	lmoyer@sanmarcos.tx.gov	512-393-8103
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APPENDIX E: MEETING DOCUMENTATION



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Green Initiatives Workshop
San Marcos City Hall
Microsoft Teams Virtual Attendance
September 6, 2023 @ 11:30 AM



Name	Jurisdiction	Title	Email	Phone
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CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Green Initiatives Workshop
San Marcos City Hall
Microsoft Teams Virtual Attendance
September 6, 2023 @ 11:30 AM




Name	Jurisdiction	Title	Email	Phone
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Stevie-Ann Hodgson-O'Donnell	H2O Partners Inc.	Mitigation Outreach Specialist	shodgson@h2opartnersusa.com	631-921-2460

APPENDIX E: MEETING DOCUMENTATION


PUBLIC MEETING DOCUMENTATION

As discussed in Section 2, public meetings were held in the City of San Marcos. Documentation in the form of sign-in sheets for each of the meetings follows.

Figure E-5. Public Meeting, March 9, 2023



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
 Kick-Off Public Meeting
 San Marcos Activity Center
 501 E. Hopkins St.
 San Marcos, TX
 March 9th, 2023 @ 5 PM



Name	Jurisdiction	Title	Email	Phone
Rhonda Murphy	H2OPartners	Mitigation Planner	Rmurphy@h2opartnersusa.com	512-571-2028
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Nathan Beasley	SM TX / TXST	intern	Nathan.Beasley@sanmarcostx.gov	512-994-8579
Bridget Bruncau	SM DEM	EM Specialist	Bbruncau@sanmarcostx.gov	512-214-5708
Karla Burnett	H2O Partners	Mitigation Specialist	Kburnett@h2opartnersusa.com	512-541-9186

APPENDIX E: MEETING DOCUMENTATION

Figure E-6. Public Meeting, May 10, 2023



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Risk Assessment Public Meeting
San Marcos Activity Center
501 E. Hopkins St.
San Marcos, TX
May 10th, 2023 @ 5:00 PM



Name	Jurisdiction	Title	Email	Phone
Rhonda Murphy	H2O Partners	Mitigation Planner	Rmurphy@h2opartnersustx.com	512-521-2088
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Robert Eby	COAD	Chair	sireeby@gmail.com	214-754-4198
Rene Martin	San Marcos Pen	Prof. Emer	rmartin@sanmarcos.tx.gov	512-281-2062
Bridget Bruncau	OSM OEM	Emergency Management Specialist	bbruncau@sanmarcostx.gov	512-214-5708
Tina Gonzalez	citizen		tina.gonzalezsmtx@gmail.com	469-544-9117
Nate Beasley	TXSP/SMTX EM	intern EM	N-B2250@txstate.edu	512-994-8579

APPENDIX E: MEETING DOCUMENTATION

Figure E-7. Public Meeting, July 12, 2023



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Mitigation Strategy Public Meeting
San Marcos Activity Center
501 E. Hopkins St.
San Marcos, TX 78666
July 12th, 2023 @ 5:00 PM



Name	Jurisdiction	Title	Email	Phone
<i>[Signature]</i>	<i>asam OER</i>	<i>M. J. [Signature]</i>	<i>[Signature]</i>	<i>917-731-427</i>
<i>Rose Murphy</i>	H2O Partners	Mitigation Planner	<i>Rmurphy@H2OPartnersUSA.com</i>	<i>512-571-2098</i>
<i>Bridget Brucan</i>	<i>Coast OER</i>	FM Specialist	<i>bbrucan@sanmarcos.tx.gov</i>	<i>989-357-9761</i>
<i>Annie Carter</i>	HALFF, INC.	Project Archaeologist	<i>annie.carter.0392@gmail.com</i>	
<i>Kileen White</i>	H2O Partners	Grant Specialist	<i>kwhite@H2OPartnersUSA.com</i>	<i>512-520-9124</i>



CITY OF SAN MARCOS HAZARD MITIGATION PLAN
Mitigation Strategy Public Meeting
San Marcos Activity Center
501 E. Hopkins St.
San Marcos, TX 78666
July 12th, 2023 @ 5:00 PM



Name	Jurisdiction	Title	Email	Phone
<i>Robert Eby</i>	<i>COAD</i>	<i>Chair</i>	<i>sinceby@gmail.com</i>	<i>214-734-4198</i>

APPENDIX E: MEETING DOCUMENTATION

PUBLIC NOTICES

Public notices to announce the City of San Marcos' participation in the Plan Update development process were posted on their website, on social media sources including Facebook and Twitter, through the local media, and/or posting the information on bulletin boards in public facilities.

Figure E-8. City of San Marcos Public Notice, Emergency Management Website

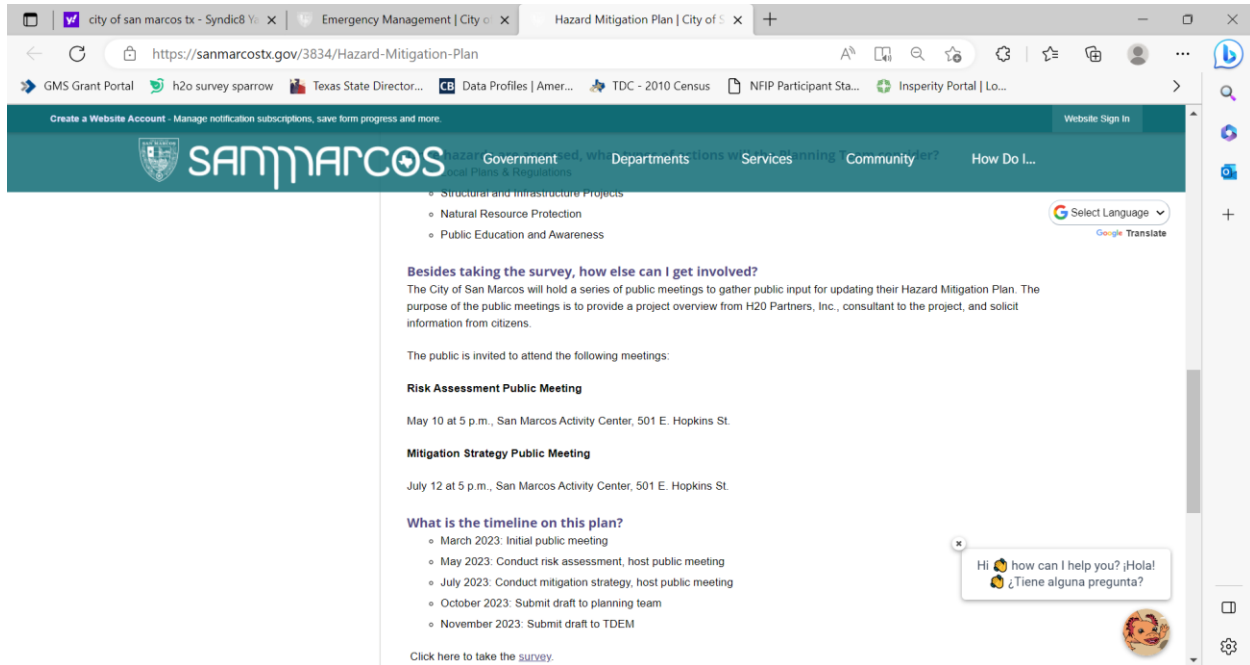
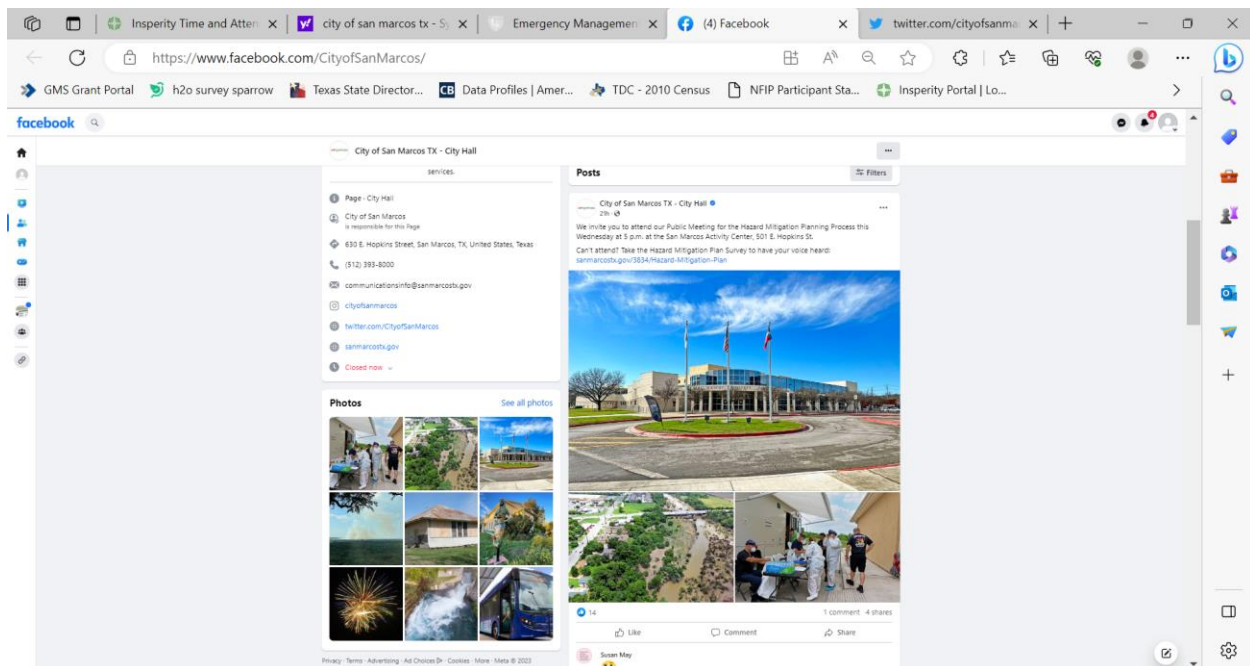


Figure E-9. City of San Marcos Public Notice, Facebook



APPENDIX E: MEETING DOCUMENTATION

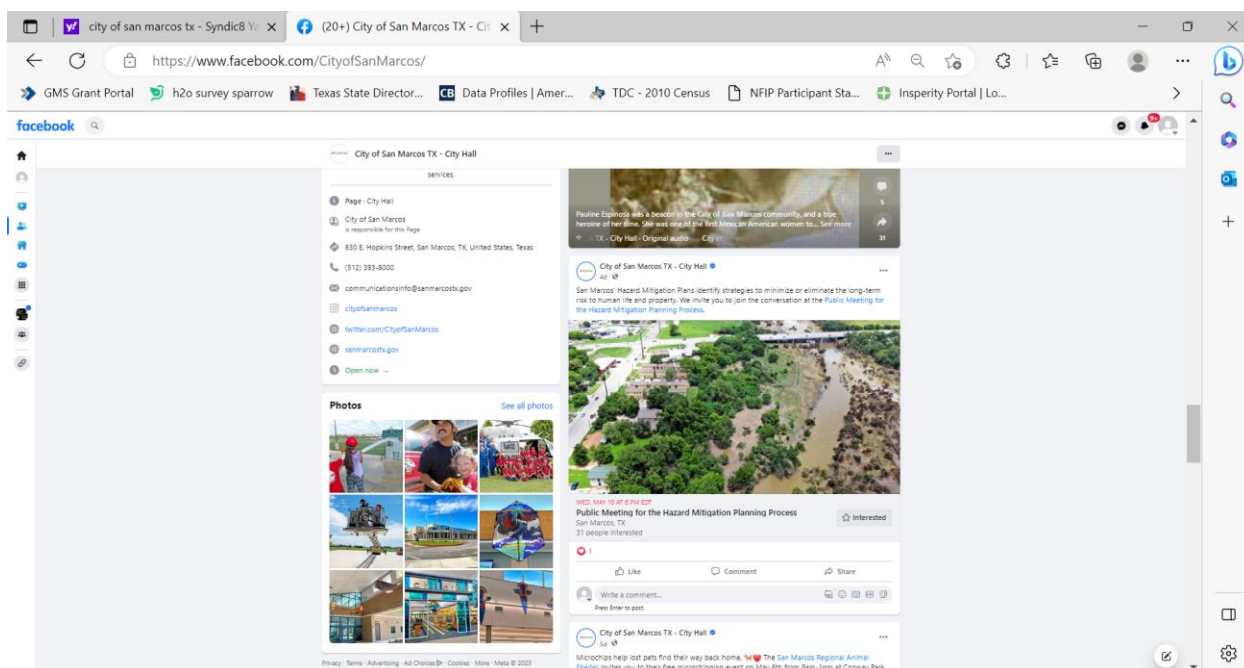
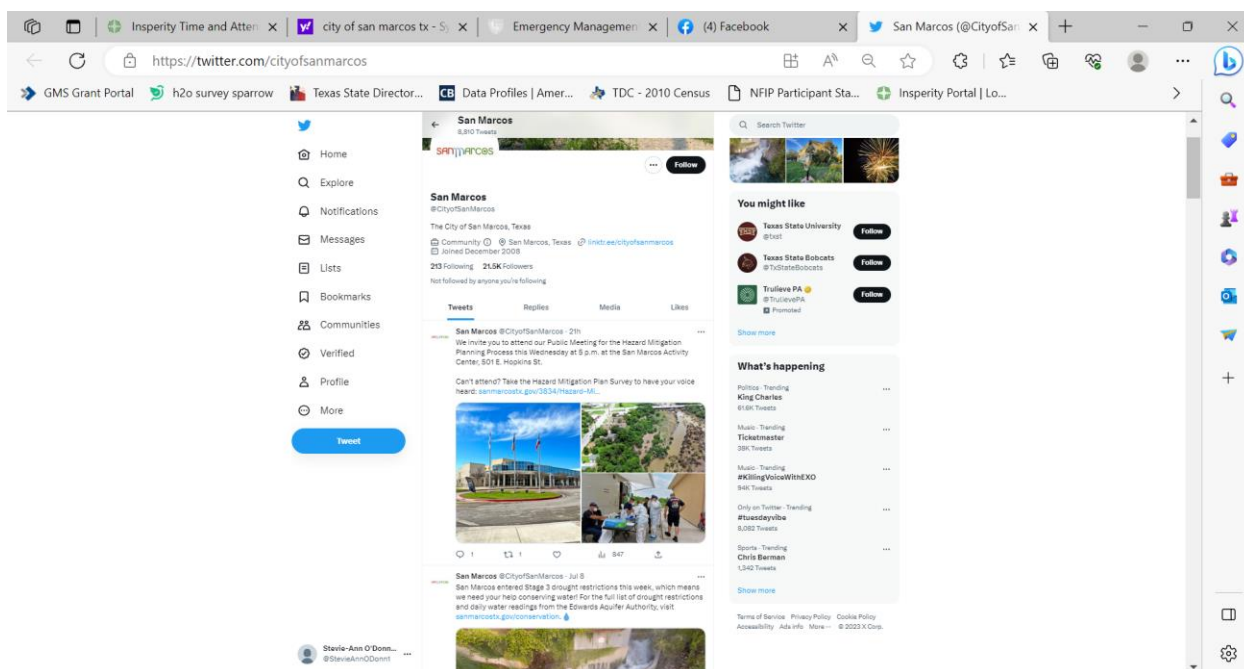


Figure E-10. City of San Marcos Public Notice, Twitter



APPENDIX E: MEETING DOCUMENTATION

Figure E-11. City of San Marcos Public Meeting Images





APPENDIX F CAPABILITY ASSESSMENT

APPENDIX F: CAPABILITY ASSESSMENT

Overview.....	1
Community Capability Assessments	2

OVERVIEW

A Community Capability Assessment is an integral component of the Hazard Mitigation Planning Process. It is an invaluable tool in assessing a community's existing planning and regulatory capabilities to support implementation of mitigation strategy objectives.

Beginning on Page 2, a completed Capability Assessment Checklist provides information on existing policies, plans, and regulations in place for Planning Team members at the city. ***Participation is denoted with an “x” on the Checklist.***

APPENDIX F: CAPABILITY ASSESSMENT

COMMUNITY CAPABILITY ASSESSMENTS

COMMUNITY CAPABILITY CHECKLIST	City of San Marcos
Plans	
Capital Improvements Plan	X
Community Wildfire Protection Plan	
Comprehensive / Master Plan / Land Use Plan	X
Continuity of Operations	X
Emergency Operations Plan	X
Evacuation Plan	X
Hazard Mitigation Plan	X
Stormwater Management Plan	X
Policies / Ordinances	
Building Codes	X
Fire Code	X
Floodplain Ordinance	X
Stormwater Ordinance	X
Subdivision Regulations	X
Wildfire Ordinance	
Zoning Ordinance/Land Use Restrictions	X
Programs / Studies	
Floodplain Maps/Flood Insurance Studies	X
Hydrologic/Hydraulic Studies	
Mutual Aid Agreement	X
National Flood Insurance Program Participant	X

APPENDIX F: CAPABILITY ASSESSMENT

COMMUNITY CAPABILITY CHECKLIST	City of San Marcos
NFIP Community Rating System Participant	X
Property Acquisition Program	X
Public Education/Awareness Programs	X
Storm Drainage Systems Maintenance Program	X
Stream Maintenance Program	X
Warning Systems/Services (reverse 911, outdoor warning sirens)	X
Staff / Departments	
Building Code Official	X
Emergency Manager	X
Engineers	X
Environmental Conservation Specialist	X
Floodplain Administrator	X
Geographic Information System (GIS) Coordinator	X
Personnel with Hazard Knowledge	X
Planners	X
Public Information Official	X
Resource Development/Grant Writer	X



APPENDIX G STATE AND FEDERAL FUNDING OPPORTUNITIES

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

Overview..... 1

OVERVIEW

Texas utilizes state funds to improve statewide hazard mitigation capabilities and advance its hazard mitigation goals to help identify, understand, and manage various risks associated with natural hazards. State funds also provide funding for state facility and infrastructure upgrades, hazard mapping, mitigation planning, and other mitigation programmatic activities. Table G-1 describes a variety of loan and grant programs offered by state agencies for which mitigation activities may be eligible.

Table G-1. Summary of State Funded Mitigation Programs

AGENCY	FUNDING PROGRAM
Texas A&M Forest Service (TAMFS)	<ul style="list-style-type: none">○ Community Fire Protection Program○ Community Wildfire Defense Grant○ Fire-Adapted Communities Program (FAC)○ Firewise USA Program○ Mitigation Project Support Fund○ Forest Land Enhancement Program○ Forest Legacy Program○ Prescribed Fire Grants○ Resilient Landscapes Program○ Rural Fire Assistance Grant○ State Fire Assistance for Mitigation (SFAM) - Mechanical Fuels Grants○ SFAM Vegetative Fuel Break Grant○ Texas Longleaf Conservation Assistance Program○ Urban Tree Canopy Project (UTC)
Texas Commission on Environmental Quality (TCEQ)	<ul style="list-style-type: none">○ Clean Water Act Section 319 Grants○ Nonpoint Source Grant Program○ High Hazard Potential Dam Program (HHPD)○ U.S.-Mexico Border Water Infrastructure Program
Texas Department of Agriculture (TDA)	<ul style="list-style-type: none">○ Agricultural Management Assistance (AMA)○ Agricultural Water Enhancement Program (AWEP)○ Community Development Block Grant○ Community Development Block Grant for Rural Texas○ Conservation Innovation Grants (CIG)○ Environmental Quality Incentives Program (EQUIP)
Texas Department of Housing and Community Affairs (TDHCA)	<ul style="list-style-type: none">○ Texas HOME Disaster Relief
Texas Department of State Health Services (TXDSHS)	<ul style="list-style-type: none">○ Hospital Preparedness Program (HPP) Cooperative Agreement○ Public Health Emergency Preparedness (PHEP) Cooperative Agreement

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

AGENCY	FUNDING PROGRAM
Texas Department of Transportation (TXDOT)	<ul style="list-style-type: none"> ○ Bridge Preventative Maintenance Program ○ Emergency Relief (ER) Program ○ Highway Bridge Replacement and Rehabilitation Program ○ Safe Rest Stops Program ○ Transportation Enhancement Program
Texas Division of Emergency Management (TDEM)	<ul style="list-style-type: none"> ○ Building Resilient Infrastructure & Communities (BRIC) ○ Emergency Management Performance Grant (EMPG) ○ Fire Management Assistance Grants (FMAG) ○ Hazard Mitigation Planning Grants Program (HMGP) ○ Homeland Security Grant Program (HSGP) ○ Individual Assistance (IA) ○ National Earthquake Hazard Reduction Program (NEHRP) ○ Public Assistance (PA) Section 406 Funds ○ Fire Management Assistance Grants (FMAG)
Texas Economic Development & Tourism (EDT)	<ul style="list-style-type: none"> ○ Economic Development Administration Grants and Investments
Texas General Land Office (TXGLO)	<ul style="list-style-type: none"> ○ Beach Grants ○ Beach Maintenance Reimbursement Fund ○ Coastal Erosion Planning and Response Act (CEPRA) ○ Coastal and Estuarine Land Conservation Program (CELCP) ○ Coastal Management Program (CMP) ○ Community Development Block Grant – Disaster Recovery (CDBG-DR) ○ Community Development Block Grant – Mitigation (CDBG-MIT) ○ Gulf of Mexico Energy Security Act (GOMESA) ○ Hazard Mitigation Grant Program Supplemental - LHMP
Texas Parks and Wildlife Department (TPWD)	<ul style="list-style-type: none"> ○ Nation Resources Damage Assessment (NRDA) ○ National Wildlife Wetland Refuge System ○ North American Wetland Conservation Fund ○ Partners for Fish and Wildlife ○ Texas Farm and Ranch Lands Conservation Program (TFRLCP) ○ Wildlife Habitat Incentive Program (WHIP)
Texas State Soil and Water Conservation Board (TSSWCB)	<ul style="list-style-type: none"> ○ Clean Water Act Section 319 Grants ○ Nonpoint Source Grant Program
Texas Water Development Board (TWDB)	<ul style="list-style-type: none"> ○ Agricultural Water Conservation Grants ○ Agricultural Water Conservation Loans ○ Clean Water State Revolving Fund (SWSRF) ○ Community Assistance Program (CAP) ○ Drinking Water State Revolving Fund (DWSRF) ○ Economically Distressed Areas Program ○ Emergency Community Water Assistance Grants ○ Flood Infrastructure Fund (FIF)

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

AGENCY	FUNDING PROGRAM
	<ul style="list-style-type: none"> ○ Flood Mitigation Assistance (FMA) Program ○ Flood Protection Planning Program ○ Groundwater Conservation District Loan Program ○ Planning Assistance to States ○ Regional Facility Planning Grant Program ○ Regional Water Planning Group Grants ○ Research and Planning Fund and Fund Development program ○ Risk MAP Program ○ Rural Development Grants ○ Rural Water Assistance Fund ○ Silver Jackets ○ Small Flood Control Projects (USACE Section 205) ○ State Participation Program – Regional Water and Wastewater Facilities ○ State Water Implementation Fund for Texas (SWIFT) ○ State Water Resources Research Act Program ○ Texas Infrastructure Resiliency Fund (TIRF) ○ Water Research Grant Program ○ Water SMART - Drought Response Program ○ Texas Water Development Fund (DFund)

In addition to state-funded programs, many local jurisdictions benefit from federal mitigation funding opportunities. FEMA'S Hazard Mitigation Assistance is a primary source for the implementation of mitigation projects throughout the nation. Table G-2 described additional federal, state, local, and non-profit mitigation funding sources specifically within the State of Texas.

Table G-2. Federal, State, Local and Non-Profit Mitigation Funding Sources in Texas

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Agricultural Management Assistance (AMA)	Federal	USDA, NRCS	TDA	Provides financial and technical assistance to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation methods into their farming operations.
Agricultural Water Enhancement Program (AWEP)	Federal	USDA, NRCS	TDA	Voluntary conservation initiative that provides financial and technical assistance to agricultural producers to implement water enhancement activities on agricultural land to conserve surface and ground water and improve water quality.
Agricultural Water Conservation Grants	State	TWDB	TWDB	Provided to state agencies and political subdivisions for projects that support the implementation of conservation of water management strategies identified in state and

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				regional water plans. Yearly applications. Up to \$1.2 million available annually. Grant categories vary from year to year.
Agricultural Water Conservation Loans	State	TWDB	TWDB	Agricultural water conservation loans to use either for improvements on facilities or as loan to individuals. Low-interest, fixed rates. Up to 10-year repayment terms. U.S. Iron and Steel requirements apply to certain projects. Eligible Loan applicants include political subdivisions.
AmeriCorps - Corporation for National & Community Service (CNCS)	Federal	AmeriCorps	N/A	Provides funding for volunteers to serve communities, including disaster prevention. AmeriCorps/Vista has assisted local communities with wildfire mitigation projects.
American Recovery and Reinvestment Act (ARRA)	Federal	DOT Federal Transit Administration	TDA	Nicknamed the Recovery Act was a stimulus package enacted by the 111th U.S. Congress and signed into law by President Barack Obama in February 2009. Developed in response to the Great Recession, the primary objective of this federal statute was to save existing jobs and create new ones as soon as possible. Other objectives were to provide temporary relief programs for those most affected by the recession and invest in infrastructure, education, health, and renewable energy.
Assistance to Firefighters program - Fire Prevention & Safety (FP&S) Grants	Federal	FEMA, AFG		Fire Prevention & Safety (FP&S) Grants support projects that enhance the safety of the public and firefighters from fire and related hazards.
Beach Grants	Federal	EPA	TXGLO	EPA awards grants under authority of the BEACH Act to eligible states, territories, and tribes with beaches on ocean and Great Lakes coasts to develop and implement programs to monitor their beaches and notify the public when it is not safe to swim.
Beach Maintenance Reimbursement Fund	State	GLO	TXGLO	Allocates approximately \$750,000 per year to help communities keep their beaches maintained. Applications are distributed to eligible participants in early fall and are due within a specified amount of time, no less than 30 days. Contracts are renewable annually.

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Bridge Preventative Maintenance Program	State	TXDOT	TXDOT	A planned, cost-effective treatment that preserves, improves, or delays future deterioration of the condition of a bridge. To be eligible for the BMIP a bridge must have a condition rating of 5 or 6 for at least one of the following: deck, superstructure, substructure, culvert, or channel. Safety and improvement to the physical conditions of the State's on-system bridges are TxDOT's main goals in the prioritization of the bridges using BMIP funds. The Bridge Division develops an initial list each FY of eligible bridges in each district and distribute to the districts for the annual program call.
Building Resilient Infrastructure & Communities (BRIC)	Federal	FEMA	TDEM	Pre-disaster/annual cycle addressing all natural hazards, emphasis on infrastructure & lifelines.
Clean Water Act Section 319 Grants	Federal	EPA	TCEQ and TSSWCB	Provides grants for a wide variety of activities related to non-point source pollution runoff mitigation.
Clean Water State Revolving Fund (CWSRF)	Federal	EPA	TWDB	Providing low-cost financing for a wide range of wastewater, stormwater, reuse, and other pollution control projects.
Coastal Erosion Planning and Response Act (CEPRA)	State	GLO	TXGLO	Since 2000, the Texas General Land Office's Coastal Erosion Planning and Response Program has received more than \$62 million in state funding and more than \$62 million in matching funds, completing more than 200 coastal erosion projects and studies. The application process for non-emergency project funding requests opens every even year in February and closes in early June of that same year.
Coastal and Estuarine Land Conservation Program (CELCP)	Federal	NOAA	TXGLO	When NOAA provides funding for CELCP, the GLO provides coastal communities an opportunity to apply for up to three projects per year, with federal grants for any single project not to exceed \$3 million.
Coastal Management Program (CMP)	Federal	NOAA	TXGLO	Texas receives approximately \$2 million annually in grants from National Oceanic and Atmospheric Administration (NOAA) and 90% of the funds are

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				passed through to local governments and entities to address environmental needs and promote sustainable economic development along the coast. Projects must improve the management of the state's coastal resources and ensure long-term ecological and economic productivity. Section 306 administrative funds can be used for non- construction, coastal planning and education, and research. Section 306A improvement funds can be utilized for construction and land acquisition projects and preservation and restoration. CMP funding categories include Coastal Natural Hazards Response, Critical Areas Enhancement, Public Access, Water/Sediment Quantity and Quality Improvements, Waterfront Revitalization and Ecotourism Development, Permit Streamlining/ Assistance, Governmental Coordination and Local Government Planning Assistance.
Community Assistance Program (CAP)	Federal	FEMA, NFIP	TWDB	Product-oriented financial assistance program directly related to the flood loss reduction objectives of the NFIP.
Community Development Block Grant	Federal	HUD	TDA	The primary objective is to develop viable communities by providing decent housing and suitable living environments and expanding economic opportunities principally for persons of low- to moderate- income. Eligible applicants are non-entitlement cities under 50,000 in population and non-entitlement counties that have a non-metropolitan population under 200,000 and are not eligible for direct CDBG funding from HUD may apply for funding through any of the Texas CDBG programs.
Community Development Block Grant for Rural Texas	State	TDA	TDA	TDA administers the Community Development Block Grant for Rural Texas. The primary objective of the CDBG is to develop viable communities by providing decent housing and suitable living environments and expanding economic opportunities principally for persons of low- to moderate-income. Eligible applicants are non-entitlement cities under 50,000 in population and non-entitlement counties that have a non-metropolitan population under 200,000 and are not eligible for direct CDBG funding from HUD

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				may apply for funding through any of the Texas CDBG programs.
Community Development Block Grant – Disaster Recovery (CDBG-DR)	Federal	HUD	TXGLO	Often following a disaster, the state may receive a CDBG-DR Supplement intended for mitigation and disaster recovery projects in the affected areas. Funding can be used to acquire properties in hazard prone areas. Since CDBG funds lose their federal identify they can also be used to supplement state or local match requirements on other funds such as FEMA HMA grants. Funding also supports public facilities including water and wastewater.
Community Development Block Grant – Mitigation (CDBG-MIT)	Federal	HUD	TXGLO	Eligible grantees to use this assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses. In February of 2018, Congress appropriated \$12 billion dollars in Community Development Block Grant (CDBG) funds specifically for mitigation activities for qualifying disasters in 2015, 2016, and 2017. HUD was able to allocate an additional \$3.9 billion, bringing the amount available for mitigation to nearly \$16 billion.
Community Fire Protection Program	Federal	USDA	TAMFS	Mitigation delivered via USDA Forest Service and Private Forestry Coop Fire Program.
Community Wildfire Defense Grant	Federal	USFS	TAMFS	Offers financial assistance to at-risk local communities with planning for and mitigating against the risk of catastrophic wildfire. This program is authorized in Public Law 117-58, the Infrastructure Investment and Jobs Act. Two primary objectives: The development and revision of Community Wildfire Protection Plans (CWPP), and the implementation of projects described in a CWPP that is less than ten years old. Prioritizes at-risk communities that are in an area identified as having high or very high wildfire hazard potential, are low-income, and/or have been impacted by a severe disaster. No minimum federal funding limit for projects.
Conservation Innovation Grants (CIG)	Federal	USDA, NRCS	TDA	Voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production.
Drinking Water State Revolving Fund (DWSRF)	Federal	EPA	TWDB	Makes funds available to drinking water systems to finance infrastructure improvements. The program also emphasizes providing funds to small and disadvantaged communities and to programs that encourage pollution prevention as a tool for ensuring safe drinking water.
Economic Development Administration Grants and Investments	Federal	U.S. DOC, EDA	EDT	Invests and provides grants for community construction projects, including mitigation activities.
Economically Distressed Areas Program	State	TWDB	TWDB	Provides financial assistance for projects serving economically distressed areas where water or sewer services do not exist, or systems do not meet minimum state standards. Eligible EDAP applicants include cities, counties, water districts, nonprofit water supply corporations, and all other political subdivisions. The city or county where the project is located must adopt and enforce Model Subdivision Rules for the regulation of subdivisions prior to application for financial assistance. Projects must also be in an economically distressed area where the median household income is not greater than 75 percent of the median state household income.
Emergency Community Water Assistance Grants	Federal	USDA	TWDB	\$150,000 to \$500,000 available to rural communities with populations over 10,000 people with a median household income less than \$65,900. Aids communities who have experienced a decline in quantity or quality of drinking water as a result of an emergency including drought.
Emergency Management Performance Grant (EMPG)	Federal	FEMA	TDEM	The EMPG program provides a yearly allocation of funding to support state and local emergency management programs. This has included providing some funding for local mitigation plans, mitigation-oriented studies, and related activities.
Emergency Relief (ER) Program	Federal	US DOT - FHWA	TXDOT	Provides funds for roads and bridges on federal-aid highways that are damaged as a direct result

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				of a natural disaster or catastrophic failure from an external cause.
Emergency Watershed Protection (EWP)	Federal	USDA, NRCS	TWDB	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds. Funding available through the Simplified Acquisition Procedures (SAP) ranges from \$25K to \$100K. Funded through contracts between project sponsors and the NRCS. There are no grants. The NRCS pays 75% of the costs.
Environmental Quality Incentives Program (EQUIP)	Federal	USDA, NRCS	TDA	Provides funding and technical assistance to farmers and ranchers to promote agricultural production and environmental quality as compatible goals.
Fire-Adapted Communities Program (FAC)	Federal	FEMA, USFA	TAMFS	Collaborates to identify its wildfire risk and works collectively on actionable steps to reduce its risk of loss. This work protects property and increases the safety of firefighters and residents.
Fire Management Assistance Grants (FMAG)	Federal	FEMA	TDEM	Provides fire suppression support to states when loss of life and property are imminent. Wildfire mitigation is also eligible under emergency protection if life is in imminent danger.
Firewise USA Program	Federal	USDA, DOI, NASFF, NFPA	TAMFS	The national Firewise USA® recognition program provides a collaborative framework to help neighbors in a geographic area get organized, find direction, and take action to increase the ignition resistance of their homes and community and to reduce wildfire risks at the local level.
Flood Infrastructure Fund (FIF)	State	TWDB	TWDB	Enacted through Senate Bill 7 to address needs identified following the flood disasters of 2015, 2016, and 2017. Senate Bill 500 appropriated \$793 million. The purpose is to provide loans and grants for flood activities and projects. Once the State Flood Plan is adopted, the account may only be used for projects included in the plan. The SWIFT Advisory Committee is the oversight entity.
Flood Mitigation Assistance Program (FMA)	Federal	FEMA	TWDB	Repetitive flood loss property reduction and projects that mitigate losses to NFIP insured properties.

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Flood Protection Planning Program	State	TWDB	TWDB	Developed to evaluate solutions to flooding problems in the State of Texas.
Forest Land Enhancement Program	Federal	USDA, NRCS	TAMFS	Provides educational, technical, and financial assistance to help landowners implement sustainable forestry management objectives.
Forest Legacy Program	Federal	USFS	TAMFS	Program providing funding to protect private forest lands that are environmentally, economically, and socially critical. This program reduces development in the wildland-urban interface.
Hazard Mitigation Grant Program (HMGP)	Federal	FEMA	TDEM	Post-disaster multi-hazard mitigation funding for federally declared disasters. HMGP Post Fire funds are available for FMAG declarations.
Hazard Mitigation Grant Program Supplemental – Local Hazard Mitigation Plan Program (LHMPP)	Federal	FEMA	TXGLO	Local Hazard Mitigation Plan Program (LHMPP) assists eligible entities by providing grants to develop or update local hazard mitigation plans, or to provide cost share for hazard mitigation planning activities funded through other federal sources. Community Development Block Grant Mitigation (CDBG-MIT) funds allocated by the United States Department of Housing and Urban Development (HUD) and administered by the Texas General Land Office (GLO) fund these planning activities, and the Hazard Mitigation Plan development and approval oversight is administered by the Federal Emergency Management Agency (FEMA) and administered by the Texas Division of Emergency Management (TDEM Grant awards will range from \$20,000 – \$100,000.
High Hazard Potential Dam Program (HHPD)	Federal	FEMA	TCEQ	Pre-disaster/annual cycle, for non-federal high hazard dams rated Unsatisfactory. Local match is 35% for each of the four grant periods.
Highway Bridge Replacement and Rehabilitation Program	Federal	FHWA	TXDOT	Provides funding to enable states to improve the condition of highway bridges through replacement, rehabilitation, and systematic preventive maintenance. Also includes the National Historic Covered Bridge Preservation Program.

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Homeland Security Grant Program (HSGP)	Federal	DHS	TDEM	Homeland security activities identified in the state and local strategic plans. Funding supports threat & hazard and risk identification for natural, technological, and human-caused hazards. Some prevention activities may be considered mitigation.
Hospital Preparedness Program (HPP) Cooperative Agreement	Federal	HHS	TXDSHS	HPP is the primary source of federal funding for health care system preparedness and response and, in collaboration with public health, prepares health care delivery systems to save lives through the development of health care coalitions (HCCs). Under the direction of the HPP providers, the HCCs develop plans and provide training, and coordinate regional exercises.
Hydrologic Research Grants	Federal	NOAA		Up to \$125,000 to conduct joint research and development on pressing surface water hydrology issues common to national, regional, local operational offices. Eligible applicants are federally recognized agencies of state or local governments, quasi-public institutions such as water supply or power companies, hydrologic consultants and companies involved in using and developing hydrologic forecasts.
Groundwater Conservation District Loan Program	State	TWDB	TWDB	Provides short-term loans to finance the start-up costs of Groundwater Conservation Districts. Funding is available for any Groundwater District or Authority with the authority to regulate the spacing of water wells, the production from water wells, or both. The program is authorized under Texas Water Code Chap. 36, Subchapter. L, and governed by TWDB rules in 31 Tex. Admin. Code Chap. 363, Subchapter. H.
Gulf of Mexico Energy Security Act (GOMESA)	Federal	DOI	TXGLO	GOMESA significantly enhances oil and gas leasing activities and creates revenue sharing provisions for the oil- and gas-producing states of Alabama, Louisiana, Mississippi, and Texas, and their coastal political subdivisions (CPSs). GOMESA funds are used for coastal conservation, restoration, and hurricane protection. The second phase of GOMESA revenue sharing began in Fiscal Year 2017 and expands the definition of qualified Outer Continental Shelf revenues to include receipts from Gulf of Mexico leases subject to withdrawal

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				or moratoria restrictions. A revenue-sharing cap of \$500 million per year for the four Gulf producing states, their CPSs and the Land and Water Conservation Fund applies from fiscal years 2016 through 2055.
Individual Assistance (IA)	Federal	FEMA	TDEM	Following a disaster, funds can be used to mitigate hazards when repairing individual and family homes.
In-Lieu Fee Program Mitigation Projects	Federal	USACE	Community Applicants	Restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for Department of the Army permits.
Mitigation Banks	Federal	USACE	Community Applicants	Mitigation Banks are sites approved by the Corps to sell compensatory mitigation credits for projects resulting in unavoidable impacts to waters of the U.S. When a permit is issued that requires compensatory mitigation, the permit will specify how many credits are required to be purchased at an approved mitigation bank.
National Earthquake Hazards Reduction Program (NEHRP)	Federal	FEMA	TDEM	Provides money to support enhanced earthquake risk assessments in local hazard mitigation plans and other earthquake hazard mitigation and preparedness activities.
Natural Resources Damage Assessment (NRDA)	Federal	EPA	TPWD	ERAs evaluate the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to physical stressors (e.g., cleanup activities) or chemical stressors (e.g., release of hazardous substances) at a site.
National Weather Service (NWS)	Federal	NOAA - NWS		NWS offers storm spotter training, along with weather and flooding safety guides. They can also sometimes provide funding to support severe weather signage in parks or other public places.
National Wildlife Wetland Refuge System	Federal	USFWS	TPWD	Provides funding for the acquisition of lands into the federal wildlife refuge system.

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Nonpoint Source Grant Program	Federal	EPA	TCEQ, TSSWCB	The federal Clean Water Act (CWA) requires States to develop a program to protect the quality of water resources from the adverse effects of nonpoint source (NPS) water pollution. TCEQ and TSSWCB administer federal grants for activities that prevent or reduce nonpoint source pollution (NPS).
North American Wetland Conservation Fund	Federal	USFWS	TPWD	Provides funding for wetland conservation projects.
NRCS Conservation Programs	Federal	USDA, NRCS	Community Applicants	Provides funding through several programs for the conservation of natural resources.
Partners for Fish and Wildlife	Federal	USFWS	TPWD	Provides financial and technical assistance to landowners for wetland restoration projects in “Focus Areas” of the state.
Planning Assistance to States	Federal	USACE	TWDB	Aids states in planning for the development, utilization, and conservation of water and related land resources.
Pre-Disaster Mitigation Loan Program	Federal	SBA		Provides low-interest loans to small businesses for mitigation projects.
Prescribed Fire Grants	State	TAMFS	TAMFS	<p>TAMFS’s Mitigation & Prevention Department annually implements four prescribed fire grants intended to protect local communities and restore ecosystems.</p> <p>(1) SFAM Plains Prescribed Fire Grant – aids communities that have been or may be threatened by wildland fire by funding prescribed burning to reduce hazardous fuels in or around communities. Treatment areas will be located adjacent to priority communities in Texas that are at the highest risk for loss during a Southern Plains Wildfire Outbreak event.</p> <p>(2) The Community Protection Program Grant aids reducing the hazard of high-risk fuels on private lands through the use of prescribed burning. The treatment area will be within 10 miles of a National Forest boundary. The grant’s goal is to protect high-risk communities and associated forest resources</p>

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				<p>by reducing the risk of catastrophic wildfire on private and public lands.</p> <p>(3) The State Fire Assistance for Mitigation Central & East Texas Grant provides assistance to communities that have been or may be threatened by wildfire by funding prescribed burning to reduce hazardous fuels in and around communities. Treatment areas will be private property in the 43 counties in Central and East Texas that have a Community Wildfire Protection Plan within the county. The goal is to protect high-risk communities and aid in ecosystem restoration by utilizing prescribed fire to consume excess vegetation before it contributes to catastrophic wildfire. Priority will be given to treatments sites that are within a CWPP, located near a Firewise community, located near homes based on Texas Wildfire Risk Assessment Portal and contain ecosystems that will benefit from prescribed fire.</p> <p>(4) Neches River and Cypress Basin Watershed Restoration Program - Prescribed Fire Grant provides assistance to landowners in utilizing prescribed fire for ecological improvement to the Neches River and Cypress Basin watersheds. This program will benefit the public and natural resources through improvement of water quality and quantity, control of invasive species and enhancement of wildlife habitat. Treatment areas will be private property in the Neches River and Cypress Basin Watersheds. Priority will be given to prescribed burn treatments that promote native ecosystem restoration, are in priority watershed protection zones and near public land.</p>
Public Assistance (PA) Section 406 Funds	Federal	FEMA	TDEM	Following a disaster, funds can be used to mitigate hazards when repairing damages to a public structure or infrastructure. Wildfire mitigation is also eligible under emergency protection if life is in imminent danger.
Public Health Emergency Preparedness	Federal	CDC	TXDSHS	Helps health departments build and strengthen their abilities to effectively respond to a range of public health threats, including infectious

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
(PHEP) Cooperative Agreement				diseases, natural disasters, and biological, chemical, nuclear, and radiological events. Preparedness activities funded by the PHEP cooperative agreement specifically target the development of emergency-ready public health departments that are flexible and adaptable.
Regional Facility Planning Grant Program	State	TWDB	TWDB	TWDB grants to political subdivisions of the State of Texas for studies and analyses to evaluate and determine the most feasible alternatives to meet regional water supply and wastewater facility needs, estimate the costs associated with implementing feasible regional water supply and wastewater facility alternatives, and identify institutional arrangements to provide regional water supply and wastewater services for areas in Texas.
Regional Water Planning Group Grants	State	TWDB	TWDB	Developed to guide and support planning of the state's water resources by administering and assisting in the development of the regional and state water plans. The department strives to improve the planning process each cycle by developing clear guidance for the program's stakeholders and utilizing best-available data, methodologies, and technical innovations.
Research and Planning Fund and Fund Development Program	State	TWDB	TWDB	Offers grants to eligible applicants for the development or revision of regional water plans. The proposed planning must be a plan, an amendment to an approved regional water plan developed by the regional water planning group for a regional water planning area pursuant to the Texas Water Code, §16.053 and Chapter 357, or other special studies approved by the TWDB which will enhance water planning efforts in the region. Activities eligible for funding are those related to the development, revision, or improvement of regional water plans including public meetings, hearings, and special studies.
Resilient Landscapes Program	Federal	USDA, USFS	TAMFS	The USFS is working with partners to restore healthy, resilient, fire-adapted ecosystems. Restoring ecosystems includes thinning crowded forests and using prescribed fire on two to three million acres each year, which can help prevent

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				the buildup of flammable vegetation that feeds extreme wildfires.
Risk MAP Program	Federal	FEMA, NFIP	TWDB	Establishes or updates floodplain mapping and multi-hazard risk products.
Rural Development Grants	Federal	USDA-Rural Development	TWDB	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas. Provides \$100,000 or 75% of the total project, whichever is less.
Rural Fire Assistance Grant	Federal	NIFC	TAMFS	Funds fire mitigation activities in rural communities.
Rural Utilities Service (RUS)	Federal	USDA-Rural Development		RUS administers programs that provide much-needed infrastructure or infrastructure improvements to rural communities. These include water and waste treatment, electric power, and telecommunications services.
Rural Water Assistance Fund	State	TWDB	TWDB	Designed to assist small rural utilities to obtain low-cost financing for water and wastewater projects. The RWAF offers tax-exempt equivalent interest rate loans with long-term finance options.
Safe Rest Stops Program	State	TXDOT	TXDOT	Texas has 21 major highways that serve as long distance travel corridors. Along each of these roadways, rest areas are an essential safety feature to reduce accidents caused by driver fatigue. These facilities give travelers a break from driving, and then return them to the road rested, refreshed and alert.
State Fire Assistance for Mitigation (SFAM) - Mechanical Fuels Grants	State	TAMFS	TAMFS	Provides financial assistance to reduce the hazard of high-risk fuels on private lands using hazardous fuel reduction. The grant's goal is to protect high risk communities within the 32 high-risk counties in Central Texas identified by Texas A&M Forest Service Mitigation and Prevention Department. Priority will be given to landowners that live with in the 32 high-risk counties, are in a county or city that has an active Community Wildfire Protection plan or live with in a Firewise USA Site.
SFAM Vegetative Fuel Break Grant	State	TAMFS	TAMFS	Provides financial assistance for the creation of vegetative fuel breaks on private lands in Texas. Vegetative fuel breaks are trees and shrubs systematically planted adjacent to fields,

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				homesteads, or feedlots to reduce or redirect the wind. Projects will be in the Texas High Plains. The goal of the grant is to protect high-risk communities by reducing the risk of catastrophic wildfire on private and public lands. Grant recipients will be reimbursed up to \$2,500 for actual costs associated with creating a green, vegetative fuel break, consisting of a minimum of 3 rows of trees and 400 feet in length.
Silver Jackets	Federal	USACE	TWDB	Can provide funding for flood related studies, public awareness, risk analysis, and flood response plans. Construction of small flood control projects.
Small Flood Control Projects (USACE Section 205)	Federal	USACE	TWDB	Authorizes use of USACE to do feasibility and construction of small flood control projects.
State Participation Program – Regional Water and Wastewater Facilities	State	TWDB	TWDB	The State Participation Program enables the TWDB to provide funding and assume a temporary ownership interest in a regional water, wastewater, or flood control project when the local sponsors are unable to assume debt for an optimally sized facility. The program is intended to encourage the optimum regional development of projects by funding excess capacity for future use where the benefits can be documented, and where such development is unaffordable without state participation. The goal is to allow for the "right sizing" of projects in consideration of future needs.
State Water Implementation Fund for Texas (SWIFT)	State	TWDB	TWDB	Passed by the Legislature and approved by Texas voters through a constitutional amendment, the SWIFT program helps communities develop and optimize water supplies at cost-effective rates. The program provides low-interest loans, extended repayment terms, deferral of loan repayments, and incremental repurchase terms for projects with state ownership aspects.
State Water Resources Research Act Program	Federal	USGS	TWDB	USGS in cooperation with the National Institutes for Water Resources supports an annual call for proposals to focus on water problems and issues that are of a regional or interstate nature or relate

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				to a specific program priority identified by the Secretary of the Interior and the Institutes.
Texas Farm and Ranch Lands Conservation Program (TFRLCP)	State	TPWD	TPWD	<p>Maintains and enhances the ecological and agricultural productivity of these lands through Agricultural Conservation Easements. The TFRLCP supports responsible stewardship and conservation of working lands, water, fish and wildlife, and agricultural production through:</p> <ul style="list-style-type: none"> ○ Generating interest and awareness in easement programs and other options for conserving working lands. ○ Leveraging available monies to fund as many high-quality projects as possible. <p>Highlighting the ecological and economic value of working lands and the opportunities to conserve working lands for the future.</p>
Texas HOME Disaster Relief	Federal	TDHCA	TDHCA	<p>The Texas HOME Disaster Relief Program is a long-term housing program designed to help eligible organizations serve income eligible households impacted by disasters. Funds are available to assist with federal or state declared disasters, or other natural or man-made disasters that may occur.</p> <p>The Department's practice is to maintain a HOME Disaster Relief Fund balance of \$1 million whenever possible. These funds can be accessed to support impacted households not located in communities that receive HOME funds directly from the U.S. Department of Housing and Urban Development (HUD).</p>
Texas Longleaf Conservation Assistance Program	Federal	National Fish and Wildlife Foundation (NFWF)	TAMFS	<p>Provides eligible landowners with financial and technical assistance for establishing, enhancing, and managing longleaf pine. Landowners with property within ten East Texas counties which include Angelina, Hardin, Jasper, Nacogdoches, Newton, Polk, San Augustine, Sabine, San Jacinto, Trinity, and Tyler are eligible to apply. Approved participants may receive up to 50% payment not to exceed a standard cap rate for implementing approved conservation practices. Approved conservation practices include prescribed burning, reforestation, site preparation, and forest stand improvement.</p>

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Texas Infrastructure Resiliency Fund (TIRF)	State	TWDB	TWDB	Enacted through Senate Bill 7 to address needs identified following the flood disasters of 2015, 2016, and 2017. Senate Bill 500 appropriated \$685 million. Purpose is to provide loans, grants, and matching funds for flood projects through four separate accounts. Each account has different purposes. The oversight entity is the TIRF Advisory Board (SWIFT Advisory Committee and TDEM Director as non-voting member).
Texas Water Development Fund (DFund)	State	TWDB	TWDB	State-funded loan program The DFund enables the Board to fund multiple eligible components in one loan to our borrowers, e.g., an application for funding of water and wastewater components can be processed in a single loan. Provide financial assistance for water supply projects, wastewater projects, and flood control projects (including structural and nonstructural flood protection improvements).
Transportation Enhancement Program	Federal	FHWA	TXDOT	Provides opportunities for non-traditional transportation related activities. Projects should go above and beyond standard transportation activities and be integrated into the surrounding environment in a sensitive and creative manner that contributes to the livelihood of the communities, promotes the quality of our environment, and enhances the aesthetics of our roadways. Projects undertaken with enhancement funds are eligible for reimbursement of up to 80 percent of allowable costs.
United States Geological Survey (USGS)	Federal	USGS		USGS issues competitive grants and cooperative agreements to support research in earthquake hazards, the physics of earthquakes, earthquake occurrence, and earthquake safety policy.
Urban Tree Canopy Project (UTC)	Federal	USDA, USFS	TAMFS	Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. In urban areas, the UTC provides an important stormwater management function by intercepting rainfall that would otherwise run off of paved surfaces and be transported into local waters through the storm drainage system, picking up various pollutants along the way. UTC also reduces the urban heat

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
				island effect, reduces heating/cooling costs, lowers air temperatures, reduces air pollution, increases property values, provides wildlife habitat, and provides aesthetic and community benefits such as improved quality of life.
U.S.-Mexico Border Water Infrastructure Program	Federal	EPA	TCEQ	Provides grant assistance to U.S. and Mexican communities located within 60 miles of the border for the development and construction of high-priority drinking water and wastewater facilities. The program furthers EPA's mission of protecting human health and the environment by providing critical resources for what is often an area's first drinking water and basic sanitation services.
Water Research Grant Program	State	TWDB	TWDB	TWDB funds a variety of water planning and water research studies and projects intended to assist and support regional water planning efforts or to answer regional water planning questions.
Water Conservation Field Services Program	Federal	HUD	Texas A&M AgriLife	Provides several grants related to safe housing initiatives.
Water2025 Challenge Grant Program for Western States	Federal	Bureau of Reclamation	TWDB	Up to \$25,000 for projects that improve water use efficiency and improve water management practices.
Watershed Processes and Water Resources	Federal	Bureau of Reclamation	TWDB	Up to \$250,000 for projects that can be completed within 24 months and that reduce conflicts through water conservation, efficiency, and markets.
Watershed Processes and Water Resources – National Research Initiative Standard Research (Part T)	Federal	USDA	TWDB	\$100,000 available. Sponsors research that addresses two areas: (1) understanding fundamental watershed processes; and (2) developing appropriate technology and management practices for improving the effective use of water (consumptive and non-consumptive) and protecting or improving water quality for agriculture and forestry production.
WaterSMART – Drought	Federal	USDA	TWDB	\$500,000 available. Innovative research in understanding fundamental processes that affect the quality and quantity of water resources at

APPENDIX G: STATE AND FEDERAL FUNDING OPPORTUNITIES

NAME	LEVEL	SOURCE AGENCY	MANAGING STATE AGENCY	PURPOSE OF FUNDING
Response Program				diverse spatial and temporal scales, ways on improving water resource management in agriculture, forested, and rangeland watersheds, and developing appropriate technology to reach those goals.
Wildlife Habitat Incentive Program (WHIP)	Federal	USDA, NRCS	TPWD	Voluntary program for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and tribal land.



APPENDIX H CAPITAL IMPROVEMENT PROJECTS

APPENDIX H: CAPITAL IMPROVEMENT PROJECTS

Overview.....	1
Capital Improvement Projects	2

OVERVIEW

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As part of the City of San Marcos Development Services Department, the City of San Marcos Capital Improvement Program division is responsible for the site design, document preparation, construction management, and inspection of capital projects for the planning area. The City of San Marcos coordinates the identification of dependable funding sources with the implementation of projects based on priorities and needs. Major capital improvements can require multiple years to strategically plan, design, fund, and eventually construct or execute. It is important to keep records of projects that would serve the community within the scope of hazard mitigation. The City of San Marcos Hazard Mitigation Action Plan allows for such record keeping. This will allow the city to coordinate with necessary departments in planning and implementing actions.

CAPITAL IMPROVEMENT PROJECTS

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Potential 2022 Bond Projects																		
Multi	006	Airport - FM 130 Connection Drive	New roadway to connect the airport to FM 130. Include Airport Drive improvements to the project. Will also support development on west side of Highway 281 on airport property. Supplemental funding may come from other sources regarding the local election and agreement with City and State. Includes local funding.	D04062	2	General	Water	\$ 250,000	\$ 2,300,000									
Multi	008	Airport - Water/Wastewater Main Replacement	Approx 300' of 36" watermain, main to connect municipal sewer lines into the existing City owned 36" watermain main near the railroad. WASTEWATER: Replacing service from airport facilities to be included in the future future development requiring service lines. Extend 1/2" water main from plant and to the Airport to the railroad line. WMS: 1200' water main.	U05126	Water/Wastewater	Development	Water	\$ 250,000	\$ 1,600,000									
Multi	007	Airport - Utilities & Stormwater	Construction of utilities and stormwater improvements from the Airport entrance to the 1/2 mile of 12" to provide development along the north side of development area. Wastewater and within the airport property and an separate construction for the 1/2 mile of 12" sewer to project #016.	U05126	Water/Wastewater		Water	\$ 200,000	\$ 600,000									
Multi	13	Hedley and Revere the Bazaar Replacement	• Keep the City City safe and secure, we need to have our best technology up to date. The City replaces old hardware after 5-7 years of use in any current or latest technology.	D04062	30	General	Water	\$ 115,000	\$ 40,000									
							Electric	\$ 60,000	\$ 20,000									
Multi	016	Belkin Drive Street Improvements	Final design information on Belkin Drive between Harbor Road and Hedley to reduce flooding. Includes roadway reconstruction, as needed for drainage, and replacing of 48" watermain main.	D04062	3	General	Water	\$ 40,000	\$ 200,000									
							Electric	\$ 80,000	\$ 400,000									
							Water	\$ 60,000	\$ 1,400,000									
Multi	027	Belkin Street Improvements	Belkin Street improvements to include watermain and wastewater projects/segment from Harbor to Southwest of street, and on intersection between Belkin to Highway 281. Stormwater improvements to be added to Belkin and connect to the outfall on Travis Street. Belkin will be a full depth reconstruction with sidewalks to accommodate commercial development. Sidewalk will be placed on Highway and East.	EP0406	Stormwater, Multi	Modal	Water	\$ 100,000	\$ 500,000									
							Water	\$ 250,000	\$ 700,000									
							Water	\$ 100,000	\$ 600,000									
							Stormwater	\$ 100,000	\$ 1,400,000									
							Water	\$ 250,000										
Multi	030	Belkin Street Improvements	Belkin Street improvements to include watermain and wastewater projects/segment from Harbor to Southwest of street, and on intersection between Belkin to Highway 281. Stormwater improvements to be added to Belkin and connect to the outfall on Travis Street. Belkin will be a full depth reconstruction with sidewalks to accommodate commercial development. Sidewalk will be placed on Highway and East.	U05126	Stormwater, Multi	Modal	Water	\$ 100,000	\$ 500,000									
							Water	\$ 250,000	\$ 700,000									
							Water	\$ 100,000	\$ 600,000									
							Stormwater	\$ 100,000	\$ 1,400,000									
Multi	038	Hedley Street Improvements	As technology ages it starts to degrade and become obsolete. Older equipment typically does not have the latest safety features or functionality. The City likes to keep equipment for at least 5-7 years before replacing.	U05126	Stormwater, Multi	Modal	Water	\$ 270,000	\$ 1,500,000									
							Water	\$ 120,000	\$ 1,400,000									
							Water	\$ 150,000	\$ 1,100,000									
							Stormwater	\$ 90,000	\$ 6,500,000									
							Electric	\$ 400,000	\$ 0									
Multi	051	Cherokee Water Line (Coalfield to Oak Hills)	Upgrade Cherokee 12" WFL from Coalfield to Oak Hills and install split main on Oak Hills area. 2700' (2000') General overhead electric to underground between Coalfield and Oak Hills. 290' 1/2"	U05126	Stormwater, Multi	Modal	Water	\$ 80,000	\$ 450,000									
							Electric	\$ 60,000	\$ 300,000									
Multi	059	Cherokee Street Improvements	Complete new sidewalks along Cherokee St. from Railroad to Aspen. Replace watermain from Highway to N.36 and the water from Railroad to N.36. Mill and overlay from Railroad to N.36. Replace curbs on Cherokee DMP #04	U05126	Stormwater, Multi	Modal	Water	\$ 175,000	\$ 2,000,000									
							Electric	\$ 275,000	\$ 1,250,000									
							Water	\$ 100,000	\$ 100,000									
							Electric	\$ 15,000	\$ 120,000									
							Water	\$ 25,000	\$ 25,000									
							Electric	\$ 40,000	\$ 40,000									
							Water	\$ 220,000	\$ 220,000									
							Electric	\$ 400,000	\$ 400,000									
Multi	14	City Wide Nonwater Hardware Replacement	As technology ages it starts to degrade and become obsolete. Older equipment typically does not have the latest safety features or functionality. The City likes to keep equipment for at least 5-7 years before replacing.	U05126	Stormwater, Multi	Modal	Water	\$ 218,000	\$ 500,000									
							Water	\$ 414,000	\$ 100,000									
							Electric	\$ 414,000	\$ 100,000									
Multi	011	Comprehensive Plan	Implement items in Vision Mission. 2008-2010-2015 Goals combined with 2020 Funding will be used to update the comprehensive plan to reflect new information. 2022 Funding will be implementation of the updated Comprehensive Plan (over the updated every 5 years)	W01101	3	General	Water	\$ 100,000	\$ 500,000									
							Water	\$ 60,000	\$ 150,000									
							Water	\$ 150,000	\$ 400,000									
							Water	\$ 100,000	\$ 400,000									
							Water	\$ 150,000	\$ 600,000									
							Electric	\$ 400,000	\$ 3,000,000									
Multi	052	Overhead Alley Reconstruction (H)	Reconstruct the alley between 30 and Coalfield from Highway to Highway. Approx 300' of 36" watermain. To include and make Alley from Coalfield to 30 will be repair first in 2023 and 2024. Pavers will be used and overhead electric and water will be converted underground along Highway. Alley Jacks and along Highway to between Coalfield and 30. In addition 1400' of 12" watermain will be replaced and converted to 36" watermain. Project will be designed and constructed as part of Overhead Alley Reconstruction. Possible 100' Funding. May include general services. Electric will need a plan for underground location needed in 2024.	U05126	Stormwater, Multi	Modal	Water	\$ 200,000	\$ 600,000									
							Water	\$ 75,000	\$ 300,000									
							Water	\$ 150,000	\$ 300,000									
							Water	\$ 100,000	\$ 700,000									
							Water	\$ 100,000	\$ 1,500,000									
Multi	049	Overhead Alley Reconstruction (H)	Reconstruct the remaining 30' between Coalfield and 30. From Addition to University to Aspen. 400' 1/2" The alley will be constructed in 2027, with possible concrete overlay. All utilities will be replaced and overhead electric and water will be converted to underground along Highway. Alley Jacks and along Highway to between Coalfield and 30. In addition 1400' of 12" watermain will be replaced and converted to 36" watermain. Project will be designed and constructed as part of Overhead Alley Reconstruction. Possible 100' Funding. May include general services. Electric will need a plan for underground location needed in 2024.	U05126	Stormwater, Multi	Modal	Water	\$ 200,000	\$ 600,000									
							Water	\$ 75,000	\$ 300,000									
							Water	\$ 150,000	\$ 300,000									
							Water	\$ 100,000	\$ 700,000									
							Water	\$ 100,000	\$ 1,500,000									
Multi	048	Overhead Alley Reconstruction (H)	Reconstruct the remaining 30' between Coalfield and 30. From Addition to University to Aspen. 400' 1/2" The alley will be constructed in 2027, with possible concrete overlay. All utilities will be replaced and overhead electric and water will be converted to underground along Highway. Alley Jacks and along Highway to between Coalfield and 30. In addition 1400' of 12" watermain will be replaced and converted to 36" watermain. Project will be designed and constructed as part of Overhead Alley Reconstruction. Possible 100' Funding. May include general services. Electric will need a plan for underground location needed in 2024.	U05126	Stormwater, Multi	Modal	Water	\$ 200,000	\$ 600,000									
							Water	\$ 75,000	\$ 300,000									
							Water	\$ 150,000	\$ 300,000									
							Water	\$ 100,000	\$ 700,000									
							Water	\$ 100,000	\$ 1,500,000									
Multi	046	Overhead Alley Reconstruction (H)	Reconstruct the remaining 30' between Coalfield and 30. From Addition to University to Aspen. 400' 1/2" The alley will be constructed in 2027, with possible concrete overlay. All utilities will be replaced and overhead electric and water will be converted to underground along Highway. Alley Jacks and along Highway to between Coalfield and 30. In addition 1400' of 12" watermain will be replaced and converted to 36" watermain. Project will be designed and constructed as part of Overhead Alley Reconstruction. Possible 100' Funding. May include general services. Electric will need a plan for underground location needed in 2024.	U05126	Stormwater, Multi	Modal	Water	\$ 200,000	\$ 600,000									
							Water	\$ 75,000	\$ 300,000									
							Water	\$ 150,000	\$ 300,000									
							Water	\$ 100,000	\$ 700,000									
							Water	\$ 100,000	\$ 1,500,000									
Multi	042	Overhead Alley Reconstruction (H)	Reconstruct the remaining 30' between Coalfield and 30. From Addition to University to Aspen. 400' 1/2" The alley will be constructed in 2027, with possible concrete overlay. All utilities will be replaced and overhead electric and water will be converted to underground along Highway. Alley Jacks and along Highway to between Coalfield and 30. In addition 1400' of 12" watermain will be replaced and converted to 36" watermain. Project will be designed and constructed as part of Overhead Alley Reconstruction. Possible 100' Funding. May include general services. Electric will need a plan for underground location needed in 2024.	U05126	Stormwater, Multi	Modal	Water	\$ 200,000	\$ 600,000									
							Water	\$ 75,000	\$ 300,000									
							Water	\$ 150,000	\$ 300,000									
							Water	\$ 100,000	\$ 700,000									
							Water	\$ 100,000	\$ 1,500,000									

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9/1/2023

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APPENDIX H: CAPITAL IMPROVEMENT PROJECTS

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2026	2027	2028	2029	2030	2031	2032	2033
Multi	796	Shady Grove Park Improvements	Project to address drainage issues at Shady Grove park. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General						\$ 190,000		\$ 1,500,000		
Multi	939	Long Street Roadway	Project to address drainage issues at Long Street Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 250,000		\$ 500,000		\$ 390,000		\$ 2,700,000		
Multi	427	Main (UK Station) Main	This project consists of replacing the Main (UK Station) from a capacity of 3.4 MGD to 10.0 MGD and extending to River Road (2.0 MGD capacity). (2019/2021)		Wastewater	10	Wastewater	\$ 1,200,000	\$ 50,000		\$ 4,000,000						
Multi	601	North River Roadway	Project to address drainage issues at North River Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	15	General, Water, Transportation			\$ 450,000		\$ 2,100,000		\$ 825,000		\$ 2,100,000	
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of addressing the substation, stormwater, and roadway, water, stormwater, and roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	2	General		\$ 200,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 4,000,000
Multi	742	North North Drainage	Project to address drainage issues at North North Drainage. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 30,000		\$ 200,000		\$ 200,000		\$ 200,000		\$ 1,500,000
Multi	464	Old Road Road Improvements	Address the old road and pedestrian facilities, as well as a senior center for senior citizens and senior citizens. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Wastewater, Multi-Modal	6	General, B	\$ 50,000	\$ 1,000,000	\$ 50,000	\$ 1,000,000						
Multi	939	Old Road Roadway	Project to address drainage issues at Old Road Roadway. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater	5	General		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000		\$ 300,000
Multi	372	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	676	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	742	Park/Garden to Community Connections	Project to address drainage issues at Park/Garden to Community Connections. This project will include parking lots, along with bike lanes from Loop Lane to I-95. This project also includes parking lots, along with bike lanes from Shady Grove to River Road and other necessary roadway improvements.		Stormwater, Multi-Modal	3	General		\$ 250,000	\$ 50,000	\$ 250,000		\$ 250,000		\$ 250,000		\$ 250,000
Multi	508	Westchick Road Substation	Total project consists of														

1

FY 2024-2033 10 Year CIP Project List

8/1/2023

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APPENDIX H: CAPITAL IMPROVEMENT PROJECTS

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Airport	755	Airport - SOA Land Acquisition	Acquisition of Department of Labor property located adjacent to the Airport. Acquisition would support airport development and other safety related projects.			10	General	\$ 1,500,000	\$ 3,000,000									
Airport	26	Airport Control Tower	The Spectrum Infrastructure Loan provided additional funds to the FAA for its Airport Tower Contract Grant Program. The city will apply for a FY23 grant to modernize and improve its tower. City needs to be under this grant. The tower was built in 2009 and requires efficiency improvements and repairs, including: (1) HVAC replacement to more efficient system, (2) upgrade of all interior/exterior lighting, (3) (3) installation of high efficiency bathroom fixtures, (4) installation of FAA required security fencing, (5) repair of exterior paint and exterior signage, (6) replacement of aging FAA required equipment as required on the MEL, (7) AWCIS repair, and (8) installation of a Night Data Input Output, Tower Data Link Services, and the Pre-Departure Clearance System.	ED0602	City Facilities	10	General		\$ 50,000									
Airport	26	Airport Infrastructure Grant Funded Projects	The San Marcos Regional Airport is eligible to receive funds each year for FY 22 through FY 26 under the Spectrum Infrastructure Loan - Airport Infrastructure Grant. Funding varies each year (\$763,000 available for FY22). CIP shows 10% match for estimated amounts to allow the Airport to use these funds as necessary. FY 23 and 24 funding are two years' worth above FY 22 and 23 CIP are already approved. Up to 10 years plus the current year of funding can be funded if approved.			8	General		\$ 77,000	\$ 153,000	\$ 153,000							
Airport	520	Airport - Runway 17-35 Extension	Extension of Runway 1735 to over 3000 ft. and decreasing of Runway 15/35 and 17/35. Extension required to accommodate larger aircraft at the airport. Runway strengthening is also being required. Decreasing is necessary to meet current FAA design standards including safety requirements. Acquisition possible for the runway protection zone. Airport Master Plan Program 6. Funding over multiple years for cover planning/environmental, design, and construction in phases. Last 3 years of funding are a 10% match to anticipated future funds.	ED0602		10	General	\$ 30,000	\$ 100,000	\$ 180,000	\$ 200,000	\$ 1,420,000						
Airport	626	Airport - WWT Tower and Electric Vault relocation	Create a developable site by relocating the major electric control vault and WWT tower out of prime development area, with access to water and utility infrastructure. The vault contains the controls and switches to the airfield lighting system. The WWT tower requires rehabilitation due to deterioration of steel joints and asbestos mitigation. The tower would make a unique entry feature to the airport and its location will be determined following the design of new FM 122 connector driveway (Project 606). Location is dependent on the Drainage Master Plan completion.	ED0604 USC205		0	General					\$ 200,000	\$ 700,000					
CMO	28	City Hall	General approved CIP as part of the FY 2023 budget to start the design concepts. Permitting design and construction will be completed by a bond program		City Facilities	10	General B		\$ 80,000,000									
CVB	410	Arts District to enhance performing and visual space	Multiple facilities to improve the Arts District. Plan to attract, permitting implementation in first funding year, design in second funding year, construction in third funding year.			3	General						\$ 180,000			\$ 2,500,000	\$ 25,000,000	
Eng.	256	Crawfish/Fishing Intersection	Improve intersection for safety and capacity to alleviate the congestion. Possible right of way acquisition.	TU-207		0	General					\$ 50,000	\$ 400,000					
Eng.	302	North, Hildreth and Mary St. Roundabout	Construction of a roundabout at the 3-way intersection of Hildreth, North and Mary Streets.	TU-207		0	General					\$ 75,000	\$ 375,000					
Eng.	611	Springway Hwy Reconstruction	Complete reconstruction of Springway Hwy from 1015 to Thurgate. Include sidewalks wider than 5 ft. if possible, to accommodate the handicapped community to the area.		Multi Modal Transportation	3	General		\$ 150,000				\$ 600,000					
Eng.	250	Transportation Master Plan	Update Transportation master plan to maintain a five year interval issuing capital transportation improvement plan.			10	General		\$ 600,000				\$ 400,000					
Eng.	581	Transportation Overlay	Provide an annual funding source for the City to participate in transportation planning. This will provide funding for the City to participate in transportation planning beyond the proportional impact of new development.	TU-202		10	General	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000
Eng.	738	SRM South Drive - Oldland Rd. Signal Cues	SRM South Drive is a major arterial road and a key intersection of Oldland and Third Street in order to enhance a local corridor that crossing. ADF funding will be used if available.			5	General	\$ 1,000,000										
Fire	796	Fire Administration and Training Facility Phase 2	Complete design and construct a new Fire Administration (250,000 sq ft), Logistics and Support Services (2,200,000 sq ft), Training Facility (2,200,000 sq ft), and a 3-story Apartment/Hotel/Motel (2,200,000 sq ft) in accordance with the Training Facility Master Plan that was completed by December 2022 and design in October 2023. These phases include soft costs (permitting, material costs, A/E/C fees, etc.).		Community Safety, City Facilities	4	General		\$ 4,000,000			\$ 18,950,000						
Fire	776	Fire Department Replacement Battalion Chief Command Vehicle	Replacement of the Battalion Chief Command Vehicle.	FFSG402	Community Safety	10	General						\$ 275,000					
Fire	402	Fire Department Replacement Truck 402 (F-350, 4 wheel drive, Station 2)	Replace Battalion Chief Vehicle (2014 Ford F-350, 2005 Ford F-350, 4 wheel drive, Station 2).	FFSG402	Community Safety	10	General					\$ 195,000						
Fire	775	Fire Department Replacement Engine 2700	Replace Fire Engine Station 6.	FFSG402	Community Safety	10	General						\$ 1,390,000					
Fire	797	Fire Department Replacement Engine Station 2	Programmed replacement of the engine for station 2. The apparatus this unit will replace was purchased in 2020 and reached its 2023. This unit will be ten years old and will be replaced to reserve status for an additional 4-5 years.	FFSG402	Community Safety	10	General								\$ 1,270,000			
Fire	798	Fire Department Replacement Engine Station 6	Programmed replacement of the engine for station 6. The apparatus this unit will replace was purchased in 2020 and reached its 2023. This unit will be ten years old and will be replaced to reserve status for an additional 4-5 years.	FFSG402	Community Safety	10	General									\$ 1,340,000		
Fire	774	Fire Department Replacement Truck 402	Replace Fire Truck Station 3.	FFSG402	Community Safety	10	General	\$ 2,300,000										
Fire	795	Fire Department Replacement Aerial Apparatus (Ladder truck) Station 5	Programmed replacement of the aerial apparatus (ladder truck) for station 5. The apparatus this unit will replace was purchased in 2020 and reached its 2023. This unit will be ten years old and will be replaced to reserve status for an additional 4-5 years.	FFSG402	Community Safety	10	General									\$ 1,055,000		
Fire	603	Fire Department New Engine - Airport	New engine for station at the Airport. Apparatus needs to be in the same year as construction, will take 1 year to build.	FFSG402	Community Safety	10	General		\$ 1,000,000									

5

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Fire	772	Fire Department New Engine - Northgate and W 35	New Engine for Station at Northgate and W 35. Apparatus needs to be in the same year as the construction, will take 1 year to build.	FFSG402	Community Safety, City Facilities	8	General B	\$ 1,000,000										
Fire	771	Fire Department New Engine #7 Northgate and W 35	Extend the existing fire station at Northgate and W 35. Potential use of 1932 funding for land purchase. First year of funding for updates to design, second year for construction.	FFSG402	Community Safety, City Facilities	4	General B	\$ 580,000	\$ 12,000,000									
Fire	600	Fire Department Replace 3000-Gallon Breathing Apparatus (3000)	Programmed replacement of the department's self-contained breathing apparatus (SCBA). Our current breathing apparatus were purchased in 2018 and have a 15 year warranty and usable life expectancy. With improvements in technology and safety, and with the wear and tear on these life-saving pieces of equipment, that are critical to firefighter safety, it is paramount that these are replaced every 15 years.			10	General							\$ 1,000,000				
Fire	518	Fire Station #1 Parking Lot Expansion	Extend the existing fire station parking lot at Fire Station 1 to connect to the back parking lot (see attached photos). We would have six spaces in the back parking lot for the connection but it looks like we would add 35, for a total of 39 new spaces. There is a storm water drain that will have to be relocated as part of this project. We are frequently over capacity and this is with most of the fire station parking in front of the apparatus bay - which is not ideal.			2	General						\$ 25,000	\$ 100,000				
Fire	601	Fire Station 1	Purchase land, design, and construct a new downtown Fire Station, including soft costs (permitting, material testing, A/E/C fees, etc.). Possible use for reserved and A/E/C improvements. New station located near downtown.	FFSG402	Community Safety, City Facilities	5	General B	\$ 7,000,000		\$ 10,000,000								
Fire	518	Fire Station #1 Remodel	This facility was opened in 2022 and is in need of renovation and maintenance. Numerous deficiencies were identified in the 2022 fire station facility needs assessment and numerous others have come to light since that time. Items include insufficient space available in apparatus bays for all equipment, without expansion capacity in the electrical panel, sharp turning radius at drive entrance has caused damage to equipment frames, no fire suppression system, exercise area is too small and some equipment is located in the bay, kitchen and restrooms in need of updates/remodel.	FFSG402	Community Safety, City Facilities	5	General	\$ 100,000	\$ 3,000,000									
Marshall/Dish.	732	Animal Shelter - Long Term Imp.	Renovation and expansion due to the 90% low outcome resolution and initiative, funding for design and construction. Portions of project may be a bond project, such as a dog park.		City Facilities	4	General	\$ 75,000	\$ 750,000	\$ 5,000,000								
Parks & Rec.	51	Activity Center Audio Visual System Installation	This project is a complete renovation and upgrade of the audio and visual components at the San Marcos Activity Center. All equipment would be replaced and that would allow for an expansion in digital frequencies. Currently, all equipment is operating on analog frequencies and most equipment is used for broadcast use. This project would allow for a facility-wide audio system, which is important for many reasons, but safety is our top priority. At this time, we do not have the means to project a message throughout the facility. Installation of a sound system into the gym and several rooms would allow for announcements during events/programs, crowd control, instruction and background music. In each meeting room, there would be video presentation functionality with touch-panel controls that are accessible by the room.			2	General		\$ 600,000									
Parks & Rec.	411	Shoreline Village City Park	City park for replacement or dedicated land. Property for park with by reserved land. Reserve Development has committed 2.000 for children. Property is currently land locked. Access to land will occur through the development process.			1	General					\$ 200,000						
Parks & Rec.	628	Community Improvements	Master plan for developing park and recreation and development of public facilities. Phase 1: Assess and redevelop 10 acres for an office, survey of property for parking, new fence, new water, new water, new water, new water. Construction of infrastructure. First year funding for design of buildings, second year funding for master plan, third year for construction.			4	General	\$ 3,225,000	\$ 400,000									
Parks & Rec.	751	Very Softball Complex Renovation	Renovate recreation building, restrooms, fencing, bleachers and sidewalks.	ED0603 BSN208		10	General B		\$ 2,500,000									
Parks & Rec.	14	15th Street Line Path Connection Project	The project is located near downtown San Marcos just upstream of where the river crosses the San Marcos River. The project will connect the river to existing shared-use paths on the east & west of 15th along the river. This project includes design and construction. It will include the installation of a pedestrian bridge. Possible grant funding.		Multi Modal Transportation	8	General	\$ 100,000		\$ 800,000								
Parks & Rec.	190	Nature Center	Provide funding to build a Nature Center for San Marcos in Purgatory Park. First year of funding for design, second year for construction.	ED0603 BSN208		0	General					\$ 300,000	\$ 2,700,000					
Parks & Rec.	55	Park Master Plan	The current plan was adopted by City Council on May 21, 2023 and should be updated every 5 years.			10	General	\$ 130,000										
Parks & Rec.	58	Park Design Improvements	There are 25 park signs that are in need of redesign and replacement across our system. The current signage signs are aging and unable to be repaired. This project will include design, procurement and installation across two fiscal years.			10	General		\$ 500,000	\$ 500,000								
Parks & Rec.	740	West Parks ACA Restroom Imp.	Parks restroom improvements including new restrooms at West Parks City Park, City Park, West Parks, Children's Park or San Marcos River Park.			3	General	\$ 200,000	\$ 200,000									
Police	820	PD Dog Run Crematory	Dog burning crematory unit (CIC200). Proposed unit, existing unit existing building and site. The number of animals killed and euthanized annually at the police department creates a need to dispose of carcasses more frequently.		Community Safety	3	General						\$ 50,000					

6

APPENDIX H: CAPITAL IMPROVEMENT PROJECTS

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033											
Police	607	PD Shooting Range Bullet Turn Upgrade	Remove and replace the current and future live-firing ranges with an Action Target Total Containment Target (TCT). The current target requires live-firing and requires and contact with the fired bullet heads to remove the bullet for recycling when it is safe. The TCT provides complete ballistic coverage, requires minimal maintenance and is equipped with a very efficient lead collection system, leading elements, target, range employees, and the environment safe.		Community Safety	10	General	\$	800,000																				
Public Safety	30	Public Safety Law Enforcement Technology	Public Safety Services Technology Refresh for 500 laptops purchased in 2020, Police 1330, Fire 220 and Public Pagers 311. 40 laptops per year over a 5-year period. Refreshing 500, "Provisionally meet capital needs."	PPF0465	Community Safety	10	General	\$	600,000	\$	230,000	\$	230,000	\$	230,000														
FW - Facilities	72004	City Facility Major Maintenance & Improvements	Major facility repairs and renovations to currently city facilities which includes roof, HVAC and parking lots. Complete an assessment of all city facilities to determine priorities.	PPF1551	City Facilities	10	General	\$	2,244,000	\$	1,300,000	\$	800,000	\$	300,000	\$	300,000	\$	800,000										
FW - Facilities	728	Durham Education Building	Stable Durham Education building to ensure public safety. Further research on possible grants, group buildings, and/or other participants for further funding sources. Future facility use is undetermined at this time.	PPF0462	Community Safety, City Facilities	10	General	\$	180,000	\$	230,000																		
FW - Facilities	722	Fire Station #2 Demolition	Fire station #2 is in need of demolishing the building to make way for new fire station and new driveway/apron. Station 2 is approx. 5.88 square feet. Possibility of CDBG using City currently available funds.	PPF0462	Community Safety, City Facilities	10	General	\$	50,000																				
FW - Transit	41	Emergency Traffic Signal Repair and Inspection	City currently maintains 17 traffic signals and funding is needed for emergency signal repair/replacement due to traffic accidents, disaster, etc. Replacing a fully equipped traffic signal costed costs approx. \$300, replacing a signal post costs \$120. The state-maintained traffic signal stations which are 20 years old, need to be replaced with ground mounted signals approx. \$480 per intersection.		Sustainability	10	General	\$	100,000																				
FW - Transit	48	Seismic Drive Resurfacing	City wants to have a 100% year for resurfacing Seismic Drive from above road to University Drive.			10	General	\$	100,000																				
FW - Transit	800	Seismic Drive Transportation and Improvement Project	Over 1000 traffic signs change. Traffic signal timing are not updated routinely to reflect traffic changes, traffic signals are not be coordinated routinely to adjust timing. This project will lower the traffic signals synchronized to systems traffic flow and include installation of leading pedestrian indicators where warranted. City, San Bernardino and San Diego every 3 years and average of signals annually, anticipated by FY2027 through 2032.	TS 021	Multi Modal Transportation	10	General	\$	121,000	\$	106,000	\$	111,000																
FW - Transit	476	Shelburne Bus Stop/Airspace Improvements	The project continues to improve bus stop facilities through the City based on the findings. Plan completed in 2024. Funding will occur over a six-year period. New recommendations will result from the 2023 Transit Strategic Plan and be implemented.	TS 022	Multi Modal Transportation	7	General	\$	330,000																				
FW - Transit	754	Transit Intermodal Station	The City of Los Angeles became the direct recipient of Federal and state transit funds on October 1, 2023. Currently the City does not have a transit facility to enable local and regional transit service connections for residents. The Transit Intermodal facility will improve a head-point for transit services and other modes of transportation in the City of Los Angeles and connect to regional, provide location in a transit facility building or downtown area. First year of funding for a facility, FY2024. Second year of funding for design and property purchase, 3rd year of funding for construction.		Multi Modal Transportation	6	General			\$	100,000	\$	500,000			\$	2,000,000												
FW - Transit	761	Transit Maintenance and Administration Facility	Masterpiece facility for transit rolling stock and office space for administration. Federal Transit Administration capital improvement grant funds to be leveraged with local funds.		Multi Modal Transportation	4	General								\$	200,000	\$	2,000,000											
General Fund Grand Total									\$	14,663,000	\$	20,538,000	\$	155,148,000	\$	33,326,000	\$	14,350,000	\$	11,647,000	\$	17,244,000	\$	15,493,000	\$	8,120,000	\$	35,500,000	
Potential Future Bond/TRI/Other Funding											\$	500,000	\$	139,400,000	\$	3,100,000	\$	-		\$	3,000,000	\$	-		\$	-		\$	-
New General Fund Grand Total Less Other Funding									\$	14,663,000	\$	20,538,000	\$	155,148,000	\$	30,226,000	\$	14,350,000	\$	8,647,000	\$	17,244,000	\$	15,493,000	\$	8,120,000	\$	35,500,000	
Impact Fee Eligible Project																													
Water	24	Centenary Rd 12" Water Main 1/4 of Old Bay	Install a 12" water main in Centenary Road from the existing 12" water main at the Marine School to the water main at Old Bay. Project is in Centenary Road. Funding year. Acquisition is under pending legal action, construction in third funding year. Project will be impact fees. (Available, NARR002)	LIC0026	3	Water 1		\$	200,000	\$	450,000																		
Water	775	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
Water	822	Centenary Rd 12" Water Main 1/4 of Old Bay	Extend a 12" water main along Centenary Road from the intersection of Old Bay Road to the intersection of 17th Street. Customers are in the Old Bay CEN but are currently being fed by Centenary Road water main.	LIC0026	10	Water 1	\$	800,000	\$	700,000																			
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7

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Water	522	Am Little Water Improvements	Replacement of undersized water mains in New Views Phase Two Improvements, 4,000' of 12" and 18" LVC in Lane 6 connecting Village LRP Station 104 to the existing. The existing mains are undersized and deteriorating and require weekly maintenance. The area is wet in the City beds but is in the water service area. City water comes to residential MARIAGE.	EPF1202	Water	1	Water		\$ 400,000		\$ 2,000,000							
Water	59	Lane 5, Waterline Crossing	Replace existing 12" waterline crossing at Lane 5, and 1000' with new 18" waterline.	LVC1205	Water	3	Water				\$ 150,000			\$ 600,000				
Water	42	North Side 12in Waterline Connection	Extended 12" water main 2000' from Village Development to 12" water main at the Fire Training facility along DP 21. MARIAGE. Needs to be used until waterline provides water main extension through Fire development.	LVC1205	Water	3	Water				\$ 500,000		\$ 200,000	\$ 1,500,000				
Water	602	Old Baiting Fire Pump to Firehouse	Install 1" Fire line existing temporary 12" Fire line Old Baiting Fire Pump to Firehouse Lane 100.	LVC1205	Water	3	Water				\$ 400,000		\$ 200,000			\$ 2,000,000		
Water	706	Old Baiting Fire Pump Connection to Firehouse	Connect 12" Fire line Old Baiting Fire Pump to Firehouse Lane 4, 2000'.	LVC1205	Water	3	Water				\$ 100,000		\$ 100,000	\$ 500,000				
Water	623	Converse 12" Water Main Line	Converse 12" Water main line to provide a remote feed to Converse area. (MARIAGE) Fire Pump Road from Old Baiting Fire Line 120. Currently we serve the subdivision with only one 12" water main along Hwy 120. Not having the ability to feed from a different source can become an issue if we have breaks or shuttles on Hwy 120. Approx. 2000'.	LVC1205	Water	3	Water	\$ 150,000			\$ 700,000							
Water	475	Medicaid Water System Expansion	Expansion of the recirculated water system for additional phases throughout various portions of the City including aquatic, storage and recovery. System to recirculate water phase.	EPF1204 LVC1205 LVC1205	Water	3	Water	\$ 300,000			\$ 700,000		\$ 6,000,000					
Water	338	Highways to Great Oaks Drive	Connect McCarty Damaging to 600' phase in Highway with 12" W1. MARIAGE.	LVC1205	Water	3	Water				\$ 650,000			\$ 2,000,000				
Water	634	Trails and Water Line Extension to Blazing Trail	Extend 12" water line from Blazing Trail South East corner to Trails end to feed Blazing Trail. 4000' of 12" waterline.	LVC1205	Water	3	Water	\$ 400,000			\$ 1,000,000							
Water	833	Transportation Line 12" Water	Extend 12" water main 4000' along Transportation Line from Firehouse Road to Converse Road near Water Main Plant. The location will need to be coordinated with Development as they extend roadway.	LVC1205	Water	3	Water				\$ 200,000		\$ 200,000	\$ 800,000				
Water	665	Frank Hill Pump	Pump at Frank Hill to fill the tank and deliver to 200' pressure plant. 2000 LPM MARIAGE.	LVC1205	Water	3	Water							\$ 2,000,000				
Water	739	University Dr Water replacement 24" after 5 seasons	Install approximately 1,400 feet of 24" water main along University Drive from 10th Ave to the Seasonal Check Square Station 100. This will replace an existing 12" water main installed in the 1980s that has suffered several breaks in recent years. The existing main is within the five percent of all water mains with the highest consequences of failure.	LVC1205	Water	4	Water	\$ 225,000			\$ 800,000							
Water	248	Water Improvements	Water mains to repair.	EPF1202	Water	50	Water	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Water	269	Water Main Overhaul	Finalize the remaining water mains to completion with development.	LVC1205	Water	30	Water	\$ 150,000			\$ 500,000		\$ 150,000		\$ 100,000		\$ 100,000	
Water	290	Water Main Plan	Finalize water system current and future needs and opportunities based on GIS/SCADA/RTU/SCADA.	LVC1205	Water	30	Water				\$ 500,000				\$ 500,000			
Water	251	Water Pump Station Improvements	Systemic repair, replacement and upgrade of water pump station.	EPF1202	Water	30	Water	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Water	267	Water System Improvements	On-going effort to repair, replace, and add water valves and hydrants throughout system, and make emergency repairs.	LVC1205	Water	30	Water	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Water Fund Grand Total									\$ 15,800,000	\$ 11,500,000	\$ 13,700,000	\$ 25,100,000	\$ 6,965,000	\$ 9,715,000	\$ 6,830,000	\$ 6,820,000	\$ 6,470,000	\$ 1,550,000
Impact Fee Projects Total									\$ 11,300,000	\$ 2,100,000	\$ 2,250,000	\$ 12,000,000	\$ 4,450,000	\$ 1,150,000	\$ 2,500,000	\$ 2,150,000	\$ -	\$ 150,000
Wastewater	576	Blanco River Village LRP Station 104 and City and Village LRP Station 104	This project WWP#911 consists of decommissioning the Blanco River Village LRP Station 104 and City and Village LRP Station 104. This project also consists of the construction of high capacity mains to replace wastewater flow from the decommissioned 104 station to the proposed 24 inch wastewater main WWP# 912.	EPF1204	Wastewater	3	Wastewater						\$ 140,000	\$ 700,000				
Wastewater	422	Blanco Terrace LRP Station 20 Rehab	Install 18" culvert 100' due to conditions. WWP #912. May require with other WRP station projects.	EPF1204	Wastewater	3	Wastewater		\$ 90,000	\$ 200,000								
Wastewater	654	Highway 10, Wastewater Improvements	Sewer Main along Highway, Allen, and Peltier is severely deteriorated based on recent sewer investigations. Some of the sewer mains are also identified as high risk based on sewer management risk assessment.	LVC1205	Wastewater	2	Wastewater				\$ 150,000		\$ 800,000					
Wastewater	584	Highway Creek 12 inch, 24-inch, and 36 inch Wastewater Main	This project consists of constructing a new 12-inch, 24-inch, and 36-inch wastewater main from State Highway 21 to Peltier Road, along Highway Creek to the proposed Highway 1010 Station (WWP# 913). This project also consists of the existing 18-inch flow main from the Gary City LRP Station and 36-inch flow main from the Blanco River Village LRP Station into the proposed 24-inch wastewater main near the intersection of State Highway 21 and Old Baiting Highway. (WWP# 912)	LVC1205	Wastewater	3	Wastewater		\$ 3,000,000				\$ 14,000,000					
Wastewater	513	Highway 10 LRP Station 104	This project consists of adding an additional pump to the Highway 10 LRP Station per WRP #912.	EPF1204	Wastewater	3	Wastewater						\$ 130,000	\$ 600,000				
Wastewater	625	Highway Trailers Neighborhood Wastewater Improvements	Sewer Mains throughout the Highway Trailers Neighborhood and surrounding Highway 10 are severely deteriorated based on recent sewer investigations. Some of the sewer mains are also identified as high risk based on sewer management risk assessment.	LVC1205	Wastewater	2	Wastewater		\$ 700,000				\$ 3,700,000					
Wastewater	97	1010 LRP to Wastewater WRP Improvements	Use trenchless technology to rehabilitate existing wastewater line along 1010 LRP to WRP station. Existing lines in Town will be rehabilitated as well. Approx. 1000' of total 48" Wastewater line also Town needs to be updated to 48" from and 48" Wastewater line along 1010 needs to be updated to 48" from according to the Wastewater Master Plan.	LVC1205	Wastewater	1	Wastewater	\$ 650,000			\$ 1,400,000							
Wastewater	838	MRI to Wastewater Improvements	Sewer Main along MRI from Aquapure Springs to 1010 and, and surrounding streets (Extended, Alameda) are severely deteriorated based on recent sewer investigations. Some of the sewer mains are also identified as high risk based on sewer management risk assessment.	LVC1205	Wastewater	2	Wastewater		\$ 200,000				\$ 1,100,000					

APPENDIX H: CAPITAL IMPROVEMENT PROJECTS

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Wastewater	817	Wilshire Street Wastewater Improvements	The sewer main in the Wilshire Street neighborhood from Robert Dr. to Thorpe Dr. is severely deteriorated based on recent sewer investigations. Some of the sewer main is also identified as high risk based on sewer investigation risk assessment.			10	Wastewater	\$ 130,000			\$ 800,000							
Wastewater	818	San Antonio St. Wastewater Improvements	Sewer main along San Antonio St. from Navea St. to Alameda St. and surrounding streets (Franklin, Scott) are severely deteriorated based on recent sewer investigations. Some of the sewer main is also identified as high risk based on sewer investigation risk assessment.			2	Wastewater			\$ 250,000			\$ 1,300,000					
Wastewater	819	Upper Blanca River 24-inch Wastewater Transfer Interceptor	The project consists of installing a 24-inch wastewater interceptor starting at State Highway 25. This project also includes the construction of a 22-inch force main that convey wastewater flow from (2,423 to the proposed 24-inch wastewater Interceptor, WANNPCE.	LU2.05		3	Wastewater						\$ 950,000		\$ 4,700,000			
Wastewater	820	Wastewater Collection Improvements	Minor operation projects to repair or replace deteriorating wastewater infrastructure, add detectors, install monitoring equipment, etc.	EPW 820		10	Wastewater	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Wastewater	844	Wastewater Improvements	Minor engineering projects to repair or replace deteriorating wastewater infrastructure, add detectors, install monitoring equipment, etc.	EPW 820		10	Wastewater	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Wastewater	845	Wastewater LR Station	Operational systematic upgrade of existing wastewater LR stations.	EPW 820		10	Wastewater	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000	\$ 150,000
Wastewater	846	Wastewater Master Plan Update	A year update, evaluate system needs and identify future projects.	EPW 820		10	Wastewater	\$ 600,000						\$ 1,000,000				
Wastewater	847	Wastewater Conveying	The project consists of either a new facility or expanding the existing wastewater treatment facility from an annual average daily flow (AADF) of 2.0MGD to an AADF of 3.0MGD, while increasing the peak 3-hour capacity from 32.0MGD to 45.0 MGD. (WANNPCE)	LU2.05		10	Wastewater	\$ 100,000		\$ 17,500,000								
Wastewater Fund Grand Total									\$ 30,800,000	\$ 11,805,000	\$ 27,340,000	\$ 25,770,000	\$ 19,900,000	\$ 5,885,000	\$ 9,452,000	\$ 3,930,000	\$ 4,840,000	\$ 1,225,000
Impact Fee Eligible Wastewater Projects Total									\$ 25,000,000	\$ 4,000,000	\$ 17,500,000	\$ 13,000,000	\$ 10,000,000	\$ -	\$ 4,700,000	\$ -	\$ -	\$ -
Stormwater	848	Stormwater Improvements	Various types (sewer) from 10 to 20 ft deep. This project will only move forward if federal money supports the project.	EPW 824	Stormwater	4	Stormwater						\$ 50,000,000		\$ 30,000,000			\$ 10,000,000
Stormwater	849	San Antonio Street Stormwater Imp.	The project of stormwater drainage basins primarily reported on Clark Street, Clark Court and along Franklin. The project consists runoff from the City Cemetery and through the Franklin Park subdivision and addresses the collapsed sewer pipe at Clark Street Elementary. Proposed recommendations were identified from the San Antonio Strategic Improvement (SIP) 2020 Stormwater Management including replacement of an existing collapsed 48" RCP at Clark Street Elementary and new storm drain at Clark Street and Franklin.	EPW 824	Stormwater	5	Stormwater		\$ 250,000	\$ 100,000	\$ 2,000,000							
Stormwater	850	Downstream Street/Code Water Quality Plan Implementation	Water quality features downstream from Glenside study in 2015. Funding over multiple years to improve other grant funds. Possible features include City Hall at Franklin St., Glenside and 10th St. Crossing, S. Glenside and 10th St. Crossing, S. 10th St. and 10th St. crossing, City Hall at Franklin St., City Library Parking Lot, City Municipal Parking Lot, Alameda between Franklin, S. Glenside and Franklin Street, San Antonio St. and 10th St.	EPW 824	Stormwater	4	Stormwater						\$ 100,000	\$ 100,000	\$ 100,000			
Stormwater	851	Wilshire Stormwater Imp.	Infrastructure project to include flooding to events up to 10 years in future. Neighborhood including reconstruction of Lugo Street, Pinar and Franklin streets to upgrade the street and install storm cover with a drainage in the future (EMPA).	EPW 824	Stormwater	4	Stormwater			\$ 100,000	\$ 1,000,000							
Stormwater	852	Lower Clark Stormwater Improvements	Improvements to neighborhood storm water at the intersection of Clark and Clark. Removal of four old area sites and installation of a 48" RCP headwall. Includes existing 48" RCP with 48" RCP. Also need to install 24" RCP at Clark Street. Additional work does not include street widening of 2 lanes.	EPW 824	Stormwater	4	Stormwater						\$ 50,000	\$ 200,000				
Stormwater	853	Land Acquisition for Future Detention/WQI Flood Storage	WQI Flood Storage facility for future stormwater detention, water quality, and flood storage improvements.	EPW 824	Stormwater	4	Stormwater	\$ 1,000,000					\$ 500,000		\$ 500,000			
Stormwater	854	Wilshire Stormwater Ph. 2	WQI Flood Storage facility for future stormwater detention, water quality, and flood storage improvements.	EPW 824	Stormwater	4	Stormwater						\$ 400,000		\$ 1,000,000			
Stormwater	855	Wilshire Spring Creek Road Bridge Replacement	Wilshire Spring Creek Road water crossing. Results during frequent rainfall events. New bridge at Middle Street at Wilshire Spring Creek. (EMPA)	EPW 824	Stormwater	4	Stormwater						\$ 200,000		\$ 700,000			
Stormwater	856	Downstream Master Plan Update	Update the City's Downstream Master Plan, including the project area to maintain a five year return frequency rainfall improvements that meet growth.	EPW 824	Stormwater	10	Stormwater						\$ 1,000,000					\$ 1,000,000
Stormwater	857	WQI Flood Storage	WQI Flood Storage facility for future stormwater detention, water quality, and flood storage improvements.	EPW 824	Stormwater	4	Stormwater						\$ 300,000		\$ 1,000,000			
Stormwater	858	Wilshire Addition Office Drainage Imp.	Office drainage improvements are required to avoid flooding in Wilshire Addition neighborhood. The existing Clark Street drainage well as Clark Street ditch including culverts do not have adequate capacity to convey 25 year fully developed storm event without backing up of Clark Street and resulting in street flooding up into the neighborhood. Case Channel improvements, culverts updating and Clark Street ditch. However the proposed culvert under Franklin Road and a channel along 10th has already property is required to contain 25 year fully developed storm. The proposed improvements will eliminate surface runoff and flooding issues currently experienced in the neighborhood. Dependent on Board Approval at December 2022. Yearly Water Development Board (WDB) Flood Infrastructure Funding (FIF) program will provide 21.7MM in 2024 and 24.0MM in FY 2025 Financing.	EPW 824	Stormwater	8	Stormwater		\$ 7,325,000	\$ 4,200,000								
Stormwater Fund Grand Total									\$ 7,750,000	\$ 12,860,000	\$ 22,450,000	\$ 11,765,000	\$ 17,050,000	\$ 6,825,000	\$ 47,135,000	\$ 6,730,000	\$ 12,000,000	\$ 98,600,000
Electric	859	Zone 2 P&S UG Conversion	Zone 2 P&S is going to be redesigned and this project will cover the cost of the conversion not covered by the developer. Plans include to convert five customers' existing and requested transformers to be powered by a 240-volt single-phase.			10	Electric			\$ 600,000								

9

FY 2024-2033 10 Year CIP Project List

8/1/2023

Category	Project ID	Project Name	Project Description	Comp Plan Goals	Strategic Initiative	Total Rank	Funding Source	Previously Approved Funding	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Electric	821	Hilltop 12 Transformer Replacement	The results of our Master Plan calls for an expansion of Hilltop Substation in FY 2025 due to growing customer loads. The way we move this project forward if there is a rapid increase of load around the Downtown area. First year of funding for design and to purchase transformer. Second year of funding for construction.			10	Electric	\$ 2,000,000			\$ 1,000,000							
Electric	822	Hilltop 121 Substation	Downtown Substation is near capacity and cannot be expanded. The utilities Department would like to build a new gas insulated substation near the dog park on Franklin. An additional substation in this area would allow more of access to existing existing needed in the Downtown area. Due to the lack of available space in the area a 121 substation was considered because the footprint is much smaller than a standard substation. Location is dependent on City Hall projects.			10	Electric	\$ 1,000,000			\$ 7,000,000							
Electric	826	Hilltop Substation 12 Transformer Replacement	The results of our Master Plan calls for an expansion of Hilltop Substation in FY2028 due to growing customer loads. The way we move this project forward if there is an increase of large industrial loads in the area around Hilltop Substation.			5	Electric						\$ 1,000,000					
Electric	834	Reduced 120 Transformer	The reduced 120 circuit needs to be upgraded to provide for the growing loads in the area.	LU2.05		10	Electric	\$ 230,000	\$ 1,500,000									
Electric	828	San Antonio Substation Electric	San Antonio Substation has an electrical overhead infrastructure that is over 50 years old. Converting the substation to underground is financially feasible, creates a more reliable and animal proof system.			10	Electric	\$ 700,000	\$ 3,500,000	\$ 3,000,000								
Electric	749	Underground Electric Conversion	Annual funding amount for underground electric conversion to be available for addressing infrastructure to support future projects development, but for which the developer is not responsible to complete.	LU2.05		10	Electric	\$ 2,300,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 200,000
Electric	44	Zone 2 Pole Replacement	This project will replace 120 (254000 per pole) power poles that are damaged or nearing Zone 2. Zones were designated based on tree trimming efforts. South of Old Branch Road St. Hilltop, University St. Park Road.			10	Electric		\$ 700,000									
Electric	46	Zone 4 Pole Replacement	This project will replace 120 (254000 per pole) power poles that are damaged or nearing Zone 4. Zones were designated based on tree trimming efforts. W. McCarty Lane, Windsor Road, Banner Drive, Del Rio, Latham.			10	Electric		\$ 700,000									
Electric	47	Zone 5 Pole Replacement	This project will replace 120 (254000 per pole) power poles that are damaged or nearing Zone 5. Zones were designated based on tree trimming efforts. S. McCarty Lane, Medical Parkway, New Rd, Applegate Spring St.			10	Electric				\$ 700,000							
Electric Fund Grand Total									\$ 7,940,000	\$ 8,645,000	\$ 10,900,000	\$ 3,425,000	\$ 8,205,000	\$ 6,825,000	\$ 4,825,000	\$ 2,000,000	\$ 9,670,000	\$ 200,000
Grand Total									\$ 14,490,000	\$ 22,510,000	\$ 38,240,000	\$ 31,195,000	\$ 24,105,000	\$ 11,647,000	\$ 17,244,000	\$ 11,631,000	\$ 11,121,000	\$ 10,500,000
Stormwater Total									\$ 13,600,000	\$ 11,920,000	\$ 17,700,000	\$ 21,150,000	\$ 4,950,000	\$ 7,115,000	\$ 8,910,000	\$ 6,470,000	\$ 6,470,000	\$ 1,500,000
Wastewater Total									\$ 30,800,000	\$ 11,805,000	\$ 27,340,000	\$ 25,770,000	\$ 19,900,000	\$ 5,885,000	\$ 9,452,000	\$ 3,930,000	\$ 4,840,000	\$ 1,225,000
Stormwater Total									\$ 7,150,000	\$ 11,960,000	\$ 17,450,000	\$ 17,700,000	\$ 4,950,000	\$ 7,115,000	\$ 8,910,000	\$ 6,470,000	\$ 6,470,000	\$ 1,500,000
Electric Total									\$ 1,040,000	\$ 8,645,000	\$ 9,950,000	\$ 3,425,000	\$ 4,255,000	\$ 6,825,000	\$ 4,825,000	\$ 2,000,000	\$ 9,670,000	\$ 200,000
Total All Funds									\$ 77,035,000	\$ 65,440,000	\$ 229,010,000	\$ 95,390,000	\$ 62,470,000	\$ 40,967,000	\$ 85,494,000	\$ 32,073,000	\$ 41,100,000	\$ 137,075,000
Grand Total									\$ 14,490,000	\$ 22,510,000	\$ 38,240,000	\$ 31,195,000	\$ 24,105,000	\$ 11,647,000	\$ 17,244,000	\$ 11,631,000	\$ 11,121,000	\$ 10,500,000
Stormwater Total									\$ 13,600,000	\$ 11,920,000	\$ 17,700,000	\$ 21,150,000	\$ 4,950,000	\$ 7,115,000	\$ 8,910,000	\$ 6,470,000	\$ 6,470,000	\$ 1,500,000
Wastewater Total									\$ 30,800,000	\$ 11,805,000	\$ 27,340,000	\$ 25,770,000	\$ 19,900,000	\$ 5,885,000	\$ 9,452,000	\$ 3,930,000	\$ 4,840,000	\$ 1,225,000
Electric Total									\$ 7,150,000	\$ 11,960,000	\$ 17,450,000	\$ 17,700,000	\$ 4,950,000	\$ 7,115,000	\$ 8,910,000	\$ 6,470,000	\$ 6,470,000	\$ 1,500,000
Grand Total									\$ 77,035,000	\$ 65,440,000	\$ 229,010,000	\$ 95,390,000	\$ 62,470,000	\$ 40,967,000	\$ 85,494,000	\$ 32,073,000	\$ 41,100,000	\$ 137,075,000

10



APPENDIX I GREEN INITIATIVES AND RESILIENCY TOOLKIT

APPENDIX I: GREEN INITIATIVES AND RESILIENCY TOOLKIT

Overview..... 1

OVERVIEW

This toolkit outlines various policy actions and practices that the City of San Marcos may consider as it continues to identify and prioritize green initiatives throughout the community. The city is committed to promoting resilience in its mitigation actions. Community resilience will enhance the ability of the city to adapt to changing conditions and withstand and recover rapidly from natural disasters.

Table I-1. Green Initiatives – Energy Resilience and Carbon Reduction

GREEN INITIATIVES THEME	POLICY / PRACTICE	ACTION ITEM
Energy Resilience and Carbon Reduction	Practice	Invest in solar infrastructure for public facilities and promote commercial and residential solar initiatives.
Energy Resilience and Carbon Reduction	Practice	Continue energy planning between the city, key energy stakeholders, and the public to ensure continued collaboration towards carbon reduction goals.
Energy Resilience and Carbon Reduction	Practice	Evaluate and implement energy storage and load shifting technologies to support efforts to develop a more resilient grid to maximize the penetration of renewable generation.
Energy Resilience and Carbon Reduction	Policy	Assess the long-term economic viability and effectiveness of alternative and increasingly cleaner fuels for existing buildings, and where optimal, propose programs that promote and incentivize their adoption and continued development.
Energy Resilience and Carbon Reduction	Practice	Provide benchmarking and reporting tools, such as EPA's Energy Star Portfolio Manager, to property owners.
Energy Resilience and Carbon Reduction	Practice	Increase efficiency in other energy intensive industries with greywater recycling systems and automated metering, and alternative solutions for landfill waste.
Energy Resilience and Carbon Reduction	Policy	Improve the proper enforcement of codes through comprehensive education (technical requirements and benefits of energy efficiency) for code enforcement officials and users.
Energy Resilience and Carbon Reduction	Policy	Develop a Zero Net Energy (ZNE) definition that will be incorporated into the Unified Development Code (UDC).

APPENDIX I: GREEN INITIATIVES AND RESILIENCY TOOLKIT

GREEN INITIATIVES THEME	POLICY / PRACTICE	ACTION ITEM
Energy Resilience and Carbon Reduction	Policy	Identify and allocate funding towards energy efficiency / green building programs working towards the goal of reduced energy consumption in buildings.
Energy Resilience and Carbon Reduction	Practice	Develop education programs and offer incentives or pay-as-you-throw models around reduced-landfill waste practices and encourage the reuse of construction waste and building materials.
Energy Resilience and Carbon Reduction	Practice	Incentivize local manufacturers and makers who develop solutions to extend product life spans, utilize manufacturing by-products and recycle products for local solutions.
Energy Resilience and Carbon Reduction	Policy	Work with businesses to accelerate commercial recycling efforts and incentivize zero-waste facilities and businesses.
Energy Resilience and Carbon Reduction	Practice	Provide education and training on how to increase energy efficiency through retrofits for aging and historic homes.

Table I-2. Green Initiatives – Transportation Infrastructure and Fleet Improvements

GREEN INITIATIVES THEME	POLICY / PRACTICE	ACTION ITEM
Transportation Infrastructure and Fleet Improvements	Practice	Invest in new electric vehicle charging infrastructure where applicable.
Transportation Infrastructure and Fleet Improvements	Practice	Assess the barriers to electric vehicle ownership, with a priority focus on equity.
Transportation Infrastructure and Fleet Improvements	Practice	Increase public transportation efficiency through rapid transit routes.
Transportation Infrastructure and Fleet Improvements	Policy	Explore the development of vehicle-free zones with Transit-Oriented Development and affordable housing.
Transportation Infrastructure and Fleet Improvements	Practice	Explore bike / pedestrian mobility routes e.g., sidewalks and bike lanes, and implement the Complete Streets Ordinance.
Transportation Infrastructure and Fleet Improvements	Policy	Develop standards for connectivity and walkability in all neighborhoods and audit existing developments for potential.

APPENDIX I: GREEN INITIATIVES AND RESILIENCY TOOLKIT

Table I-3. Green Initiatives – Development of Land and Structures

GREEN INITIATIVES THEME	POLICY / PRACTICE	ACTION ITEM
Development of Land and Structures	Policy	Consider Green Space Development Requirements.
Development of Land and Structures	Practice	Promotion of drought tolerant landscaping that supports water conservation, including xeriscaping and, the use of native plants.
Development of Land and Structures	Policy	Incentivize a market for local compost and mulch for landscaping uses.
Development of Land and Structures	Practice	Incentivize development that meets minimum metrics for density, connectivity, and affordability.
Development of Land and Structures	Policy	Strengthen and explore financial incentives to support building reuse.
Development of Land and Structures	Policy	Update guiding planning documents like Stormwater and Parks Master Plans incorporating resilience and nature based solutions.
Development of Land and Structures	Practice	Promote Open Space preservation and audit of tree canopy coverage in urban areas.
Development of Land and Structures	Policy	Develop design standards for sustainable building materials used for public facilities.

The actions outlined in this toolkit provide a starting point for green initiatives the city can consider as it seeks energy resilience, transportation and land development sustainability and adaptation practices. When enhancing infrastructure resilience throughout the city there are seven qualities to consider:

- Reflectiveness
- Resourcefulness
- Robustness
- Redundancy
- Flexibility
- Inclusiveness
- Integration

These qualities can create redundancy and robustness of current infrastructure systems including water / wastewater, electric, telecommunications and broadband; integrating flood risk reduction measures and evaluate opportunities for drought management co-benefits; diversify energy sources and increase the flexibility of the city's energy grid with renewable or other carbon-free resources. Striving to achieve these qualities in the infrastructure and systems throughout the city can help ensure continuity of critical services, enhanced protection to natural and man-made assets and reliable communication and mobility for effective emergency response and overall community resilience.